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The Volcanism Ontology (VO): Semantic Modeling of Volcanic Eruptions and Volcanoes

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THE VOLCANISM ONTOLOGY (VO): SEMANTIC MODELING OF VOLCANIC ERUPTIONS
AND VOLCANOES

By

JOHN MYER

Under the Direction of Hassan Babaie, PhD

ABSTRACT

We have modeled the complex material and process entities and properties of volcanic eruptions and structures in the Volcanism Ontology (VO) applying several top-level ontologies such as Basic Formal Ontology (BFO), SWEET, and Ontology of Physics for Biology (OPB) within a single framework. The upper level framework separates the entities into investigative and volcanism entities, and each further separated into their own BFO framework. This allows for VO to be one of the best steps towards a domain ontology to cover the complexity found in volcanology. When deployed on the web, VO will be used to explicitly and formally annotate data and information collected by volcanologists based on domain knowledge. This will enable the integration of global volcanic data and improve the interoperability of software that deal with such data.

INDEX WORDS: Ontology, Ontology development OWL-Ontology Web Language, Volcanism, BFO, Continuant, Occurrent, Volcanic eruption, Protégé

THE VOLCANISM ONTOLOGY (VO): SEMANTIC MODELING OF VOLCANIC ERUPTIONS
AND VOLCANOES

by

JOHN MYER

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of

Master of Science

in the College of Arts and Sciences

Georgia State University

2018

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2018

THE VOLCANISM ONTOLOGY (VO): SEMANTIC MODELING OF VOLCANIC ERUPTIONS
AND VOLCANOES

by

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Georgia State University

June 2018

DEDICATION

With love and appreciation to my family, parents Deborah McCarty and John Rea Myer, and brothers, Peter, Benjamin, and Patrick. Additional appreciation to friends, both within and outside the graduate program circle, who have continued to support me with their love and encouragement.

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CHAPTER 1 INTRODUCTION

The collection of observations and measurements known as data is one of the major foundational components of science. The collection, size, storage, and processing of data have expanded with new technology, leading to the concept of big data. The size, rate of production, and type of data have become so large and diverse that the ability to efficiently interpret data into new, useful knowledge is potentially beyond the limits of human capabilities (Sinha et al., 2010). To develop new knowledge, an agreed-upon semantics for terminology needs to be established so that the processing of data into information may be streamlined utilizing digital and network processing and interpretation. Inspired by its philosophical metaphysical counterpart, ontologies fulfill the role of defining terminology and inferring the connections between concepts that make up reality (Arp et al., 2015).

The goal of this thesis is the development of Volcanism Ontology (VO) that would include both material and process concepts utilizing the framework from Basic Formal Ontology as the foundation. The resulting framework is designed to be open-source and non-proprietary. The goal of building this ontology is to allow integration and annotation of volcanic data.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction to Ontology

Ontologies are computer-based artifacts that are designed to model a domain of knowledge in an attempt to represent reality. Ontologies are organized into a hierarchal taxonomy design with nodes of clearly defined concepts, known as classes, connected by relationships to other classes (Arp et al., 2015; Smith & Ceusters, 2010). Classes or “entities” (hereafter, all classes and properties mentioned in this thesis shall be marked as **Class** and **hasProperty**) are the representations of concepts within ontologies. Top-level concepts are the most generalized entities and terms (e.g., **Rock**, **Lava**) from which more specialized entities extend (e.g. **IgneousRock**, **RhyoliticLava**). Classes are the abstract ideas that are fundamental to the understanding of scientific knowledge and assumptions within the domain of knowledge, without which other terms could not be properly described (Smith, 2004). More specialized concepts and terms are typically broken down into subclasses (Arp et al., 2015) (e.g., the class **Olivine** is a subclass of the class **Mineral**). This may include tangible instances (objects) of the entities that may be described through observation and experimentation (e.g. Mt. St. Helens, a specific hand sample) (Smith & Ceusters, 2010). Association and relationships between entities are represented within ontologies as properties and subproperties. The most common relationship found in ontologies is the **isA** relation, which bridges classes, but many properties and relationships can be created to be used for all sorts of connections (Arp et al., 2015). For example, basalt is a type of igneous rock, which is a type of rock, so in the ontology, the class **Basalt** is related to the class **IgneousRock** and the **IgneousRock** class is related to the **Rock** class through the **isA** property (Figure 2.1).

2.2 Types of Ontologies and the Semantic Web

Since domains have few limits in terms of expansiveness and complexity of their nature, well-designed ontologies can serve as effective representations of the world (Horrocks, 2008). What’s more, ontologies can be built upon one another, creating extensible ontology libraries that may function together with other ontologies, or developed independently that may connect back to similar ontologies.

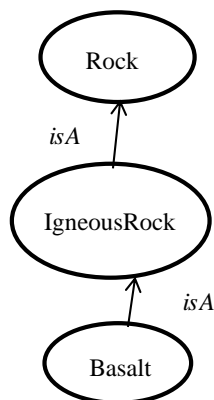


Figure 2-1: Class hierarchy showing the relationships between Basalt, IgneousRock, and Rock through the isA relation.

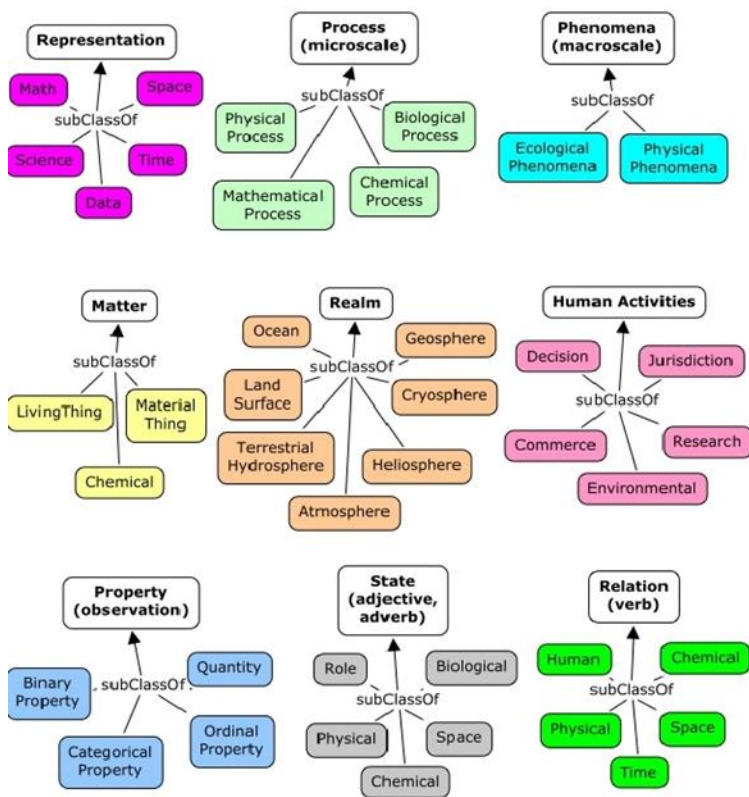


Figure 2-2: Various domains within the upper-level SWEET ontology (from Jet Propulsion Laboratory, 2010).

Ontologies are often broken down based on the broadness of their knowledge base. Upper-level ontologies cover broad terms and concepts, with less detail given to specific terms and concepts. An

example of an upper-level ontology would be the Semantic Web for Earth and Environmental Terminology (SWEET), upper level ontology, designed to cover a large range of terminology and concepts utilized within earth and environmental science disciplines (Figure 2.2) (Raskin & Pan, 2005). Given its broad basis, many of the concepts are undefined and have only basic relationships setup, often leading SWEET acting as a starting point for the creation of more specialized domain ontologies (Tripathi & Babaie, 2008). Domain ontologies cover a specific realm of knowledge, and are more detailed and thorough in their description than upper-level ontologies (Arp et al., 2015). An example of a more specialized domain is the hydrogeology ontology created by Tripathi & Babaie, which originally developed from SWEET and focusing specifically within the domain of hydrogeography (Tripathi & Babaie, 2008)

The most utilized ontologies are designed to be open-sourced and non-proprietary, allowing usage by developers and researchers to suit their needs, with the ability to work with other ontologies. In an effort to ensure that these knowledge bases are easily accessible, most of them are stored and manipulated online through the Semantic Web, a continually developing extension of the World Wide Web, where concepts are stored, accessed and shared with other computer systems and scientists, providing either new data or integrating with other geoinformatic systems (Berners-Lee, Hendler, & Lassila, 2001). The inference capabilities of ontologies and other knowledge bases make them efficient and reliable query systems that may provide important reasoning checks that can find inconsistencies, or reveal new connections between concepts that remained undiscovered (Horrocks, 2008).

2.3 Geoinformatics Ontology Development

Geoinformatics, the geoscience-branch of informatics, is the use of computer-aided knowledge engineering and schemas to create a truthful representation of reality related to Earth. The main concepts involved in the discipline include utilizing new digital tools and methods to collect data and developing web-assessable portals collecting wide range and variety of data points for easy access and sharing of knowledge from multiple disciplines to create and discover new knowledge. For the latter goal, ontologies

serve as the main way of collecting, sharing, and discovering knowledge, acting as a template for knowledge bases in specific domains (Sinha et al., 2010).

Within the span of several years, many disciplines in geosciences have developed or are in the process of developing their own ontologies, representing broad and narrow fields and domains (Babaie et al., 2013; DiGiuseppe et al., 2014; Scheuer et al., 2013; Tripathi & Babaie, 2008). Many of these are domain ontologies, focusing within a particular discipline or subdiscipline in sufficient detail (Arp et al., 2015). Projects such as San Andreas Fault Observatory at Depth (SAFOD) present brittle microstructural and rock mechanics data collected from cores of samples across the San Andreas Fault (Babaie et al., 2013). Utilizing their ability to define relations between ideas and terms, some ontologies have been developed solely for searching and finding GI services and related data catalogues across multiple brokers and heterogeneous datasets (Klien et al., 2006). As mentioned previously, SWEET has become the de-facto ontology library within the realm of geoinformatics given its broad range of topics and sufficient detail in concepts and relations (DiGiuseppe et al., 2014). Overall, Earth science has a strictly low number of ontologies developed compared to other fields, such as biomedicine (Arp et al., 2015).

2.4 Volcanology and Knowledge Engineering

Volcanology, like the rest of the geosciences, has just begun to make its knowledge represented into ontologies (Figure 2-3) (Pshenichny, 2014). Even with its early start, there have already been several developmental ontologies created for the field. McGuinness and colleagues have already established the groundwork for a reference ontology for volcano systems as one of the first detailed branches designed off of the Semantically-Enabled Scientific Data Integration (SESDI), one of the larger Earth science ontology libraries (Fox et al., 2006; McGuinness et al., 2007). Other ontologies have been done solely focusing on the volcanic hazards (Faaziati & Wantanabe, 2010).

One of the unique challenges developing ontologies and knowledge engineering of volcanology is the focus on events as well as objects. By their nature, ontologies are generally designed to describe objects that are static in their nature. Volcanology, however, also heavily relies on more event-based

knowledge, changing events that occur periodically or concurrently leading or preceding other events. To be useful, ontologies need to model both static material and structures as well as varied dynamic volcanic processes that occur during eruptions (Pshenichny, 2014). Given the larger focus on the development of static object-based ontologies, work is being done to develop classifications and methods that better describe dynamic event-based ontologies (Pshenichny & Mouromtsev, 2015). Opportunities to develop ontologies to cover static and dynamic knowledge (Babaie, 2011) are present and have a wide range of potential uses within volcanology, as well as other disciplines of science (Pshenichny, 2014).

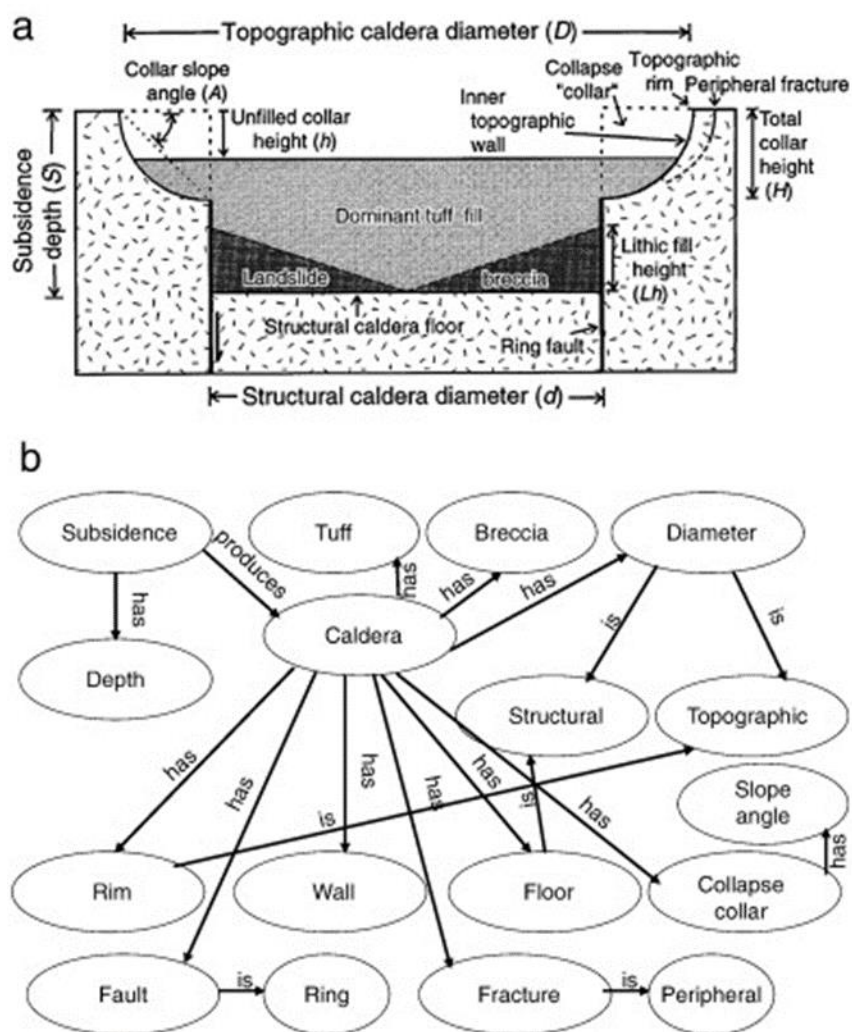


Figure 2-3: (a): Conceptual drawing of a caldera setting; (b): semantic graphic network of the same setting (from Pshenichny, 2014).

2.5 Basic Formal Ontology

Basic Formal Ontology (BFO) is an upper-level ontology created as a starting point for developing more specialized domain ontologies (IFOMIS, 2010). Being small and un-descriptive, BFO provides the beginning framework for expressing knowledge within the specialists' domain of interest (Figure 2-4). One of the unique aspects of BFO is that the ontology starts by dividing entities into "continuants" and "occurrents." Continuants cover entities that continue to exist as a whole through time, while occurrents cover entities which unfold over time, whether by occurrence or happening. Like other ontologies, terminology from an upper level ontology can be referenced and extended into other domain specific ontologies, allowing compatibility across multi disciplines and subdisciplines (Arp et al., 2015). BFO has been used extensively as a framework among many domains of science, both for upper-level ontologies and domain-specific (Figure 2-5). BFO is used extensively in bioinformatics, for example in upper level Ontology for General Medical Science (OGMS), that model continuant and occurrent concepts for the medical field (Scheuermann et al., 2009). From OGMS, many domain specific ontologies have been built as extensions, in particular the Infection Disease Ontology (IDO) that covers processes and concepts for infectious diseases (Cowell and Smith, 2010).

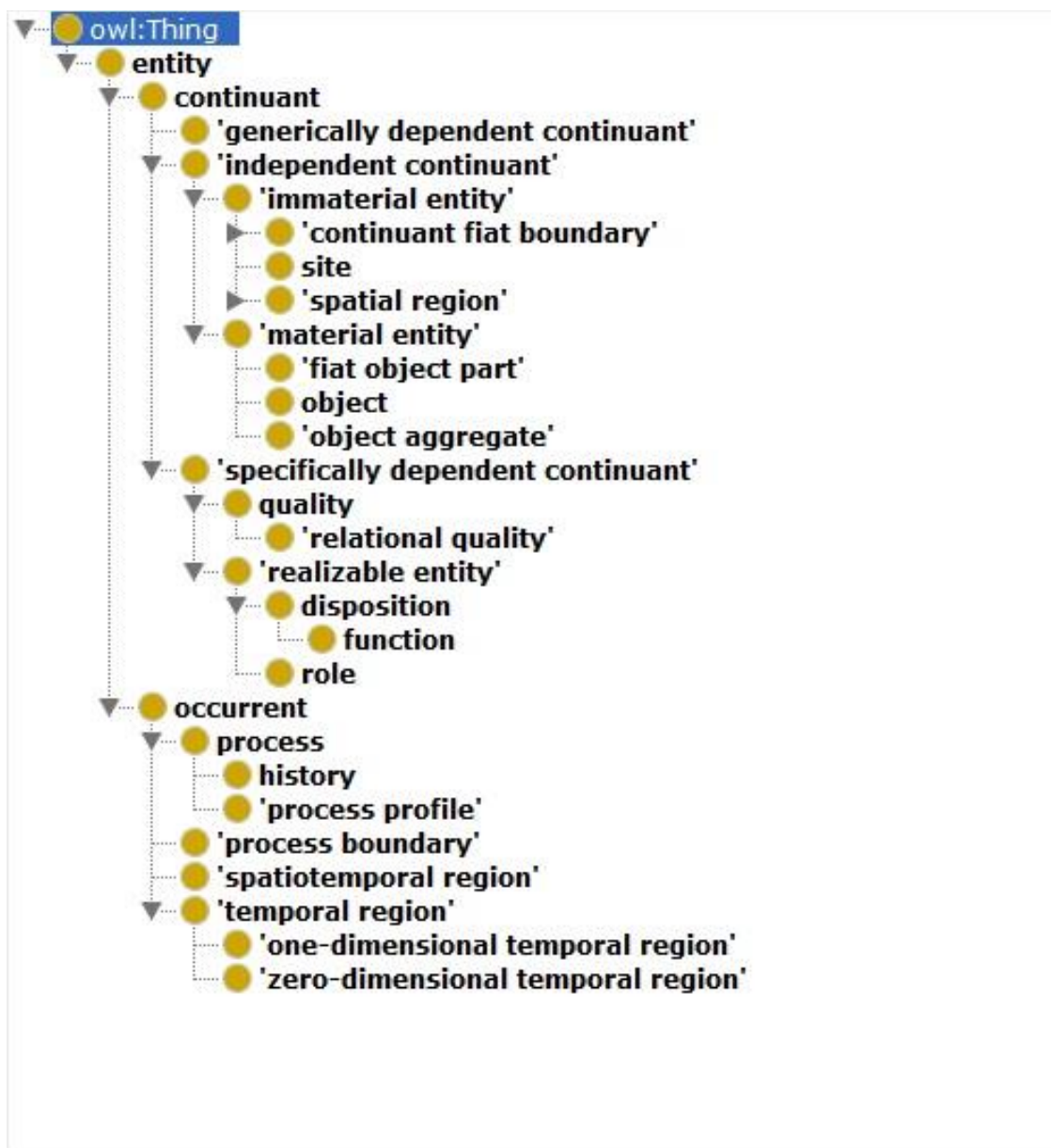


Figure 2-4: Class hierarchy of Basic Formal Ontology (BFO).

| | | |
|--|---|---|
| Ontology of Clinical Research | Ontology for Biomedical Investigations | Ontology for Drug Discovery Investigations |
| Ontology for General Medical Science | Ontology for Guiding Appropriate Antibiotic Prescribing | Ontology for Newborn Screening and Translational Research |
| Ontology for Mental Health and Quality of Life | Ontology of Biobanking Administration | Ontology for Parasite LifeCycle |
| Ontology for Rehabilitation (Traumatic Brain Injury) | Ontology of Data Mining | Ontology of Medically Related Social Entities |
| Ontology of Vaccine Adverse Event | Ontology-Based eXtensible Data Model | Oral Health and Disease Ontology |
| Parasite Experiment Ontology | Petrochemical Ontology | Phenotypic Quality Ontology |
| Plant Ontology | Population and Community Ontology | Proper Name Ontology |
| Protein-Ligand Interaction Ontology | Proteomics Data and Process Provenance Ontology | Protein Ontology |
| RNA Ontology | Saliva Ontology | Semantic HER |
| Senselab Ontology | Sequence Ontology | Sleep Domain Ontology |
| Semanticscience Integrated Ontology | Spatiotemporal Ontology for the Administrative Units of Switzerland | Special Nuclear Materials Detection Ontology |
| Subcellular Anatomy Ontology | Time Event Ontology | Translational Medicine Ontology |
| Universal Core Semantic Layer | Vaccine Ontology | Xenopus Anatomy Ontology |

Figure 2-5: A sample of the ontologies developed using BFO (from Arp et al., 2015).

2.6 Terminology

The following are definitions for terms that are used throughout this paper as related to this ontology.

Basic Formal Ontology (BFO): A top-level ontology based on the continuants and occurrents concepts.

Class: A term to describe the type of an entity within an ontology.

Continuant: an entity that persists (or continues) through time without changing into another entity. One of the main categories of BFO.

Domain: An area of knowledge within a scientific discipline that is modeled in an ontology.

Entity: Anything that exists; represented as a class within an ontology.

Individual: Instance of a universal entity. Within an ontology, they are related to a particular class.

Occurrent: an entity that changes (or occurs) over time. One of the main categories of BFO.

Ontology: A computer-based representation of knowledge, using a taxonomy of universals, defined classes, and relations between said classes to provide a model of reality.

Particular: A instance of a particular universal entity, e.g., Amazon river.

Property: representation of a relation within the ontology framework. Connects two or more classes together (Arp et al., 2015) (Amazon rivers drains water from South America to Atlantic Ocean).

Protégé: the main editing software program utilized to build and test ontology frameworks (Musen, 2015).

Relation: the manner for how two or more entities are connected.

Resource Description Framework (RDF): A programming language that allows relationships between entities to exist through a subject-predicate-object “triple” structure.

RDF Schema: (RDFS): An enhanced version of RDF that allows for properties to exist as the main relations between entities.

Semantic Web: an interconnected system that makes up the content of data and information from World Wide Web (WWW) pages. Allows machines to respond to complex queries.

Term: the word used to describe any concept that will be represented as classes within an ontology.

Top-level ontology: An ontology of highly general categories that are build more for specific domain ontologies.

Universal: A independent repeatable feature of reality (i.e. rock, olivine). A particular is an instance of a universal (a sample of rock, a sample of olivine).

Web Ontology Language (OWL): the major family of languages used for the Semantic Web; the main family of programming languages for ontologies (Arp et al., 2015).

CHAPTER 3 METHODOLOGY

The Volcanism Ontology (VO) was primarily developed utilizing the Protégé ontology development software, version 5.2.0 (Musen, 2015). The open-source software is the standard integrated development environment (IDE) used for developing domain ontologies, allowing other similar ontologies built with the program to be able to incorporate with this ontology (Figure 3-1) (Arp et al., 2015).

The resulting ontologies are designed based on Extensible Markup Language (XML), Resource Description Framework (RDF), RDF Schema (RDFS), and the Semantic Web's Web Ontology Language (OWL). These ontology languages are the formal languages for developing ontologies. XML is a basic machine readable format that has gained wide usage on the World Wide Web (WWW) and offers a basic schema and tagging system that is utilized in ontologies (W3C, 2016). RDF was created as a unifying language that could merge and create metadata regardless of the schema. Written in XML, RDF consists of a basic structure of subject-predicate-object (SPO), each of which is assigned a unique Internationalized Resource Identifier (IRI) (W3C Consortium, 2014a). The subject may be a concept or entity with an IRI (e.g., *Andesite*) or a blank node (an entity with no label). The object may be another entity, a blank node, or an actual instance or value (e.g. *ExtrusiveIgneousRock*). The subject is connected to the object through the predicate, representing the property sought to model (e.g., the 'isAnIntermediate' in the 'Andesite isAnIntermediate ExtrusiveIgneousRock' statement) (Horrocks, 2008). As another example, the subject, predicate, and object in the "Volcano erupts Lava" SPO statement are Volcano, erupts, and Lava, respectively. RDF Schema is a more vocabulary-focused extension of RDF that allows for more hierarchical structure of classes found in ontologies (W3C Consortium, 2014b). The Web Ontology Language (OWL) was developed as the standard for ontologies, focusing on processing the information content without the need to present information for human consumption (W3C Consortium, 2009). OWL achieves this by integrating similar frameworks and languages, including RDF and RDFS, and building upon them with its own framework (W3C OWL Working Group, 2012). Specifically, OWL has its logic basis in descriptive logic (DL), which allows

more flexibility by providing more information on concepts compared to languages like RDF and RDFS. This allows OWL to express universal and existential statements, cardinality, Boolean operators, equivalence assertions, and relational properties. An example of this in use are the equivalent classes *VolcanicArc* and *VolcanicChain*, which are both terms use to describe the same concept just within slightly different circumstances, with *VolcanicArc* being a subclass of *Arc*, and *VolcanicChain* being the more general class under '*VolcanicFeature*,' although both are subclasses of '*VolcanicFeature*' (Figure 3-2). Ontologies built in OWL have the advantages of being untethered to specific data or assumptions, and can run complex queries and inferences much easier than general relational databases (Arp et al., 2015).

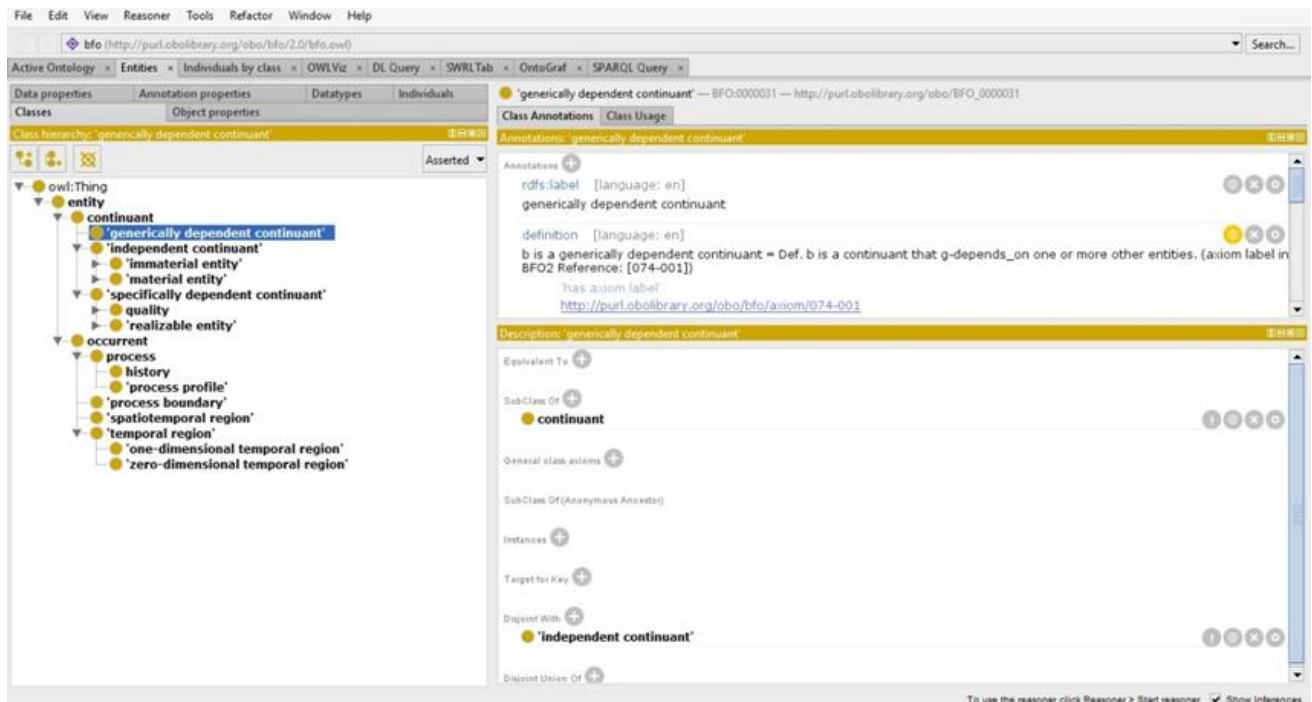


Figure 3-1: Screenshot of the Protégé software window showing the BFO class hierarchy.

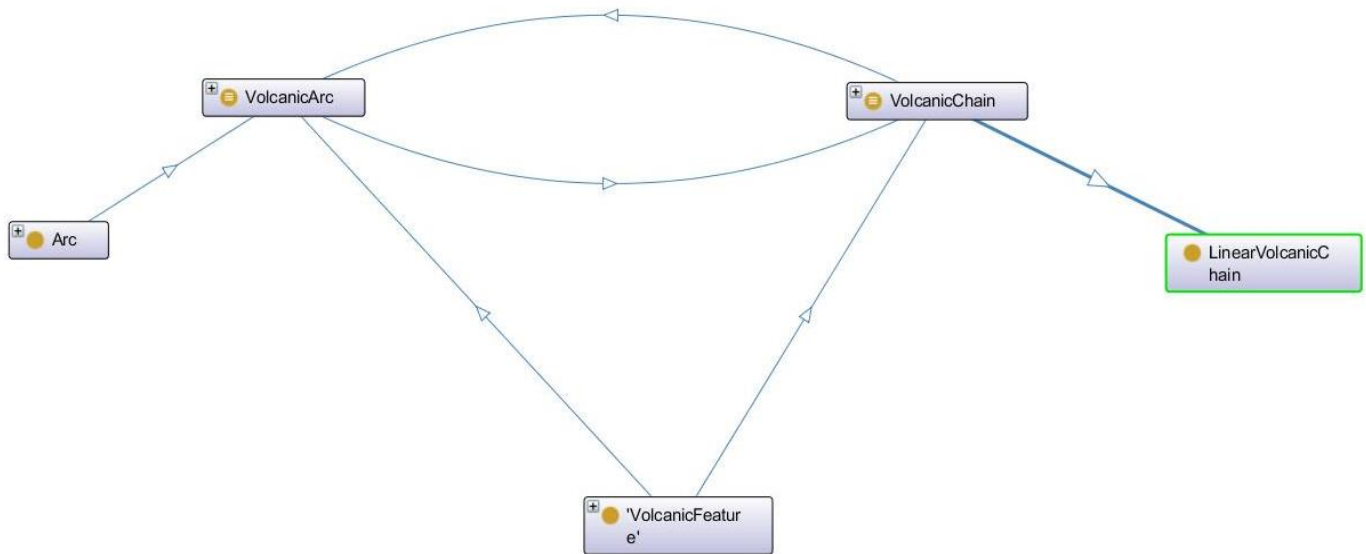


Figure 3-2: Screenshot of VolcanicArc and VolcanicChain classes, showcasing the OWL equivalence classes, visualized here as a pair of circular blue lines, which represent isA object properties, as well as the small golden equal symbol next to the term .

Table 4-1: List of ontologies and other resources utilized for developing classes for Volcanism Ontology (VO).

| Source | Description | Citation |
|--|--|---|
| Basic Formal Ontology (BFO) | Top-level ontology; Starting point for building VO | (IFOMIS Institute for Formal Ontology and Medical Information Sciences, 2010) |
| Semantic Web for Earth and Environmental Terminology (SWEET) | Earth science, physics, and other broad general classes | (Jet Propulsion Laboratory, 2010) |
| Statistics Ontology (STATO) | Statistics and Investigative terminology classes | (“Statistics Ontology - Summary NCBO BioPortal,” 2016) |
| Ontology of Physics for Biology (OPB) | Physics related classes | (“The Ontology of Physics for Biology - Semantics of Biological Processes,” 2011) |
| <i>Petrology: The Study of Igneous, Sedimentary, & Metamorphic Rocks</i> | Main literary source for volcanological, petrological, and mineralogical concepts | (Raymond, 2002) |
| “Rock Classification Scheme Volume 1: Classification of igneous rocks” | Source for IUGS and TAS classifications of volcanic rocks; texture details; and related descriptive concepts | (Self et al., 2007) |
| <i>Volcanoes of the World</i> | Source for volcanism and volcanic eruptions processes and objects | (Simkin & Siebert, 2010) |
| <i>The Handbook of Geosciences</i> | Source for additional volcanic processes and volcanic eruptions | (Spellman & Stoudt, 2013) |
| <i>Handbook of Mineralogy</i> | Source for additional descriptions for minerals | (Anthony, Bideaux, Bladh, & Nichols, 2006) |
| “Basic Statistical Concepts and Methods for Earth Scientists” | Source for statistical concepts specifically utilized in Earth Science | (Olea, 2008) |

CHAPTER 4 ONTOLOGY FRAMEWORK DEVELOPMENT

4.1 Ontology workflow

The framework development for the volcanism ontology follows the guidelines set out by Arp and others (2015) applying BFO. The first step involved the determination of the most general terms and relationships that are essential for representation. To ease initial development and acquisition, already established concepts from existing ontologies were reused; a practice common in the ontology development community (Arp et al., 2015). For Earth, atmospheric, and other related sciences, concepts from SWEET Ontology version 2.3 were reused (Raskin & Pan, 2005). Statistical concepts were derived from the Statistics Ontology (STATO), a BFO-based ontology (“Statistics Ontology - Summary | NCBO BioPortal,” 2016). Physics concepts were brought in from the Ontology of Physics for Biology (OPB), another ontology based on BFO (Cook, Bookstein, & Gennari, 2011). Supplementing the existing concepts, any remaining undescribed but essential terms and relationships were gathered from textbooks within the field of volcanology and igneous petrology (Neuendorf et al., 2011; Raymond, 2002; Simkin & Siebert, 2010; Spellman & Stoudt, 2013) (Table 4-1). Classes imported from other ontologies that have no description are provided with correct and domain-specific descriptions, following the example of SWEET (Jet Propulsion Laboratory, 2010), using Wikipedia as a source for descriptions.

4.2 Concept development

Classes irrelevant to the knowledge domain were removed to streamline the development process. With terms and relationships collected, the regimentation of these terms using BFO began by organizing types as classes, and relationships as properties, using Protégé. As a best practice, the entities were hierarchically organized under the BFO’s orthogonal occurrents and continuant types, split between volcanism and investigative entities (Figure 4-1).

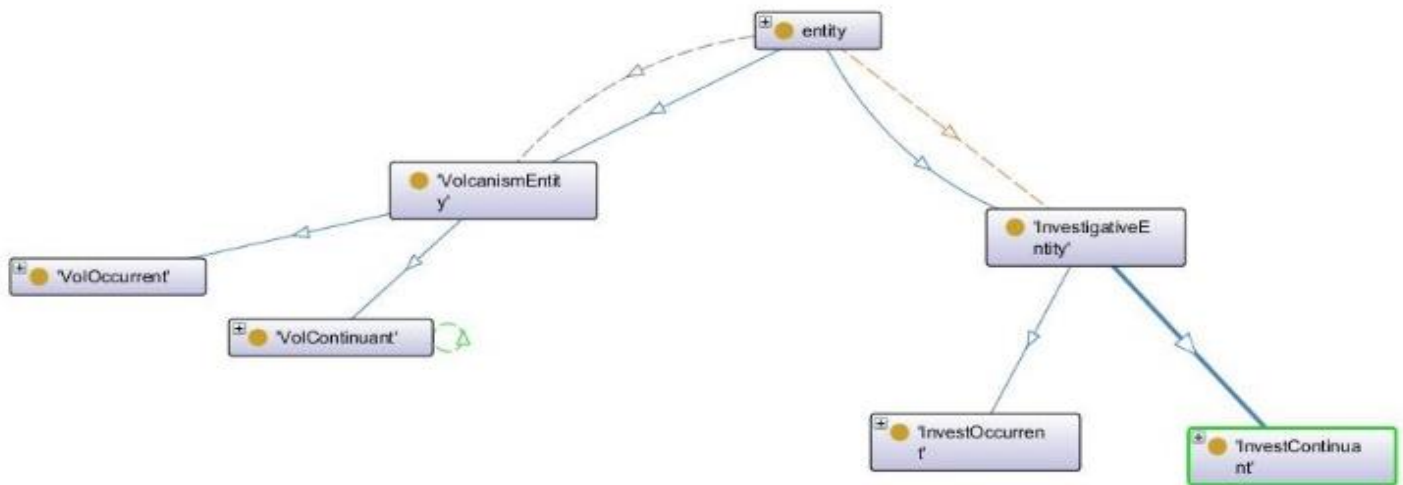


Figure 4-1: Volcanism Ontology showcasing split between 'InvestigativeEntity' and 'VolcanismEntity', each with their own continuant and occurrent entities. Solid blue lines indicate isA object property. Dashed tan line indicates 'hasInvestigativeEntity' object property with Range set for 'InvestigativeEntity,' while dashed brown line represents 'hasVolcanismEntity' with Range set for 'VolcanismEntity.'

4.2.1 Continuant concepts

The continuant classes; entities that persist through time as wholes, include volcano types, deposits, structures, measurements, rocks, and composition, among others. The continuants are broken down into further subcategories into Independent and Dependent entities (Arp et al., 2015). Dependent categories have classes that are dependent or reliant on other classes. This is further broken down into generically dependent entities and specifically dependent entities.

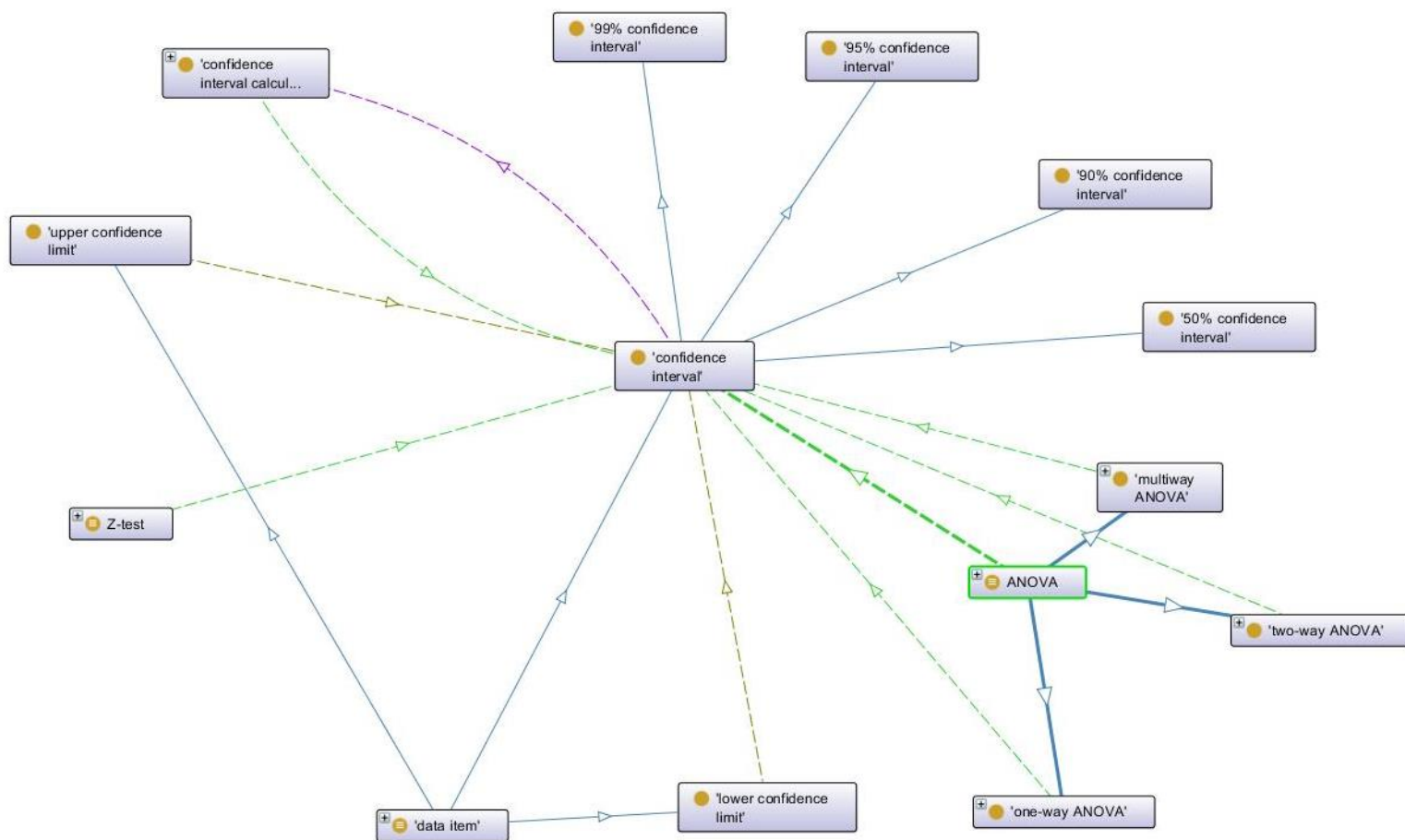


Figure 4-2: Classes related to the generically dependent continuant 'confidence interval.' Solid blue lines indicate isA object property, while green-dashed lines represent 'has_specified_output' property, purple-dashed line indicates 'is_specified_output_of' object property, and yellow-dashed lines represent 'is part of' object property. These classes were imported from STATO Ontology ("Statistics Ontology - Summary | NCBO BioPortal," 2016).

Generically dependent entities are those classes that are wholly dependent on other independent classes. In the case of the Volcanism Ontology, they are primarily useful for providing classes for statistics and investigative classes. This includes scientific investigative concepts such as hypothesis, and conclusions, presentation concepts such as graphs and figures, as well as statistical concepts such as mean standard deviation, and confidence intervals (Figure 4-2). Specifically dependent entities are those that

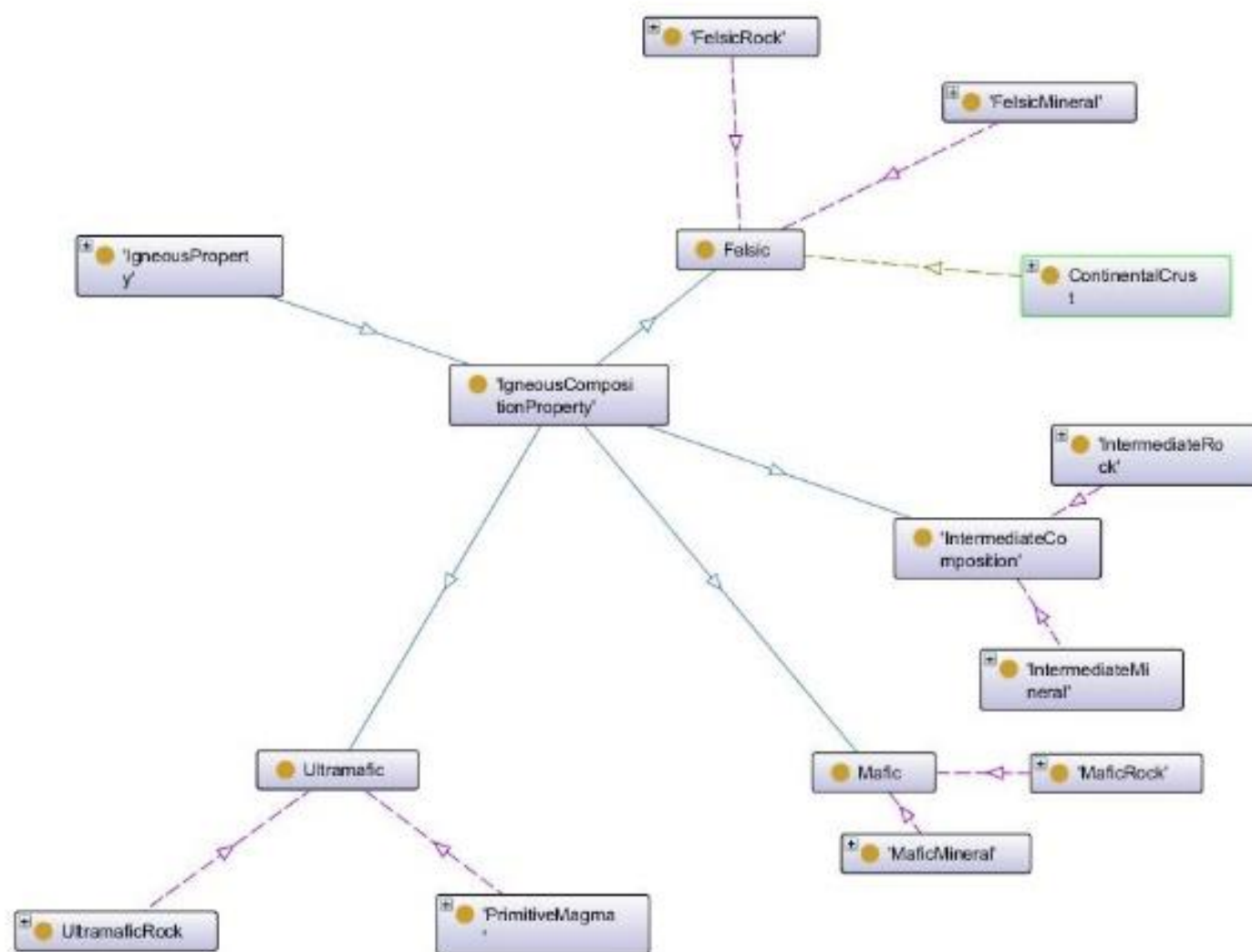


Figure 4-3: Classes related to the specifically dependent 'IgneousCompositionProperty' class. Solid blue lines indicate isA object property. Purple dashed lines indicate the hasProperty object property, while dashed yellow line represents hasRock object property.

describe or adhere to other classes. This includes qualitative entities such as properties for describing rocks by silica content and the roles and functions taken by some investigators (Figure 4-3).

Independent entities are entities that are reliant into and of themselves, that can be independent of other entities. This is where we find most of the classes for rocks, volcanic features as well as investigative devices such as seismometers (Figure 4-4). This also includes spatial regions such as the layers of the Earth and boundaries such as faults and seismic zones (Arp et al., 2015; Smith, 2004).

4.2.2 Occurrent concepts

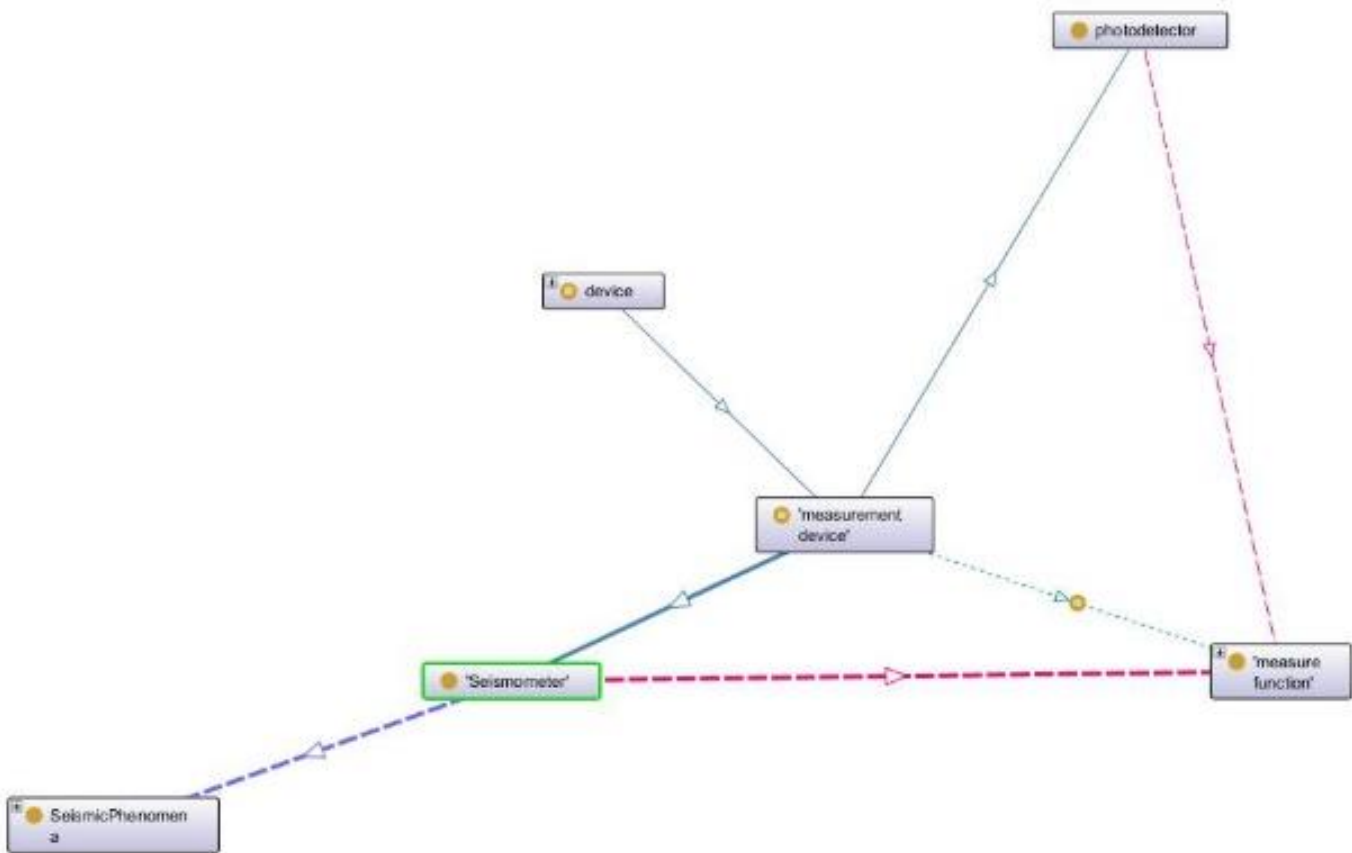


Figure 4-4: Classes related to the class 'Seismometer.' Solid blue lines indicate isA object property. Purple dashed line represents measures property, while pink lines represent "has function" property. The dotted light blue line with equal symbol indicates that 'measurement device' is equivalent to device class that connects to 'measure function' by 'has function' object property.

Entities that require a change over an extent of time are categorized under BFO's occurrent class. Occurrent classes include those that are related to eruption processes such as lava flow, ejection of ash, debris flow, and cooling of lava, and data collection, among others. Process is the main category for occurrents, ranging from numerous physical processes such as volcanic eruptions themselves to the processes related to research and data transformation (Figure 4-5). Occurrent entities also include temporal and historical entities such as TimeInterval and classes representing a range of time (Arp et al., 2015).

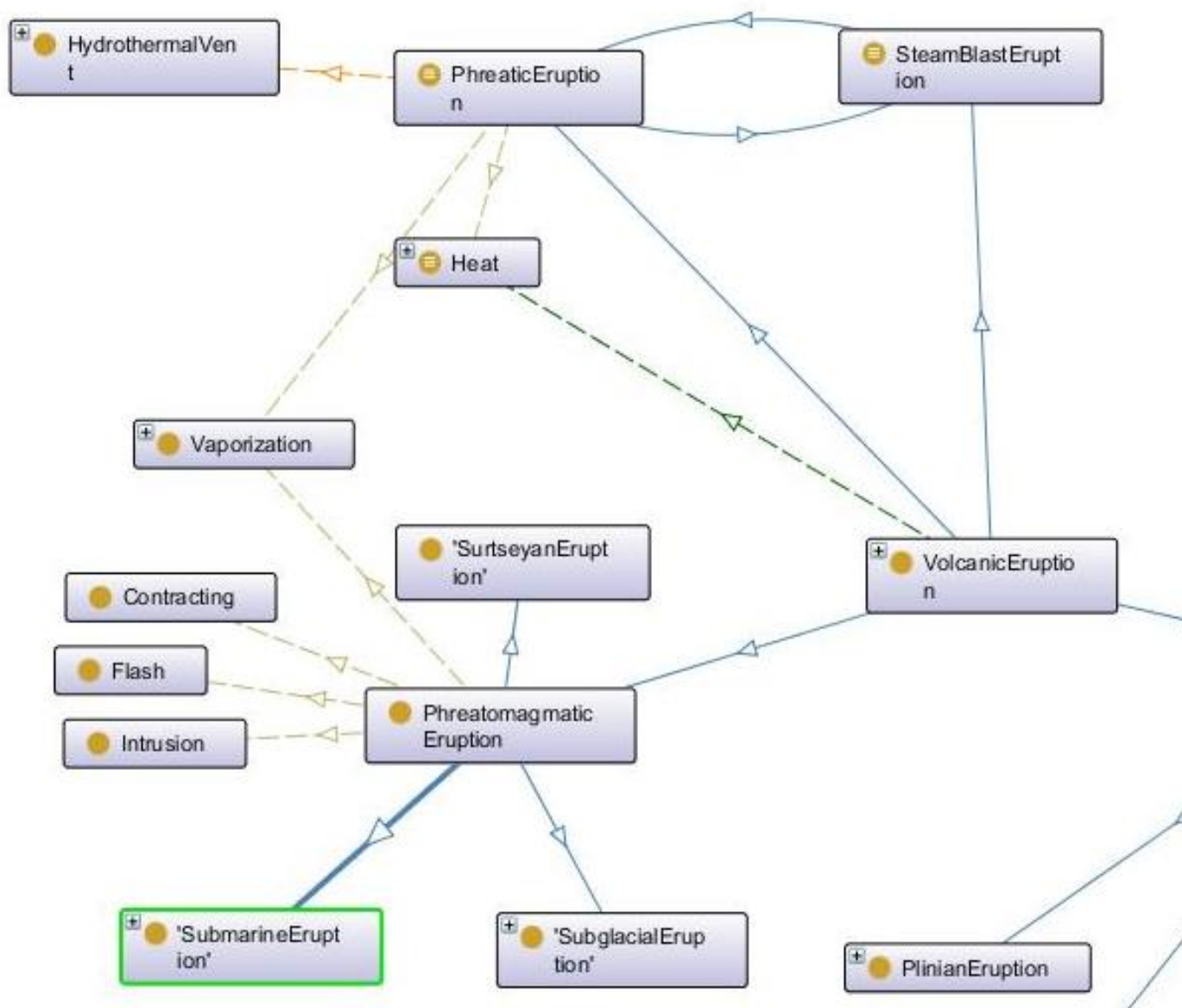


Figure 4-5: Classes related to VolcanicEruption. Yellow dashed lines represent the processOf property, while green dashed line represents hasTransport property, and the dashed orange line indicates 'associatedWith' property.

CHAPTER 5 RESULTS: VOLCANISM ONTOLOGY (VO)

5.1 Classes

To help distinguish classes, and all other new entries created just for the Volcanism Ontology, the names of new classes are given in single quotation marks and notated as such in this thesis. Between the single quotation marks, nomenclature for Volcanism Ontology entries follows similar nomenclature pattern found in the SWEET Ontology, which labels classes with no spaces between words and proper capitalization (Jet Propulsion Laboratory, 2010). Examples of VO's nomenclature are as follows: 'ExampleName' an example of a class in VO; 'hasExampleProperty' an example of a property in VO. While imported SWEET classes and properties Imported classes and properties from other ontologies such as BFO, STATO, and OPB ontologies do have single quotation marks in their nomenclature, but have lower case letters, and have spaces or dashes between words (Figure 5-1). Definitions were sourced

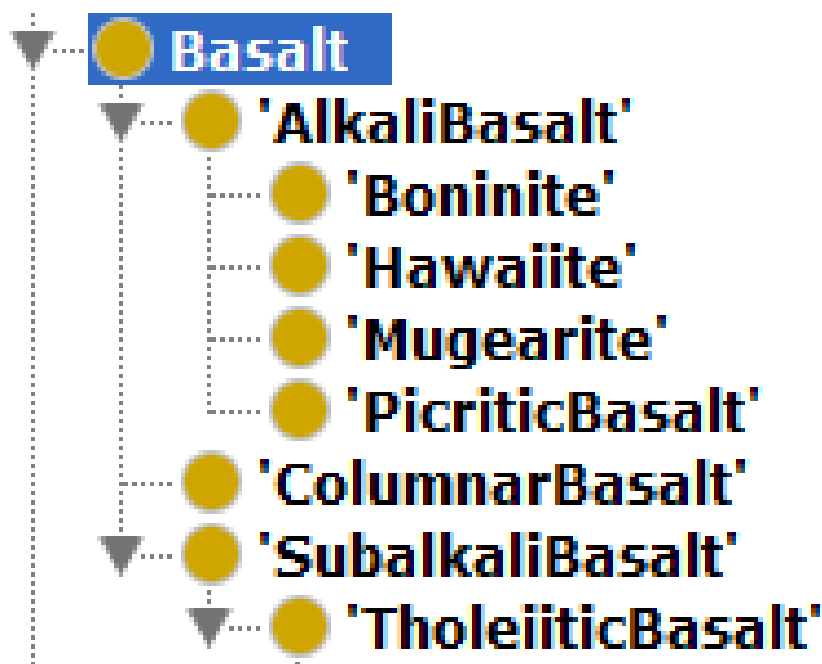


Figure 5-1: Screenshot of the class hierarchy of Basalt in Protégé. The class Basalt is imported from SWEET, while classes such as 'AlkaliBasalt,' 'ColumnarBasalt,' and 'SubalkaliBasalt' the new classes to the right created for the Volcanism Ontology, and therefore, marked with ' ' within the name of the class.

mainly from Wikipedia, following the schema utilized in SWEET's classes, with additional definitions provided by Raymond (2002) as needed (Jet Propulsion Laboratory, 2010).

5.2 Object Properties

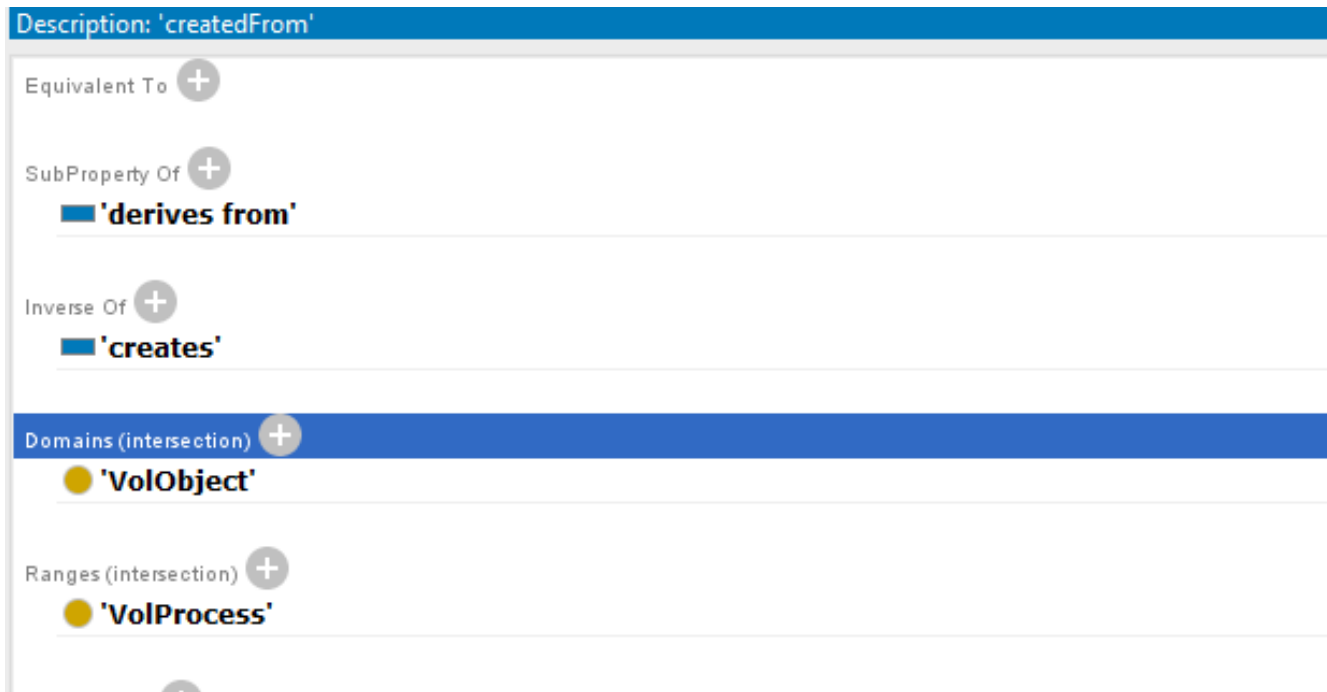


Figure 5-2: Screenshot of the object property 'createdFrom,' showing that this is a subproperty of 'derives from' object property and the inverse property of 'creates' property. 'VoObject' is the domain for the property, representing the "subject" of RDF triple, while the range of the property, 'VolProcess,' represents the "object of the RDF triple.

Object properties allow for classes of concepts to bridge (relate to) one another. Object relationships are established for both occurrent and continuant classes. For example, instances of the continuant 'VoObject' class can be created by the 'VolProcess' occurrent class, through the 'createdFrom' object property (Figure 5-2). Some object properties were utilized from other ontologies, often modified to include new subproperties or to create inverse properties of existing properties (Figure 5-3).

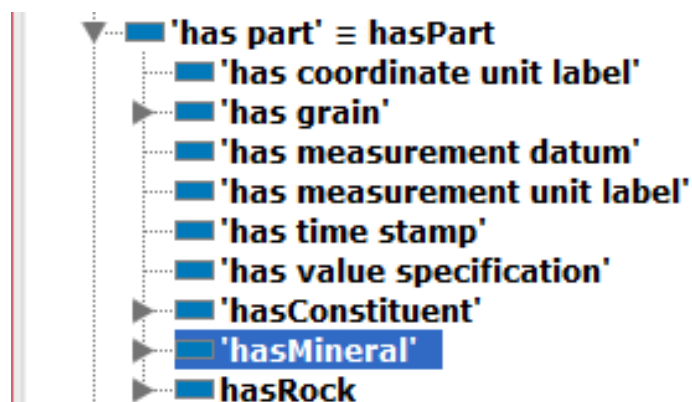


Figure 5-3: Hierarchy of a few of the VolOnt subproperties structured under BFO's 'has part' property. Note that 'hasConstituent,' 'hasMineral,' are newly created properties for VO, while hasRock comes from SWEET, and the others are native subproperties from BFO.

5.3 Data Properties

Data properties work with classes that required data or input information. For example, in Figure 5-4, samples are typically listed with people collected them. The property 'collectedBy' therefore would have a domain of 'SampleName' and a range of `xsd:string`, which allows the user to input the name of the person. Additionally, when considering classifications based on numerical ranges, such as QAPF (Quartz, Alkali Feldspar, Plagioclase, Feldspathoid) and TAS (Total Alkali Silica) percentage classifications schemes for rock names, data properties were utilized to provide the proper percentage ranges for the rock class in question (Figure 5-5).

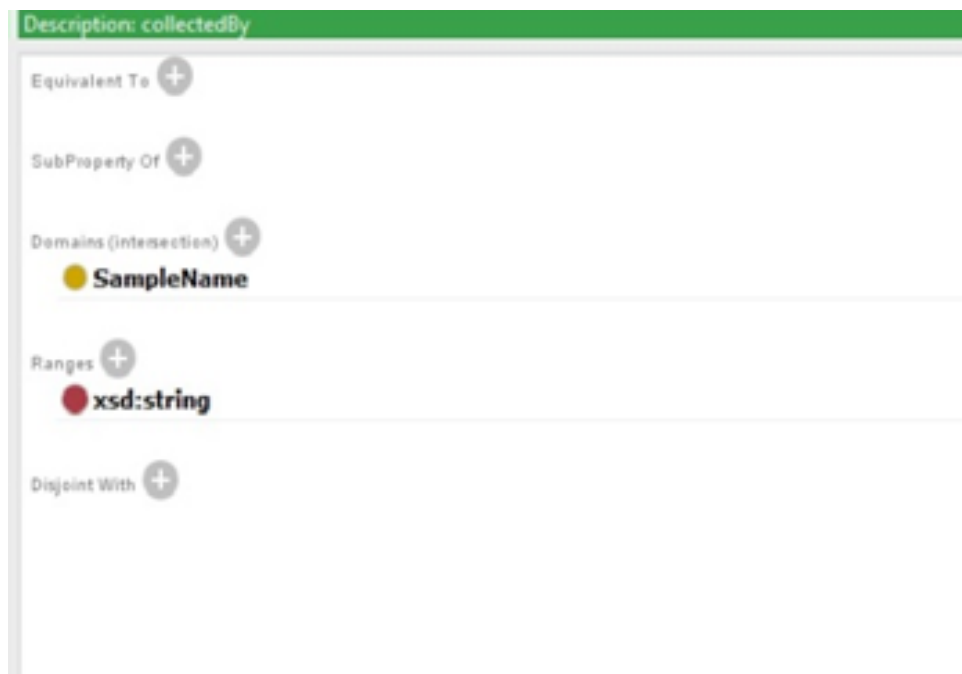


Figure 5-4: Screenshot of the 'collectedBy' data property with the domain connected to the class 'SampleName' and range to a string-based class (xsd:string), allowing user input.

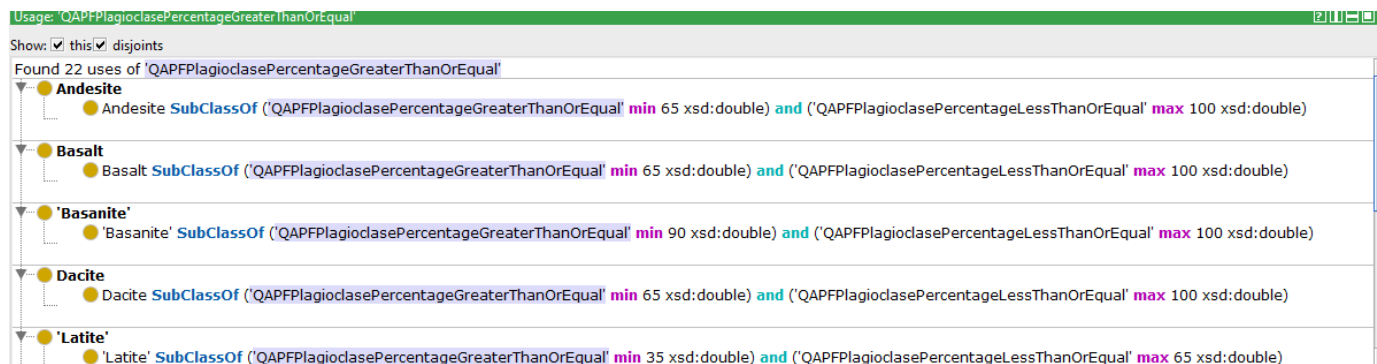


Figure 5-5: Instances of the use of the data properties of represent the limits of minerals using the QAPF classification of rock schemes. In these instances, each rock indicates the numerical limits of percentage of plagioclase based on QAPF classification, with 'QAPFPlagioclaseGreaterThanOrEqualTo' representing the lower limit for percentage of plagioclase feldspar, while 'QAPFPlagioclaseLessThanOrEqualTo' representing the upper limit for plagioclase feldspar.

5.4 OWL Reasoner assessment

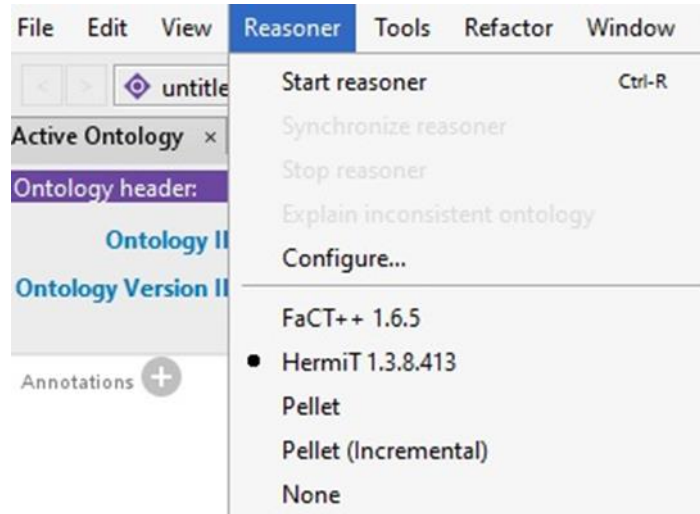


Figure 5-6: Screenshot of reasoners available through Protégé.

For ensuring that the completed ontology will cover the knowledge of the domain effectively and thoroughly, a reasoner software will be utilized. Reasoners are software designed to look at the inferences created by the established assertions (Arp et al., 2015). Protégé 5.2.0 comes preinstalled with HermiT OWL Reasoner, a reasoner implemented with Java (Information System Group, 2016). Other reasoners, including Pellet and FaCT++ that are downloaded and installed automatically through Protégé installation (Figure 5-6). Pellet, like HermiT is another Java-based OWL Reasoner (W3C Consortium, 2011). FaCT++, unlike Pellet, and HermiT, was implemented using C++ (Tsarkov, 2014). After each test, the inferred relations were compared to the actual relations. Once this is completed, simple querying tests were done using the SPARQL Query software, already integrated within Protégé (Figure 5-7) (W3C SPARQL Working Group, 2013).

| subject | object |
|------------------------------------|---|
| Sand | Sediment |
| 'State Change' | ● from only StateOfMatter |
| Kimberlite | ● hasMaterial value 'Diamond' |
| q-value | 'quantitative confidence value' |
| 'Benmoreite' | Trachyandesite |
| 'HawaiianEruption' | ● not (hasProcess some Explosion) |
| 'absence of enrichment hypothesis' | 'absence of positive difference hypothesis' |
| Unstable | SystemState |
| Peridotite | UltramaficRock |
| 'CrystalTexture' | 'Texture' |
| HeightRange | ● rangeOf some Height |
| PolarWander | EarthOscillation |
| Moho | GeologicBoundary |
| Constituent | ConsistenceProperty |
| 'study design' | ● denotes some 'study group population' |
| Set | Bag |
| SpatialDistribution | SpatialConfiguration |

*Figure 5-7: Screenshot of the SPARQL Query for Volcanism Ontology within Protégé, using RDF triple (subject-predicate-object) format to find relationships between subject and object. Object classes without a yellow circle are direct **isA** relationship. Those with yellow circles indicate a special predicate connecting the object class to the subject class.*

CHAPTER 6 DISCUSSION, CONCLUSIONS AND FUTURE WORK

6.1 Discussion



Figure 6-1: the continuant investigative object class 'Seismometer' is related to the occurrent volcanism process class SeismicPhenomena by the object property measures.

Initial versions of the Volcanism Ontology had all classes organized under the single base framework of BFO. Continued development showed that the initial organization was too convoluted and confusing to be able to easily navigate and understand how the entities relate. Taking inspiration from other ontological development, the decision was made to separate the investigative entities and the volcanism entities into their own frameworks, each still organized using BFO (Babaie et al., 2013). This change reduced the confusion and allowed for easier organization of entities. Properties were utilized to connect investigative entities with volcanism entities, such as the continuant object class 'Seismometer' found under the 'InvestigativeEntity' framework, connects to the occurrent process class SeismicPhenomena in the 'VolcanismEntity' framework, by the property measures (Figure 6-1).



Figure 6-2: The class 'data item,' which is imported from STATO ontology is set as an equivalent class to the class Data, which is imported from SWEET Ontology.

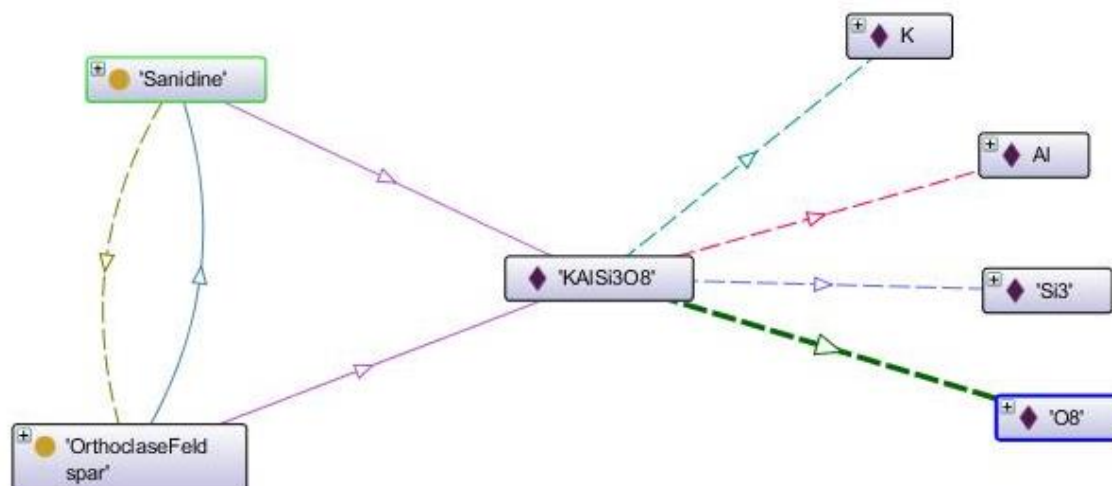


Figure 6-3: The classes 'OrthoclaseFeldspar' and 'Sanidine' and their associated element individuals. Note the construction of the chemical formula instance 'KAISI3O8,' which utilizes an approach from SWEET ontology and uses object properties (hasChemical_1, hasChemical_2, hasChemical_3, hasChemical_4) to connect to other elemental and molecular individuals. Solid blue line represents isA object property, solid purple lines indicate hasIndividual object property, dashed green line represents 'formOf' object property, and the remaining dashed lines indicate the previously mentioned hasChemical object properties.

Given that multiple ontologies were imported, identical entities were connected between these entities via equivalence relations (Figure 6-2). For assistance in mineral classification, instances of those minerals and their chemical formulas were created (Figure 6-3). These chemical formulas followed similar formula construction found in SWEET ontology utilizing object and data properties (Jet Propulsion Laboratory, 2010). Classes of minerals were modeled in mineral reaction series such as Bowen's Reaction Series (Figure 6-4). As mentioned previously, classification of rocks was assisted by data properties to provide mineral percentage ranges based on TAS and QAPF rock classifications (Figure 6-5). Minerals and rocks were further organized by silica content with property classes referring to Felsic, 'IntermediateComposition,' Mafic, and Ultramafic (Figure 6-6).

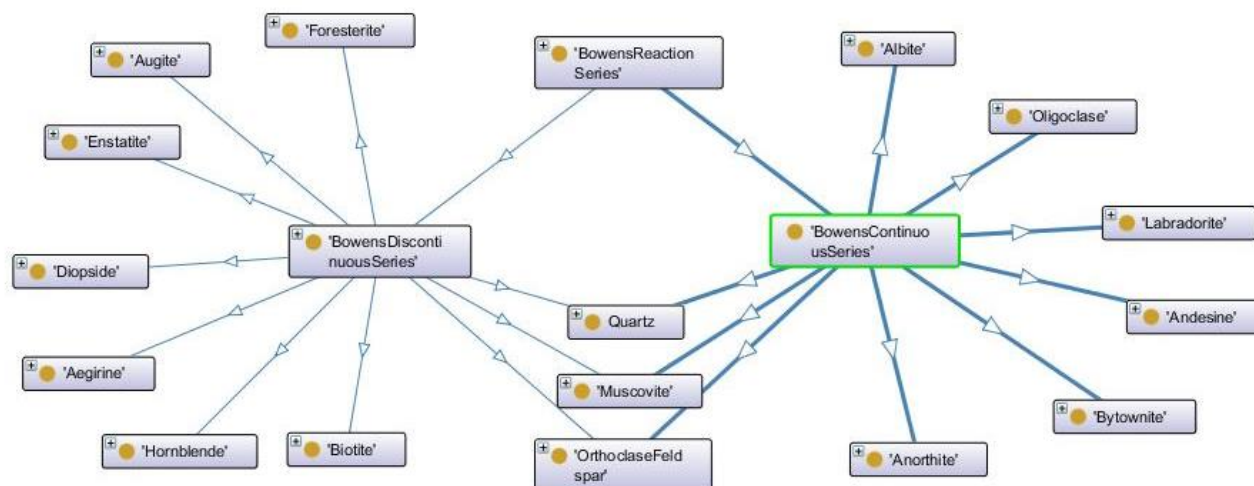


Figure 6-5: The class 'BowensReactionSeries,' broken down into subclasses 'BowensDiscontinuousSeries' and 'BowensContinuousSeries' and their associated mineral classes. Note that the minerals 'Muscovite,' 'OrthoclaseFeldspar,' and 'Quartz' are found in both series, since they occur at the end of these reaction series. Blue solid lines represent isA object property.

Description: Basalt

Equivalent To

SubClass Of

- 'hasMineral' some 'MaficMineral'
- 'MaficRock'
- ('hasGrainSize' value 'FineGrained') or ('hasGrainSize' value 'VeryFineGrained')
- ('hasTexture' some 'Aphanitic') or ('hasTexture' some 'IntergranularTexture') or ('hasTexture' some 'PorphyriticTexture')
- ('QAPFAlkaliPercentageGreaterThanOrEqualTo' min 0 xsd:double) and ('QAPFAlkaliPercentageLessThanOrEqualTo' max 35 xsd:double)
- ('QAPFFeldspathoidPercentageGreaterThanOrEqualTo' min 0 xsd:double) and ('QAPFFeldspathoidPercentageLessThanOrEqualTo' max 10 xsd:double)
- ('QAPFPlagioclasePercentageGreaterThanOrEqualTo' min 65 xsd:double) and ('QAPFPlagioclasePercentageLessThanOrEqualTo' max 100 xsd:double)
- ('QAPFQuartzPercentageGreaterThanOrEqualTo' min 0 xsd:double) and ('QAPFQuartzPercentageLessThanOrEqualTo' max 20 xsd:double)
- ('silicaPercentageGreaterThanOrEqualTo' min 45 xsd:double) and ('silicaPercentageLessThanOrEqualTo' max 52 xsd:double)
- ('TASAlkaliPercentageGreaterThanOrEqualTo' min 0 xsd:double) and ('TASAlkaliPercentageLessThanOrEqualTo' max 5 xsd:double)
- VolcanicRock
- wasDerivedFrom some UpperMantle

Figure 6-4: Detail on some of the relations for the class Basalt. Note several data properties used to indicate the percentage limits for minerals used in QAPF and TAS rock classification schemes. (The data properties 'silicaPercentage...' represent the silica aspect of the TAS classification)

Similar approaches were done also when it comes to occurrent entities. A notable example being the class 'VolcanicExplosivityIndex,' an index used to measure the explosiveness of volcanic eruptions (Neuendorf et al., 2011). Classes were created for each classification of VEI with their volume limits included as part of data properties (Figure 6-7). These VEI level classes were connected to eruption type classes using the object property 'hasVEIValue' (Figure 6-8).

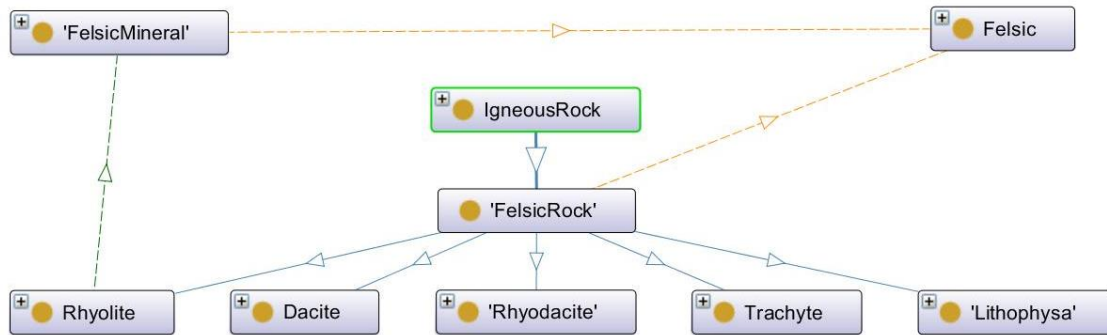


Figure 6-7: Classes connected to class 'FelsicRock' with the subclasses being different felsic rocks. The blue solid lines represent isA object property, dashed yellow lines indicate hasProperty object property, and green dashed line represents 'hasMineral' object property.

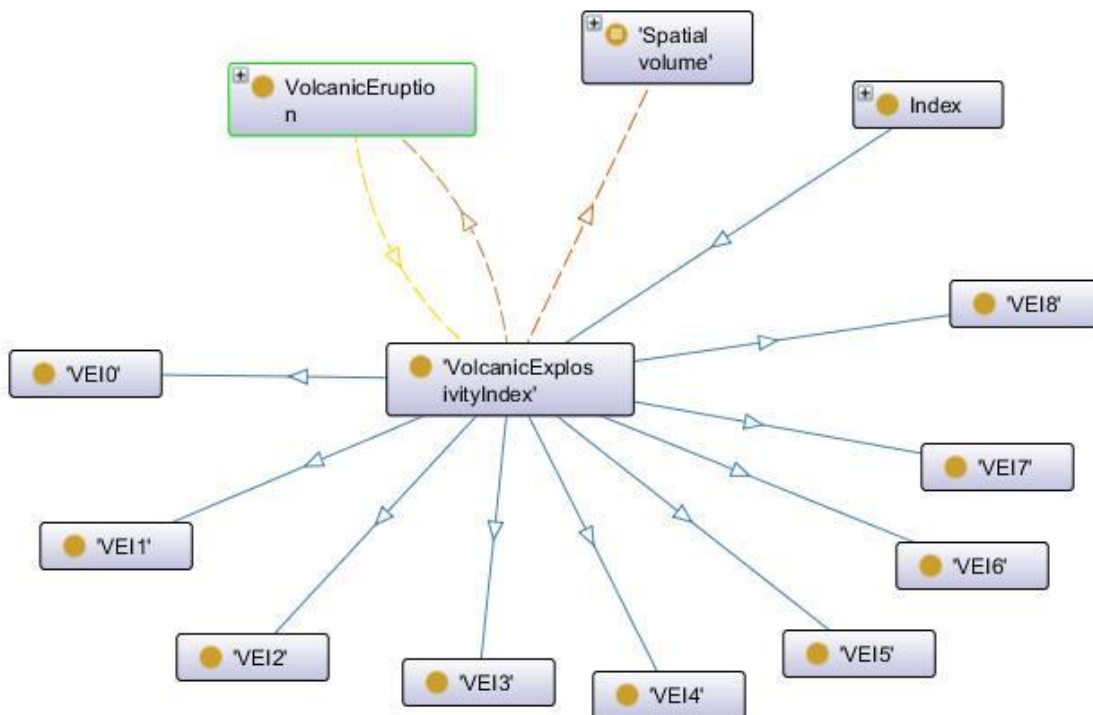


Figure 6-6: Classes related to the class 'VolcanicExplosivityIndex.' Solid blue line indicates isA object property, dashed orange line indicates measures object property, dashed brown line represents 'measureOf' object property, and dashed yellow line indicates the range class for the object property 'hasVEIValue.'

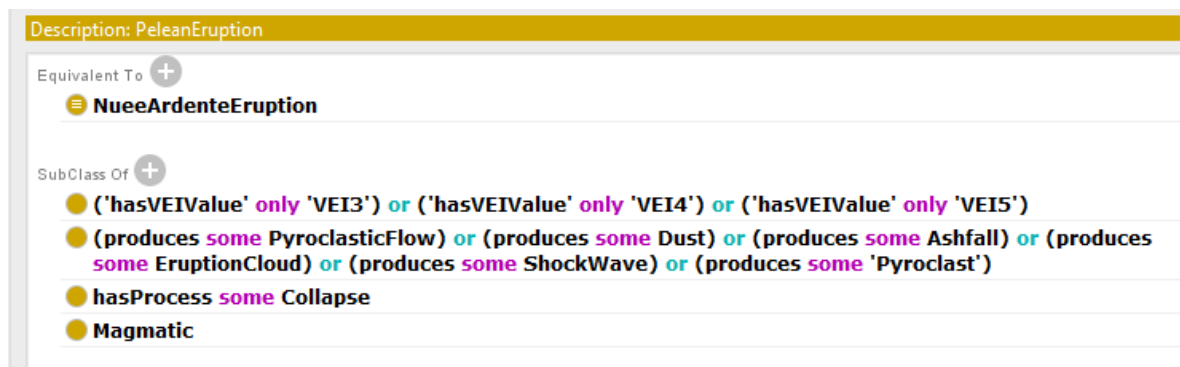


Figure 6-8: Detail on the relations of the class PeleanEruption. Note the appropriate VEI classes listed with the relation 'hasVEIValue.'

6.2 Conclusions

As previously mentioned, work within the realm of geosciences is fast growing, leading to the use of ontologies and the semantic integration of data processing, filtering, and long-term knowledge management (Sinha et al., 2010). Much of this work in the field has been focused more on the development of top-level domain ontologies such as SWEET and SESDI, with less work on more specialized domain ontologies (Barahmand et al., 2010; McGuinness et al., 2007). Within the domain of volcanology, the need for knowledge representation has been noted (C. A. Pshenichny, 2014).

The Volcanism Ontology (VO) is the first major attempt to consolidate and cover the continuant and occurrent entities found within volcanology within a single framework thanks to BFO (Arp et al., 2015). Thanks to BFO, VO has been demonstrated to be a potential domain ontology needed for volcanologists (C. A. Pshenichny, 2014). The ontology may be of practical use, for example, for volcanic hazard assessments. Given the high-intensity environments during any geological hazard, including volcanic eruption, clear communication, familiarity with the terminology, and sharing of accurate information and data is key for successful management and mitigation (Sinha et al., 2010). The works of ontologies such as IDO within the realm of bioinformatics show that these same capabilities could be applied for volcanic hazards mitigation, particularly given the need for the communication of accurate information in a short period of time (Arp et al., 2015; C. A. Pshenichny, 2014).

With the work created here within of BFO, there forgoes the need of using more ontologies for proper filtering and analyzing of data to commence. Given that the work also utilizes concepts from other existing upper-level ontologies, this allows this ontology framework to work as extension of other upper-level ontologies (DiGiuseppe et al., 2014). This allows the integration of other ontologies developed to create a much larger, more precise filtering and analysis of data as needed, given that the ontology would eventually be stored on the Semantic Web for use by any researcher needing its capabilities (Horrocks, 2008).

6.2.1 Future Work

This thesis focuses only on the development of the ontology, and not on the building of the web user interface for data input into its knowledge base. Future work would focus on helping those to ensure that this framework can work easily with a web interface. Further work would need to help the ontology better provide straightforward and clear connections to assist in making sure web interface development is smooth and with few major issues of compatibility. Once connected to a web interface, efforts can be made to ensure that there is proper connections with the Semantic Web and allow recognition and usage of the ontology (Horrocks, 2008). More work can also be done into looking into the refining and finding the blind spots in the ontology and including more rare minerals and rock varieties as sample are provided into a database. Areas of particular refinement would be the development of volcanoclastic deposits and the realm of petrogenesis of certain magmas of the rare variety such as calc-alkaline volcanism (Raymond, 2002). As the domain of volcanology is a complex tapestry of continuant and occurrent concepts intertwining with one another, the Volcanism Ontology will continue to grow in its own complexity to be a better representation of reality (C. A. Pshenichny, 2014).

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APPENDIX A: OWL CODE

```

<?xml version="1.0"?>
<Ontology xmlns="http://www.w3.org/2002/07/owl#"
  xml:base="http://www.semanticweb.org/jom32/ontologies/2018/1/VolOnt"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:xml="http://www.w3.org/XML/1998/namespace"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
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  <Prefix name="xml" IRI="http://www.w3.org/XML/1998/namespace"/>
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    <AnnotationProperty IRI="http://purl.org/dc/elements/1.1/rights"/>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#anyURI">STATO Ontology is
distributed under a Creative Commons Attribution License</Literal>
  </Annotation>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
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for Physics in Biology</Literal>
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  <Annotation>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
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statistical methods ontology. It contains concepts and properties related to statistical methods, probability
distributions and other concepts related to statistical analysis, including relationships to study designs and
plots.</Literal>
  </Annotation>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
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  <Annotation>
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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">STATO: the
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Myer</Literal>
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</Declaration>
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ture&apos;"/>

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      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000059"/>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000668"/>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200170"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/reprMathStatistics.owl#tTest"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/repr.owl#IndependentVariable"/>
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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000144"/>
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  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000040"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000006"/>
</SubClassOf>
<SubClassOf>
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  <Class IRI="#&apos;InvestMaterialEntity&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000028"/>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000006"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000029"/>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000141"/>

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</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000040"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000031"/>
  <Class IRI="#&apos;InvestDependentContinuant&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000034"/>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000016"/>
</SubClassOf>
<SubClassOf>
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</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000038"/>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000008"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000040"/>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000004"/>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000141"/>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000004"/>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000140"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000144"/>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000015"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000146"/>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000140"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000147"/>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000140"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000148"/>

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    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000008"/>
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  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000182"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000015"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000182"/>
    <Class IRI="#&apos;InvestProcess&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/CHEBI_33250"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#SubstanceForm"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000001"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000033"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000003"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000009"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000005"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000033"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000007"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000033"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000007"/>
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      <ObjectComplementOf>
        <ObjectUnionOf>
          <Class IRI="http://purl.obolibrary.org/obo/IAO_0000005"/>
          <Class IRI="http://purl.obolibrary.org/obo/IAO_0000104"/>
        </ObjectUnionOf>
      </ObjectComplementOf>
    </ObjectAllValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000009"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000009"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>

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    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
  </SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000031"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/BFO_0000001"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000032"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000032"/>
    <ObjectSomeValuesFrom>
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      <Class IRI="http://purl.obolibrary.org/obo/OBI_0001931"/>
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  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000033"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000033"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/BFO_0000017"/>
    </ObjectSomeValuesFrom>
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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000037"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000309"/>
  </SubClassOf>

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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000055"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000001"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000064"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000104"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000088"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000101"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000308"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000104"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000033"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000104"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000005"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000104"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000007"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000312"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000070"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>

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<ObjectSomeValuesFrom>
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  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000028"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000144"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000300"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000144"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001909"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000144"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000124"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000144"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000312"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000338"/>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
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<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000300"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000308"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
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<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000308"/>
</SubClassOf>

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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000400"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000219"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000018"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000400"/>
  <ObjectExactCardinality cardinality="1">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000407"/>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000401"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000400"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000401"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000219"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/BFO_0000018"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
        <Class IRI="http://purl.obolibrary.org/obo/BFO_0000026"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000401"/>
  <DataExactCardinality cardinality="1">
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  </DataExactCardinality>
</SubClassOf>
<SubClassOf>
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</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000402"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000219"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/BFO_0000018"/>
      <ObjectSomeValuesFrom>

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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000009"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000402"/>
  <DataExactCardinality cardinality="1">
    <DataProperty IRI="http://purl.obolibrary.org/obo/IAO_0000404"/>
  </DataExactCardinality>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000402"/>
  <DataExactCardinality cardinality="1">
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  </DataExactCardinality>
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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000414"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000416"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000032"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000572"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanResearch.owl#Research"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000572"/>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000088"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000577"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000028"/>

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</SubClassOf>
<SubClassOf>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000579"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000579"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000582"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000582"/>
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    <ObjectSomeValuesFrom>
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      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000416"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
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      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
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  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000584"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000584"/>
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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000582"/>
  </ObjectSomeValuesFrom>
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  <Class IRI="http://purl.obolibrary.org/obo/NCBITaxon_7742"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/NCBITaxon_2759"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0100026"/>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/NCBITaxon_40674"/>

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</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/NCBITaxon_32523"/>
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  <Class IRI="http://purl.obolibrary.org/obo/NCBITaxon_32523"/>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/NCBITaxon_2759"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/NCBITaxon_33213"/>
  <Class IRI="http://purl.obolibrary.org/obo/NCBITaxon_33154"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/NCBITaxon_40674"/>
  <Class IRI="http://purl.obolibrary.org/obo/NCBITaxon_32524"/>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/NCBITaxon_314146"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000011"/>
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  <Class IRI="#&apos;InvestObject&apos;"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000066"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanResearch.owl#Research"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000066"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000572"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
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  <ObjectSomeValuesFrom>

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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000338"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000066"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000471"/>
  </ObjectSomeValuesFrom>
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<SubClassOf>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000339"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000070"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanResearch.owl#Research"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000071"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000094"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanResearch.owl#Research"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000094"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000040"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000094"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000047"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>

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<Class IRI="http://purl.obolibrary.org/obo/OBI_0000094"/>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
      <Class IRI="http://purl.obolibrary.org/obo/BFO_0000040"/>
    </ObjectAllValuesFrom>
  </SubClassOf>
</SubClassOf>
<SubClassOf>
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  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
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</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000097"/>
  <Class IRI="#&apos;InvestRole&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000097"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000054"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000471"/>
    </ObjectAllValuesFrom>
  </SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000112"/>
  <Class IRI="#&apos;InvestRole&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000112"/>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000052"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/BFO_0000040"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000312"/>
          <Class IRI="http://purl.obolibrary.org/obo/OBI_0000659"/>
        </ObjectSomeValuesFrom>
      </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
  </SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000115"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000071"/>
</SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>

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<ObjectSomeValuesFrom>
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  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000312"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000181"/>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000185"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000070"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000185"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000101"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
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  <ObjectSomeValuesFrom>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000441"/>
  </ObjectSomeValuesFrom>
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  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000027"/>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000104"/>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
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    </ObjectSomeValuesFrom>
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      <Class IRI="http://purl.obolibrary.org/obo/OBI_0001909"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000011"/>
  </SubClassOf>
  <SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000374"/>
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  <SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000034"/>
  </SubClassOf>
  <SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000034"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000372"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000034"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000374"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000034"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000378"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000372"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000387"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000034"/>
  </SubClassOf>
  <SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000034"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000401"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000034"/>
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  <SubClassOf>
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  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000423"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000047"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000423"/>
    <ObjectSomeValuesFrom>
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      <Class IRI="http://purl.obolibrary.org/obo/OBI_0302884"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000425"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200166"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000434"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000686"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000437"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000441"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000441"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000005"/>
  </SubClassOf>
  <SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000453"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000034"/>
  </SubClassOf>
  <SubClassOf>
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    <ObjectSomeValuesFrom>
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      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000047"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000453"/>
    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000054"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>

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    </ObjectSomeValuesFrom>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000005"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000471"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000011"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000639"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000456"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000649"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000650"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000094"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000652"/>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000040"/>
  </ObjectSomeValuesFrom>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000040"/>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000011"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000659"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanResearch.owl#Research"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000659"/>

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<ObjectSomeValuesFrom>
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  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000659"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0100051"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000662"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000668"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000200"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001834"/>
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<SubClassOf>
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  <ObjectSomeValuesFrom>
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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000116"/>
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<SubClassOf>
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  <ObjectSomeValuesFrom>
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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000207"/>
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</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000674"/>

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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000674"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000029"/>
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  <SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000152"/>
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  <SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200166"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
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      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000288"/>
    </ObjectSomeValuesFrom>
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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
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  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000679"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
  </SubClassOf>
  <SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000029"/>
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  <SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000639"/>
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  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000684"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000005"/>
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  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000686"/>

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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000456"/>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
    <ObjectIntersectionOf>
      <ObjectExactCardinality cardinality="1">
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000193"/>
      </ObjectExactCardinality>
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        <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
        <ObjectIntersectionOf>
          <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
          <ObjectSomeValuesFrom>
            <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
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              <Class IRI="http://purl.obolibrary.org/obo/IAO_0000032"/>
              <ObjectExactCardinality cardinality="1">
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                <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
              </ObjectExactCardinality>
            </ObjectIntersectionOf>
          </ObjectSomeValuesFrom>
        </ObjectIntersectionOf>
      </ObjectExactCardinality>
    </ObjectIntersectionOf>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>
        <DataHasValue>
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        </DataHasValue>
      </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>

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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
  <ObjectSomeValuesFrom>
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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000059"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000176"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
        <ObjectIntersectionOf>
          <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>
          <DataHasValue>
            <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
            <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
          </DataHasValue>
        </ObjectIntersectionOf>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
  <ObjectExactCardinality cardinality="1">

```

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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000090"/>
    </ObjectIntersectionOf>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
      <ObjectExactCardinality cardinality="1">
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0000181"/>
      </ObjectExactCardinality>
    </ObjectIntersectionOf>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000740"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000112"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000744"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000659"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000033"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000258"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
</SubClassOf>

```

```

    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000033"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000258"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000791"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200186"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000806"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000005"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000832"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000968"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000861"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000191"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000861"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000069"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000861"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000861"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000224"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>

```

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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000861"/>
  <ObjectExactCardinality cardinality="1">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000140"/>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000861"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000889"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000889"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000573"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000889"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000006"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000219"/>
        <Class IRI="http://purl.obolibrary.org/obo/IAO_0000416"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000889"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000312"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0200111"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0200194"/>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000924"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000953"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000931"/>

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```

    <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanResearch.owl#Research"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000931"/>
    <ObjectIntersectionOf>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0100051"/>
      </ObjectSomeValuesFrom>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0100051"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000931"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0000471"/>
        <ObjectSomeValuesFrom>
          <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000055"/>
          <ObjectSomeValuesFrom>
            <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000059"/>
            <Class IRI="http://purl.obolibrary.org/obo/OBI_0000115"/>
          </ObjectSomeValuesFrom>
        </ObjectSomeValuesFrom>
      </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000932"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000968"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000938"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000938"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0001938"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0001930"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000953"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000047"/>
  </SubClassOf>
</SubClassOf>

```



```

    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000953"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0100051"/>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000963"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000009"/>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000967"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000968"/>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000968"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000047"/>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000968"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrEquipment.owl#Infrastructure"/>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000968"/>
    <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000085"/>
        <Class IRI="http://purl.obolibrary.org/obo/BFO_0000034"/>
    </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000968"/>
    <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000312"/>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0000094"/>
    </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001032"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000968"/>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001034"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000968"/>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001442"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000071"/>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001442"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000662"/>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001442"/>

```

```

<ObjectSomeValuesFrom>
  <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000057"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001554"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000032"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001755"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000033"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001834"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000339"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001834"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001865"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000968"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001865"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000085"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000399"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001909"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001909"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000124"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001909"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000312"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000338"/>
  </ObjectSomeValuesFrom>

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    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001930"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001933"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001931"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001933"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001931"/>
    <ObjectMinCardinality cardinality="1">
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000039"/>
    </ObjectMinCardinality>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001931"/>
    <DataMinCardinality cardinality="1">
      <DataProperty IRI="http://purl.obolibrary.org/obo/OBI_0001937"/>
    </DataMinCardinality>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0001933"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0100026"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrBiomass.owl#LivingEntity"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0100051"/>
    <Class IRI="'#&apos;InvestMaterialEntity&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0100051"/>
    <Class IRI="'#&apos;InvestObject&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanResearch.owl#Analysis"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanResearch.owl#Research"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000055"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>

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```

    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000059"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000064"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
        <Class IRI="http://purl.obolibrary.org/obo/IAO_0000005"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200031"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200166"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200078"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200166"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200083"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200166"/>
</SubClassOf>

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```

<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200089"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000668"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200094"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200169"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200094"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200167"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200102"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200102"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000119"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000218"/>
      </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000107"/>
        <ObjectSomeValuesFrom>
          <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
          <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
        </ObjectSomeValuesFrom>
      </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200111"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanResearch.owl#Research"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200111"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
  </ObjectSomeValuesFrom>

```

```

</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200111"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <ObjectUnionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000101"/>
    </ObjectUnionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200111"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
  </ObjectAllValuesFrom>
</SubClassOf>
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  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <ObjectUnionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000101"/>
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  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200117"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200181"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200117"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200184"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200117"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000674"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0200177"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200117"/>

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<ObjectSomeValuesFrom>
  <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000033"/>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200117"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200078"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200119"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200181"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200119"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200184"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200119"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000674"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0200177"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200078"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200166"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000005"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200167"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200166"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200168"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200166"/>

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</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200169"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200170"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200177"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200166"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200181"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200184"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
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<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200168"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200194"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200200"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200200"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000279"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  <ObjectIntersectionOf>

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<ObjectSomeValuesFrom>
  <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
  <ObjectIntersectionOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
  </ObjectIntersectionOf>
</ObjectSomeValuesFrom>
<ObjectSomeValuesFrom>
  <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
  <ObjectIntersectionOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
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</ObjectSomeValuesFrom>
</ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000054"/>
      <DataHasValue>
        <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
        <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
      </DataHasValue>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>
        <DataHasValue>
          <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
          <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
        </DataHasValue>
      </ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000234"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  <ObjectSomeValuesFrom>

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```

    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000069"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000204"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000100"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000196"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000061"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  <ObjectMinCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>

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    <ObjectExactCardinality cardinality="1">
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000181"/>
    </ObjectExactCardinality>
  </ObjectIntersectionOf>
</ObjectMinCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0300311"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0302884"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0600014"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0302884"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000681"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400065"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001032"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400065"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000085"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000367"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400078"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000932"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400078"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000085"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000378"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400079"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000932"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400079"/>
  <ObjectSomeValuesFrom>

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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000085"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000378"/>
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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400082"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000832"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400082"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000085"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000453"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400110"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000967"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400110"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001034"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400110"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000085"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000370"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400110"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000085"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000401"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0400147"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001865"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000104"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000272"/>
  </ObjectSomeValuesFrom>

```

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</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000066"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000219"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000193"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Annotation>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">This statement
can actually be inferred from &apos;plan specification&apos;, because &apos;independent variable
specification&apos; is a subclass of &apos;is part of&apos; some &apos;plan
specification&apos;</Literal>
  </Annotation>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000001"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000001"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500006"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500020"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0600014"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000094"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0600014"/>
  <ObjectSomeValuesFrom>

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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000040"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0600014"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000040"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000002"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000006"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000011"/>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000573"/>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000011"/>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000010"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000009"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000011"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000009"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000026"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000010"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000010"/>

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<ObjectSomeValuesFrom>
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    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000006"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000011"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000007"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000012"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000011"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000013"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000009"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000013"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000008"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000013"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000020"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000013"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000009"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000016"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000010"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000017"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000018"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000026"/>
</SubClassOf>
<SubClassOf>

```

```

    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000058"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000020"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000402"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000020"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000026"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000021"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000196"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000022"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000009"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000022"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000006"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000022"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000025"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000022"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/BFO_0000026"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000023"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000067"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000024"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000009"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000024"/>
    <ObjectSomeValuesFrom>

```



```

    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000012"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000024"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000018"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000024"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/BFO_0000028"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000025"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000401"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000025"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000026"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000026"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000400"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000027"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000028"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000028"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <ObjectUnionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
    </ObjectUnionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000029"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>

```

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</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000029"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <ObjectUnionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
    </ObjectUnionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000030"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000039"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000030"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000295"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200200"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000031"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000033"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000649"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000033"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000674"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000033"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000029"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000034"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000034"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000107"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000035"/>

```

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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000028"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000036"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000036"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000037"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000037"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000039"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000039"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000044"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000044"/>
    <ObjectIntersectionOf>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000086"/>
      </ObjectSomeValuesFrom>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>

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</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000044"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000054"/>
      <DataHasValue>
        <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
        <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
      </DataHasValue>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000044"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>
        <DataHasValue>
          <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
          <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
        </DataHasValue>
      </ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000234"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000044"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000069"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000044"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>

```

```

<Class IRI="http://purl.obolibrary.org/obo/STATO_0000044"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000196"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000044"/>
  <ObjectExactCardinality cardinality="1">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
    </ObjectIntersectionOf>
  </ObjectExactCardinality>
</SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000045"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
</SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000045"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000086"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000045"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000054"/>
      <DataHasValue>
        <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
        <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
      </DataHasValue>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000045"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>

```

```

<ObjectIntersectionOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>
  <DataHasValue>
    <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
  </DataHasValue>
</ObjectIntersectionOf>
<ObjectSomeValuesFrom>
  <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000234"/>
</ObjectSomeValuesFrom>
</ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000045"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000069"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000045"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000045"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000196"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000045"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
    </ObjectIntersectionOf>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000047"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>

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</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000047"/>
  <DataExactCardinality cardinality="1"/>
    <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
    <Datatype abbreviatedIRI="xsd:integer"/>
  </DataExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000048"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200201"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000048"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000086"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000048"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000054"/>
      <DataHasValue>
        <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
        <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
      </DataHasValue>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000048"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>
        <DataHasValue>
          <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
          <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
        </DataHasValue>
      </ObjectIntersectionOf>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>

```

```

    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000234"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000048"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000069"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
</SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000048"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
    </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
  </SubClassOf>
</SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000048"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000196"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
</SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000048"/>
  <ObjectMinCardinality cardinality="3">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
    </ObjectIntersectionOf>
    </ObjectMinCardinality>
  </SubClassOf>
</SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000050"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000184"/>
</SubClassOf>
</SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000051"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000117"/>
</SubClassOf>
</SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000052"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000279"/>

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```

</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000052"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>
      <DataHasValue>
        <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
        <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
      </DataHasValue>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000052"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000052"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000376"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000052"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000052"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000196"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000052"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000052"/>

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<ObjectSomeValuesFrom>
  <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000300"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000054"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000065"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000054"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000226"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000056"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000065"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000056"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000121"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000057"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000065"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000057"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000058"/>

```

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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000065"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000058"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000224"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000059"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000067"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000059"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000329"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000059"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000068"/>
        <DataHasValue>
          <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
          <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#integer">0</Literal>
        </DataHasValue>
      </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000061"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000065"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000061"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000065"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000062"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000065"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000062"/>
    <ObjectSomeValuesFrom>

```

```

    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000253"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000065"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000065"/>
  <DataSomeValuesFrom>
    <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
    <Datatype abbreviatedIRI="xsd:boolean"/>
  </DataSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000066"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000037"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000067"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000068"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000068"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <ObjectUnionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
    </ObjectUnionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000069"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000047"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000070"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000081"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000070"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>

```

```

</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000070"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000069"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000070"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000138"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000070"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000229"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000070"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000070"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000121"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000070"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000071"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000184"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000073"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000027"/>
</SubClassOf>

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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000073"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000073"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000073"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000073"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000121"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000073"/>
  <ObjectExactCardinality cardinality="1">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000140"/>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000073"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000076"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000198"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000076"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
  <ObjectIntersectionOf>

```

```

<Class IRI="http://purl.obolibrary.org/obo/STATO_0000118"/>
<ObjectSomeValuesFrom>
  <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
  <ObjectIntersectionOf>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
    </ObjectIntersectionOf>
  </ObjectIntersectionOf>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
      <ObjectComplementOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000227"/>
      </ObjectComplementOf>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000076"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000076"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000076"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000076"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
</SubClassOf>

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<Class IRI="http://purl.obolibrary.org/obo/STATO_0000076"/>
<ObjectExactCardinality cardinality="1">
  <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
  <ObjectIntersectionOf>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000090"/>
  </ObjectIntersectionOf>
</ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000076"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
      <ObjectExactCardinality cardinality="1">
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0000181"/>
      </ObjectExactCardinality>
    </ObjectIntersectionOf>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000080"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000137"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000080"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200119"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000080"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000080"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000080"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>

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```

    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000226"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000081"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200200"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000081"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000081"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000081"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000069"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000081"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000140"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000081"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000229"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000081"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000081"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000121"/>
  </ObjectSomeValuesFrom>

```

```

    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000081"/>
    <ObjectExactCardinality cardinality="2">
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
    </ObjectExactCardinality>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000082"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000107"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000083"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000191"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000083"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000083"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000067"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000083"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000083"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000083"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000224"/>
    </ObjectSomeValuesFrom>

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</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000191"/>
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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000086"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000204"/>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000086"/>
  <ObjectSomeValuesFrom>
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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000282"/>
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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000086"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0500006"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000089"/>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000219"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000193"/>
  </ObjectExactCardinality>

```

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</SubClassOf>
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  <ObjectExactCardinality cardinality="1">
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    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000090"/>
    </ObjectIntersectionOf>
  </ObjectExactCardinality>
</SubClassOf>
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<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000090"/>
  <ObjectIntersectionOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
    <ObjectExactCardinality cardinality="2">
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  </ObjectIntersectionOf>
</SubClassOf>
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<SubClassOf>
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    <ObjectIntersectionOf>
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        <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
        <ObjectIntersectionOf>
          <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
          <Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
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  </ObjectSomeValuesFrom>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
    </ObjectIntersectionOf>
  </ObjectExactCardinality>
</SubClassOf>

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        </ObjectIntersectionOf>
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    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
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<SubClassOf>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000092"/>
  <ObjectSomeValuesFrom>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
  </ObjectSomeValuesFrom>
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<SubClassOf>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000253"/>
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<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000095"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000202"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000095"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>

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    <DataHasValue>
      <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
      <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
    </DataHasValue>
  </ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000095"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000095"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000059"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000095"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000176"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000095"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
    </ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>
        <DataHasValue>
          <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
          <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
        </DataHasValue>
      </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000095"/>
  <ObjectSomeValuesFrom>

```

```

    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000095"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000095"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000253"/>
  </ObjectSomeValuesFrom>
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<SubClassOf>
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  <ObjectExactCardinality cardinality="1">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000090"/>
    </ObjectIntersectionOf>
  </ObjectExactCardinality>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000098"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000279"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000098"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000098"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000132"/>
  </ObjectSomeValuesFrom>
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<SubClassOf>

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<Class IRI="http://purl.obolibrary.org/obo/STATO_0000098"/>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
    </ObjectSomeValuesFrom>
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</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000098"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
    </ObjectSomeValuesFrom>
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</SubClassOf>
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  <ObjectMinCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
          <Class IRI="http://purl.obolibrary.org/obo/OBI_0000181"/>
        </ObjectSomeValuesFrom>
      <ObjectMinCardinality cardinality="2">
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
          <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
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    </ObjectMinCardinality>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000100"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000295"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000175"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000100"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000193"/>
    </ObjectExactCardinality>
  </SubClassOf>

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</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000104"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000039"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000104"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
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      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000237"/>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
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<SubClassOf>
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  <ObjectSomeValuesFrom>
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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
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<SubClassOf>
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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000107"/>
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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000034"/>
  </ObjectSomeValuesFrom>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
  <ObjectIntersectionOf>
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      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
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    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000339"/>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000118"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000118"/>
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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000228"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000119"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>

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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000119"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000144"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000121"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000121"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000056"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000123"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000142"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000123"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000090"/>
  </ObjectExactCardinality>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000055"/>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000037"/>
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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000126"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000184"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000127"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000196"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000131"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000132"/>

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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
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  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000133"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000279"/>
  </SubClassOf>
  <SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000184"/>
  </SubClassOf>
  <SubClassOf>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000138"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000140"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000138"/>
    <ObjectIntersectionOf>
      <ObjectExactCardinality cardinality="1">
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        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000090"/>
      </ObjectExactCardinality>
      <ObjectExactCardinality cardinality="1">
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
        <ObjectIntersectionOf>
          <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
          <ObjectExactCardinality cardinality="2">
            <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0001927"/>
            <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
          </ObjectExactCardinality>
        </ObjectIntersectionOf>
      </ObjectExactCardinality>
    </ObjectIntersectionOf>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000140"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
  </SubClassOf>

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</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000140"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000142"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000142"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000295"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000142"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000101"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000301"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000142"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000259"/>
    <ObjectExactCardinality cardinality="2">
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000237"/>
    </ObjectExactCardinality>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000142"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000258"/>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000142"/>
  <DataSomeValuesFrom>
    <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
    <DataIntersectionOf>
      <DatatypeRestriction>
        <Datatype abbreviatedIRI="owl:real"/>
        <FacetRestriction facet="http://www.w3.org/2001/XMLSchema#minInclusive">

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        <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#integer">-1</Literal>
      </FacetRestriction>
    </DatatypeRestriction>
  <DatatypeRestriction>
    <Datatype abbreviatedIRI="owl:real"/>
    <FacetRestriction facet="http://www.w3.org/2001/XMLSchema#maxInclusive">
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    </FacetRestriction>
  </DatatypeRestriction>
</DataIntersectionOf>
</DataSomeValuesFrom>
</SubClassOf>
<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000328"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000143"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000266"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000143"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000143"/>
  <ObjectMinCardinality cardinality="2">
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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000107"/>
  </ObjectMinCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000144"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000144"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
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      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000034"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000312"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000119"/>
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  </ObjectIntersectionOf>

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    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000144"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000403"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000034"/>
  </ObjectSomeValuesFrom>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000145"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000283"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000150"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000150"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000151"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000151"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000152"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000291"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000153"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000191"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000153"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>
</SubClassOf>

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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000153"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000132"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000153"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000153"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000224"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000153"/>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0000181"/>
      </ObjectSomeValuesFrom>
      <ObjectMinCardinality cardinality="2">
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
      </ObjectMinCardinality>
    </ObjectIntersectionOf>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000154"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000155"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000155"/>
  <ObjectMinCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>

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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000312"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000066"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000159"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000166"/>
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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000160"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000067"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000160"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000068"/>
      <DataHasValue>
        <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
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      </DataHasValue>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000161"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000030"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000161"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000028"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000161"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000029"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000163"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000029"/>
</SubClassOf>

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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000164"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000028"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000165"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000166"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000166"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000006"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000219"/>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0000963"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000008"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000219"/>
        <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000167"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000152"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000170"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000152"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000173"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
</SubClassOf>
<SubClassOf>

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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000175"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000175"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000175"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000196"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000176"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000039"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000176"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000295"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000176"/>
    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaMath.owl#hasTest"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/reprMathStatistics.owl#tTest"/>
    </ObjectAllValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000177"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000067"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000178"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000178"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <ObjectUnionOf>
        <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
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    </ObjectSomeValuesFrom>
  </SubClassOf>

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    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000179"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000179"/>
    <ObjectIntersectionOf>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
        <ObjectIntersectionOf>
          <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
          <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
        </ObjectIntersectionOf>
      </ObjectSomeValuesFrom>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
        <ObjectIntersectionOf>
          <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
          <Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
        </ObjectIntersectionOf>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000179"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000180"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000227"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000180"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000113"/>
        <DataHasValue>
          <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
          <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#integer">1</Literal>
        </DataHasValue>
      </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000180"/>

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<ObjectSomeValuesFrom>
  <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
  <ObjectIntersectionOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000230"/>
    <DataHasValue>
      <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
      <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#integer">0</Literal>
    </DataHasValue>
  </ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000183"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000183"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000217"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000184"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000185"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000140"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000189"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000107"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000191"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000192"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000193"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000181"/>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000192"/>
</SubClassOf>
<SubClassOf>

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      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000339"/>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
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<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000329"/>
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  </ObjectSomeValuesFrom>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000228"/>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000196"/>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000028"/>
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          <ObjectSomeValuesFrom>
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            <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
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        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
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    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>

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</ObjectSomeValuesFrom>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
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<SubClassOf>
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    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000674"/>
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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000032"/>
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</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000253"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000253"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000062"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000061"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000258"/>

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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000258"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000033"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000262"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000276"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000264"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000264"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000265"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000265"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000266"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000266"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000107"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000266"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000295"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000143"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000267"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000166"/>
  </SubClassOf>
  <SubClassOf>

```



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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000268"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000067"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000271"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000274"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000274"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000006"/>
        <ObjectSomeValuesFrom>
          <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000219"/>
          <Class IRI="http://purl.obolibrary.org/obo/STATO_0000233"/>
        </ObjectSomeValuesFrom>
      </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000274"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000008"/>
        <ObjectSomeValuesFrom>
          <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000219"/>
          <Class IRI="http://purl.obolibrary.org/obo/STATO_0000134"/>
        </ObjectSomeValuesFrom>
      </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000274"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <ObjectUnionOf>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0000070"/>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000031"/>
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    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000274"/>
    <ObjectSomeValuesFrom>

```

```

    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000312"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0200111"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000276"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000117"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000279"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000280"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000142"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000280"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
        <ObjectIntersectionOf>
          <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>
          <DataHas Value>
            <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
            <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
          </DataHas Value>
        </ObjectIntersectionOf>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000282"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000039"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000282"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000295"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000086"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000283"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000117"/>
</SubClassOf>
<SubClassOf>

```

```

    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000286"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000286"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000286"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
        <ObjectSomeValuesFrom>
          <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
          <ObjectIntersectionOf>
            <Class IRI="http://purl.obolibrary.org/obo/STATO_0000068"/>
            <DataHas Value>
              <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
              <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#integer">0</Literal>
            </DataHas Value>
          </ObjectIntersectionOf>
        </ObjectSomeValuesFrom>
      </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000286"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000286"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
        <ObjectIntersectionOf>
          <ObjectSomeValuesFrom>
            <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
          <ObjectUnionOf>
            <Class IRI="http://purl.obolibrary.org/obo/STATO_0000294"/>
            <Class IRI="http://purl.obolibrary.org/obo/STATO_0000295"/>
          </ObjectUnionOf>
        </ObjectIntersectionOf>
      </ObjectSomeValuesFrom>
    </ObjectSomeValuesFrom>
  </SubClassOf>

```

```

    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectComplementOf>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000294"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000295"/>
      </ObjectIntersectionOf>
    </ObjectComplementOf>
  </ObjectSomeValuesFrom>
</ObjectIntersectionOf>
</ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000286"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000675"/>
      <ObjectUnionOf>
        <ObjectSomeValuesFrom>
          <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
          <ObjectIntersectionOf>
            <Class IRI="http://purl.obolibrary.org/obo/STATO_0000294"/>
            <ObjectComplementOf>
              <Class IRI="http://purl.obolibrary.org/obo/STATO_0000295"/>
            </ObjectComplementOf>
          </ObjectIntersectionOf>
        </ObjectSomeValuesFrom>
      </ObjectUnionOf>
    </ObjectSomeValuesFrom>
  </ObjectSomeValuesFrom>
  <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
  <ObjectIntersectionOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000295"/>
    <ObjectComplementOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000294"/>
    </ObjectComplementOf>
  </ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</ObjectUnionOf>
</ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000287"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000287"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>

```

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</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000287"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
        <ObjectIntersectionOf>
          <Class IRI="http://purl.obolibrary.org/obo/STATO_0000068"/>
          <DataHasValue>
            <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
            <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#integer">0</Literal>
          </DataHasValue>
        </ObjectIntersectionOf>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000287"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000288"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000065"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000289"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000009"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000289"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000289"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000107"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000289"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>

```

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    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000219"/>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000750"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000289"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000219"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000289"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000295"/>
    <ObjectUnionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000218"/>
    </ObjectUnionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000291"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000291"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <ObjectUnionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
    </ObjectUnionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000292"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000291"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000293"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000291"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000294"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000065"/>
</SubClassOf>

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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000294"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000295"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000065"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000295"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000296"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000295"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000297"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000294"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000298"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000191"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000298"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000298"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000276"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000298"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>

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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000298"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000224"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000299"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0001834"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000299"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanResearch.owl#Research"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000299"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000673"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000063"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000116"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000299"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000144"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000300"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000184"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000301"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000301"/>
  <ObjectMinCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000230"/>
  </ObjectMinCardinality>
</SubClassOf>
<SubClassOf>

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<Class IRI="http://purl.obolibrary.org/obo/STATO_0000301"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000258"/>
    </ObjectExactCardinality>
  </SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000302"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000302"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000279"/>
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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000302"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000059"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000302"/>
  <ObjectSomeValuesFrom>
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  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000302"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000302"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000303"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000303"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000279"/>
</SubClassOf>
</SubClassOf>

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<Class IRI="http://purl.obolibrary.org/obo/STATO_0000303"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000303"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000059"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000303"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000176"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000303"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>
      <DataHasValue>
        <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
        <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
      </DataHasValue>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
</SubClassOf>
<SubClassOf>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000303"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>

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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000303"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000679"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000193"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000304"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0000739"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000304"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000279"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000304"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000304"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000059"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000304"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000176"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000304"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0000751"/>

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<Class IRI="http://purl.obolibrary.org/obo/STATO_0000251"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
      <ObjectIntersectionOf>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000019"/>
          <DataHasValue>
            <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
              <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#boolean">true</Literal>
            </DataHasValue>
          </ObjectIntersectionOf>
        </ObjectSomeValuesFrom>
      </ObjectIntersectionOf>
    </ObjectSomeValuesFrom>
  </SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000304"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
        <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
      </ObjectSomeValuesFrom>
    </SubClassOf>
  <SubClassOf>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000304"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
          <Class IRI="http://purl.obolibrary.org/obo/STATO_0000255"/>
        </ObjectSomeValuesFrom>
      </SubClassOf>
    <SubClassOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000304"/>
        <ObjectExactCardinality cardinality="2">
          <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
            <ObjectIntersectionOf>
              <Class IRI="http://purl.obolibrary.org/obo/OBI_0000679"/>
                <ObjectSomeValuesFrom>
                  <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
                    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000193"/>
                  </ObjectSomeValuesFrom>
                </ObjectIntersectionOf>
              </ObjectExactCardinality>
            </SubClassOf>
          <SubClassOf>
            <Class IRI="http://purl.obolibrary.org/obo/STATO_0000309"/>
              <Class IRI="http://purl.obolibrary.org/obo/OBI_0200200"/>
            </SubClassOf>
          <SubClassOf>
            <Class IRI="http://purl.obolibrary.org/obo/STATO_0000309"/>
              <Class IRI="http://purl.obolibrary.org/obo/STATO_0000191"/>
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          <SubClassOf>
            <Class IRI="http://purl.obolibrary.org/obo/STATO_0000309"/>

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<ObjectSomeValuesFrom>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000309"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000069"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000309"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000140"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000309"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000229"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000309"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000309"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000224"/>
  </ObjectSomeValuesFrom>
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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000309"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000310"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000027"/>
</SubClassOf>

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<SubClassOf>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000053"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000310"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000299"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000310"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000417"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000121"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000310"/>
  <ObjectExactCardinality cardinality="1">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000138"/>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000310"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000252"/>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000310"/>
  <ObjectExactCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
        <Class IRI="http://purl.obolibrary.org/obo/STATO_0000193"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </ObjectExactCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000314"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>

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</SubClassOf>
<SubClassOf>
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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000196"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000315"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000315"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000196"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000317"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000317"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000295"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000175"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000321"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000321"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000329"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000321"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000068"/>
      <DataHasValue>
        <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
        <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#integer">0</Literal>
      </DataHasValue>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>

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<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000324"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000144"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000325"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000325"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000107"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000325"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000295"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000328"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000326"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000325"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000327"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000327"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000107"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000327"/>
  <ObjectSomeValuesFrom>
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    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000328"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000328"/>
  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000328"/>
  <ObjectSomeValuesFrom>

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    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000100"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000328"/>
  <ObjectMinCardinality cardinality="2">
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000293"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000107"/>
  </ObjectMinCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000329"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000329"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000205"/>
    <ObjectIntersectionOf>
      <Class IRI="http://purl.obolibrary.org/obo/STATO_0000068"/>
      <DataHasValue>
        <DataProperty IRI="http://purl.obolibrary.org/obo/STATO_0000129"/>
        <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#integer">0</Literal>
      </DataHasValue>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000330"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000331"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
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<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000333"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000225"/>
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<SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000335"/>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000330"/>

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</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000027"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000346"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000050"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000390"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000346"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000301"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000368"/>
  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000109"/>
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  <Class IRI="http://purl.obolibrary.org/obo/STATO_0000368"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000136"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000107"/>
  </ObjectSomeValuesFrom>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/OBI_0000295"/>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000328"/>
  </ObjectSomeValuesFrom>
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  <Class IRI="http://purl.obolibrary.org/obo/OBI_0200000"/>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
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  <Class IRI="http://purl.obolibrary.org/obo/IAO_0000003"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#PoreSpace"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#VolcanicPhenomena"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Pyroclastic"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTime.owl#Repose"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#RockConstituent"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/human.owl#HumanActivity"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanCommerce.owl#Demand"/>

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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanDecision.owl#DecisionActivity"/>
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</SubClassOf>

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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrParticle.owl#EnergeticParticle"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrParticle.owl#SubatomicParticle"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrParticle.owl#SubatomicParticle"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrParticle.owl#Photon"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrParticle.owl#HeavyNuclei"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrParticle.owl#SubatomicParticle"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrParticle.owl#Molecule"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#SubstanceForm"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrParticle.owl#Neutron"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrParticle.owl#SubatomicParticle"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateSpaceScale.owl#SubatomicScale"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRock.owl#HeterogenousRock"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRock.owl#SedimentaryRock"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRock.owl#MetamorphicRock"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRock.owl#Rock"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRock.owl#Rock"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matr.owl#Mixture"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matr.owl#SolidSubstance"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRock.owl#RockBody"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matr.owl#Mixture"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRock.owl#MetamorphicRock"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Aa"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Basalt"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Aa"/>
  <ObjectHasValue>
    <ObjectProperty IRI="#&apos;hasForm&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#Fragment"/>
  </ObjectHasValue>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
  <Class IRI="#&apos;IntermediateRock&apos;"/>
</SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
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    <DataMaxCardinality cardinality="35">
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  </ObjectIntersectionOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
  <ObjectIntersectionOf>
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      <Datatype abbreviatedIRI="xsd:double"/>
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    <DataMaxCardinality cardinality="10">
      <DataProperty IRI="#&apos;QAPFFeldspathoidPercentageLessThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
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  <ObjectIntersectionOf>
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      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
  </ObjectIntersectionOf>

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    </DataMinCardinality>
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      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
    <DataMaxCardinality cardinality="20">
      <DataProperty IRI="#&apos;QAPFQuartzPercentageLessThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </ObjectIntersectionOf>
</SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
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    <DataMinCardinality cardinality="1">
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      <Datatype abbreviatedIRI="xsd:double"/>
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    <DataMaxCardinality cardinality="7">
      <DataProperty IRI="#&apos;TASAlkaliPercentageLessThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
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    <DataMinCardinality cardinality="54">
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      <Datatype abbreviatedIRI="xsd:double"/>
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    <DataMaxCardinality cardinality="62">
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      <Datatype abbreviatedIRI="xsd:double"/>
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  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;createdFrom&apos;"/>

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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenHydro.owl#HydrothermalAlteration"/>
  </ObjectSomeValuesFrom>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
    <Class IRI="#&apos;FractionalCrystallization&apos;"/>
  </ObjectSomeValuesFrom>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
    <Class IRI="#&apos;MagmaMixing&apos;"/>
  </ObjectSomeValuesFrom>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
    <Class IRI="#&apos;MagmaticAssimilation&apos;"/>
  </ObjectSomeValuesFrom>
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    <Class IRI="#&apos;PartialMelting&apos;"/>
  </ObjectSomeValuesFrom>
</ObjectUnionOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#ContinentalRift"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolOrogen.owl#Arc"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#SubductionZone"/>
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  </ObjectUnionOf>
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    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Aphanitic&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>

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    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PorphyriticTexture&apos;"/
>
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    </ObjectUnionOf>
</SubClassOf>
<SubClassOf>
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    <ObjectUnionOf>
        <ObjectHasValue>
            <ObjectProperty IRI="#&apos;hasGrainSize&apos;"/>
            <NamedIndividual IRI="#&apos;FineGrained&apos;"/>
        </ObjectHasValue>
        <ObjectHasValue>
            <ObjectProperty IRI="#&apos;hasGrainSize&apos;"/>
            <NamedIndividual IRI="#&apos;VeryFineGrained&apos;"/>
        </ObjectHasValue>
    </ObjectUnionOf>
</SubClassOf>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
    <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaProvenance.owl#wasDerivedFrom"/>
        <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#Subduction"/>
    </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
    <ObjectSomeValuesFrom>
        <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
        <Class IRI="#&apos;IntermediateMineral&apos;"/>
    </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#AnorogenicIgneousRock"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IntrusiveRock"/>
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<SubClassOf>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Basalt"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
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<SubClassOf>
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            <Datatype abbreviatedIRI="xsd:double"/>
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    </ObjectIntersectionOf>

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    </DataMinCardinality>
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    <DataMaxCardinality cardinality="10">
      <DataProperty IRI="#&apos;QAPFFeldspathoidPercentageLessThanOrEqual&apos;"/>
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    </DataMaxCardinality>
  </ObjectIntersectionOf>
</SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Basalt"/>
  <ObjectIntersectionOf>
    <DataMinCardinality cardinality="65">
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      <Datatype abbreviatedIRI="xsd:double"/>
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    <DataMaxCardinality cardinality="100">
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    </DataMaxCardinality>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Basalt"/>
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    <DataMinCardinality cardinality="0">
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      <Datatype abbreviatedIRI="xsd:double"/>
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    <DataMaxCardinality cardinality="20">
      <DataProperty IRI="#&apos;QAPFQuartzPercentageLessThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </ObjectIntersectionOf>
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    <DataMinCardinality cardinality="0">
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  <DataMaxCardinality cardinality="5">
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    <Datatype abbreviatedIRI="xsd:double"/>
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      <DataProperty IRI="#&apos;silicaPercentageGreaterThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
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      <Datatype abbreviatedIRI="xsd:double"/>
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</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Basalt"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Aphanitic&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;IntergranularTexture&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PorphyriticTexture&apos;"/>
    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Basalt"/>
  <ObjectUnionOf>
    <ObjectHasValue>
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    </ObjectHasValue>
  </ObjectUnionOf>
</SubClassOf>

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  <ObjectHasValue>
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    <NamedIndividual IRI="#&apos;VeryFineGrained&apos;"/>
  </ObjectHasValue>
</ObjectUnionOf>
</SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Basalt"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaProvenance.owl#wasDerivedFrom"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#UpperMantle"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Basalt"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
    <Class IRI="#&apos;MaficMineral&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#CinderCone"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicCone"/>
</SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#CinderCone"/>
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    <ObjectProperty IRI="#&apos;associatedWith&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#VolcanicField"/>
  </ObjectSomeValuesFrom>
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<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#CinderCone"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#StrombolianEruption"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#CinderCone"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Pyroclastic"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#CompositeCone"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicCone"/>
</SubClassOf>

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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Dacite"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
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<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Dacite"/>
  <Class IRI="#&apos;FelsicRock&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Dacite"/>
  <Class IRI="#&apos;IntermediateRock&apos;"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Dacite"/>
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    <DataMinCardinality cardinality="0">
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</SubClassOf>
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    <DataMinCardinality cardinality="65">
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    <DataMaxCardinality cardinality="100">
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  <ObjectIntersectionOf>
    <DataMinCardinality cardinality="0">
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    <DataMaxCardinality cardinality="8">
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  </ObjectIntersectionOf>
</SubClassOf>

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    <DataMaxCardinality cardinality="77">
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#ContinentalMargin"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#SubductionZone"/>
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  </ObjectUnionOf>
</SubClassOf>
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      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Aphanitic&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
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    >
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  <ObjectSomeValuesFrom>

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      <Class IRI="#&apos;IntermediateMineral&apos;"/>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#ExtrusiveRock"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IgneousRock"/>
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y&apos;"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Felsic"/>
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    <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
    <Class IRI="#&apos;Aluminum&apos;"/>
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    <Class IRI="#&apos;Oxygen&apos;"/>
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    <Class IRI="#&apos;Potassium&apos;"/>
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    <Class IRI="#&apos;Silicon&apos;"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IgneousRock"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
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      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PorphyriticTexture&apos;"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRock.owl#Rock"/>
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  <SubClassOf>
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      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaProvenance.owl#hasGenesis"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeol.owl#Igneous"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Magma"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IgneousRock"/>

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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Kimberlite"/>
  <Class IRI="#&apos;UltramaphicRock&apos;"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#containsMaterial"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Xenolith"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Kimberlite"/>
  <ObjectHasValue>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
    <NamedIndividual IRI="#&apos;Diamond&apos;"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Pyroclastic"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Lava"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
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    <Class IRI="#&apos;Iron&apos;"/>
  </ObjectSomeValuesFrom>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IgneousRock"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>

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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Crust"/>
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    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasRealm"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Mantle"/>
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  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#containsMaterial"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Glass"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
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    <ObjectProperty IRI="#&apos;hasForm&apos;"/>
    <NamedIndividual IRI="#&apos;Smooth&apos;"/>
  </ObjectHasValue>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Peridotite"/>
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  <Class IRI="#&apos;UltramaphicRock&apos;"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#SubmarineVolcano"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#MidOceanRidge"/>
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    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasRealm"/>
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  </ObjectUnionOf>

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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#Pillow"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IntrusiveRock"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IntrusiveRock"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#ExtrusiveRock"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Pyroclastic"/>
  <ObjectAllValuesFrom>

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    <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
    <Class IRI="http://purl.obolibrary.org/obo/bfo.owl#VolcanicEruption"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <Class IRI="#&apos;FelsicRock&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Obsidian"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Pumice"/>
    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
      <Class IRI="#&apos;FractionalCrystallization&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
      <Class IRI="#&apos;MagmaMixing&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
      <Class IRI="#&apos;MagmaticAssimilation&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
      <Class IRI="#&apos;PartialMelting&apos;"/>
    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>

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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#ContinentalRift"/>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolOrogen.owl#Arc"/>
  </ObjectSomeValuesFrom>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#TripleJunction"/>
  </ObjectSomeValuesFrom>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#HotSpot"/>
  </ObjectSomeValuesFrom>
</ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Aphanitic&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;HolohylineTexture&apos;"/>
    >
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;HypocrystallineTexture&ap
os;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PorphyriticTexture&apos;"/>
    >
    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <ObjectAllValuesFrom>

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    <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
    <Class IRI="#&apos;FelsicMineral&apos;"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <DataMinCardinality cardinality="35">
    <DataProperty IRI="#&apos;QAPFAlkaliPercentageGreaterThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMinCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <DataMinCardinality cardinality="10">
    <DataProperty IRI="#&apos;QAPFPlagioclasePercentageGreaterThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMinCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <DataMinCardinality cardinality="20">
    <DataProperty IRI="#&apos;QAPFQuartzPercentageGreaterThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMinCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <DataMinCardinality cardinality="1">
    <DataProperty IRI="#&apos;TASAlkaliPercentageGreaterThan&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMinCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <DataMinCardinality cardinality="69">
    <DataProperty IRI="#&apos;silicaPercentageGreaterThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMinCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <DataMaxCardinality cardinality="90">
    <DataProperty IRI="#&apos;QAPFAlkaliPercentageLessThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMaxCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <DataMaxCardinality cardinality="65">
    <DataProperty IRI="#&apos;QAPFPlagioclasePercentageLessThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMaxCardinality>

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    </DataMaxCardinality>
  </SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite"/>
  <DataMaxCardinality cardinality="60">
    <DataProperty IRI="#&apos;QAPFQuartzPercentageLessThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMaxCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#SpatterCone"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicCone"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tephra"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Pyroclastic"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyandesite"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyandesite"/>
  <Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyandesite"/>
  <Class IRI="#&apos;IntermediateRock&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyandesite"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00282"/>
      <Class IRI="#&apos;Alkali&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00282"/>
      <Class IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Undersaturated&apos;"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyandesite"/>
  <ObjectIntersectionOf>
    <DataMinCardinality cardinality="6">
      <DataProperty IRI="#&apos;TASAlkaliPercentageGreaterThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
    <DataMaxCardinality cardinality="12">

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    <DataProperty IRI="#&apos;TASAlkaliPercentageLessThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMaxCardinality>
</ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyandesite"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmsGeolContinental.owl#ContinentalRift"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmsGeolOrogen.owl#Arc"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmsLandTectonic.owl#SubductionZone"/>
    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyandesite"/>
  <DataMaxCardinality cardinality="20">
    <DataProperty IRI="#&apos;silicaPercentageLessThan&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMaxCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachybasalt"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachybasalt"/>
  <Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachybasalt"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
      <Class IRI="#&apos;IntermediateMineral&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
      <Class IRI="#&apos;MaficMineral&apos;"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
</SubClassOf>

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<Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachybasalt"/>
<ObjectIntersectionOf>
  <DataMinCardinality cardinality="5">
    <DataProperty IRI="#&apos;TASAlkaliPercentageGreaterThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMinCardinality>
  <DataMaxCardinality cardinality="7">
    <DataProperty IRI="#&apos;TASAlkaliPercentageLessThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMaxCardinality>
</ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
  <Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
  <Class IRI="#&apos;FelsicRock&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
  <Class IRI="#&apos;IntermediateRock&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
      <Class IRI="#&apos;FelsicMineral&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
      <Class IRI="#&apos;IntermediateMineral&apos;"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
  <ObjectIntersectionOf>
    <DataMinCardinality cardinality="65">
      <DataProperty IRI="#&apos;QAPFAlkaliPercentageGreaterThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
    <DataMaxCardinality cardinality="90">
      <DataProperty IRI="#&apos;QAPFAlkaliPercentageLessThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </ObjectIntersectionOf>
</SubClassOf>

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    </DataMaxCardinality>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
  <ObjectIntersectionOf>
    <DataMinCardinality cardinality="10">
      <DataProperty IRI="#&apos;QAPFPlagioclasePercentageGreaterThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
    <DataMaxCardinality cardinality="35">
      <DataProperty IRI="#&apos;QAPFPlagioclasePercentageLessThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#ContinentalRift"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolOrogen.owl#Arc"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#SubductionZone"/>
    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;associatedWith&apos;"/>
    <Class IRI="#&apos;AlkaliBasalt&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;hasEssentialMineral&apos;"/>
    <Class IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Sanidine&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
  <ObjectAllValuesFrom>

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    <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;TrachyticTexture&apos;"/>
    </ObjectAllValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
    <DataMinCardinality cardinality="7">
      <DataProperty IRI="#&apos;TASAlkaliPercentageGreaterThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
    <DataMaxCardinality cardinality="5">
      <DataProperty IRI="#&apos;QAPFQuartzPercentageLessThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte"/>
    <DataMaxCardinality cardinality="20">
      <DataProperty IRI="#&apos;silicaPercentageLessThan&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tuff"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tephra"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tuff"/>
    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrAerosol.owl#Ash"/>
    </ObjectAllValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tuff"/>
    <ObjectHasValue>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000039"/>
      <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#millimeter"/>
    </ObjectHasValue>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tuff"/>
    <DataHasValue>
      <DataProperty IRI="#&apos;grainSizeSmallerThan&apos;"/>
      <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#integer">2</Literal>
    </DataHasValue>

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</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#TuffCone"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicCone"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#TuffRing"/>
  <Class IRI="#&apos;VolcanicFeature&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#TuffRing"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;hasShape&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realm.owl#Ring"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Ultramaphic"/>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;IgneousCompositionProperty&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Ultramaphic"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
    <Class IRI="#&apos;Iron&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Ultramaphic"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
    <Class IRI="#&apos;Magnesium&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicCone"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#Volcano"/>
</SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicCone"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSpace.owl#hasGeometricalObject"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/reprSpaceGeometry3D.owl#Cone"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicNeck"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#VolcanicSystem"/>
</SubClassOf>

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<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicNeck"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#Volcano"/>
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  </ObjectSomeValuesFrom>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrWater.owl#Ice"/>
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      <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateSolid.owl#Crystal"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matr.owl#Substance"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenSystem.owl#Exchange"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenSystem.owl#Exchange"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propSpaceMultidimensional.owl#CrossSection"/>
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    <Class IRI="#&apos;UltraplinianEruption&apos;" />
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  <ObjectAllValuesFrom>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#GeologicBoundary"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Fracture"/>
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</SubClassOf>

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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#GeologicTimeUnit"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Eon"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaTime.owl#temporalPartOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Supereon"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Epoch"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#GeologicTimeUnit"/>
</SubClassOf>

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<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Epoch"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaTime.owl#temporalPartOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Period"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Era"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#GeologicTimeUnit"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Era"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaTime.owl#temporalPartOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Eon"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#GeologicTimeUnit"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTime.owl#Duration"/>
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<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#NeotectonicPeriod"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/reprTime.owl#TimeReference"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Period"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#GeologicTimeUnit"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Period"/>
  <Class IRI="http://www.w3.org/2006/time#ProperInterval"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Period"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaTime.owl#temporalPartOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Era"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Supereon"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#GeologicTimeUnit"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Aegirine&apos;"/>
  <Class IRI="#&apos;BowensDiscontinuousSeries&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Aegirine&apos;"/>

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    <Class IRI="#&apos;Clinopyroxene&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Aegirine&apos;"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
      <Class IRI="#&apos;Sodium&apos;"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Aegirine&apos;"/>
    <ObjectHasValue>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
      <NamedIndividual IRI="#&apos;Feplusplus&apos;"/>
    </ObjectHasValue>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Aegirine&apos;"/>
    <ObjectHasValue>
      <ObjectProperty IRI="#&apos;hasDistinctiveColor&apos;"/>
      <NamedIndividual IRI="#&apos;Green&apos;"/>
    </ObjectHasValue>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Agglomerate&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Pyroclastic"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Agglomerate&apos;"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
      <ObjectUnionOf>
        <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Block"/>
        <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Bomb"/>
      </ObjectUnionOf>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Agglomerate&apos;"/>
    <ObjectHasValue>
      <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000039"/>
      <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#millimeter"/>
    </ObjectHasValue>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Agglomerate&apos;"/>
    <ObjectHasValue>
      <ObjectProperty IRI="#&apos;crystalHasShape&apos;"/>
      <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateSpaceConfiguration.owl#Rounded"/>
    </ObjectHasValue>
  </SubClassOf>

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<SubClassOf>
  <Class IRI="#&apos;Agglomerate&apos;"/>
  <DataHasValue>
    <DataProperty IRI="#&apos;grainSizeLargerThan&apos;"/>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#integer">64</Literal>
  </DataHasValue>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Albite&apos;"/>
  <Class IRI="#&apos;BowensContinuousSeries&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Albite&apos;"/>
  <Class IRI="#&apos;FelsicMineral&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Albite&apos;"/>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PlagioclaseFeldspar&apos;"
/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Albite&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <Class IRI="#&apos;Sodium&apos;"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Albite&apos;"/>
  <DataMinCardinality cardinality="0">
    <DataProperty IRI="#&apos;percentageGreaterThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMinCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Albite&apos;"/>
  <DataMaxCardinality cardinality="10">
    <DataProperty IRI="#&apos;percentageLessThan&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMaxCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Alkali&apos;"/>
  <Class IRI="#&apos;AlkaliContent&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Alkali&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;hasNormativeMineral&apos;"/>
    <Class IRI="#&apos;Nepheline&apos;"/>
  </ObjectSomeValuesFrom>

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    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AlkaliBasalt&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Basalt"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AlkaliBasalt&apos;"/>
    <ObjectIntersectionOf>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="#&apos;hasEssentialMineral&apos;"/>
        <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Olivine"/>
      </ObjectSomeValuesFrom>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="#&apos;hasEssentialMineral&apos;"/>
        <Class IRI="#&apos;Augite&apos;"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AlkaliBasalt&apos;"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasProperty"/>
      <Class IRI="#&apos;Alkali&apos;"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AlkaliContent&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;GeochemicalProperty&apos
;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AlkaliContent&apos;"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#containsMaterial"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#AlkaliMetal"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AlkaliFeldspar&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Feldspar"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AlkaliFeldspar&apos;"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#contains"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#AlkaliMetal"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>

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    <Class IRI="#&apos;AlkalineIgneousRock&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IgneousRock"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AlkalineIgneousRock&apos;"/>
    <ObjectIntersectionOf>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00282"/>
        <Class IRI="#&apos;Alkali&apos;"/>
      </ObjectSomeValuesFrom>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00282"/>
        <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Undersaturated&apos;"/>
        </ObjectSomeValuesFrom>
      </ObjectIntersectionOf>
    </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
    <Class IRI="#&apos;AlkalineIgneousRock&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
    <ObjectUnionOf>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
        <Class IRI="#&apos;CrustalAssimilation&apos;"/>
      </ObjectSomeValuesFrom>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
        <Class IRI="#&apos;FluxMelting&apos;"/>
      </ObjectSomeValuesFrom>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
        <Class IRI="#&apos;FractionalCrystallization&apos;"/>
      </ObjectSomeValuesFrom>
    </ObjectUnionOf>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Allotriomorphic-GranularTexture&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;HolocrystallineTexture&apo
s;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Allotriomorphic-GranularTexture&apos;"/>
    <ObjectSomeValuesFrom>

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    <ObjectProperty IRI="#&apos;dominatedBy&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;AnhedralCrystal&apos;"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Aluminum&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Aluminum&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#TransitionMetal"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AluminumContent&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;GeochemicalProperty&apos;
;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AluminumContent&apos;"/>
    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#containsMaterial"/>
      <Class IRI="#&apos;Aluminum&apos;"/>
    </ObjectAllValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Amphibole&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Inosilicate&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AmygdaloidalTexture&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;VolcanicTexture&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;AmygdaloidalTexture&apos;"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;SecondaryMineral&apos;"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Ankerite&apos;"/>
    <Class IRI="#&apos;CarbonateMineral&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Ankerite&apos;"/>
    <ObjectAllValuesFrom>

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    <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasCrystalSystem&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Trigonal&apos;"/>
    </ObjectAllValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Antimony&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Chalcophile"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Antimony&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Prictogen"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Argon&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#NobleGas"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Arsenic&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Chalcophile"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Arsenic&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Prictogen"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Augite&apos;"/>
    <Class IRI="#&apos;BowensDiscontinuousSeries&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Augite&apos;"/>
    <Class IRI="#&apos;Clinopyroxene&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Augite&apos;"/>
    <Class IRI="#&apos;MaficMineral&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Augite&apos;"/>
    <ObjectUnionOf>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
        <Class IRI="#&apos;Aluminum&apos;"/>
      </ObjectSomeValuesFrom>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
        <Class IRI="#&apos;Iron&apos;"/>
      </ObjectSomeValuesFrom>
    </ObjectUnionOf>
  </SubClassOf>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
  </ObjectSomeValuesFrom>

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    <Class IRI="#&apos;Magnesium&apos;"/>
  </ObjectSomeValuesFrom>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <Class IRI="#&apos;Titanium&apos;"/>
  </ObjectSomeValuesFrom>
</ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Augite&apos;"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
      <Class IRI="#&apos;Aluminum&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
      <Class IRI="#&apos;Silicon&apos;"/>
    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Augite&apos;"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
      <Class IRI="#&apos;Calcium&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
      <Class IRI="#&apos;Sodium&apos;"/>
    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Augite&apos;"/>
  <ObjectHasValue>
    <ObjectProperty IRI="#&apos;seriesRangeBasedOn&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca"/>
  </ObjectHasValue>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Augite&apos;"/>
  <DataMinCardinality cardinality="25">
    <DataProperty IRI="#&apos;percentageGreaterThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMinCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Augite&apos;"/>
  <DataMaxCardinality cardinality="45">

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    <DataProperty IRI="#&apos;percentageLessThan&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMaxCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Autolith&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#RockConstituent"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Banding&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#StructuralConfiguration"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basaltic-Andesite&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basaltic-Andesite&apos;"/>
  <Class IRI="#&apos;IntermediateRock&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basaltic-Andesite&apos;"/>
  <Class IRI="#&apos;MaficRock&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basaltic-Andesite&apos;"/>
  <ObjectIntersectionOf>
    <DataMinCardinality cardinality="0">
      <DataProperty IRI="#&apos;TASAlkaliPercentageGreaterThan&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
    <DataMaxCardinality cardinality="6">
      <DataProperty IRI="#&apos;TASAlkaliPercentageLessThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basaltic-Andesite&apos;"/>
  <ObjectIntersectionOf>
    <DataMinCardinality cardinality="52">
      <DataProperty IRI="#&apos;silicaPercentageGreaterThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
    <DataMaxCardinality cardinality="57">
      <DataProperty IRI="#&apos;silicaPercentageLessThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </ObjectIntersectionOf>
</SubClassOf>
</SubClassOf>

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<Class IRI="#&apos;Basaltic-Andesite&apos;"/>
<ObjectSomeValuesFrom>
  <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
  <ObjectIntersectionOf>
    <Class IRI="#&apos;IntermediateMineral&apos;"/>
    <Class IRI="#&apos;MaficMineral&apos;"/>
  </ObjectIntersectionOf>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basanite&apos;"/>
  <Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basanite&apos;"/>
  <Class IRI="#&apos;MaficRock&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basanite&apos;"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00282"/>
      <Class IRI="#&apos;Alkali&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00282"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Undersaturated&apos;"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basanite&apos;"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
      <Class IRI="#&apos;Magnesium&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasEssentialMineral&apos;"/>
      <Class IRI="#&apos;Nepheline&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectHasValue>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
      <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#Silica"/>
    </ObjectHasValue>
  </ObjectIntersectionOf>
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  <Class IRI="#&apos;Basanite&apos;"/>
  <ObjectIntersectionOf>

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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Olivine"/>
    </ObjectSomeValuesFrom>
    <DataMinCardinality cardinality="10">
      <DataProperty IRI="#&apos;percentageGreaterThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
  </ObjectIntersectionOf>
</SubClassOf>
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      <DataProperty IRI="#&apos;QAPFAlkaliPercentageGreaterThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
    <DataMaxCardinality cardinality="10">
      <DataProperty IRI="#&apos;QAPFAlkaliPercentageLessThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basanite&apos;"/>
  <ObjectIntersectionOf>
    <DataMinCardinality cardinality="10">
      <DataProperty IRI="#&apos;QAPFFeldspathoidPercentageGreaterThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
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    <DataMaxCardinality cardinality="60">
      <DataProperty IRI="#&apos;QAPFFeldspathoidPercentageLessThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basanite&apos;"/>
  <ObjectIntersectionOf>
    <DataMinCardinality cardinality="90">
      <DataProperty IRI="#&apos;QAPFPlagioclasePercentageGreaterThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
    <DataMaxCardinality cardinality="100">
      <DataProperty IRI="#&apos;QAPFPlagioclasePercentageLessThanOrEqual&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
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</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basanite&apos;"/>

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  </DataMinCardinality>
  <DataMaxCardinality cardinality="49">
    <DataProperty IRI="#&apos;silicaPercentageLessThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMaxCardinality>
</ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basanite&apos;"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Aphanitic&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PorphyriticTexture&apos;"/>
    >
    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Basanite&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
    <Class IRI="#&apos;MaficMineral&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#HotSpot"/>
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<SubClassOf>
  <Class IRI="#&apos;Basanite&apos;"/>
  <DataMaxCardinality cardinality="9">
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    <Class IRI="#&apos;BatchMelting&apos;"/>
    <ObjectSomeValuesFrom>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenMixing.owl#Separation"/>
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  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Benmoreite&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Benmoreite&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyandesite"/>
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  <SubClassOf>
    <Class IRI="#&apos;Benmoreite&apos;"/>
    <ObjectIntersectionOf>
      <ObjectComplementOf>
        <ObjectSomeValuesFrom>
          <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
          <Class IRI="#&apos;Potassium&apos;"/>
        </ObjectSomeValuesFrom>
      </ObjectComplementOf>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
        <Class IRI="#&apos;Sodium&apos;"/>
      </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Benmoreite&apos;"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
      <Class IRI="#&apos;FractionalCrystallization&apos;"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Benmoreite&apos;"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasEssentialMineral&apos;"/>
      <Class IRI="#&apos;Nepheline&apos;"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Beryllium&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#AlkalineEarthMetal"/>
  </SubClassOf>

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<SubClassOf>
  <Class IRI="#&apos;Beryllium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
</SubClassOf>
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  <Class IRI="#&apos;Biotite&apos;"/>
  <Class IRI="#&apos;BowensDiscontinuousSeries&apos;"/>
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  <Class IRI="#&apos;Biotite&apos;"/>
  <Class IRI="#&apos;FelsicMineral&apos;"/>
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<SubClassOf>
  <Class IRI="#&apos;Biotite&apos;"/>
  <Class IRI="#&apos;IntermediateMineral&apos;"/>
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  <Class IRI="#&apos;Biotite&apos;"/>
  <Class IRI="#&apos;MaficMineral&apos;"/>
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      <Class IRI="#&apos;Aluminum&apos;"/>
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      <Class IRI="#&apos;Iron&apos;"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
      <Class IRI="#&apos;Magnesium&apos;"/>
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  </ObjectSomeValuesFrom>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolOrogen.owl#ForeArc"/>
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  <Class IRI="#&apos;Boninite&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
    <Class IRI="#&apos;FluxMelting&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Boninite&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
    <Class IRI="#&apos;Magnesium&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
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  <Class IRI="#&apos;Boninite&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#Subduction"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
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<SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Metalloid"/>
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  <Class IRI="#&apos;BowensContinuousSeries&apos;"/>
  <Class IRI="#&apos;BowensReactionSeries&apos;"/>
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<SubClassOf>
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  <Class IRI="#&apos;BowensReactionSeries&apos;"/>
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  <Class IRI="#&apos;ReactionSeries&apos;"/>

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  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;creates&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Mineral"/>
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  <Class IRI="#&apos;Bromine&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Halogen"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Chalcophile"/>
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  <Class IRI="#&apos;Cadmium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#TransitionMetal"/>
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  <Class IRI="#&apos;Calcite-Carbonatite&apos;"/>
  <Class IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Carbonatite&apos;"/>
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  <ObjectAllValuesFrom>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Calcite"/>
  </ObjectAllValuesFrom>
</SubClassOf>
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  <Class IRI="#&apos;Calcite-Carbonatite&apos;"/>
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    <DataProperty IRI="#&apos;percentageGreaterThan&apos;"/>
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</SubClassOf>

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    <Class IRI="#&apos;Calcium&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#AlkalineEarthMetal"/>
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  <SubClassOf>
    <Class IRI="#&apos;Calcium&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Carbon&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Nonmetal"/>
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  <SubClassOf>
    <Class IRI="#&apos;CarbonateMineral&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;NonsilicateMineral&apos;"/
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  <SubClassOf>
    <Class IRI="#&apos;CarbonateMineral&apos;"/>
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      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#containsMaterial"/>
      <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrIon.owl#Carbonate"/>
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    <Class
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/prop.owl#ChemicalProperty"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;ChemicalRepresentation&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/reprDataModel.owl#SpatialRepresentation"/>
  </SubClassOf>
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    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasRealm"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Chemistry"/>
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  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Chlorine&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Halogen"/>
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  <SubClassOf>
    <Class IRI="#&apos;Chlorine&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>

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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
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  <Class IRI="#&apos;Chromium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#TransitionMetal"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Pyroxine"/>
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    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Monoclinic&apos;"/>
    </ObjectAllValuesFrom>
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  <Class IRI="#&apos;SystemType&apos;"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasState"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateSystem.owl#Closed"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Basalt"/>
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    <ObjectProperty IRI="#&apos;formOf&apos;"/>
    <Class IRI="#&apos;ColumnarJoint&apos;"/>
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<SubClassOf>
  <Class IRI="#&apos;ColumnarJoint&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Joint"/>

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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/procPhysical.owl#Cooling"/>
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    <ObjectProperty IRI="#&apos;hasShape&apos;"/>
    <NamedIndividual IRI="#&apos;Columnar&apos;"/>
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  <Class IRI="#&apos;FractionalCrystallization&apos;"/>
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    <ObjectProperty IRI="#&apos;differentiateBy&apos;"/>
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  <Class IRI="#&apos;CongruentMelting&apos;"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#SolidEarth"/>
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  <Class IRI="#&apos;ContinentalRiftVolcanism&apos;"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#ContinentalRift"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Chalcophile"/>
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  <Class IRI="#&apos;Copper&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#TransitionMetal"/>
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  <Class IRI="#&apos;CrustalAssimilation&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#TectonicPhenomena"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenBiol.owl#Assimilation"/>
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  <Class IRI="#&apos;Crystal&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateSolid.owl#SolidState"/>
</SubClassOf>
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  <Class IRI="#&apos;CrystalTuff&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tuff"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;CrystalTuff&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;dominatedBy&apos;"/>
    <Class IRI="#&apos;Crystal&apos;"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;DecompressionMelting&apos;"/>
  <Class IRI="#&apos;PartialMelting&apos;"/>
</SubClassOf>
<SubClassOf>

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<Class IRI="#&apos;DecompressionMelting&apos;"/>
<ObjectSomeValuesFrom>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/procPhysical.owl#Decompression"/>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;DecompressionMelting&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#MagmaMotion"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;DecompressionMelting&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#Rift"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Dendrochronology&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/reprSciProvenance.owl#Chronology"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Dendrochronology&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#measureOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/reprMath.owl#Interval"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Dendrochronology&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#measures"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrPlant.owl#TreeRing"/>
  </ObjectAllValuesFrom>
</SubClassOf>
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  <Class IRI="#&apos;DiabasicTexture&apos;"/>
  <Class IRI="#&apos;PoikilliticTexture&apos;"/>
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<SubClassOf>
  <Class IRI="#&apos;DiabasicTexture&apos;"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasChadacryst&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Pyroxine"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasOikocryst&apos;"/>

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    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PlagioclaseFeldspar&apos;"
/>
    </ObjectSomeValuesFrom>
    </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
    <Class IRI="#&apos;Diopside&apos;" />
    <Class IRI="#&apos;BowensDiscontinuousSeries&apos;" />
</SubClassOf>
<SubClassOf>
    <Class IRI="#&apos;Diopside&apos;" />
    <Class IRI="#&apos;Clinopyroxene&apos;" />
</SubClassOf>
<SubClassOf>
    <Class IRI="#&apos;Diopside&apos;" />
    <Class IRI="#&apos;MaficMineral&apos;" />
</SubClassOf>
<SubClassOf>
    <Class IRI="#&apos;Diopside&apos;" />
    <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance" />
        <Class IRI="#&apos;Calcium&apos;" />
    </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
    <Class IRI="#&apos;Diopside&apos;" />
    <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance" />
        <Class IRI="#&apos;Magnesium&apos;" />
    </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
    <Class IRI="#&apos;Diopside&apos;" />
    <ObjectHasValue>
        <ObjectProperty IRI="#&apos;seriesRangeBasedOn&apos;" />
        <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca" />
    </ObjectHasValue>
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    <Class IRI="#&apos;Diopside&apos;" />
    <DataMinCardinality cardinality="45">
        <DataProperty IRI="#&apos;percentageGreaterThanOrEqual&apos;" />
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    </DataMinCardinality>
</SubClassOf>
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    <Class IRI="#&apos;Diopside&apos;" />
    <DataMaxCardinality cardinality="50">
        <DataProperty IRI="#&apos;percentageLessThan&apos;" />
        <Datatype abbreviatedIRI="xsd:double" />
    </DataMaxCardinality>
</SubClassOf>

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    </DataMaxCardinality>
  </SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Dolomite&apos;"/>
  <Class IRI="#&apos;CarbonateMineral&apos;"/>
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  <Class IRI="#&apos;Dolomite&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasCrystalSystem&apos;"/>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Trigonal&apos;"/>
  </ObjectAllValuesFrom>
</SubClassOf>
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  <Class IRI="#&apos;Dolomite-Carbonatite&apos;"/>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Carbonatite&apos;"/>
  </SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Dolomite-Carbonatite&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;hasPrimaryMineral&apos;"/>
    <Class IRI="#&apos;Dolomite&apos;"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Dolomite-Carbonatite&apos;"/>
  <DataMaxCardinality cardinality="90">
    <DataProperty IRI="#&apos;percentageGreaterThan&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMaxCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Dunite&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IntrusiveRock"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Dunite&apos;"/>
  <Class IRI="#&apos;UltramaphicRock&apos;"/>
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  <Class IRI="#&apos;Dunite&apos;"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#containsMaterial"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Olivine"/>
    </ObjectSomeValuesFrom>
    <DataMinCardinality cardinality="90">
      <DataProperty IRI="#&apos;percentageGreaterThan&apos;"/>

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    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMinCardinality>
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</SubClassOf>
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  <Class IRI="#&apos;Dunite&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;occursWithin&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#UpperMantle"/>
  </ObjectAllValuesFrom>
</SubClassOf>
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  <Class IRI="#&apos;Enstatite&apos;"/>
  <Class IRI="#&apos;BowensDiscontinuousSeries&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Enstatite&apos;"/>
  <Class IRI="#&apos;MaficMineral&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Enstatite&apos;"/>
  <Class IRI="#&apos;Orthopyroxene&apos;"/>
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  <Class IRI="#&apos;Enstatite&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <Class IRI="#&apos;Magnesium&apos;"/>
  </ObjectAllValuesFrom>
</SubClassOf>
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  <Class IRI="#&apos;EssentialMineral&apos;"/>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PrimaryMineral&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;EutecticPoint&apos;"/>
  <Class IRI="#&apos;PhaseDiagram&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;ExplosiveDecompression&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/procPhysical.owl#Decompression"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;ExplosiveDecompression&apos;"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenReaction.owl#Explosion"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
  <ObjectSomeValuesFrom>

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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenReaction.owl#Release"/>
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</ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Exsolution&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/procChemical.owl#ChemicalProcess"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Exsolution&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Crystallization"/>
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</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;FaultFeature&apos;"/>
  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000024"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Fault"/>
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<SubClassOf>
  <Class IRI="#&apos;Fayalite&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Olivine"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Fayalite&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
    <Class IRI="#&apos;Iron&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Feldspathoid&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Mineral"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Feldspathoid&apos;"/>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Tectosilicate&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Feldspathoid&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
    <ObjectComplementOf>
      <Class IRI="#&apos;SilicaContent&apos;"/>
    </ObjectComplementOf>
  </ObjectSomeValuesFrom>

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    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;FelsicMineral&apos;"/>
    <Class IRI="#&apos;MineralBySilicaContent&apos;"/>
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    <Class IRI="#&apos;FelsicMineral&apos;"/>
    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00282"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Felsic"/>
    </ObjectAllValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;FelsicRock&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IgneousRock"/>
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  <SubClassOf>
    <Class IRI="#&apos;FelsicRock&apos;"/>
    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00282"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Felsic"/>
    </ObjectAllValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Ferroan-Carbonatite&apos;"/>
    <Class
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  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Ferroan-Carbonatite&apos;"/>
    <ObjectUnionOf>
      <ObjectAllValuesFrom>
        <ObjectProperty IRI="#&apos;hasPrimaryMineral&apos;"/>
        <Class IRI="#&apos;Ankerite&apos;"/>
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      <ObjectAllValuesFrom>
        <ObjectProperty IRI="#&apos;hasPrimaryMineral&apos;"/>
        <Class IRI="#&apos;Dolomite&apos;"/>
      </ObjectAllValuesFrom>
      <ObjectAllValuesFrom>
        <ObjectProperty IRI="#&apos;hasPrimaryMineral&apos;"/>
        <Class IRI="#&apos;Siderite&apos;"/>
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    </ObjectUnionOf>
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  <SubClassOf>
    <Class IRI="#&apos;FlowBanding&apos;"/>
    <Class IRI="#&apos;Banding&apos;"/>
  </SubClassOf>
  <SubClassOf>

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<Class IRI="#&apos;FlowBanding&apos;"/>
<ObjectSomeValuesFrom>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
  <Class IRI="#&apos;FractionalCrystallization&apos;"/>
</ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;FlowBanding&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#partOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IgneousRock"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;FlowDifferentiation&apos;"/>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;differentiateBy&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenSystem.owl#Flow"/>
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</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Fluorine&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Halogen"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Fluorine&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
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  <Class IRI="#&apos;FluxMelting&apos;"/>
  <Class IRI="#&apos;PartialMelting&apos;"/>
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  <Class IRI="#&apos;FluxMelting&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenMixing.owl#Separation"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;FluxMelting&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#reduce"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTemperature.owl#MeltingPoint"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>

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<Class IRI="#&apos;FluxMelting&apos;"/>
<ObjectSomeValuesFrom>
  <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
  <ObjectHasValue>
    <ObjectProperty IRI="#&apos;influxOf&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#Fluid"/>
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</ObjectSomeValuesFrom>
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<SubClassOf>
  <Class IRI="#&apos;Foresterite&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Olivine"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Foresterite&apos;"/>
  <Class IRI="#&apos;BowensDiscontinuousSeries&apos;"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Foresterite&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
    <Class IRI="#&apos;Magnesium&apos;"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;FractionalCrystallization&apos;"/>
  <Class IRI="#&apos;IgneousDifferentiation&apos;"/>
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  <Class IRI="#&apos;FractionalCrystallization&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Crystallization"/>
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</SubClassOf>
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  <Class IRI="#&apos;FractionalCrystallization&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;processWithin&apos;"/>
    <Class IRI="#&apos;MagmaChamber&apos;"/>
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</SubClassOf>
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  <Class IRI="#&apos;FractionalCrystallization&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;separates&apos;"/>
    <Class IRI="#&apos;Crystal&apos;"/>
  </ObjectAllValuesFrom>
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  <Class IRI="#&apos;FractionalCrystallization&apos;"/>

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<ObjectHasValue>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSpace.owl#separatedFrom"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#Liquid"/>
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  <Class IRI="#&apos;FreezingPoint&apos;"/>
  <Class IRI="http://bhi.washington.edu/OPB#OPB_00293"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTemperature.owl#Temperature"/>
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  <Class IRI="#&apos;Geochronology&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geology"/>
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  <Class IRI="#&apos;Geochronology&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/reprSciProvenance.owl#Chronology"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateSystem.owl#SystemState"/>
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  <Class IRI="#&apos;GeologySystemState&apos;"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geology"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaHuman.owl#studyOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Physics"/>
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  <Class IRI="#&apos;GravitationalSeparation&apos;"/>
  <Class IRI="#&apos;FractionalCrystallization&apos;"/>
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  <Class IRI="#&apos;GravitationalSeparation&apos;"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>

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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasProcess"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenFluidTransport.owl#Buoyancy"/>
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  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasProcess"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenMixing.owl#Settling"/>
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</ObjectUnionOf>
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  <Class IRI="#&apos;GravitationalSeparation&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;differentiateBy&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/procPhysical.owl#GravitationalForce"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Gregoryite&apos;"/>
  <Class IRI="#&apos;CarbonateMineral&apos;"/>
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  <Class IRI="#&apos;Gregoryite&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasCrystalSystem&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Hexagonal&apos;"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;HawaiianEruption&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#Magmatic"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;HawaiianEruption&apos;"/>
  <ObjectUnionOf>
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      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaHuman.owl#produces"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Aa"/>
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      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaHuman.owl#produces"/>
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    </ObjectComplementOf>
    <ObjectSomeValuesFrom>
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      <Class IRI="#&apos;Iron&apos;"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#HotSpot"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tephra"/>
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    <Class IRI="#&apos;Welding&apos;"/>
  </ObjectSomeValuesFrom>
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  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
    <Class IRI="http://purl.obolibrary.org/obo/bfo.owl#PyroclasticFlow"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#SolidEarth"/>
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y&apos;"/>
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  <Class IRI="#&apos;InvestRealizableEntity&apos;"/>
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;"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrIsotope.owl#Isotope"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Kimberlite"/>
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      <Class IRI="#&apos;Magnesium&apos;"/>
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    <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
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      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#hasUnit"/>
      <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#millimeter"/>
    </ObjectHasValue>
  </SubClassOf>

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</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Lapilli&apos;"/>
  <DataMinCardinality cardinality="2">
    <DataProperty IRI="#&apos;hasDiameter&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMinCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Lapilli&apos;"/>
  <DataMaxCardinality cardinality="64">
    <DataProperty IRI="#&apos;hasDiameter&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
  </DataMaxCardinality>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;LapilliTuff&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tuff"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;LapilliTuff&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
    <ObjectIntersectionOf>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrAerosol.owl#Ash"/>
      <Class IRI="#&apos;Lapilli&apos;"/>
    </ObjectIntersectionOf>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;LapilliTuff&apos;"/>
  <ObjectHasValue>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000039"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#millimeter"/>
  </ObjectHasValue>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;LapilliTuff&apos;"/>
  <DataHasValue>
    <DataProperty IRI="#&apos;grainSizeLargerThan&apos;"/>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#integer">2</Literal>
  </DataHasValue>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;LapilliTuff&apos;"/>
  <DataHasValue>
    <DataProperty IRI="#&apos;grainSizeSmallerThan&apos;"/>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#integer">64</Literal>
  </DataHasValue>
</SubClassOf>
<SubClassOf>

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    <Class IRI="#&apos;Latite&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Hypabyssal"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Latite&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyandesite"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Latite&apos;"/>
    <Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Latite&apos;"/>
    <Class IRI="#&apos;IntermediateRock&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Latite&apos;"/>
    <ObjectIntersectionOf>
      <DataMinCardinality cardinality="35">
        <DataProperty IRI="#&apos;QAPFAlkaliPercentageGreaterThanOrEqual&apos;"/>
        <Datatype abbreviatedIRI="xsd:double"/>
      </DataMinCardinality>
      <DataMaxCardinality cardinality="65">
        <DataProperty IRI="#&apos;QAPFAlkaliPercentageLessThanOrEqual&apos;"/>
        <Datatype abbreviatedIRI="xsd:double"/>
      </DataMaxCardinality>
    </ObjectIntersectionOf>
  </SubClassOf>
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    <Class IRI="#&apos;Latite&apos;"/>
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      <DataMinCardinality cardinality="35">
        <DataProperty IRI="#&apos;QAPFPlagioclasePercentageGreaterThanOrEqual&apos;"/>
        <Datatype abbreviatedIRI="xsd:double"/>
      </DataMinCardinality>
      <DataMaxCardinality cardinality="65">
        <DataProperty IRI="#&apos;QAPFPlagioclasePercentageLessThanOrEqual&apos;"/>
        <Datatype abbreviatedIRI="xsd:double"/>
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    </ObjectIntersectionOf>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Latite&apos;"/>
    <ObjectUnionOf>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
        <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenHydro.owl#Intrusion"/>
      </ObjectSomeValuesFrom>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
        <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmlandVolcanic.owl#HotSpot"/>
      </ObjectSomeValuesFrom>
    </ObjectUnionOf>
  </SubClassOf>

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    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Latite&apos;"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
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      <Class
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      </ObjectSomeValuesFrom>
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      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Aphyritic&apos;"/>
      </ObjectSomeValuesFrom>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PorphyriticTexture&apos;"/>
  >
    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Latite&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
    <Class IRI="#&apos;Potassium&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Latite&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;hasEssentialMineral&apos;"/>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Sanidine&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Latite&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
    <Class IRI="#&apos;IntermediateMineral&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Latite&apos;"/>

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<DataMaxCardinality cardinality="5">
  <DataProperty IRI="#&apos;QAPFQuartzPercentageLessThanOrEqual&apos;"/>
  <Datatype abbreviatedIRI="xsd:double"/>
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  <Class IRI="#&apos;LavaFlow&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#VolcanicPhenomena"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;LavaFlow&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Lava"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;LavaFountain&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#VolcanicPhenomena"/>
</SubClassOf>
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  <Class IRI="#&apos;LavaFountain&apos;"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;associatedWith&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#StrombolianEruption"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;associatedWith&apos;"/>
      <Class IRI="#&apos;HawaiianEruption&apos;"/>
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  </ObjectUnionOf>
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  <Class IRI="#&apos;LavaFountain&apos;"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenReaction.owl#Eruption"/>
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  <Class IRI="#&apos;LavaFountain&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Lava"/>
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<SubClassOf>
  <Class IRI="#&apos;LavaTube&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandFluvial.owl#Cave"/>
</SubClassOf>

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<SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#VolcanicSystem"/>
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<SubClassOf>
  <Class IRI="#&apos;LavaTube&apos;"/>
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    <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
    <Class IRI="#&apos;LavaFlow&apos;"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Lead&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Chalcophile"/>
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  <Class IRI="#&apos;Lead&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#PostTransitionMetal"/>
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  <Class IRI="#&apos;Leucite&apos;"/>
  <Class IRI="#&apos;Feldspathoid&apos;"/>
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  <Class IRI="#&apos;Leucite&apos;"/>
  <ObjectSomeValuesFrom>
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    <Class IRI="#&apos;Potassium&apos;"/>
  </ObjectSomeValuesFrom>
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  <Class IRI="#&apos;Leucite&apos;"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasCrystalSystem&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateSpaceConfiguration.owl#Tetragonal"/>
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  <Class IRI="#&apos;Leucitite&apos;"/>
  <Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
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  <Class IRI="#&apos;Leucitite&apos;"/>
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    <ObjectComplementOf>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
        <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Feldspar"/>
      </ObjectSomeValuesFrom>
    </ObjectComplementOf>
  </ObjectIntersectionOf>

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<ObjectComplementOf>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
    <Class IRI="#&apos;Magnesium&apos;"/>
  </ObjectSomeValuesFrom>
</ObjectComplementOf>
<ObjectComplementOf>
  <ObjectHasValue>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#Silica"/>
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</ObjectComplementOf>
</ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Leucitite&apos;"/>
  <ObjectIntersectionOf>
    <ObjectAllValuesFrom>
      <ObjectProperty IRI="#&apos;hasEssentialMineral&apos;"/>
      <Class IRI="#&apos;Augite&apos;"/>
    </ObjectAllValuesFrom>
    <ObjectAllValuesFrom>
      <ObjectProperty IRI="#&apos;hasEssentialMineral&apos;"/>
      <Class IRI="#&apos;Leucite&apos;"/>
    </ObjectAllValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Leucitite&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
    <Class IRI="#&apos;PartialMelting&apos;"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Leucitite&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#HotSpot"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Liquidus&apos;"/>
  <Class IRI="#&apos;PhaseBoundaries&apos;"/>
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<SubClassOf>
  <Class IRI="#&apos;Liquidus&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaMath.owl#representationOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTemperature.owl#MeltingPoint"/>
  </ObjectAllValuesFrom>

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</SubClassOf>
<SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Clast"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;LithicClast&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#containsMaterial"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRock.owl#Rock"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;LithicTuff&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tuff"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;LithicTuff&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;dominatedBy&apos;"/>
    <Class IRI="#&apos;LithicClast&apos;"/>
  </ObjectAllValuesFrom>
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  <Class IRI="#&apos;Lithium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#AlkaliMetal"/>
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  <Class IRI="#&apos;Lithium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
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  <Class IRI="#&apos;FelsicRock&apos;"/>
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    <ObjectHasValue>
      <ObjectProperty IRI="#&apos;hasShape&apos;"/>
      <NamedIndividual
IRI="http://sweet.jpl.nasa.gov/2.3/stateSpaceConfiguration.owl#Spherical"/>
    </ObjectHasValue>
    <ObjectHasValue>
      <ObjectProperty IRI="#&apos;hasShape&apos;"/>
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    </ObjectHasValue>
  </ObjectUnionOf>
</SubClassOf>

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</ObjectUnionOf>
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  <Class IRI="#&apos;Lithophysa&apos;"/>
  <ObjectSomeValuesFrom>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/reprSpaceGeometry3D.owl#Cavity"/>
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  <ObjectHasValue>
    <ObjectProperty IRI="#&apos;formOf&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#Silica"/>
  </ObjectHasValue>
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  <Class IRI="#&apos;MaarDiatremeVolcanism&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#Volcanism"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;MaarDiatremeVolcanism&apos;"/>
  <ObjectSomeValuesFrom>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#SteamBlastEruption"/>
  </ObjectSomeValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;MaarDiatremeVolcanism&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaProvenance.owl#wasDerivedFrom"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#LowerMantle"/>
  </ObjectAllValuesFrom>
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  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;createsFeature&apos;"/>
    <Class IRI="#&apos;KimberlitePipe&apos;"/>
  </ObjectAllValuesFrom>
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  <Class IRI="#&apos;MineralBySilicaContent&apos;"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Mafic"/>
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</SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IgneousRock"/>
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  <Class IRI="#&apos;MaficRock&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00282"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Mafic"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realMLandVolcanic.owl#VolcanicSystem"/>
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  <Class IRI="#&apos;MagmaChamber&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Magma"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;MagmaMixing&apos;"/>
  <Class IRI="#&apos;MagmaticPhenomena&apos;"/>
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  <Class IRI="#&apos;MagmaMixing&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realMOceanFloor.owl#processOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenMixing.owl#Mixing"/>
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</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;MagmaticAssimilation&apos;"/>
  <Class IRI="#&apos;MagmaticPhenomena&apos;"/>
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<SubClassOf>
  <Class IRI="#&apos;MagmaticAssimilation&apos;"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasProcess"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Dissolution"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasProcess"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/procStateChange.owl#Ionization"/>
    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasProcess"/>
  </ObjectSomeValuesFrom>

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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/procStateChange.owl#Melting"/>
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  <Class IRI="#&apos;MagmaticAssimilation&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realOceanFloor.owl#processOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenBiol.owl#Assimilation"/>
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  <Class IRI="#&apos;MagmaticPhenomena&apos;"/>
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    <ObjectProperty IRI="#&apos;occursWithin&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realGeol.owl#UpperMantle"/>
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  <Class IRI="#&apos;MagmaticPhenomena&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;processWithin&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realGeol.owl#Lithosphere"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Magnesium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#AlkalineEarthMetal"/>
</SubClassOf>
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  <Class IRI="#&apos;Magnesium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
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  <Class IRI="#&apos;Manganese&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Siderophile"/>

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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#TransitionMetal"/>
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  <Class IRI="#&apos;Mercury&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Chalcophile"/>
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  <Class IRI="#&apos;Mica&apos;"/>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Phylosilicate&apos;"/>
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    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Monoclinic&apos;"/>
    </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;MidOceanRidgeBasalt&apos;"/>
  <Class IRI="#&apos;TholeiiticBasalt&apos;"/>
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<SubClassOf>
  <Class IRI="#&apos;MidOceanRidgeBasalt&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#causedBy"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Extension"/>
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  <Class IRI="#&apos;MidOceanRidgeBasalt&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
    <Class IRI="#&apos;RiftVolcanism&apos;"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;MidOceanRidgeBasalt&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#MidOceanRidge"/>
  </ObjectAllValuesFrom>

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&apos;"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeol.owl#GeologicalPhenomena"/>
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  <Class
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Siderophile"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#TransitionMetal"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyandesite"/>
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  <Class IRI="#&apos;AlkaliBasalt&apos;"/>
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    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasEssentialMineral&apos;"/>
      <Class IRI="#&apos;Oligoclase&apos;"/>
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<SubClassOf>
  <Class IRI="#&apos;Mugearite&apos;"/>

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    <ObjectSomeValuesFrom>
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      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PorphyriticTexture&apos;"/>
    >
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  <SubClassOf>
    <Class IRI="#&apos;Muscovite&apos;"/>
    <Class IRI="#&apos;BowensContinuousSeries&apos;"/>
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  <SubClassOf>
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    <Class IRI="#&apos;BowensDiscontinuousSeries&apos;"/>
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    <Class IRI="#&apos;FelsicMineral&apos;"/>
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    <Class IRI="#&apos;Mica&apos;"/>
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        <Class IRI="#&apos;Aluminum&apos;"/>
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        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
        <Class IRI="#&apos;Potassium&apos;"/>
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    <Class IRI="#&apos;Natrocarbonatite&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Carbonatite&apos;"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Natrocarbonatite&apos;"/>

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    <ObjectProperty IRI="#&apos;hasPrimaryMineral&apos;"/>
    <Class IRI="#&apos;Gregoryite&apos;"/>
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    <Class IRI="#&apos;Nyerereite&apos;"/>
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</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Neon&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#NobleGas"/>
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  <Class IRI="#&apos;Nepheline&apos;"/>
  <Class IRI="#&apos;Feldspathoid&apos;"/>
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  <Class IRI="#&apos;Nepheline&apos;"/>
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    <Class IRI="#&apos;Sodium&apos;"/>
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    <ObjectProperty
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    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Hexagonal&apos;"/>
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  <Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
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        <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Feldspar"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#Silica"/>
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    <ObjectAllValuesFrom>
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      <Class IRI="#&apos;Augite&apos;"/>
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      <Class IRI="#&apos;Nepheline&apos;"/>
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  </ObjectIntersectionOf>
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  <Class IRI="#&apos;Nephelinite&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realMOceanFloor.owl#processOf"/>
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  </ObjectSomeValuesFrom>
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  <Class IRI="#&apos;Nephelinite&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realMLandVolcanic.owl#HotSpot"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Prictogen"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propCategorical.owl#Classification"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateSystem.owl#SystemState"/>
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    <Class IRI="#&apos;Orthorhombic&apos;"/>
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  <Class IRI="#&apos;OceanIslandBasalt&apos;"/>
  <Class IRI="#&apos;TholeiiticBasalt&apos;"/>
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  <Class IRI="#&apos;OceanIslandBasalt&apos;"/>
  <ObjectSomeValuesFrom>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeol.owl#IntraplateProcess"/>
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  <ObjectSomeValuesFrom>
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    <Class IRI="#&apos;HotSpotVolcanism&apos;"/>
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    <ObjectProperty IRI="#&apos;createsFeature&apos;"/>
    <Class IRI="#&apos;VolcanicIsland&apos;"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmOcean.owl#OceanRegion"/>
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  <Class IRI="#&apos;OceanicCrust&apos;"/>
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    <Class IRI="#&apos;MaficRock&apos;"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#Chadacryst"/>
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      <ObjectSomeValuesFrom>
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        <Class IRI="#&apos;Calcium&apos;"/>
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        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
        <Class IRI="#&apos;Sodium&apos;"/>
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    <Class IRI="#&apos;Oligoclase&apos;"/>
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  <Class IRI="#&apos;SystemType&apos;"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateSystem.owl#Open"/>
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      <Class IRI="#&apos;Augite&apos;"/>
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      <ObjectProperty IRI="#&apos;hasOikocryst&apos;"/>
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        <Class IRI="#&apos;Orthorhombic&apos;"/>
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    </SubClassOf>
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    <Class IRI="#&apos;SilicaContent&apos;"/>
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    <Class IRI="#&apos;Oversaturated&apos;"/>
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      <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#Silica"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Chalcogen"/>
  </SubClassOf>
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    <Class IRI="#&apos;Oxygen&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
  </SubClassOf>
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    <Class IRI="#&apos;MagmaticMelting&apos;"/>
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    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;ParentalMagma&apos;"/>
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  </SubClassOf>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;associatedWith&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#Volcanism"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>

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    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
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      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#SubductionZone"/>
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  <SubClassOf>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#HotSpot"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#MidOceanRidge"/>
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  </SubClassOf>
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  <SubClassOf>
    <Class IRI="#&apos;PhaseDiagram&apos;"/>
    <Class IRI="http://purl.obolibrary.org/obo/IAO_0000038"/>
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  <SubClassOf>
    <Class IRI="#&apos;PhaseDiagram&apos;"/>
    <Class IRI="#&apos;ChemicalRepresentation&apos;"/>
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    <Class IRI="#&apos;PhaseDiagram&apos;"/>
    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaMath.owl#representationOf"/>
      <Class IRI="#&apos;SolidSolution&apos;"/>
    </ObjectAllValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Phosphorus&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Phosphorus&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Prictogen"/>
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  <SubClassOf>

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    <Class IRI="#&apos;PicriticBasalt&apos;"/>
    <Class IRI="#&apos;AlkaliBasalt&apos;"/>
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    <Class IRI="#&apos;PicriticBasalt&apos;"/>
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      <Class IRI="#&apos;SubalkaliBasalt&apos;"/>
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  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;PicriticBasalt&apos;"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
      <Class IRI="#&apos;Magnesium&apos;"/>
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  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;PicriticBasalt&apos;"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasEssentialMineral&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Olivine"/>
    </ObjectSomeValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;Pigeonite&apos;"/>
    <Class IRI="#&apos;Clinopyroxene&apos;"/>
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  <SubClassOf>
    <Class IRI="#&apos;Pigeonite&apos;"/>
    <Class IRI="#&apos;MaficMineral&apos;"/>
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    <Class IRI="#&apos;Pigeonite&apos;"/>
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      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
        <Class IRI="#&apos;Calcium&apos;"/>
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      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
        <Class IRI="#&apos;Iron&apos;"/>
      </ObjectSomeValuesFrom>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
        <Class IRI="#&apos;Magnesium&apos;"/>
      </ObjectSomeValuesFrom>
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  <SubClassOf>
    <Class IRI="#&apos;Pigeonite&apos;"/>

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    <ObjectHasValue>
      <ObjectProperty IRI="#&apos;seriesRangeBasedOn&apos;"/>
      <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca"/>
    </ObjectHasValue>
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  <Class IRI="#&apos;Pigeonite&apos;"/>
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    <DataProperty IRI="#&apos;percentageGreaterThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
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  <Class IRI="#&apos;PoikilliticTexture&apos;"/>
  <Class IRI="#&apos;SubvolcanicTexture&apos;"/>
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s;"/>
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    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00085"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmsGeolConstituent.owl#Chadacryst"/>
    </ObjectAllValuesFrom>
    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00085"/>
      <Class IRI="#&apos;Oikocryst&apos;"/>
    </ObjectAllValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Polonium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#PostTransitionMetal"/>
</SubClassOf>

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<SubClassOf>
  <Class IRI="#&apos;Potassium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#AlkaliMetal"/>
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  <Class IRI="#&apos;Potassium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
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  <Class IRI="#&apos;Pyroclast&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Pyroclastic"/>
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<SubClassOf>
  <Class IRI="#&apos;PyroclasticBreccia&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRock.owl#Breccia"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Bomb"/>
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  </ObjectSomeValuesFrom>
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  <Class IRI="#&apos;PyroclasticBreccia&apos;"/>
  <ObjectHasValue>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/IAO_0000039"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#millimeter"/>
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  <Class IRI="#&apos;PyroclasticBreccia&apos;"/>
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    <NamedIndividual IRI="#&apos;Angular&apos;"/>
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</SubClassOf>
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  <Class IRI="#&apos;PyroclasticBreccia&apos;"/>
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    <DataProperty IRI="#&apos;grainSizeLargerThan&apos;"/>
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  <Class IRI="#&apos;UltramaphicRock&apos;"/>
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  <Class IRI="#&apos;Pyrolite&apos;"/>
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    <ObjectSomeValuesFrom>
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      <Class IRI="#&apos;Dunite&apos;"/>
    </ObjectSomeValuesFrom>
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      <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00085"/>
      <Class IRI="#&apos;TholeiiticBasalt&apos;"/>
    </ObjectSomeValuesFrom>
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  <Class IRI="#&apos;RockNameClassification&apos;"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#relatedTo"/>
    <Class IRI="#&apos;NormativeMineralogy&apos;"/>
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  <Class IRI="#&apos;QAPFClassification&apos;"/>
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    <ObjectProperty IRI="#&apos;utilizeSubstance&apos;"/>
    <ObjectIntersectionOf>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Quartz"/>
      <Class IRI="#&apos;AlkaliFeldspar&apos;"/>
      <Class IRI="#&apos;Feldspathoid&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PlagioclaseFeldspar&apos;"
/>
    </ObjectIntersectionOf>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Radium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#AlkalineEarthMetal"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Radon&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#NobleGas"/>
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<SubClassOf>

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    <Class IRI="#&apos;ReactionSeries&apos;"/>
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    <Class IRI="#&apos;ReactionSeries&apos;"/>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Crystallization"/>
    </ObjectSomeValuesFrom>
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    <Class IRI="#&apos;ReactionSeries&apos;"/>
    <ObjectAllValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasRealm"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#SolidEarth"/>
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  </SubClassOf>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#Volcanism"/>
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      <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Extension"/>
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  </SubClassOf>
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    <Class IRI="#&apos;RiftVolcanism&apos;"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#Rift"/>
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  <SubClassOf>
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    <Class IRI="#&apos;NomenclatureClassification&apos;"/>
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    <Class IRI="#&apos;RockNameClassification&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;GeologicalClassification&a
pos;"/>
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  <SubClassOf>
    <Class IRI="#&apos;Seismometer&apos;"/>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0000832"/>
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  <SubClassOf>
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  <Class IRI="#&apos;Seismometer&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#measures"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolSeismicity.owl#SeismicPhenomena"/>
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  <Class IRI="#&apos;Selenium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Chalcogen"/>
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  <Class IRI="#&apos;Selenium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Chalcophile"/>
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  <Class IRI="#&apos;Shoshonite&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyandesite"/>
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        <Class IRI="#&apos;Sodium&apos;"/>
      </ObjectSomeValuesFrom>
    </ObjectComplementOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
      <Class IRI="#&apos;Potassium&apos;"/>
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</SubClassOf>
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  <Class IRI="#&apos;Siderite&apos;"/>
  <Class IRI="#&apos;CarbonateMineral&apos;"/>
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  <Class IRI="#&apos;Siderite&apos;"/>
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    <ObjectProperty
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    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Trigonal&apos;"/>
    </ObjectAllValuesFrom>
  </SubClassOf>
  <SubClassOf>
    <Class IRI="#&apos;SilicaContent&apos;"/>
  </Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;GeochemicalProperty&apos;
;"/>
  </SubClassOf>
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    <Class IRI="#&apos;SilicaContent&apos;"/>
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      <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00122"/>
      <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#Silica"/>
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    <Class IRI="#&apos;Silicon&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Metalloid"/>
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  <SubClassOf>
    <Class IRI="#&apos;Sodalite&apos;"/>
    <Class IRI="#&apos;Feldspathoid&apos;"/>
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    <Class IRI="#&apos;Sodalite&apos;"/>
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      <NamedIndividual IRI="#&apos;Blue&apos;"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matr.owl#Solution"/>
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  <SubClassOf>

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    <Class IRI="#&apos;SolidSolution&apos;"/>
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    <Class IRI="#&apos;SolidSolution&apos;"/>
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      <Class IRI="#&apos;Exsolution&apos;"/>
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    <Class
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&apos;"/>
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    <Class IRI="#&apos;Solidus&apos;"/>
    <ObjectAllValuesFrom>
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      <Class IRI="#&apos;FreezingPoint&apos;"/>
    </ObjectAllValuesFrom>
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    <Class IRI="#&apos;SpheruliticTexture&apos;"/>
    <Class
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    <Class
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s;"/>

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</SubClassOf>
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  <Class IRI="#&apos;Strontium&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#AlkalineEarthMetal"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
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      <Class IRI="#&apos;Nepheline&apos;"/>
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  </ObjectAllValuesFrom>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#PillowLava"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenHydro.owl#Flood"/>
    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>

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    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;SubglacialEruption&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
    <Class IRI="#&apos;SubglacialVolcano&apos;"/>
  </ObjectAllValuesFrom>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;SubglacialVolcano&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#Volcano"/>
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<SubClassOf>
  <Class IRI="#&apos;SubglacialVolcano&apos;"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSpace.owl#under"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmCryo.owl#GlacialRegion"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSpace.owl#under"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmCryo.owl#Glacier"/>
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      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSpace.owl#under"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmCryo.owl#IceSheet"/>
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      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSpace.owl#under"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmCryo.owl#IceShelf"/>
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  </ObjectUnionOf>
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  <Class IRI="#&apos;SubglacialVolcano&apos;"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasRealm"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrWater.owl#Ice"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaHuman.owl#produces"/>
    <Class IRI="#&apos;SubglacialEruption&apos;"/>
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</SubClassOf>
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  <Class IRI="#&apos;SubhedralCrystal&apos;"/>

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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#PhreatomagmaticEruption"/>
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<SubClassOf>
  <Class IRI="#&apos;SubmarineEruption&apos;"/>
  <ObjectSomeValuesFrom>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#PillowLava"/>
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</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;SubmarineEruption&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realMLandVolcanic.owl#SubmarineVolcano"/>
  </ObjectAllValuesFrom>
</SubClassOf>
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  <Class IRI="#&apos;SubvolcanicTexture&apos;"/>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;IgneousTexture&apos;"/>
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  <Class IRI="#&apos;Sulfur&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Chalcogen"/>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Sulfur&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Chalcophile"/>
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  <Class IRI="#&apos;SurtseyanEruption&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#PhreatomagmaticEruption"/>
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  <Class IRI="#&apos;SurtseyanEruption&apos;"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Ashfall"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaHuman.owl#produces"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Mudflow"/>
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  </ObjectUnionOf>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaHuman.owl#produces"/>
  </ObjectSomeValuesFrom>

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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#Surge"/>
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</ObjectUnionOf>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;associatedWith&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#SubmarineVolcano"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
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    </ObjectSomeValuesFrom>
  </ObjectUnionOf>
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  <Class IRI="#&apos;SystemType&apos;"/>
  <Class IRI="#&apos;GeologySystemState&apos;"/>
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  <Class IRI="#&apos;RockNameClassification&apos;"/>
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    <ObjectProperty IRI="#&apos;utilizeProperty&apos;"/>
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      <Class IRI="#&apos;SilicaContent&apos;"/>
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  </ObjectAllValuesFrom>
</SubClassOf>
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  <Class IRI="#&apos;TephraChronology&apos;"/>
  <Class IRI="#&apos;Geochronology&apos;"/>
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  <Class IRI="#&apos;TephraChronology&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#measures"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tephra"/>
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</SubClassOf>

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<Class IRI="#&apos;Tephrite&apos;"/>
<Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
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  <Class IRI="#&apos;Tephrite&apos;"/>
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    <ObjectComplementOf>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="#&apos;hasElementRichness&apos;"/>
        <Class IRI="#&apos;Magnesium&apos;"/>
      </ObjectSomeValuesFrom>
    </ObjectComplementOf>
    <ObjectComplementOf>
      <ObjectHasValue>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasMaterial"/>
        <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#Silica"/>
      </ObjectHasValue>
    </ObjectComplementOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasEssentialMineral&apos;"/>
      <Class IRI="#&apos;Nepheline&apos;"/>
    </ObjectSomeValuesFrom>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Tephrite&apos;"/>
  <ObjectIntersectionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;hasMineral&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Olivine"/>
    </ObjectSomeValuesFrom>
    <DataMaxCardinality cardinality="10">
      <DataProperty IRI="#&apos;percentageLessThan&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </ObjectIntersectionOf>
</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Tephrite&apos;"/>
  <ObjectIntersectionOf>
    <DataMinCardinality cardinality="0">
      <DataProperty IRI="#&apos;QAPFAlkaliPercentageGreaterThanOrEqualTo&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
    <DataMaxCardinality cardinality="10">
      <DataProperty IRI="#&apos;QAPFAlkaliPercentageLessThanOrEqualTo&apos;"/>
      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMaxCardinality>
  </ObjectIntersectionOf>
</SubClassOf>
</SubClassOf>

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<Class IRI="#&apos;Tephrite&apos;"/>
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  <DataMaxCardinality cardinality="60">
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    <Datatype abbreviatedIRI="xsd:double"/>
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      <Datatype abbreviatedIRI="xsd:double"/>
    </DataMinCardinality>
    <DataMaxCardinality cardinality="100">
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</SubClassOf>
<SubClassOf>
  <Class IRI="#&apos;Tephrite&apos;"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenHydro.owl#Intrusion"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realMLandVolcanic.owl#HotSpot"/>
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  </ObjectUnionOf>
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  <Class IRI="#&apos;Tephrite&apos;"/>
  <ObjectUnionOf>
    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>
      <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Aphanitic&apos;"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasTexture&apos;"/>

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    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PorphyriticTexture&apos;"/
>
    </ObjectSomeValuesFrom>
    </ObjectUnionOf>
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    <Class IRI="#&apos;Tephrite&apos;"/>
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        <Datatype abbreviatedIRI="xsd:double"/>
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    <Class IRI="#&apos;TholeiiticBasalt&apos;"/>
    <Class IRI="#&apos;SubalkaliBasalt&apos;"/>
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    <Class IRI="#&apos;TholeiiticBasalt&apos;"/>
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        <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
        <Class IRI="#&apos;PartialMelting&apos;"/>
    </ObjectSomeValuesFrom>
</SubClassOf>
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    <Class IRI="#&apos;Thorium&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Actinoid"/>
</SubClassOf>
<SubClassOf>
    <Class IRI="#&apos;Thorium&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
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    <Class IRI="#&apos;Titanium&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Lithophile"/>
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    <Class IRI="#&apos;Titanium&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#TransitionMetal"/>
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    <Class IRI="#&apos;UltramaphicRock&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IgneousRock"/>
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    <Class IRI="#&apos;UltramaphicRock&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
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    <ObjectProperty IRI="http://bhi.washington.edu/OPB#OPB_00282"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Ultramaphic"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#PlinianEruption"/>
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      <Class IRI="#&apos;VEI6&apos;"/>
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      <ObjectProperty IRI="#&apos;hasVEIValue&apos;"/>
      <Class IRI="#&apos;VEI7&apos;"/>
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    <ObjectAllValuesFrom>
      <ObjectProperty IRI="#&apos;hasVEIValue&apos;"/>
      <Class IRI="#&apos;VEI8&apos;"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaHuman.owl#produces"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenPlanetClimate.owl#NuclearWinter"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#hasImpact"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenEnvirImpact.owl#MassExtinctionEvent"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realMLandVolcanic.owl#Caldera"/>
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  <Class IRI="#&apos;UltraplinianEruption&apos;"/>
  <ObjectHasValue>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaTime.owl#hasFrequency"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Rare"/>
  </ObjectHasValue>

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    </ObjectHasValue>
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    <Class IRI="#&apos;Uranium&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Actinoid"/>
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    <Class IRI="#&apos;VEI3&apos;"/>
    <Class IRI="#&apos;VolcanicExplosivityIndex&apos;"/>
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  <Class IRI="#&apos;VEI4&apos;"/>
  <Class IRI="#&apos;VolcanicExplosivityIndex&apos;"/>
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    <DataProperty IRI="#&apos;hasVolumeGreaterThan&apos;"/>
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  <Class IRI="#&apos;VEI7&apos;"/>
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    <DataProperty IRI="#&apos;hasVolumeGreaterThan&apos;"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Varve"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realMLandVolcanic.owl#VolcanicSystem"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realMLandVolcanic.owl#Volcano"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realMLandVolcanic.owl#VolcanicField"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/reprSpaceGeometry3D.owl#Dome"/>
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  <Class IRI="#&apos;VolcanicExplosivityIndex&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/proprIndex.owl#Index"/>

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    <Class IRI="http://bhi.washington.edu/OPB#OPB_00523"/>
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  <Class IRI="#&apos;VolcanicExplosivityIndex&apos;"/>
  <ObjectAllValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#measureOf"/>
    <Class IRI="http://purl.obolibrary.org/obo/bfo.owl#VolcanicEruption"/>
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  <Class IRI="#&apos;VolcanicFeature&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#GeologicFeature"/>
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    <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#Volcanism"/>
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  <Class IRI="#&apos;VolcanicIsland&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandCoastal.owl#Island"/>
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  <Class IRI="#&apos;VolcanicFeature&apos;"/>
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  <Class IRI="#&apos;VolcanicIsland&apos;"/>
  <ObjectSomeValuesFrom>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#processOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#Volcanism"/>
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  <ObjectSomeValuesFrom>

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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#partOf"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#VolcanicChain"/>
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  <Class IRI="#&apos;VolcanicPipe&apos;"/>
  <Class IRI="#&apos;VolcanicFeature&apos;"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/reprSpaceGeometry3D.owl#Cone"/>
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  <Class IRI="http://purl.obolibrary.org/obo/BFO_0000001"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#Magmatic"/>
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  <Class IRI="#&apos;VulcanianEruption&apos;"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tephra"/>
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      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaHuman.owl#produces"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Ashfall"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaHuman.owl#produces"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Block"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaHuman.owl#produces"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Bomb"/>
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      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaHuman.owl#produces"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#EruptionCloud"/>
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      <ObjectProperty IRI="#&apos;associatedWith&apos;"/>
      <Class IRI="#&apos;VolcanicDome&apos;"/>
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  <Class IRI="#&apos;VulcanianEruption&apos;"/>
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    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;producesMaterial&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite"/>
    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="#&apos;producesMaterial&apos;"/>
      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Dacite"/>
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    <ObjectSomeValuesFrom>
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    <ObjectAllValuesFrom>
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      <Class IRI="#&apos;VEI2&apos;"/>
    </ObjectAllValuesFrom>
    <ObjectAllValuesFrom>
      <ObjectProperty IRI="#&apos;hasVEIValue&apos;"/>
      <Class IRI="#&apos;VEI3&apos;"/>
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  <Class IRI="#&apos;VulcanianEruption&apos;"/>
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    <ObjectProperty IRI="#&apos;releaseOf&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#Gas"/>
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    <Class IRI="#&apos;Welding&apos;"/>
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</SubClassOf>
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  <Class IRI="#&apos;Zinc&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#TransitionMetal"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Andesine&apos;"/>
    <Class IRI="#&apos;BowensContinuousSeries&apos;"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Andesine&apos;"/>
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    <Class
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PlagioclaseFeldspar&apos;"/>
  />
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        <Class IRI="#&apos;Calcium&apos;"/>
      </ObjectSomeValuesFrom>
      <ObjectSomeValuesFrom>
        <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
        <Class IRI="#&apos;Sodium&apos;"/>
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    </ObjectIntersectionOf>
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    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;CrystalTexture&apos;"/>
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</SubClassOf>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Anorthite&apos;"/>
    <Class IRI="#&apos;BowensContinuousSeries&apos;"/>
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</SubClassOf>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Anorthite&apos;"/>
    <Class IRI="#&apos;MaficMineral&apos;"/>
  </Class

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  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PlagioclaseFeldspar&apos;"/>
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  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Anorthite&apos;"/>
  <ObjectSomeValuesFrom>
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    <Class IRI="#&apos;Calcium&apos;"/>
  </ObjectSomeValuesFrom>
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    <Datatype abbreviatedIRI="xsd:double"/>
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  <Class IRI="#&apos;AlkaliFeldspar&apos;"/>
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  <Class IRI="#&apos;MaficMineral&apos;"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Anorthoclase&apos;"/>
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    <ObjectProperty IRI="#&apos;seriesRangeBasedOn&apos;"/>
    <Class IRI="#&apos;Albite&apos;"/>
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</SubClassOf>

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    <ObjectProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;hasCrystalSystem&apos;"/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Triclinic&apos;"/>
    </ObjectAllValuesFrom>
  </SubClassOf>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Anorthoclase&apos;"/>
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  </DataMinCardinality>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Anorthoclase&apos;"/>
  <DataMaxCardinality cardinality="90">
    <DataProperty IRI="#&apos;percentageLessThanOrEqual&apos;"/>
    <Datatype abbreviatedIRI="xsd:double"/>
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</SubClassOf>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Aphanitic&apos;"/>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;GrainDefinedCrystallineTex
ture&apos;"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Aphanitic&apos;"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasState"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateSolid.owl#Crystalline"/>
  </ObjectHasValue>
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  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;GrainDefinedCrystallineTex
ture&apos;"/>
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  </SubClassOf>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Bytownite&apos;"/>
  <Class IRI="#&apos;BowensContinuousSeries&apos;"/>

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  <Class IRI="#&apos;MaficMineral&apos;"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Bytownite&apos;"/>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PlagioclaseFeldspar&apos;"/>
/>
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    </ObjectSomeValuesFrom>
    <ObjectSomeValuesFrom>
      <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
      <Class IRI="#&apos;Sodium&apos;"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
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    <Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
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        <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#Carbonate"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#ContinentalRift"/>
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    <Class
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pos;"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;CrystallineProperty&apos;"/>
  >
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    <Class
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Texture&apos;"/>
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    <SubClassOf>
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    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;CrystallineTexture&apos;"/>
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s;"/>
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s;"/>
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os;"/>
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s;"/>
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os;"/>
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os;"/>
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pos;"/>
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pos;"/>
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s;"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Magma"/>
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s;"/>
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    <SubClassOf>

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    <Class IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Phaneritic-
PorphyriticTexture&apos;"/>
    <ObjectSomeValuesFrom>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Phaneritic&apos;"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PhaseOfMatter&apos;"/>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#StateOfMatter"/>
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</SubClassOf>
<Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Phonolite&apos;"/>
  <Class IRI="#&apos;AlkalineVolcanicRock&apos;"/>
  </SubClassOf>
</SubClassOf>
<Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Phonolite&apos;"/>
  <Class IRI="#&apos;IntermediateRock&apos;"/>
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</SubClassOf>
<Class
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</SubClassOf>
</SubClassOf>
<Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Phonolite&apos;"/>
  <ObjectIntersectionOf>
    <DataMinCardinality cardinality="10">
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    <DataMaxCardinality cardinality="60">
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</SubClassOf>

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        <ObjectProperty IRI="#&apos;createdFrom&apos;"/>
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        <ObjectProperty IRI="#&apos;occursAlong&apos;"/>
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      <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateSolid.owl#Crystalline"/>
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/>
    <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;HolocrystallineTexture&apos;"
/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Magma"/>
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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRock.owl#Rock"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/rela.owl#hasProperty"/>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Ultramaphic"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PumieousTexture&apos;"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;VolcanicTexture&apos;"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;QuartzLatite&apos;"/>
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  <SubClassOf>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock"/>
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      <DataMaxCardinality cardinality="69">
        <DataProperty IRI="#&apos;silicaPercentageLessThanOrEqual&apos;"/>
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      <ObjectIntersectionOf>
        <Class IRI="#&apos;FelsicMineral&apos;"/>
        <Class IRI="#&apos;IntermediateMineral&apos;"/>
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  <Class IRI="#&apos;FelsicMineral&apos;"/>
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tion&apos;"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#Silica"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;VolcanicTexture&apos;"/>
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        <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#Silica"/>
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    </ObjectComplementOf>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;VolcanicTexture&apos;"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;VitricTuff&apos;"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Glass"/>
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os;"/>
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</SubClassOf>

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      <Class IRI="http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#Phenocryst"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#Charged"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#StateOfMatter"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#Condensed"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#Humid"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateRoleImpact.owl#Moderate"/>
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pos;"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateSystem.owl#Deterministic"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateSystem.owl#Dormant"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateSystem.owl#Intermittent"/>

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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateSystem.owl#TimeVarying"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateThermodynamic.owl#BlackBody"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateThermodynamic.owl#BoilingHot"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateThermodynamic.owl#Cold"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateThermodynamic.owl#DryAdiabatic"/>
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  <ClassAssertion>

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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/stateThermodynamic.owl#ThermodynamicState"/>
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    <NamedIndividual
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateThermodynamic.owl#Superadiabatic"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Ancient"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Antique"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Old"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Past"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Rare"/>
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  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTimeFrequency.owl#Frequency"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#SemiDiurnal"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTimeFrequency.owl#Frequency"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Spasmodic"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTimeFrequency.owl#Frequency"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Stationary"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTimeFrequency.owl#Frequency"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Steady"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTimeFrequency.owl#Frequency"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Uninterrupted"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTimeFrequency.owl#Frequency"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Unusual"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTimeFrequency.owl#Frequency"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Usual"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTimeFrequency.owl#Frequency"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Weekly"/>
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  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propTimeFrequency.owl#Frequency"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Yearly"/>
  </ClassAssertion>
  <ClassAssertion>

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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Bright"/>
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<ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Clear"/>
</ClassAssertion>
<ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Cloudy"/>
</ClassAssertion>
<ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Colored"/>
</ClassAssertion>
<ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Dark"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Dim"/>
</ClassAssertion>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Dirty"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Dusty"/>
</ClassAssertion>
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    <Class IRI="#&apos;OrdinalTexture&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Glassy"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Hazy"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Invisible"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Light"/>
</ClassAssertion>
<ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Luminous"/>
</ClassAssertion>

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<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Murky"/>
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<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Opaque"/>
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<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Overcast"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Translucent"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Transparent"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Turbid"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Visibility"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Visible"/>
</ClassAssertion>
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  <Class IRI="#&apos;Ankerite&apos;"/>
  <NamedIndividual IRI="#CaFeMgMnCO32"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;Dolomite&apos;"/>
  <NamedIndividual IRI="#CaMgCO32"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;Fayalite&apos;"/>
  <NamedIndividual IRI="#Fa"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;Fayalite&apos;"/>
  <NamedIndividual IRI="#Fe2SiO4"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;Siderite&apos;"/>
  <NamedIndividual IRI="#FeCO3"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;Foresterite&apos;"/>
  <NamedIndividual IRI="#Fo"/>

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</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#Allotrope"/>
  <NamedIndividual IRI="#K2"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#Allotrope"/>
  <NamedIndividual IRI="#Mg2"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;Foresterite&apos;"/>
  <NamedIndividual IRI="#Mg2SiO4"/>
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<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#Allotrope"/>
  <NamedIndividual IRI="#Na2"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#Allotrope"/>
  <NamedIndividual IRI="#O6"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;Natrocarbonatite&apos;"/>
  <NamedIndividual IRI="#OldoinyoLengai"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geochemistry"/>
  <NamedIndividual IRI="#Po210"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrIsotope.owl#Isotope"/>
  <NamedIndividual IRI="#Po210"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#Allotrope"/>
  <NamedIndividual IRI="#Si4"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#InorganicCompound"/>
  <NamedIndividual IRI="#SiO4"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#Allotrope"/>
  <NamedIndividual IRI="#&apos;Al2&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#Allotrope"/>
  <NamedIndividual IRI="#&apos;Al4&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#Allotrope"/>

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    <NamedIndividual IRI="#&apos;Al6&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#InorganicCompound"/>
    <NamedIndividual IRI="#&apos;AlSi3O10&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propSpace.owl#Shape"/>
    <NamedIndividual IRI="#&apos;Angular&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geochemistry"/>
    <NamedIndividual IRI="#&apos;Ar39&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrIsotope.owl#Isotope"/>
    <NamedIndividual IRI="#&apos;Ar39&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geochemistry"/>
    <NamedIndividual IRI="#&apos;Ar40&apos;"/>
  </ClassAssertion>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrIsotope.owl#Isotope"/>
    <NamedIndividual IRI="#&apos;Ar40&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geochemistry"/>
    <NamedIndividual IRI="#&apos;Ar40/Ar39&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="#&apos;Geochronology&apos;"/>
    <NamedIndividual IRI="#&apos;Ar40/Ar39&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="#&apos;IsotopeRatio&apos;"/>
    <NamedIndividual IRI="#&apos;Ar40/Ar39&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Color"/>
    <NamedIndividual IRI="#&apos;Blue&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#InorganicCompound"/>
    <NamedIndividual IRI="#&apos;CO3&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#InorganicCompound"/>
    <NamedIndividual IRI="#&apos;CO32&apos;"/>
  </ClassAssertion>
  <ClassAssertion>

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<Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Anorthite&apos;"/>
  <NamedIndividual IRI="#&apos;CaAl2Si2O8&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;SolidSolution&apos;"/>
  <NamedIndividual IRI="#&apos;CaNa&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geochemistry"/>
  <NamedIndividual IRI="#&apos;Cl36&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrIsotope.owl#Isotope"/>
  <NamedIndividual IRI="#&apos;Cl36&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;Geochronology&apos;"/>
  <NamedIndividual IRI="#&apos;Cl36&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;OrdinalTexture&apos;"/>
  <NamedIndividual IRI="#&apos;Coarse&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propSpaceDistance.owl#GrainSize"/>
  <NamedIndividual IRI="#&apos;CoarseGrained&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propSpace.owl#Shape"/>
  <NamedIndividual IRI="#&apos;Columnar&apos;"/>
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<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propSpaceDistance.owl#GrainSize"/>
  <NamedIndividual IRI="#&apos;Cryptocrystalline&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#Allotrope"/>
  <NamedIndividual IRI="#&apos;Diamond&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;Enstatite&apos;"/>
  <NamedIndividual IRI="#&apos;En&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Hematite"/>
  <NamedIndividual IRI="#&apos;Fe2O3&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/matrIon.owl#Ion"/>
  <NamedIndividual IRI="#&apos;Feplusplus&apos;"/>

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</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;OrdinalTexture&apos;"/>
  <NamedIndividual IRI="#&apos;Fine&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propSpaceDistance.owl#GrainSize"/>
  <NamedIndividual IRI="#&apos;FineGrained&apos;"/>
</ClassAssertion>
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  <NamedIndividual IRI="#&apos;Green&apos;"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geochemistry"/>
  <NamedIndividual IRI="#&apos;He3/He4&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;IsotopeRatio&apos;"/>
  <NamedIndividual IRI="#&apos;He3/He4&apos;"/>
</ClassAssertion>
<ClassAssertion>
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  <NamedIndividual IRI="#&apos;High&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propPressure.owl#Viscosity"/>
  <NamedIndividual IRI="#&apos;HighViscosity&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geochemistry"/>
  <NamedIndividual IRI="#&apos;K40/Ar40&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#&apos;Geochronology&apos;"/>
  <NamedIndividual IRI="#&apos;K40/Ar40&apos;"/>
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  <NamedIndividual IRI="#&apos;K40/Ar40&apos;"/>
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<ClassAssertion>
  <Class IRI="#&apos;Leucite&apos;"/>
  <NamedIndividual IRI="#&apos;KAlSi2O6&apos;"/>
</ClassAssertion>
<ClassAssertion>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;OrthoclaseFeldspar&apos;"/
>
  <NamedIndividual IRI="#&apos;KAlSi3O8&apos;"/>
</ClassAssertion>

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<ClassAssertion>
  <Class
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'Sanidine'"/>
  <NamedIndividual IRI="#"'KAlSi3O8'"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propSpace.owl#Shape"/>
  <NamedIndividual IRI="#"'Lenticular'"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#TemperatureRange"/>
  <NamedIndividual IRI="#"'Low'"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propPressure.owl#Viscosity"/>
  <NamedIndividual IRI="#"'LowViscosity'"/>
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  <Class IRI="http://sweet.jpl.nasa.gov/2.3/propSpaceDistance.owl#GrainSize"/>
  <NamedIndividual IRI="#"'MediumGrained'"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#"'Diopside'"/>
  <NamedIndividual IRI="#"'MgCaSi2O6'"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#"'Enstatite'"/>
  <NamedIndividual IRI="#"'MgSiO3'"/>
</ClassAssertion>
<ClassAssertion>
  <Class IRI="#"'Nyerereite'"/>
  <NamedIndividual IRI="#"'Na2CaCO32'"/>
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  <Class IRI="#"'Gregoryite'"/>
  <NamedIndividual IRI="#"'Na2K2CaCO3'"/>
</ClassAssertion>
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  <NamedIndividual IRI="#"'Na3'"/>
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  <Class IRI="#"'Nepheline'"/>
  <NamedIndividual IRI="#"'Na3KAl4Si4O16'"/>
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  <NamedIndividual IRI="#"'Na8'"/>
</ClassAssertion>
<ClassAssertion>
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    <NamedIndividual IRI="#&apos;Na8Al6Si6O24Cl2&apos;"/>
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  <ClassAssertion>
    <Class IRI="#&apos;Albite&apos;"/>
    <NamedIndividual IRI="#&apos;NaAlSi3O8&apos;"/>
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  <ClassAssertion>
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    <NamedIndividual IRI="#&apos;NaFeSi2O6&apos;"/>
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    <NamedIndividual IRI="#&apos;O10&apos;"/>
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    <NamedIndividual IRI="#&apos;OH2&apos;"/>
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    <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geochemistry"/>
    <NamedIndividual IRI="#&apos;Pb210&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
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    <NamedIndividual IRI="#&apos;Pb210&apos;"/>
  </ClassAssertion>
  <ClassAssertion>
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    <NamedIndividual IRI="#&apos;Po&apos;"/>
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  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geochemistry"/>
    <NamedIndividual IRI="#&apos;Po210/Pb210&apos;"/>
  </ClassAssertion>
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    <Class IRI="#&apos;Geochronology&apos;"/>
    <NamedIndividual IRI="#&apos;Po210/Pb210&apos;"/>
  </ClassAssertion>
  <ClassAssertion>

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    <Class IRI="#&apos;IsotopeRatio&apos;"/>
    <NamedIndividual IRI="#&apos;Po210/Pb210&apos;"/>
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  <ClassAssertion>
    <Class IRI="#&apos;Radium&apos;"/>
    <NamedIndividual IRI="#&apos;Ra&apos;"/>
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    <NamedIndividual IRI="#&apos;Ra236/Th230&apos;"/>
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    <Class IRI="#&apos;Geochronology&apos;"/>
    <NamedIndividual IRI="#&apos;Ra236/Th230&apos;"/>
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    <NamedIndividual IRI="#&apos;Si3&apos;"/>
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    <NamedIndividual IRI="#&apos;Si6&apos;"/>
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  <ClassAssertion>
    <Class IRI="http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#SubstanceForm"/>
    <NamedIndividual IRI="#&apos;Smooth&apos;"/>
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  <ClassAssertion>
    <Class IRI="#&apos;Strontium&apos;"/>
    <NamedIndividual IRI="#&apos;Sr&apos;"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaTime.owl#moreFrequentThan"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Common"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Rare"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaTime.owl#hasPeriod"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Decadal"/>

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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#10year"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Diurnal"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#1day"/>
  </ObjectPropertyAssertion>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Frequent"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Infrequent"/>
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  <ObjectPropertyAssertion>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Frequent"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Rare"/>
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  <ObjectPropertyAssertion>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Hourly"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#1hour"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaTime.owl#hasPeriod"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#1month"/>
  </ObjectPropertyAssertion>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaTime.owl#hasPeriod"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Pentad"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#5day"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaTime.owl#hasPeriod"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Seasonal"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#3month"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaTime.owl#hasPeriod"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#SemiAnnual"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#6month"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaTime.owl#hasPeriod"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#SemiDiurnal"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTime.owl#12hour"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateTimeFrequency.owl#Unusual"/>

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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Turbid"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Opaque"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Opaque"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Opaque"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Dark"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Luminous"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Opaque"/>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaPhysical.owl#moreVisibleThan"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Translucent"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Opaque"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Transparent"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Translucent"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Visible"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/stateVisibility.owl#Invisible"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_1"/>
  <NamedIndividual IRI="#CaFeMgMnCO32"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>

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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
    <NamedIndividual IRI="#CaFeMgMnCO32"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Fe"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_3"/>
    <NamedIndividual IRI="#CaFeMgMnCO32"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Mg"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_4"/>
    <NamedIndividual IRI="#CaFeMgMnCO32"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Mn"/>
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    <NamedIndividual IRI="#CaFeMgMnCO32"/>
    <NamedIndividual IRI="#&apos;CO32&apos;"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_1"/>
    <NamedIndividual IRI="#CaMgCO32"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
    <NamedIndividual IRI="#CaMgCO32"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Mg"/>
</ObjectPropertyAssertion>
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    <NamedIndividual IRI="#CaMgCO32"/>
    <NamedIndividual IRI="#&apos;CO32&apos;"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
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    <NamedIndividual IRI="#Fe2SiO4"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#Fe2"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
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    <NamedIndividual IRI="#SiO4"/>
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    <NamedIndividual IRI="#FeCO3"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Fe"/>
</ObjectPropertyAssertion>
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    <NamedIndividual IRI="#FeCO3"/>
    <NamedIndividual IRI="#&apos;CO3&apos;"/>
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    <NamedIndividual IRI="#K2"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#K"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#Mg2"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Mg"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_1"/>
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    <NamedIndividual IRI="#Mg2"/>
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    <NamedIndividual IRI="#SiO4"/>
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  <ObjectPropertyAssertion>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Na"/>
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  <ObjectPropertyAssertion>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#O"/>
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  <ObjectPropertyAssertion>
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    <NamedIndividual IRI="#&apos;Po&apos;"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Si"/>
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    <NamedIndividual IRI="#SiO4"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Si"/>
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    <NamedIndividual IRI="#&apos;Al2&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Al"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#&apos;Al4&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Al"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Al"/>
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    <NamedIndividual IRI="#&apos;AlSi3O10&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Al"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
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    <NamedIndividual IRI="#&apos;AlSi3O10&apos;"/>
    <NamedIndividual IRI="#&apos;Si3&apos;"/>
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    <NamedIndividual IRI="#&apos;AlSi3O10&apos;"/>
    <NamedIndividual IRI="#&apos;O10&apos;"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ar"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ar"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#O3"/>
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  <NamedIndividual IRI="#&apos;CO32&apos;"/>
  <NamedIndividual IRI="#&apos;CO3&apos;"/>
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  <NamedIndividual IRI="#&apos;CaAl2Si2O8&apos;"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca"/>
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  <NamedIndividual IRI="#&apos;Al2&apos;"/>
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  <NamedIndividual IRI="#&apos;O8&apos;"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Cl"/>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#hasUnit"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#millimeter"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#millimeter"/>
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  <NamedIndividual IRI="#&apos;Fe2O3&apos;"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#Fe2"/>
</ObjectPropertyAssertion>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
  <NamedIndividual IRI="#&apos;Fe2O3&apos;"/>
  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#O3"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrIsotope.owl#He3"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrIsotope.owl#He4"/>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrIsotope.owl#K40"/>
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<ObjectPropertyAssertion>
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<NamedIndividual IRI="#&apos;KAlSi2O6&apos;"/>
<NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Al"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
<ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_3"/>
<NamedIndividual IRI="#&apos;KAlSi2O6&apos;"/>
<NamedIndividual IRI="#&apos;Si2&apos;"/>
</ObjectPropertyAssertion>
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<NamedIndividual IRI="#&apos;KAlSi2O6&apos;"/>
<NamedIndividual IRI="#O6"/>
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<ObjectPropertyAssertion>
<ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_1"/>
<NamedIndividual IRI="#&apos;KAlSi3O8&apos;"/>
<NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#K"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
<ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
<NamedIndividual IRI="#&apos;KAlSi3O8&apos;"/>
<NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Al"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
<ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_3"/>
<NamedIndividual IRI="#&apos;KAlSi3O8&apos;"/>
<NamedIndividual IRI="#&apos;Si3&apos;"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
<ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_4"/>
<NamedIndividual IRI="#&apos;KAlSi3O8&apos;"/>
<NamedIndividual IRI="#&apos;O8&apos;"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
<ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#hasUnit"/>
<NamedIndividual IRI="#&apos;MediumGrained&apos;"/>
<NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#millimeter"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
<ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_1"/>
<NamedIndividual IRI="#&apos;MgCaSi2O6&apos;"/>
<NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Mg"/>
</ObjectPropertyAssertion>
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    <NamedIndividual IRI="#&apos;MgCaSi2O6&apos;"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_3"/>
    <NamedIndividual IRI="#&apos;MgCaSi2O6&apos;"/>
    <NamedIndividual IRI="#&apos;Si2&apos;"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_4"/>
    <NamedIndividual IRI="#&apos;MgCaSi2O6&apos;"/>
    <NamedIndividual IRI="#O6"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_1"/>
    <NamedIndividual IRI="#&apos;MgSiO3&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Mg"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
    <NamedIndividual IRI="#&apos;MgSiO3&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Si"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_3"/>
    <NamedIndividual IRI="#&apos;MgSiO3&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#O3"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_1"/>
    <NamedIndividual IRI="#&apos;Na2CaCO3&apos;"/>
    <NamedIndividual IRI="#Na2"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
    <NamedIndividual IRI="#&apos;Na2CaCO3&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_3"/>
    <NamedIndividual IRI="#&apos;Na2CaCO3&apos;"/>
    <NamedIndividual IRI="#&apos;CO3&apos;"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_1"/>
    <NamedIndividual IRI="#&apos;Na2K2CaCO3&apos;"/>
    <NamedIndividual IRI="#Na2"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
    <NamedIndividual IRI="#&apos;Na2K2CaCO3&apos;"/>

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    <NamedIndividual IRI="#K2"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_3"/>
    <NamedIndividual IRI="#&apos;Na2K2CaCO3&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_4"/>
    <NamedIndividual IRI="#&apos;Na2K2CaCO3&apos;"/>
    <NamedIndividual IRI="#&apos;CO3&apos;"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#&apos;Na3&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Na"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_1"/>
    <NamedIndividual IRI="#&apos;Na3KAL4Si4O16&apos;"/>
    <NamedIndividual IRI="#&apos;Na3&apos;"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
    <NamedIndividual IRI="#&apos;Na3KAL4Si4O16&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#K"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_3"/>
    <NamedIndividual IRI="#&apos;Na3KAL4Si4O16&apos;"/>
    <NamedIndividual IRI="#&apos;Al4&apos;"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_4"/>
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    <NamedIndividual IRI="#Si4"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_5"/>
    <NamedIndividual IRI="#&apos;Na3KAL4Si4O16&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrIsotope.owl#O16"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#&apos;Na8&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Na"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_1"/>
    <NamedIndividual IRI="#&apos;Na8Al6Si6O24Cl2&apos;"/>
    <NamedIndividual IRI="#&apos;Na8&apos;"/>
  </ObjectPropertyAssertion>

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</ObjectPropertyAssertion>
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    <NamedIndividual IRI="#&apos;Al6&apos;"/>
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<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_3"/>
    <NamedIndividual IRI="#&apos;Na8Al6Si6O24Cl2&apos;"/>
    <NamedIndividual IRI="#&apos;Si6&apos;"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_4"/>
    <NamedIndividual IRI="#&apos;Na8Al6Si6O24Cl2&apos;"/>
    <NamedIndividual IRI="#&apos;O24&apos;"/>
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<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_5"/>
    <NamedIndividual IRI="#&apos;Na8Al6Si6O24Cl2&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#Cl2"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_1"/>
    <NamedIndividual IRI="#&apos;NaAlSi3O8&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Na"/>
</ObjectPropertyAssertion>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
    <NamedIndividual IRI="#&apos;NaAlSi3O8&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Al"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_3"/>
    <NamedIndividual IRI="#&apos;NaAlSi3O8&apos;"/>
    <NamedIndividual IRI="#&apos;Si3&apos;"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_4"/>
    <NamedIndividual IRI="#&apos;NaAlSi3O8&apos;"/>
    <NamedIndividual IRI="#&apos;O8&apos;"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_1"/>
    <NamedIndividual IRI="#&apos;NaFeSi2O6&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Na"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
    <NamedIndividual IRI="#&apos;NaFeSi2O6&apos;"/>
    <NamedIndividual IRI="#&apos;Feplusplus&apos;"/>
</ObjectPropertyAssertion>

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    <NamedIndividual IRI="#&apos;NaFeSi2O6&apos;"/>
    <NamedIndividual IRI="#&apos;Si2&apos;"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_4"/>
    <NamedIndividual IRI="#&apos;NaFeSi2O6&apos;"/>
    <NamedIndividual IRI="#O6"/>
</ObjectPropertyAssertion>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#&apos;O10&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#O"/>
</ObjectPropertyAssertion>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#&apos;O22&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#O"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#&apos;O24&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#O"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#&apos;O8&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#O"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#&apos;OH2&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#OH"/>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#&apos;Pb210&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Pb"/>
</ObjectPropertyAssertion>
<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#&apos;Po210/Pb210&apos;"/>
    <NamedIndividual IRI="#Po210"/>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#&apos;Po210/Pb210&apos;"/>
    <NamedIndividual IRI="#&apos;Pb210&apos;"/>
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    <NamedIndividual IRI="#&apos;U238/Th230&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrIsotope.owl#U238"/>
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    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#hasUnit"/>
    <NamedIndividual IRI="#&apos;VeryCoarseGrained&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#millimeter"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#hasUnit"/>
    <NamedIndividual IRI="#&apos;VeryFineGrained&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#millimeter"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaSci.owl#hasUnit"/>
    <NamedIndividual IRI="#&apos;kilometerCubed&apos;"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#kilometer"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
    <NamedIndividual IRI="#(Ca,Na)(Al(Al,Si)Si2O8)"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Al"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_4"/>
    <NamedIndividual IRI="#(Ca,Na)(Al(Al,Si)Si2O8)"/>
    <NamedIndividual IRI="#&apos;Si2&apos;"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_5"/>
    <NamedIndividual IRI="#(Ca,Na)(Al(Al,Si)Si2O8)"/>
    <NamedIndividual IRI="#&apos;O8&apos;"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(Ca,Na)(Al(Al,Si)Si2O8)"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Al"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(Ca,Na)(Al(Al,Si)Si2O8)"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(Ca,Na)(Al(Al,Si)Si2O8)"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Na"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(Ca,Na)(Al(Al,Si)Si2O8)"/>

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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Si"/>
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    <NamedIndividual IRI="'#&apos;O8&apos;"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(Ca,Na)(Al,Si)4O8"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Al"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(Ca,Na)(Al,Si)4O8"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(Ca,Na)(Al,Si)4O8"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Na"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(Ca,Na)(Al,Si)4O8"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Si"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_3"/>
    <NamedIndividual IRI="#(CaMgFe)(MgFe)Si2O6"/>
    <NamedIndividual IRI="'#&apos;Si2&apos;"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_4"/>
    <NamedIndividual IRI="#(CaMgFe)(MgFe)Si2O6"/>
    <NamedIndividual IRI="#O6"/>
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  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(CaMgFe)(MgFe)Si2O6"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(CaMgFe)(MgFe)Si2O6"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Fe"/>
  </ObjectPropertyAssertion>
  <ObjectPropertyAssertion>
    <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(CaMgFe)(MgFe)Si2O6"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Mg"/>
  </ObjectPropertyAssertion>

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</ObjectPropertyAssertion>
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    <NamedIndividual IRI="#O6"/>
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<ObjectPropertyAssertion>
  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(CaNa)(MgFeAlTi)(SiAl)2O6"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Al"/>
  </ObjectPropertyAssertion>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(CaNa)(MgFeAlTi)(SiAl)2O6"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ca"/>
  </ObjectPropertyAssertion>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
    <NamedIndividual IRI="#(CaNa)(MgFeAlTi)(SiAl)2O6"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Fe"/>
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    <NamedIndividual IRI="#(CaNa)(MgFeAlTi)(SiAl)2O6"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Mg"/>
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  </ObjectPropertyAssertion>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasSubstance"/>
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    <NamedIndividual IRI="#&apos;Ti&apos;"/>
  </ObjectPropertyAssertion>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_2"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Al"/>
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    <NamedIndividual IRI="#(NaK)AlSi3O8"/>
    <NamedIndividual IRI="#&apos;Si3&apos;"/>
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  <ObjectProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaChemical.owl#hasChemical_5"/>
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  <NamedIndividual IRI="#Ca2(MgFeAl)5(AlSi)8O22OH2"/>
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    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprMath.owl#NormalizedRange"/>
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    <DataProperty IRI="http://sweet.jpl.nasa.gov/2.3/relaMath.owl#hasUpperBound"/>
    <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprMath.owl#NormalizedRange"/>
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  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#double">3.1556926E9</Literal>
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  <NamedIndividual IRI="http://sweet.jpl.nasa.gov/2.3/reprSciUnits.owl#deca"/>
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IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;submissionDate&apos;"/>
    <Datatype abbreviatedIRI="xsd:dateTime"/>
  </DataPropertyRange>
</DataPropertyRange>
  <DataProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;submittedBy&apos;"/>
    <Datatype abbreviatedIRI="xsd:string"/>
  </DataPropertyRange>
</DisjointDataProperties>
  <DataProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;firstName&apos;"/>
  <DataProperty
IRI="http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;lastName&apos;"/>
  </DisjointDataProperties>
</DLSafeRule>
<Body>
  <ClassAtom>
    <Class IRI="http://purl.obolibrary.org/obo/OBI_0500000"/>
    <Variable IRI="urn:swrl#d"/>
  </ClassAtom>
  <ClassAtom>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000193"/>
    <Variable IRI="urn:swrl#g1"/>
  </ClassAtom>
  <ClassAtom>
    <Class IRI="http://purl.obolibrary.org/obo/STATO_0000193"/>
    <Variable IRI="urn:swrl#g2"/>
  </ClassAtom>
  <ObjectPropertyAtom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Variable IRI="urn:swrl#d"/>
    <Variable IRI="urn:swrl#g1"/>
  </ObjectPropertyAtom>
  <ObjectPropertyAtom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/BFO_0000051"/>
    <Variable IRI="urn:swrl#d"/>
    <Variable IRI="urn:swrl#g2"/>
  </ObjectPropertyAtom>
  <ObjectPropertyAtom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000115"/>

```

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    <Variable IRI="urn:swrl#g1"/>
    <Variable IRI="urn:swrl#m1"/>
  </ObjectPropertyAtom>
  <ObjectPropertyAtom>
    <ObjectProperty IRI="http://purl.obolibrary.org/obo/STATO_0000115"/>
    <Variable IRI="urn:swrl#g2"/>
    <Variable IRI="urn:swrl#m2"/>
  </ObjectPropertyAtom>
  <SameIndividualAtom>
    <Variable IRI="urn:swrl#m1"/>
    <Variable IRI="urn:swrl#m2"/>
  </SameIndividualAtom>
  <DifferentIndividualsAtom>
    <Variable IRI="urn:swrl#g1"/>
    <Variable IRI="urn:swrl#g2"/>
  </DifferentIndividualsAtom>
</Body>
<Head>
  <ClassAtom>
    <ObjectComplementOf>
      <Class IRI="http://purl.obolibrary.org/obo/OBI_0500006"/>
    </ObjectComplementOf>
    <Variable IRI="urn:swrl#d"/>
  </ClassAtom>
</Head>
</DLSafeRule>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00002</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Rate properties
represent the FORCE DIFFERENTIAL or the RATE OF FLOW of material, charge, energy, or
information across a boundary separating one physical entity from another via some pathway. Examples:

```

- 1) fluid flow rate through a tube or vessel (dimensions of volume/time)
- 2) charge flow rate of an electrical current through an ion channel or wire (dimensions of charge/time or current)
- 3) chemical flux through a reaction kinetic pathway (dimensions of amount/time typically moles/sec or concentration/time)
- 4) the force in a spring as applied by entities at either end and as transmitted through the length of the spring.

Rate properties can be properly attributed to entities in two mathematically equivalent, but logically different, ways.

1) Representing the source/sink of a process where the rate properties are attributed to participants in a process. For example, a fluid flow process has a fluid-source entity and a fluid-sink entity so that the fluid rate is expressed as flow from source-to-sink. Similarly, mechanical process is due to forces exerted by "entity A" upon "entity B". This kind of formulation asserts that the flow/force properties are so-called "cross properties" because they describe how energy is transmitted across a process in which entities participate.

2) Representing rates as “through” properties as attributes of a “mediator” that is an entity through which the process occurs. For a fluid flow process, the fluid flow rate is thus attributed to the flow conduit (or more properly, the lumen of the conduit) that mediates the source-to-sink flow. Or, in the case of the transmission of mechanical force, across the interface or boundary between two mechanical solid entities.

These different approaches yield mathematically equivalent results yet their semantic-logical representations differ ways that is a burden for the reasoning required to detect and resolve their equivalence. In the “cross” representation, source/sink entities are represented as source/sink participants in a process. In the “through” representation, source/sink entities are represented as parts of an entity that “mediates” the process.

The distinction between “through” and “cross” properties (variables in math models) is commonly used in engineering analyses such the PhysSys ontology; see:

1. Borst, P., H. Akkermans, and J. Top: Engineering ontologies. Int. J. Human-Computer Studies 1997. 46:365-406.
2. Karnopp, D., D.L. Margolis, and R.C. Rosenberg, System dynamics: a unified approach. 2nd ed. A Wiley-Interscience Publication 1990, New York: Wiley.

</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00002</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A dynamical property that is the temporal differential of a dynamical state property.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00002</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Dynamical rate property</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00006</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A hasParticipant relation that relates a dynamical process to a dynamical entity whose dynamical state is a precondition for the process to occur but whose dynamical state changes only by participation in some other process.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00006</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">hasMediatorParticipant</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

```

    <IRI>http://bhi.washington.edu/OPB#OPB_00008</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Solid
conductance</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00010</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A portion of
energy proportional to the amount and displacement of a dynamical entity in a potential energy field or
potential energy difference.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00010</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Portion of
potential energy</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00011</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Fluid
conductance</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00012</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0001756</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00012</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Heat
conductance</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00014</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A potential
energy field are produced by moving electric charges and/or the intrinsic magnetic moments of
elementary particles that exerts force on moving electrical charges and magnetic dipoles. </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00014</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Magnetic
field</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00018</IRI>

```

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Fluid pressure of a portion of gas in a mixture of gasses contained in a spatial region as if that portion of gas were the only gas contained the region.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00018</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Partial gas pressure</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00025</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Solid elastic potential energy</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00026</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Chemical potential energy</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00027</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Heat potential energy</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00028</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Diffusion potential energy</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00030</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Magnetic potential energy</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00032</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The intuitive aim of "hasParticipant" is to relate an occurrence of a dynamical process to those dynamical entities that must exist in defined physical state for the process to occur during which the states of participants may, or may not be, changed.

Note that: "hasParticipant" relates physical processes to physical entities while "hasPropertyParticipant" relates physical properties to physical dependencies.</Literal>

</AnnotationAssertion>

```

<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00032</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
topObjectProperty that relates an occurrence of a physical process to an instance of a physical continuant
that is required for the process to occur or is changed by the process</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00032</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasParticipant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00033</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A solid
momentum property that is the temporal integral of a force, or the product of linear velocity and mass of a
solid material entity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00033</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Translational
momentum</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00034</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0001035</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00034</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">...that accelerates
or deforms solid entities; measured as ratio of ratio the acceleration of the entity divided by its mass
(Newton's Law) or as the deformation of the entity divided by its stiffness (Hooke's
Law)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00034</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Mechanical
force</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01370"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00037</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Joule SI-
unit</Literal>

```



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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00037</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An energy
amount that is the sum of kinetic and potential energies that inheres in a physical entity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00037</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Total
energy</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00038</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">...that relates an
occurrence of a process to the temporal interval during which it occurs</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00038</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">occursDuring</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00041</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A force-driven
flow proportionality that is the ratio of flow to force in a resistive flow dependency.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00041</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Conductance</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00042</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasMomentumPlayer</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00050</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasForcePlayer</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

```

```

    <IRI>http://bhi.washington.edu/OPB#OPB_00051</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
topObjectProperty that relates a property to a property attribute</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00051</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasPropertyAttribute</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00052</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">synonym</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00053</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Bending
distortion</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00054</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasFlowPlayer</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00055</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">ideal
property</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00055</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral"> i.e., having a
linear relationship that intersects the origin; a characteristic of &quot;ideal&quot; dynamical elements

```

By rights, a conductance (or its inverse, resistance) is a constitutive property of an electrochemical flow process (see: OPB:Electrical conductance). However, we classify ionic conductances as dynamical amounts because they are, ultimately, determined by the aggregates of the molecular conformational states of the ionic channels mediating the electropotential ion transport. Thus, these classes are suitable for representing the conductance ion channels at a moment in time, as well as the conductance of ion channel as characterized for standard conditions and by which the channel is named (e.g., "250 pS Ca-dependent K-channel");</Literal>

```

  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00055</IRI>

```

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Constitutive proportionalities apply only to those constitutive dependencies that can be expressed by which the dependent property is proportional to the independent property. Any other algebraic form of the dependency may have specially-defined parameters (e.g., offsets, rate parameters). Given the creativity and license of modelers for creating the best fit to constitutive dependencies, the parameters of such non-proportional dependencies must be annotated by some local mechanism that does not depend on OPB classifications.

Constitutive proportionalities are approximations to dependencies for which a first-order, linear approximation is sufficient for the purposes of analysis. Piecewise linear approximations may apply over a limited range of dynamical property values. In general, various algebraic functions may be required using one or more parameters to fit observed dependency relationships. Given the range of possible constitutive dependencies, OPB defers representing such possibilities on a case-by-case basis for specific use-cases.

Non-proportionality constants include coefficients and parameters required to characterize linear and nonlinear dependencies that are not simple proportionalities. Some may constitutive dependencies may include dynamic modeling schemes with internal dynamic states (e.g., the "gating variable" of Hodgkin-Huxley ion gating equations). We will treat such properties as "internal" to the constitutive dependency, shielded from other entities in the system and known solely as hypothetical constructs derived as constitutively observed dynamic phenomena. Thus, HH gating variables will be classified as properties of constitutive dependencies which are also subclasses of Dynamical property without, however, declaring a Dynamical entity of which it is a property.

Important to realize that MM params, HH params, etc. are all derived and asserted by virtue of curve-fits to the directly observed attributes of a system; number of gating particles and their respective states is entirely inferential by best fits and, so, are no more physically real than any other coefficient or parameter.</Literal>

```
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00055</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A constitutive
property that is a proportionality between values of dynamical property players.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00055</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Constitutive
proportionality</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00056</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Chemical amount</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00056</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A material amount that is the
temporal integral of a chemical flow or the amount of chemical in a portion of chemical</Literal>
```

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00056</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Amount of
chemical</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00057</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasAmountPlayer</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00059</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">...that relates a
property to the spatial coordinate system in which an instance of the property is defined</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00059</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasSpatialCoordinate</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00063</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasNegPropertyPlayer</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00065</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">...that is a
algebraic relation that relates the values of dynamical properties in a constitutive dependency</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00065</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasConstitutivePlayer</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00066</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasDynamicalPlayer</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>

```

```

    <IRI>http://bhi.washington.edu/OPB#OPB_00067</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasThermodynamicPlayer</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00068</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasDependencyPlayerProperty</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00072</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">synonym</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00073</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Pressure
momentum</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00073</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A momentum property that is
proportional to the temporal differential of an fluid flow rate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00073</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Fluid
momentum</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00074</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">successorTo</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00075</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasFlowSink</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00078</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Flow rate property that is the
temporal derivative of a mechanical displacement</Literal>

```

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00078</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Mechanical
velocity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00085</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">hasPart</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00092</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Gravitational field</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00092</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Potential energy field in
which material entities exert an attractive force on each other that proportional to the product of their
masses and inversely to the square of the distance separating them.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00092</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Gravitational
field</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00094</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">...that tends to
accelerate or move an entity away from the origin of its spatial location</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00094</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasForceSink</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00095</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">successorOf</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00096</IRI>

```

```

    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">...that tends to
    accelerate or move an entity toward the origin of its spatial location</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00096</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasForceSource</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00097</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">IUPACclass</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00098</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasPosPropertyPlayer</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00102</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The intuitive aim
of &quot;hasPropertyPlayer&quot; is to relate an occurrence of a dynamical dependency to instances of
dynamical properties that .

```

Note that: "hasParticipant" relates physical processes to physical entities while
"hasPropertyPlayer" relates instances of physical properties to occurrences of physical
dependencies.</Literal>

```

  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00102</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
topObjectProperty that relates an occurrence of a physical dependency to an instance of a physical
property upon which dependency</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00102</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasPropertyPlayer</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00103</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">wikipedia</Literal>
  </AnnotationAssertion>

```

```

<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00107</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">...that relates an
occurrence to the process class of which it is an instance</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00107</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">occurrenceOf</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00108</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">subProcessOf</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00109</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasSubProcess</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00110</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasFlowSource</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00120</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Shear force</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00120</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Shear
force</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00122</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
topObjectProperty that relates a physical property to the physical entity in which the property
inheres</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00122</IRI>

```



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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">propertyOf</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00126</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0002284</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00126</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Tensile force</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00126</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Tensile
force</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00135</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A dynamical
state property that is the temporal integral of a flow rate property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00135</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Amount</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00142</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">... is the nominal acceleration
due to gravity at the Earth's surface at sea level; http://en.wikipedia.org/wiki/Standard
gravity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00142</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Standard gravity
constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00159</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A temporal entity that is a
point in time</Literal>
  </AnnotationAssertion>

```

```

<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00159</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Temporal
instant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00160</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Fluid flow
resistance</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00163</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">rotational
momentum</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00163</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A solid
momentum property that is the temporal integral of a torque, or the product of rotational velocity and
rotational moment of inertia about a common axis of a solid material entity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00163</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Rotational
momentum</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00168</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Chemical
resistance</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00176</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Solid momentum</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00176</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A momentum
property that is the temporal integral of a momentum-driving force property</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00176</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Mechanical
momentum</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00183</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Solid viscous
resistance</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00198</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Heat transfer
resistance</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00201</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Energy flow rate that is the
temporal rate of the loss of heat energy of a dynamical entity that is the product of the entity's
temperature times the difference of its entropy with that of its surroundings.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00201</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Heat flow
rate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00212</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Newtonian gravitational
constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00212</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">...that is the constant of
proportionality that relates the gravitational force between two Material physical entities as the product of
the masses of the entities divided by the distance between the entities;
&lt;http://en.wikipedia.org/wiki/Gravitational_constant&gt;</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00212</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Newtonian
gravitational constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00221</IRI>

```

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A force-driven flow proportionality is the derivative of force versus flow in a resistive dependency; reciprocal of kinetic conductance property</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00221</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Resistance</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00226</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Diffusion resistance</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00249</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Chemical bonds are represented in a cursory fashion pending use-cases involving molecular dynamic analyses and modeling for which more detailed annotations will be required.

In the interim, a bond is an abstraction that represents ONLY the energetics of an attractive interaction between entities; i.e., the bond is manifested as a minimum energy state (usually as a function of entity-entity distance). Thus, a bond can be defined irrespective of the physical mechanism that mediates the bond such as electron-sharing or the extracellular matrix between cells.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00249</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A potential energy field that is an attractive interaction between atoms that allows the formation of chemical substances that contain two or more atoms</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00249</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Chemical bond</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00251</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Lineal translational velocity</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>

<IRI>http://bhi.washington.edu/OPB#OPB_00268</IRI>

```

    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">duration</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00268</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">time
span</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01370"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00268</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Second SI-
unit</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00268</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Temporal
property that is the amount of time between two temporal instants.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00268</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Temporal
duration</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00269</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Translational
displacement</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00269</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A mechanical
displacement that is the temporal integral of a mechanical velocity.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00269</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Translational
displacement</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00281</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An immaterial
dynamical entity that is the distribution of potential energy due to the separation of material, charge, or
magnetic monopoles</Literal>

```

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00281</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Potential energy
field</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00282</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
topObjectProperty that relates an instance of a physical entity to an instance of a property that inheres in
the entity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00282</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasProperty</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00293</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">&quot;A
temperature is an objective comparative measurement of hotness or coldness.&quot;;

```

<https://en.wikipedia.org/wiki/Temperature>

Because temperature is an intensive property that properly only applies to a single point in an entity, assigning a "temperature" as a property of a discretized physical entity that extends its space presents problems. If temperature is constant over the spatial extent of an entity (i.e., it is "isothermic") then it is fair to say that the entity has a single value of temperature. Such an assumption is quite often made for homeothermic biological organisms and their parts. However, it is not meaningful to calculate a spatial integral of temperature to derive an "average" temperature because such integrals have meaning only for extensive properties like mass density or current density. However, some analyses do aim to account explicitly for temperature gradients that drive heat transfers between entities or parts of entities. In such cases it is useful to define, for continuum modeling, a spatial distribution for temperature and heat fluxes.

However, for discrete modeling, the temperature of an entity can be assigned a value while its parts are assigned different temperatures – the discrete analogue of a continuum temperature distribution. For example, the temperature of mitochondria is likely to be higher than the surrounding portion of cytosol. That being said, there is utility in expressing that a discrete, dynamical entity can have a discrete temperature property with one value while allowing one or more of its parts to have separate temperature properties with different values. For computational purposes one can make the assumption that all parts of an entity share the same temperature property instance as the (whole) entity while parts that have a different temperature will have their own temperature property with a value that may differ from the temperature value of the whole entity (and the other parts).</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>

```

```

<IRI>http://bhi.washington.edu/OPB#OPB_00293</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0000146</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00293</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Because
temperature is an intensive property that properly only applies to a single point in an entity, assigning a
&quot;temperature&quot; as a property of a discretized physical entity that extends its space presents
problems. If temperature is constant over the spatial extent of an entity (i.e., it is &quot;isothermic&quot;)
then it is fair to say that the entity has a single value of temperature. Such an assumption is quite often
made for homeothermic biological organisms and their parts. However, it is not meaningful to calculate a
spatial integral of temperature derive an &quot;average&quot; temperature because such integrals have
meaning only for extensive properties like mass density or current density. However, some analyses do
aim to account explicitly for temperature gradients that drive heat transfers between entities or parts of
entities. In such cases it is useful to define, for continuum modeling, a spatial distribution for temperature
and heat fluxes.

```

However, for discrete modeling, the temperature of an entity can be assigned a value while its parts are assigned different temperatures – the discrete analogue of a continuum temperature distribution. For example, the temperature of mitochondria is likely to be higher than the surrounding portion of cytosol. That being said, there is utility in expressing that a discrete, dynamical entity can have a discrete temperature property with one value while allowing one or more of its parts to have separate temperature properties with different values. For computational purposes one can make the assumption that all parts of an entity share the same temperature property instance as the (whole) entity while parts that have a different temperature will have their own temperature property with a value that may differ from the temperature value of the whole entity (and the other parts).</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00293</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
thermodynamical property that is the driving force for the flow of heat energy and is a measure of the heat
content of a material entity</Literal>

```

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00293</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Temperature</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00299</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">VolumetricFlowRate - Volume of fluid passing a point in a system per unit of time.

```

```

http://www.unitsofmeasurement.org/apidocs/index.html</Literal>
</AnnotationAssertion>
<AnnotationAssertion>

```

```

    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00299</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">volume
flow</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00299</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">volume flow
rate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00299</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A flow rate
property that is the temporal derivative of a fluid volume</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00299</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Fluid flow
rate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00320</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
topObjectProperty that relates a physical property to the domain of the entity or dependency for which it
is a property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00320</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasPhysicalDomain</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00321</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0000040</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00321</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A mechanical
displacement that is a change in the shape of a solid entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00321</IRI>

```



```

    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Solid
distortion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00334</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Shear displacement</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00334</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Shear
distortion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00340</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The molar
amount of a portion of molecules normalized to the spatial amount of the spatial region occupied by the
molecules</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00340</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasPhysicalDomain exactly 1 &apos;Chemical kinetic domain&apos;</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00340</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Concentration of
chemical</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00357</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Bending
distortion velocity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00364</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">...that relates a
property to the spatial scope for which an instance of the property is defined</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00364</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasSpatialScope</Literal>
  </AnnotationAssertion>

```

```

<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00371</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A temporal
instant that is the first temporal instant in a temporal interval</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00371</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Initial instant of
process</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00373</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A temporal
instant that is the last temporal instant in a temporal interval</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00373</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Terminal instant
of process</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00378</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">G</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00378</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Gibbs free
energy</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00378</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">partial molar free
energy</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00378</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">&quot;...gradients of Gibbs free energy represent the thermodynamic driving force for
constant temperature and pressure (isothermal and isobaric) systems...typical of laoratory conditions and a
reasonable approximation for most biological systems.&quot;

```

Isobaric, isothermal systems are also referred to "NPT" systems where N is the number of particles (participants), P, the pressure, and T, the temperature are held constant.

Beard, D.A. and H. Qian, Chemical Biophysics: Quantitative Analysis of Cellular Systems. Cambridge Texts in Biomedical Engineering. 2008: Cambridge University Press. p. 9

```

</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00378</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A flow-driving potential that
drives the chemical transformation of one kind of chemical species into another. </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00378</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Chemical
potential</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00382</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasBoundary</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00411</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0002193</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00411</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Electrical charge</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00411</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An amount
property that is the temporal integral of an electrical current relative to an initial amount</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00411</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Charge
amount</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00421</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Gravitational
constant</Literal>

```

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00425</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Absolute amount
of chemical that is the mass a portion of a chemical within a spatial region normalized to the molecular
weight of the chemical.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00425</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Molar amount of
chemical</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00454</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Mass density</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00454</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Mass
density</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00462</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Particle amount</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00462</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An amount
property that is the temporal integral of a particle flow rate or the number of particles in a portion of
particles.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00462</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Amount of
particles</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00477</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Torsional
distortion</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

```

```

<IRI>http://bhi.washington.edu/OPB#OPB_00480</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A dynamical
state property that is the temporal integral of a force relative to an initial value of the state
property</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00480</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Momentum
property</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#classTerm"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00493</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Heat amount</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00493</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A amount
property that is the temporal integral of a heat flow</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00493</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Heat energy
amount</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00507</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string"></Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00507</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">discussion</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00509</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0001025</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00509</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A momentum
driving force that is the force per unit area that a fluid exerts on itself or on a surface that bounds the fluid,
and can accelerate or displace a portion of fluid</Literal>

```

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00509</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Fluid
pressure</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00511</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">boundaryOf</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00518</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">OPB strongly
distinguishes the terms &quot;dynamical&quot; and &quot;thermodynamical&quot;;

```

"Dynamical" is used as an adjective applied to continuant entities, processes, attributes, etc. that possess thermodynamic energy whereas "thermodynamical" is applied to portions, fluxes, etc. of energy (a primitive) that inher in continuants and are exchanged during dynamical processes.</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00518</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A physics
continuant that is portion of thermodynamic energy or entropy.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00518</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Thermodynamical entity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00523</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">volume</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00523</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0000918</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_00523</IRI>

```

```

    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A spatial
property that is the quantity of space enclosed in a bounded volume region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00523</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Spatial
volume</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00525</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A temporal entity that is a
contiguous interval of time bounded by temporal instants.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00525</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Temporal
span</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00535</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
topObjectProperty that relates an instance of a dynamical entity to an instance of a thermodynamic entity
that inheres in the dynamical entity.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00535</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">isThermodynamicEntityOf</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00562</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0001021</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00562</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Thermodynamical state property that is the amount of energy in a portion of
energy</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00562</IRI>

```

```

    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Energy
amount</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00563</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">power</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00563</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0001024</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00563</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
thermodynamical rate property that is the temporal rate at which energy is transported across an entity
boundary.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00563</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Energy flow
rate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00568</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://en.wikipedia.org/wiki/Dynamical_system</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00568</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">OPB:Dynamical
properties are attributes of dynamical systems whose values determine the thermodynamic content,
forces, and flows of the system's participants and processes. The categorization of properties
parallels that of OPB:Physical processes and OPB:Dynamical dependency, follows the development seen
in:

```

1. Borst, P., H. Akkermans, and J. Top: Engineering ontologies. *Int. J. Human-Computer Studies* 1997. 46:365-406.

2. Karnopp, D., D.L. Margolis, and R.C. Rosenberg, *System dynamics: a unified approach*. 2nd ed. A Wiley-Interscience Publication 1990, New York: Wiley.

```

</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

```



```

    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00568</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A physical
property that is an attribute of a dynamical entity, a dynamical process or a constitutive dynamical
dependency whose value determines the amount or rate of change of thermodynamic energy inhering in
the entity or the rate of energy transfer during a dynamical process.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00568</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Dynamical
property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00569</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://en.wikipedia.org/wiki/State_variable</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00569</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Dynamical state
properties are the CONSERVED amount or the CONSERVED momentum within the boundary of a
physical entity. State property values are changed during a span of time according to the temporal
integration of flow rates or forces according, respectively, to Stokes's law.

```

Differentials of state property values between physical entity process participants are the drivers for flows between entities as expressed in the constitutive dependencies according to the (linear, proportional) laws of Ohm, Hooke, and Newton.

State properties are termed "across" or "cross" variables to express the idea that the value differential exists across the path to which a rate property applies. In PhysSys ontology [1] and Karnopp [2], they are classified as "forces" variables (f).

1. Borst, P., H. Akkermans, and J. Top: Engineering ontologies. Int. J. Human-Computer Studies 1997. 46:365-406.
2. Karnopp, D., D.L. Margolis, and R.C. Rosenberg, System dynamics: a unified approach. 2nd ed. A Wiley-Interscience Publication 1990, New York: Wiley.

```

</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00569</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A dynamical
property that is the temporal integral of a dynamical rate property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>

```

```

    <IRI>http://bhi.washington.edu/OPB#OPB_00569</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Dynamical state
property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00573</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Dynamical rate
property that is the temporal differential of an amount property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00573</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Flow rate
property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00574</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A dynamical rate
property that is a temporal differential of a momentum or amount property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00574</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Force
property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00627</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A flux driving
potential that drives the flow of particles from one portion of particles to another according to the
difference in concentration of the particles</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_00627</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Diffusion
potential</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01000</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Particle
concentration</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01001</IRI>

```

```

    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Particle
count</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01016</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">topObjectProperty that assigns an instance of an SI unit class to physical property
class</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasSIunit</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01035</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">surface
tension</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01035</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0001461</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01035</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Surface tension
has the dimension of force per unit length, or of energy per unit area. The two are equivalent&acirc"but when
referring to energy per unit of area, people use the term surface energy&acirc"which is a more general term in
the sense that it applies also to solids and not just liquids.

Surface tension, usually represented by the symbol  $\hat{I}^3$ , is measured in forces per unit length. Its SI unit is
newton per meter but the cgs unit of dyne per cm is also used.
(http://en.wikipedia.org/wiki/Surface\_tension)</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01035</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A Tensile stress
that is the amount of force normal to a spatial line region normalized to the length of the line
region.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01035</IRI>

```

```

    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Axial normal tensile stress</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01036</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A material
amount of a portion of gas or liquid</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01036</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Amount of fluid</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01040</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A charged atom
that has a net positive electrical charge</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01040</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Atomic anion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01041</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A hasParticipant
relation by which the dynamical state of dynamical entity can change the rate of a dynamical
process.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01041</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasTransactorParticipant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01043</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Surface area</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01053</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A mechanical
force property that is the amount of force per unit of spatial extent.</Literal>

```

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01053</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Mechanical stress</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01061</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An amount
property that is the temporal integral of an fluid flow rate relative to an initial volume</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01061</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Fluid volume</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01067</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">chemical
product</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01067</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">chemical
reactant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01067</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">chemical
substrate</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01067</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">compound</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01067</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">molecular
species</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>

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```

    <IRI>http://bhi.washington.edu/OPB#OPB_01067</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">reactant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01067</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">substrate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01067</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">As discrete
structures, OPB:Chemical substance classes are intended to represent single discrete atomic or molecular
scale structures for purposes of analyzing the molecular dynamic processes by which they interact and
deform. Chemical reactions involving innumerable (e.g., molar quantities) atoms and molecules are
modeled using the OPB:Portions of chemical reactant class.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01067</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A solid
dynamical entity that can participate in chemical reaction processes.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01067</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Chemical
structure</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01068</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO_id</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01069</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Solid potential energy</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01071</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A three-
dimensional region that has a finite spatial extent defined by on or more contiguous spatial
surfaces.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

```

```

    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01071</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Bounded volume region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01073</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Solid gravitational potential energy</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01074</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A three-
dimensional region that has a infinite spatial extent incompletely limited by zero or more two-dimensional
regions.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01074</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Unbounded volume region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01080</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A charged atom
that has a net negative electrical charge</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01080</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Atomic cation</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01084</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A fluid pressure
that is the difference in pressure that exists between two portions of fluid.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01084</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Pressure
differential</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01085</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A fluid pressure
that is measured relative to the absolute zero pressure of a vacuum</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01085</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Absolute
pressure</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01093</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A mechanical
stress that is the amount of force normal to a spatial line or surface region normalized to the spatial extent
of the region.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01093</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Tensile stress</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01096</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">ion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01096</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">ionic
species</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01096</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A particulate that
bears a net electrical charge</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01096</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Charged particulate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01097</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A tensile stress
that is the amount of force normal to a surface region normalized to the area of the surface
region.</Literal>

```



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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01097</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Surface normal tensile stress</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01107</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">inertia</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01107</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">mass</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01107</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">https://en.wikipedia.org/wiki/Inertia

```

No physical difference has been found between gravitational and inertial mass in a given inertial frame.

Inertial mass is found by applying a known net force to an unknown mass, measuring the resulting acceleration, and applying Newton's Second Law, $m = F/a$.

Gravitational mass is measured by comparing the force of gravity of an unknown mass to the force of gravity of a known mass.</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01107</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0000125</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01107</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">synonyms: mass,
inertia, inertial mass</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01107</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An amount
property that is the temporal integral of a material flow rate relative to and initial amount.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>

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```

    <IRI>http://bhi.washington.edu/OPB#OPB_01107</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Material
amount</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01110</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Diffusion conductance</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01125</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A mechanical
stress that is the amount of force acting in the plane of a spatial region normalized to the spatial extent of
the region.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01125</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Shear stress</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01141</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
hasPropertyAttribute that specifies or limits the value of a physical property </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01141</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasConstraint</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01146</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Physical constant
that is the mass of a molecule calculated as the sum of the atomic weights of each constituent element
multiplied by the number of atoms of that element in the molecular formula</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01146</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Molecular
weight</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01150</IRI>

```

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A shear stress that is the amount of force acting in the along a line spatial region normalized to the length of the line.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_01150</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Lineal shear stress</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://bhi.washington.edu/OPB#OPB_01154</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A shear stress that is the amount of force acting in the plane of a surface spatial region normalized to the area of the region.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_01154</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Surface shear stress</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://bhi.washington.edu/OPB#OPB_01155</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A matrial dyamical entity that can participate in a diffusive process, advection or convection.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_01155</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Particulate</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://bhi.washington.edu/OPB#OPB_01158</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A spatial property that is a set of coordinate values (in 1-, 2-, or 3-dimensions) of point in space relative to the origin of a coordinate system.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_01158</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Spatial location</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://bhi.washington.edu/OPB#OPB_01170</IRI>

```

    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Convective transport process</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01179</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A potential
energy field that is a spatial gradient of particle concentration.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01179</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Diffusion gradient</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01192</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0002027</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01192</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A chemical
concentration the amount of solute per liter of solution.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01192</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Osmolality</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01197</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0001655</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01197</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A chemical
concentration the amount of solute per kilogram of solution.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01197</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Osmolarity</Literal>
  </AnnotationAssertion>

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```

<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01198</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A momentum
driving force that acts to accelerate, displace, or deform a solid physical entity </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01198</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Mechanical force</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01199</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Activity of anion
for univalent sodium ions</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01199</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">pNa</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01200</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An amount of
chemical that is the thermodynamic activity of a chemical as affected by interactions with other chemical
species</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01200</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Chemical activity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01208</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">rate
constant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01208</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Constitutive
proportionality between properties in a dynamical flow dependency.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>

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    <IRI>http://bhi.washington.edu/OPB#OPB_01208</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Constitutive flow proportionality</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01213</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A spatial
property that is the degree to which a spatial line region or surface region deviates from being straight or
flat, respectively.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01213</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Spatial curvature</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01215</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A dynamical
property that is the temporal rate of change of a flow rate property.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01215</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Dynamical acceleration property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01220</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Flow rate
property that is the temporal rate of change of the a material amount or, equivalently, the temporal rate at
which matter passes across a spatial boundary, or from one discrete entity to another.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01220</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Material flow
rate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01226</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Mass of solid entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01240</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A material
dynamical entity that occupies a portion of space and has inherent shape and solid mechanical properties.
</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01240</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Solid dynamical
entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01261</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
topObjectProperty that relates an instance of a thermodynamical entity to an instance of a dynamical
entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01261</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasThermodynamicEntity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01279</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasConstraint</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01282</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
thermodynamical property that is the amount of energy or entropy of a dynamical entity.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01282</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Thermodynamical state property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01283</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
thermodynamical property that is the temporal rate of energy or entropy flow.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01283</IRI>

```

```

    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Thermodynamical rate property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01288</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An amount
property that is the amount of material that inheres in a solid entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01288</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Amount of solid entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01289</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Constitutive flow
proportionality for an amount-driven flow proportionality</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01289</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Amount-driven flow proportionality</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01296</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Reaction rate constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01298</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">State fraction of chemical</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01306</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Diffusion coefficient</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01309</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">https://en.wikipedia.org/wiki/Heat_capacity</Literal>
  </AnnotationAssertion>

```



```

<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01309</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A thermal
constitutive property that is the ratio of the heat energy added or removed to a physical entity to the
change in its temperature </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01309</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Heat capacity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01313</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An amount of
chemical that is the thermodynamic activity of a chemical solute as affected by other solutes in a solution.
</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01313</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Activity of solute</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01314</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Amount property</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01315</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The distinction
between micromolecule and macromolecule subclasses is necessarily vague because there is no
universally agreed upon or satisfactory molecular weight or structural criteria by which these subclasses
are to be distinguished. In service to the representing function, OPB distinguishes micro/macro more
along the lines of function: micromolecules play the roles of substrate/product/modifier/transportee in
processes while macromolecules serve as the catalysts and mediators of the processes. Clearly, such a
distinction admits to many exceptions which we leave for subsequent OPB versions or the cleverness of
OPB user to work around</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01315</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A chemical
structure composed of elements linked by covalent chemical bonds.</Literal>
</AnnotationAssertion>
</AnnotationAssertion>

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    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01315</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Molecule</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01370"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01317</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Joule SI-
unit</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01317</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Thermodynamic
potentials are quantified by scalar, extensive variables (e.g., U, H, F, G...) and are used predominantly
(historically?) for the analysis of chemical and fluid systems. Consequently, the kinetic and potential
energies of other entities </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01317</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A portion of
energy defined as algebraic sums or differences of portions of energy defined according to constraints on
the values of physical properties.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01317</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Thermodynamic potential</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01320</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Weight of solid
entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01322</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A material
amount of a portion of liquid</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01322</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Amount of liquid</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

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    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01325</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasReciprocalProperty</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01326</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An impedance
that is the opposition to flow due to the combination of resistance, capacitance, and inductance along a
flow path </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01326</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Impedence
property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01327</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An impedance
that is the opposition to flow due to the combination capacitance and inductance of a flow path </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01327</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Reactance
property</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01328</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A force-driven
flow proporationality that is the opposition to flow due to the duration and/or rate of change of a flow
property.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01328</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Impedance</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01331</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Spatial fraction of particle</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

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```

<IRI>http://bhi.washington.edu/OPB#OPB_01361</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A chemical
structure that is a single atom composed of protons, neutrons and electrons.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01361</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Element</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01363</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">displayName</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01364</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A force property
that can change only the potential energy of a portion of entity.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01364</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Flow-driving potential</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01365</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Momentum
driving forces are so-named to capture the idea that such forces are relevant only in-so-far as they may
change the kinetic energy of material entities (solid or fluid) as well as changing their potential energy by
changes of elevation (in a gravitational field) or by changes of elastic potential energy.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01365</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A force property
that can change the momentum of a material entity and can change either/both the kinetic and potential
energy.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01365</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Momentum-driving force</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>

```

```

<IRI>http://bhi.washington.edu/OPB#OPB_01370</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasSI-unit</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="owl:priorVersion"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01370</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A annotation
property that assigns a class of &quot;SI-unit&quot; to OPB:Physical property classes. Multiple instances
of hasSI-unit and hasReciprocal-SI-unit may be assigned to a given property class to express, as factors
and reciprocals, compound units such as for a velocity (distance/time) or density (mass / volume).

```

SI-units are the only system of units to be represented in OPB and is implemented according to the globally-adopted system as described in:

https://en.wikipedia.org/wiki/International_System_of_Units. SI-unit classes.

Accordingly and by fiat, some are "base units" that are irreducible and some are "derived units" that are derived from base units by multiplication or division. In other formal systems or conventional usages, other allocations between base/derived units may be encountered.

SI-unit classes map, non-exclusively to classes of OPB:PropertyDimension either as single classes, or as multiples/quotients of base units

```

</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01376</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Tensile distortion</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01379</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Fractional
amount of chemical that is the proportion of an amount chemical in a one spatial region normalized to the
total amount of the same chemical in another spatial region.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01379</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Spatial fraction of chemical</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01383</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A fractional
amount of chemical that is the ratio of the molar concentration of one portion of chemical to that of
another species occupying the same spatial region</Literal>
</AnnotationAssertion>

```

```

<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01383</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Molar fraction of chemical</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01385</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The
&quot;state&quot; in the definition may refer to, say, the structural state of molecules in a portion of
chemical be it molecules in a particular structural conformation. Examples: fraction of open channels,
fraction of ion channels in a particular gating state (e.g., m, n, h of HH model); enzyme activity
normalized to maximal activity (e.g., V/Vmax in MM enzyme model).</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01385</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Fractional
amount of chemical that is the proportion of a chemical in a particular conformational state normalized to
the total amount of the portion of chemical.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01385</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Fractional amount of chemical</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01389</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Absolute amount
of a chemical that is the mass of a portion of a chemical within a spatial region.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01389</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Mass amount of chemical</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01395</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Absolute amount of chemical</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01396</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Volumetric concentration of solute</Literal>

```

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01398</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A mechanical
displacement that is the temporal integral of a rotational velocity of two solid entites that are constrained
to rotate relative to each other around a rotational axis or planar axis.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01398</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Joint displacement</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01401</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasPropertyAttribute that relates a derived SI unit to an SI unit that is a multiplicative
component of the derived SI unit.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01401</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasMultiplierUnit</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01402</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasPropertyAttribute that relates a derived SI unit to an SI unit that is a divisor
component of the derived SI unit.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01402</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasDivisorUnit</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01411</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0001019</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01411</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An amount
density for a material entity.</Literal>

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```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01411</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Material density</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01412</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0001353</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01412</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A material
density expressed per unit volume</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01412</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Material volumetric density</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01434</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Joint rotational displacement</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01445</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Joint angular displacement</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01449</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Constitutive flow
proportionality for a force-driven flow proportionality.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01449</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Force-driven flow proportionality</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>

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    <IRI>http://bhi.washington.edu/OPB#OPB_01451</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PATO:0001034</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01451</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A mechanical
displacement that is a local solid displacement normalized to the extent of the solid entity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01451</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Solid strain</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01452</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Shear strain</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01453</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Tensile strain</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01460</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A charged
particle that is a single element.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01460</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Charged atom</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01482</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Lineal mechanical force</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01484</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Rotational strain</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01495</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An amount
property that is a temporal integral of a mechanical velocity property of a solid kinetic entity relative to an
inertial frame.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01495</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Mechanical displacement</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01500</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">H</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01500</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">enthalpy</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01370"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01500</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Joule SI-
unit</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01500</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
thermodynamic potential that is the energy required to create a system, and the amount of energy required
to make room for it by displacing its environment and establishing its volume and pressure -
Wikipedia.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01500</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Enthalpic energy</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01068"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01502</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral"></Literal>
</AnnotationAssertion>
<AnnotationAssertion>

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<AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
 <IRI>http://bhi.washington.edu/OPB#OPB_01502</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Constitutive dynamical properties ultimately depend on an empirically determined material property (e.g., density, resistivity) of a participant in the process. For example, mass density depends on both the spatial distribution of atoms and the atomic weight of each. Resistance of a conductor depends on the resistivity of the material in the wire which is only defined and determinable empirically.

There are two conflicting views of constitutive properties as properties of processes or of continuant entities:

1. The definition of constitutive property as a "ratio or partial derivative" of physical property values necessarily implicates a measurement process whereby values of two or more physical properties are varying and are measured and computed. However...
2. Constitutive properties are conventionally viewed as inherent attributes of a continuant or a process:
 - . mass density is the ratio of a material amount to the extent of the spatial region that it occupies.
 - . resistivity is the ratio of a potential difference to current flow rate for an electrical flow process
 - .
- 3) what is common to each case is that "constitutive properties" are defined in the context of a specific entity or process in a manner that depends on the material and structural composition of the entities participating in the measurement process.

Any other algebraic form of the dependency may have specially-defined parameters (e.g., offsets, rate parameters). Given the creativity and license of modelers for creating the best fit to constitutive dependencies, the parameters of such non-proportional dependencies must be annotated by some local mechanism that does not depend on OPB classifications.

Constitutive proportionalities are approximations to dependencies for which a first-order, linear approximation is sufficient for the purposes of analysis. Piecewise linear approximations may apply over a limited range of dynamical property values. In general, various algebraic functions may be required using one or more parameters to fit observed dependency relationships. Given the range of possible constitutive dependencies, OPB defers representing such possibilities on a case-by-case basis for specific use-cases.

Non-proportionality constants include coefficients and parameters required to characterize linear and nonlinear dependencies that are not simple proportionalities. Some constitutive dependencies may include dynamic modeling schemes with internal dynamic states (e.g., the "gating variable" of Hodgkin-Huxley ion gating equations). We will treat such properties as "internal" to the constitutive dependency, shielded from other entities in the system and known solely as hypothetical constructs derived as constitutively observed dynamic phenomena. Thus, HH gating variables will be classified as properties of constitutive dependencies which are also subclasses of Dynamical property without, however, declaring a Dynamical entity of which it is a property.

Important to realize that MM params, HH params, etc. are all derived and asserted by virtue of curve-fits to the directly observed attributes of a system; number of gating particles and their respective states is entirely inferential by best fits and, so, are no more physically real than any other coefficient or parameter.</Literal>

</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01502</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A dynamical
property whose value depends on the material composition and spatial properties of a physical process or
process participant.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01502</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Dynamical constitutive property</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01509</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">specific
heat</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01509</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A heat capacity
that is the heat capacity per unit mass of a material</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01509</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Specific heat capacity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01512</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Ar</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01512</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">https://en.wikipedia.org/wiki/Relative_atomic_mass</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01512</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Atomic amount
that is a dimensionless (number only) that is the ratio of the average mass of atoms of an element in a
given sample to one atomic mass constant. </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>

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    <IRI>http://bhi.washington.edu/OPB#OPB_01512</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Relative atomic mass</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01513</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Atomic constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01523</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A chemical bond
mediated by ionic (i.e., electrostatic) interactions, hydrophobic interactions, hydrogen bonds, and van der
Waals forces.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01523</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Noncovalent chemical bond</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01527</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A chemical bond
mediated by the sharing of electron pairs between atoms.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01527</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Covalent chemical bond</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01537</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">https://en.wikipedia.org/wiki/Thermodynamic_activity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01537</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">p(ion) is the
decimal logarithm of the reciprocal of the ion activity in a solution.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01537</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A chemical
activity that is the decimal logarithm of the reciprocal of the activity of an ion in solution</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01537</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">p-
Ion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01552</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Activity of
chemical of a solute that is a cation</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01552</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">p-
cation</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01553</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Decimal
cologarithm of chemical activity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01553</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">p-
anion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01554</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Activity of anion
for univalent protons</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01554</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">pH</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01555</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Activity of anion
for divalent calcium cations</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01555</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">pCa</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01557</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Ionic chemical bond</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01560</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Hydrophobic chemical bond</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01563</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Activity of cation
for univalent chloride ions</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01563</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">pCl</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01564</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Hydrogen bond</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01565</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Van der waals bond</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01568</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Atomic amount
that is the relative atomic mass (of elements from natural, stable, terrestrial sources. </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01568</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Atomic weight</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01582</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">start
time</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01582</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">time
zero</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01582</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">zero
time</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01582</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A temporal
instant that is the origin of a temporal coordinate system.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01582</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Temporal coordinate origin</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01584</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">U</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01584</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">https://en.wikipedia.org/wiki/Internal_energy</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_01370"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01584</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Joule SI-
unit</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

```



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<AnnotationProperty abbreviatedIRI="rdfs:comment"/>
<IRI>http://bhi.washington.edu/OPB#OPB_01584</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
thermodynamic potential that is the total energy of a dynamical entity excluding its kinetic energy of
motion as a whole and the potential energy of the system as a whole due to external force fields.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01584</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Internal energy</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01599</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Solid displacement</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01601</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Rotational displacement</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01602</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Solid displacement rate</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01611</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">subclass_of_BFOclass</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01618</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Solid distortion velocity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01622</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">NA</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01622</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">https://en.wikipedia.org/wiki/Avogadro_constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01622</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Avogadro
constant is  $6.022140857(74)\text{Å}^{-10^{*}23}$  per mole in the International System of Units (SI).</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01622</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A physical
constant that is the number of constituent particles, usually atoms or molecules, in one mole of a
substance. </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01622</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Avogadro constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01623</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">F</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01623</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">https://en.wikipedia.org/wiki/Faraday_constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01623</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Faraday constant
has the currently accepted value of  $96485.3365(21)\text{ C mol}^{-1}$  that is the product of the unit charge of an
electron ( $1.6021766\text{Å}^{-10^{*}19}\text{ C}$ ) and the Avogadro constant ( $N_A \hat{=} 6.022141\text{Å}^{-1023}
\text{ mol}^{-1}$ ).</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01623</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A physical
constant that is the amount electric charge of a mole of electrons.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01623</IRI>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Faraday constant</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://bhi.washington.edu/OPB#OPB_01624</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An amount property that is the difference between the number of protons and the number of electrons composing a material dynamic entity</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:label"/>
 <IRI>http://bhi.washington.edu/OPB#OPB_01624</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Ionic charge</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
 <IRI>http://bhi.washington.edu/OPB#OPB_01625</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">k</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
 <IRI>http://bhi.washington.edu/OPB#OPB_01625</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">https://en.wikipedia.org/wiki/Boltzmann_constant</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
 <IRI>http://bhi.washington.edu/OPB#OPB_01625</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The Boltzmann constant is the gas constant R divided by the Avogadro constant: $k = R / N_A$ which has the dimension energy divided by temperature.

The accepted value in SI units is $1.3806488(13) \times 10^{-23}$ J/K.</Literal>

</AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://bhi.washington.edu/OPB#OPB_01625</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A physical constant that is the ratio of the energy of a particle to its temperature.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:label"/>
 <IRI>http://bhi.washington.edu/OPB#OPB_01625</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Boltzmann constant</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
 <IRI>http://bhi.washington.edu/OPB#OPB_01626</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">R</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01626</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">ideal gas
constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01626</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">molar gas
constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01626</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">universal gas
constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01626</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">https://en.wikipedia.org/wiki/Gas_constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#discussion"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01626</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The gas constant
is the Boltzmann constant (k) times the number of moles of a gas (N) such that  $R = Nk$ .</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01626</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A physical
constant that is the increment in the total energy of a mole of matter due to an increment of temperature.
</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01626</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Gas constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01627</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Atomic mass
unit</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01627</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">https://en.wikipedia.org/wiki/Atomic_mass_constant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01627</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Atomic amount
that is one twelfth of the mass of an unbound atom of carbon-12 at rest and in its ground state</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01627</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Atomic mass constant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01628</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">https://en.wikipedia.org/wiki/Atmosphere_(unit)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01628</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A physical
constant that is the standard atmospheric pressure defined as 101325 Pa (1.01325 bar) as used as a
reference or standard pressure.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01628</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Standard atmosperic pressure</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01639</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Shear distortion velocity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01643</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Tensile distortion velocity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

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<IRI>http://bhi.washington.edu/OPB#OPB_01644</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An amount
property that is the amount of dynamical entity distributed over a spatial region normalized to the size of
the region</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01644</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Amount density</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01649</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
topObjectProperty that relates a physical domain to the entity or dependency for which it is a
domain</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01649</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">isPhysicalDomainFor</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01653</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An annotation
property that assigns the reciprocal of an SI-unit as the measurement unit for a physical
property</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01653</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">hasReciprocal-SI-unit</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01657</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A mechanical
velocity that is the rate of displacement of solid entity,</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01657</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Solid velocity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

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    <IRI>http://bhi.washington.edu/OPB#OPB_01687</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A constitutive
state property of continuum that relates state properties of a portion of ideal gas</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01687</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Gas law constant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01703</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Solid acceleration</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01704</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A dynamical
acceleration property that is the temporal rate of change of a fluid flow rate.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01704</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Fluid acceleration</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01705</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">R</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01705</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">gas
constant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00072"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01705</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">universal gas law
constant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01705</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A gas law
constant for the ideal gas law</Literal>
</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01705</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Ideal gas constant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01706</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A gas law
constant for the Boyle&apos;s gas law</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01706</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Boyle gas constant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01707</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A gas law
constant for the Avogadro&apos;s gas law</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01707</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Avogadro gas constant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01708</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A gas law
constant for Charles&apos; gas law</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01708</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Charles gas constant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01709</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A gas law
constant for Guy-Lussac&apos;s gas law</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://bhi.washington.edu/OPB#OPB_01709</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Guy-Lussac gas constant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01710</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A material
amount of a portion of gas</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://bhi.washington.edu/OPB#OPB_01710</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Amount of gas</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://example.com/bfo-spec-label</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Person:Alan
Ruttenberg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Julius Caesar</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Verdi's Requiem</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

```

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<IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the Second World War</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">your body mass index</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: In all areas of empirical inquiry we encounter general terms of two
sorts. First are general terms which refer to universals or types: animal tuberculosis surgical
procedure disease Second, are general terms used to refer to groups of entities which instantiate a given
universal but do not correspond to the extension of any subuniversal of that universal because there is
nothing intrinsic to the entities in question by virtue of which they "and only they" are counted as
belonging to the given group. Examples are: animal purchased by the Emperor tuberculosis diagnosed on
a Wednesday surgical procedure performed on a patient from Stockholm person identified as candidate for
clinical trial #2056-555 person who is signatory of Form 656-PPV painting by Leonardo da Vinci Such
terms, which represent what are called "specializations" in [81</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000004</IRI>
  </Annotation>
</Annotation>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">per discussion
with Barry Smith</Literal>
</Annotation>
<Annotation>
  <AnnotationProperty abbreviatedIRI="rdfs:seeAlso"/>
  <IRI>http://www.referent-tracking.com/_RTU/papers/CeustersICbookRevised.pdf</IRI>
</Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Entity doesn't have a closure axiom because the subclasses don't
necessarily exhaust all possibilities. For example Werner Ceusters' portions of reality'
include 4 sorts, entities (as BFO construes them), universals, configurations, and relations. It is an open
question as to whether entities as construed in BFO will at some point also include these other portions of
reality. See, for example, 'How to track absolutely everything' at http://www.referent-
tracking.com/_RTU/papers/CeustersICbookRevised.pdf</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>

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    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/001-001</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An entity is anything that exists or has existed or will exist. (axiom label in BFO2
Reference: [001-001])</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>
    <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000001</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">continuant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Continuant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">continuant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
heart</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
person</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
symphony orchestra</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the color of a tomato</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of blood to coagulate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the lawn and atmosphere in front of our building</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the mass of a cloud</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An entity that exists in full at any time in which it exists at all, persists through time
while maintaining its identity and has no temporal parts.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: Continuant entities are entities which can be sliced to yield parts only
along the spatial dimension, yielding for example the parts of your table which we call its legs, its top, its
nails. "My desk stretches from the window to the door. It has spatial parts, and can be sliced (in space)
in two. With respect to time, however, a thing is a continuant." [60, p. 240</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000007</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Continuant doesn't have a closure axiom because the subclasses don't
necessarily exhaust all possibilities. For example, in an expansion involving bringing in some of
Ceuster's other portions of reality, questions are raised as to whether universals are
continuants</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">endurant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/008-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
continuant is an entity that persists, endures, or continues to exist through time while maintaining its
identity. (axiom label in BFO2 Reference: [008-002])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/126-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">if
b is a continuant and if, for some t, c has_continuant_part b at t, then c is a continuant. (axiom label in
BFO2 Reference: [126-001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/009-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">if
b is a continuant and if, for some t, cis continuant_part of b at t, then c is a continuant. (axiom label in
BFO2 Reference: [009-002])</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/011-002</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">if
b is a material entity, then there is some temporal interval (referred to below as a one-dimensional
temporal region) during which b exists. (axiom label in BFO2 Reference: [011-002])</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/009-002</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x y) (if
(and (Continuant x) (exists (t) (continuantPartOfAt y x t))) (Continuant y))) // axiom label in BFO2 CLIF:
[009-002] </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/126-001</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x y) (if
(and (Continuant x) (exists (t) (hasContinuantPartOfAt y x t))) (Continuant y))) // axiom label in BFO2
CLIF: [126-001] </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/008-002</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(Continuant x) (Entity x))) // axiom label in BFO2 CLIF: [008-002] </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/011-002</IRI>

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</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(Material Entity x) (exists (t) (and (TemporalRegion t) (existsAt x t)))) // axiom label in BFO2 CLIF:
[011-002] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
<IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty abbreviatedIRI="rdfs:label"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000002</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">&apos;VolContinuant&apos;</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">occurrent</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Occurrent</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">occurrent</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
surgical operation as processual context for a nosocomial infection</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the life of an organism</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>

```

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the most interesting part of Van Gogh's life</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the spatiotemporal context occupied by a process of cellular meiosis</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the spatiotemporal region occupied by the development of a cancer tumor</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An entity that has temporal parts and that happens, unfolds or develops through time.
Sometimes also called perdurants.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: every occurrent that is not a temporal or spatiotemporal region is s-
dependent on some independent continuant that is not a spatial region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: s-dependence obtains between every process and its participants in
the sense that, as a matter of necessity, this process could not have existed unless these or those
participants existed also. A process may have a succession of participants at different phases of its
unfolding. Thus there may be different players on the field at different times during the course of a
football game; but the process which is the entire game s-dependes_on all of these players nonetheless.
Some temporal parts of this process will s-depend_on on only some of the players.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000006</IRI>
    </Annotation>
    <Annotation>
      <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
      <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">per discussion
with Barry Smith</Literal>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

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<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Occurrent doesn't have a closure axiom because the subclasses don't
necessarily exhaust all possibilities. An example would be the sum of a process and the process boundary
of another process.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000012</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
      <IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
      <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Simons uses
different terminology for relations of occurrents to regions: Denote the spatio-temporal location of a given
occurent e by 'span[e]'; and call this region its span. We may say an occurrent is at its span, in
any larger region, and covers any smaller region. Now suppose we have fixed a frame of reference so that
we can speak not merely of spatio-temporal but also of spatial regions (places) and temporal regions
(times). The spread of an occurrent, (relative to a frame of reference) is the space it exactly occupies, and
its spell is likewise the time it exactly occupies. We write 'spr[e]'; and 'spl[e]';
respectively for the spread and spell of e, omitting mention of the frame.</Literal>
    </Annotation>
  </AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">perdurant</Literal>
  </AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
</AnnotationAssertion>
  <Annotation>
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      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/077-002</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
      <IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
      <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An occurrent is an entity that unfolds itself in time or it is the instantaneous boundary of
such an entity (for example a beginning or an ending) or it is a temporal or spatiotemporal region which
such an entity occupies_temporal_region or occupies_spatiotemporal_region. (axiom label in BFO2
Reference: [077-002])</Literal>
    </Annotation>
  </AnnotationAssertion>
</AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/108-001</IRI>
    </Annotation>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Every occurrent occupies_spatiotemporal_region some spatiotemporal region. (axiom
label in BFO2 Reference: [108-001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
<IRI>http://purl.obolibrary.org/obo/bfo/axiom/079-001</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is an occurrent entity iff b is an entity that has temporal parts. (axiom label in BFO2 Reference: [079-
001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
<IRI>http://purl.obolibrary.org/obo/bfo/axiom/108-001</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(Occurrent x) (exists (r) (and (SpatioTemporalRegion r) (occupiesSpatioTemporalRegion x r)))) // axiom
label in BFO2 CLIF: [108-001] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
<IRI>http://purl.obolibrary.org/obo/bfo/axiom/079-001</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (iff
(Occurrent x) (and (Entity x) (exists (y) (temporalPartOf y x)))) // axiom label in BFO2 CLIF: [079-001]
</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
<IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty abbreviatedIRI="rdfs:label"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000003</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">&apos;VolOccurrent&apos;</Literal>
</AnnotationAssertion>
<AnnotationAssertion>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">ic</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">IndependentContinuant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">independent continuant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
chair</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
heart</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
leg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
molecule</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
person</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
spatial region</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
symphony orchestra</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an atom</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an orchestra.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an organism</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the bottom right portion of a human torso</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the interior of your mouth</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the lawn and atmosphere in front of our building</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
continuant that is a bearer of quality and realizable entity entities, in which other entities inhere and
which itself cannot inhere in anything.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>

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<Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/017-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is an independent continuant = Def. b is a continuant which is such that there is no c and no t such that b
s-depends_on c at t. (axiom label in BFO2 Reference: [017-002])</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">substantial entity</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/134-001</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
      <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
      <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">For any independent continuant b and any time t there is some spatial region r such that
b is located_in r at t. (axiom label in BFO2 Reference: [134-001])</Literal>
    </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
        <IRI>http://purl.obolibrary.org/obo/bfo/axiom/018-002</IRI>
      </Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
        <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
        <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">For every independent continuant b and time t during the region of time spanned by its
life, there are entities which s-depends_on b during t. (axiom label in BFO2 Reference: [018-
002])</Literal>
      </AnnotationAssertion>
    <AnnotationAssertion>
      <Annotation>
        <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
          <IRI>http://purl.obolibrary.org/obo/bfo/axiom/134-001</IRI>
        </Annotation>
        <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
          <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>

```

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x t) (if
(IndependentContinuant x) (exists (r) (and (SpatialRegion r) (locatedInAt x r t)))) // axiom label in BFO2
CLIF: [134-001] </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/018-002</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x t) (if
(and (IndependentContinuant x) (existsAt x t)) (exists (y) (and (Entity y) (specificallyDependsOnAt y x
t)))) // axiom label in BFO2 CLIF: [018-002] </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/017-002</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(iff
(IndependentContinuant a) (and (Continuant a) (not (exists (b t) (specificallyDependsOnAt a b t)))) //
axiom label in BFO2 CLIF: [017-002] </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000004</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">&apos;VolIndependentContinuant&apos;</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000005</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">dependent continuant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000005</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
continuant that is either dependent on one or other independent continuant bearers or inheres in or is
borne by other entities.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000005</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000005</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">&apos;VolDependentContinuant&apos;</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">s-
region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">SpatialRegion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">spatial region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">parts of the sum total of all space in the universe</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the sum total of all space in the universe</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
continuant that is neither bearer of quality entities nor inheres in any other entities.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">All instances of continuant [snap:Continuant] are spatial entities, that is, they enter in

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the relation of (spatial) location with spatial region [snap:SpatialRegion] entities. As a particular case, the exact spatial location of a spatial region [snap:SpatialRegion] is this region itself.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An instance of spatial region [snap:SpatialRegion] is a part of space. All parts of space are spatial region [snap:SpatialRegion] entities and only spatial region [snap:SpatialRegion] entities are parts of space. Space is the entire extent of the spatial universe, a designated individual, which is thus itself a spatial region [snap:SpatialRegion].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">BFO 2 Reference: Spatial regions do not participate in processes.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Space and spatial region [snap:SpatialRegion] entities are entities in their own rights which exist independently of any entities which can be located at them. This view of space is sometimes called "absolutist" or "the container view". In BFO, the class site [snap:Site] allows for a so-called relational view of space, that is to say, a view according to which spatiality is a matter of relative location between entities and not a matter of being tied to space. The bridge between these two views is secured through the fact that while instances of site [snap:Site] are not spatial region [snap:SpatialRegion] entities, they are nevertheless spatial entities.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000002</IRI>

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<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">per discussion with Barry Smith</Literal>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Spatial region doesn't have a closure axiom because the subclasses don't exhaust all possibilities. An example would be the union of a spatial point and a spatial line that doesn't overlap the point, or two spatial lines that intersect at a single point. In both cases the resultant spatial region is neither 0-dimensional, 1-dimensional, 2-dimensional, or 3-dimensional.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>


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<IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/035-001</IRI>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
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spatial region is a continuant entity that is a continuant_part_of spaceR as defined relative to some frame
R. (axiom label in BFO2 Reference: [035-001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
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    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/036-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">All continuant parts of spatial regions are spatial regions.Â (axiom label in BFO2
Reference: [036-001])</Literal>
</AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/036-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x y t) (if
(and (SpatialRegion x) (continuantPartOfAt y x t) (SpatialRegion y))) // axiom label in BFO2 CLIF:
[036-001] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/035-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(SpatialRegion x) (Continuant x))) // axiom label in BFO2 CLIF: [035-001] </Literal>
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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000006</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
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ns#PlainLiteral">spatial region</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000008</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">t-
region</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000008</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">TemporalRegion</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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  <Annotation>
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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">per discussion
with Barry Smith</Literal>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000008</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Temporal region doesn't have a closure axiom because the subclasses don't
exhaust all possibilites. An example would be the mereological sum of a temporal instant and a temporal
interval that doesn't overlap the instant. In this case the resultant temporal region is neither 0-
dimensional nor 1-dimensional</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/100-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000008</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
temporal region is an occurrent entity that is part of time as defined relative to some reference frame.
(axiom label in BFO2 Reference: [100-001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/101-001</IRI>

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</Annotation>
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ns#PlainLiteral">All parts of temporal regions are temporal regions.Â (axiom label in BFO2 Reference:
[101-001])</Literal>
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<IRI>http://purl.obolibrary.org/obo/bfo/axiom/119-002</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000008</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Every temporal region t is such that t occupies_temporal_region t. (axiom label in BFO2
Reference: [119-002])</Literal>
</AnnotationAssertion>
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<IRI>http://purl.obolibrary.org/obo/bfo/axiom/119-002</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000008</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (r) (if
(TemporalRegion r) (occupiesTemporalRegion r))) // axiom label in BFO2 CLIF: [119-002] </Literal>
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<IRI>http://purl.obolibrary.org/obo/bfo/axiom/101-001</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000008</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x y) (if
(and (TemporalRegion x) (occurrentPartOf y x)) (TemporalRegion y))) // axiom label in BFO2 CLIF:
[101-001] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
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<IRI>http://purl.obolibrary.org/obo/bfo/axiom/100-001</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000008</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(TemporalRegion x) (Occurrent x))) // axiom label in BFO2 CLIF: [100-001] </Literal>
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<AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>

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    <IRI>http://purl.obolibrary.org/obo/BFO_0000008</IRI>
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ns#PlainLiteral">temporal region</Literal>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000009</IRI>
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region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000009</IRI>
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ns#PlainLiteral">TwoDimensionalSpatialRegion</Literal>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000009</IRI>
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ns#PlainLiteral">an infinitely thin plane in space.</Literal>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000009</IRI>
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ns#PlainLiteral">the surface of a cube-shaped part of space</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000009</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the surface of a rectilinear planar figure-shaped part of space</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000009</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the surface of a sphere-shaped part of space</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000009</IRI>
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spatial region with two dimensions.</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000009</IRI>
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  </Annotation>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000009</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
two-dimensional spatial region is a spatial region that is of two dimensions. (axiom label in BFO2
Reference: [039-001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/039-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000009</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(TwoDimensionalSpatialRegion x) (SpatialRegion x))) // axiom label in BFO2 CLIF: [039-001]
</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000009</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
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ns#PlainLiteral">two dimensional region</Literal>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000009</IRI>
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ns#PlainLiteral">two-dimensional spatial region</Literal>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000015</IRI>
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ns#PlainLiteral">Process</Literal>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000015</IRI>
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process of cell-division, \ a beating of the heart</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000015</IRI>
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process of meiosis</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000015</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
process of sleeping</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000015</IRI>
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ns#PlainLiteral">the course of a disease</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000015</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the flight of a bird</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000015</IRI>
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ns#PlainLiteral">the life of an organism</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000015</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">your process of aging.</Literal>

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</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000015</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">p
is a process = Def. p is an occurrent that has temporal proper parts and for some time t, p s-depends_on
some material entity at t. (axiom label in BFO2 Reference: [083-003])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000015</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: The realm of occurrents is less pervasively marked by the presence of
natural units than is the case in the realm of independent continuants. Thus there is here no counterpart of
â€˜objectâ€™. In BFO 1.0 â€˜processâ€™ served as such a counterpart. In BFO 2.0 â€˜processâ€™ is,
rather, the occurrent counterpart of â€˜material entityâ€™. Those natural â€˜ as contrasted with
engineered, which here means: deliberately executed â€˜ units which do exist in the realm of occurrents
are typically either parasitic on the existence of natural units on the continuant side, or they are fiat in
nature. Thus we can count lives; we can count football games; we can count chemical reactions
performed in experiments or in chemical manufacturing. We cannot count the processes taking place, for
instance, in an episode of insect mating behavior. Even where natural units are identifiable, for example
cycles in a cyclical process such as the beating of a heart or an organismâ€™s sleep/wake cycle, the
processes in question form a sequence with no discontinuities (temporal gaps) of the sort that we find for
instance where billiard balls or zebrafish or planets are separated by clear spatial gaps. Lives of organisms
are process units, but they too unfold in a continuous series from other, prior processes such as
fertilization, and they unfold in turn in continuous series of post-life processes such as post-mortem
decay. Clear examples of boundaries of processes are almost always of the fiat sort (midnight, a time of
death as declared in an operating theater or on a death certificate, the initiation of a state of war)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/083-003</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000015</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(iff (Process a)
(and (Occurrent a) (exists (b) (properTemporalPartOf b a)) (exists (c t) (and (MaterialEntity c)
(specificallyDependsOnAt a c t)))))) // axiom label in BFO2 CLIF: [083-003] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000015</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>

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ns#PlainLiteral">disposition</Literal>
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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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ns#PlainLiteral">disposition</Literal>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an atom of element X has the disposition to decay to an atom of element Y</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">certain people have a predisposition to colon cancer</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">children are innately disposed to categorize objects in certain ways.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the cell wall is disposed to filter chemicals in endocytosis and exocytosis</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of a patient with a weakened immune system to contract
disease</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of a vase to brake if dropped</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of blood to coagulate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of metal to conduct electricity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of vegetables to decay when not refrigerated</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
realizable entity that essentially causes a specific process or transformation in the object in which it
inheres, under specific circumstances and in conjunction with the laws of nature. A general formula for
dispositions is: X (object has the disposition D to (transform, initiate a process) R under conditions
C.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: Dispositions exist along a strength continuum. Weaker forms of
disposition are realized in only a fraction of triggering cases. These forms occur in a significant number of
cases of a similar type.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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<Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/062-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is a disposition means: b is a realizable entity &amp; b's bearer is some material entity &amp; b is
such that if it ceases to exist, then its bearer is physically changed, &amp; b's realization occurs when
and because this bearer is in some special physical circumstances, &amp; this realization occurs in virtue
of the bearer's physical make-up. (axiom label in BFO2 Reference: [062-002])</Literal>
  </AnnotationAssertion>
</AnnotationAssertion>
<Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/063-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">If
b is a realizable entity then for all t at which b exists, b s-dependes_on some material entity at t. (axiom
label in BFO2 Reference: [063-002])</Literal>
  </AnnotationAssertion>
</AnnotationAssertion>
<Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/063-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x t) (if
(and (RealizableEntity x) (existsAt x t) (exists (y) (and (MaterialEntity y) (specificallyDepends x y t))))))
// axiom label in BFO2 CLIF: [063-002] </Literal>
  </AnnotationAssertion>
</AnnotationAssertion>
<Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/062-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(Disposition x) (and (RealizableEntity x) (exists (y) (and (MaterialEntity y) (bearerOfAt x y t)))))) //
axiom label in BFO2 CLIF: [062-002] </Literal>
  </AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000016</IRI>
    <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
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ns#PlainLiteral">&apos;VolDisposition&apos;</Literal>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">realizable</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
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ns#PlainLiteral">RealizableEntity</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">realizable entity</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of blood to coagulate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of metal to conduct electricity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of this piece of metal to conduct electricity.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of your blood to coagulate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the function of the reproductive organs</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the function of your reproductive organs</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of being a doctor</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of this boundary to delineate where Utah and Colorado meet</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
specifically dependent continuant that inheres in continuant entities and are not exhibited in full at every
time in which it inheres in an entity or group of entities. The exhibition or actualization of a realizable
entity is a particular manifestation, functioning or process that occurs under certain
circumstances.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">If
a realizable entity [snap:RealizableEntity] inheres in a continuant [snap:Continuant], this does not imply
that it is actually realized.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/058-002</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">To say that b is a realizable entity is to say that b is a specifically dependent continuant

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that inheres in some independent continuant which is not a spatial region and is of a type instances of which are realized in processes of a correlated type. (axiom label in BFO2 Reference: [058-002])</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/060-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">All realizable dependent continuants have independent continuants that are not spatial regions as their bearers. (axiom label in BFO2 Reference: [060-002])</Literal>
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    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/060-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x t) (if (RealizableEntity x) (exists (y) (and (IndependentContinuant y) (not (SpatialRegion y)) (bearerOfAt y x t)))))) // axiom label in BFO2 CLIF: [060-002] </Literal>
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    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/058-002</IRI>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if (RealizableEntity x) (and (SpecificallyDependentContinuant x) (exists (y) (and (IndependentContinuant y) (not (SpatialRegion y)) (inheresIn x y)))))) // axiom label in BFO2 CLIF: [058-002] </Literal>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000017</IRI>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000018</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">0d-s-
region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000018</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">ZeroDimensionalSpatialRegion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000018</IRI>
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  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000018</IRI>
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point</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000018</IRI>
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spatial region with no dimensions.</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000018</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000018</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
zero-dimensional spatial region is a point in space. (axiom label in BFO2 Reference: [037-001])</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
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      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/037-001</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000018</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(ZeroDimensionalSpatialRegion x) (SpatialRegion x))) // axiom label in BFO2 CLIF: [037-001]
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000018</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000018</IRI>
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ns#PlainLiteral">zero dimensional region</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000018</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">zero-dimensional spatial region</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">quality</Literal>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Quality</Literal>
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ns#PlainLiteral">quality</Literal>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
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ns#PlainLiteral">the ambient temperature of air</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
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ns#PlainLiteral">the ambient temperature of this portion of air</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

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    <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the circumference of a waist</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the color of a tomato</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the length of the circumference of your waist</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the mass of a piece of gold</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the mass of this piece of gold.</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the shape of a nose</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the shape of your nose</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the shape of your nostril</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the weight of a chimpanzee</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
specifically dependent continuant that is exhibited if it inheres in an entity or entities at all (a categorical
property).</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/055-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
quality is a specifically dependent continuant that, in contrast to roles and dispositions, does not require
any further process in order to be realized. (axiom label in BFO2 Reference: [055-001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/105-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">If
an entity is a quality at any time that it exists, then it is a quality at every time that it exists. (axiom label
in BFO2 Reference: [105-001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/055-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(Quality x) (SpecificallyDependentContinuant x))) // axiom label in BFO2 CLIF: [055-001] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/105-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>

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    <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
    (exists (t) (and (existsAt x t) (Quality x))) (forall (t_1) (if (existsAt x t_1) (Quality x)))) // axiom label in
    BFO2 CLIF: [105-001] </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
    <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000019</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
    ns#PlainLiteral">&apos;VolQuality&apos;</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">sdc</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
    ns#PlainLiteral">SpecificallyDependentContinuant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
    ns#PlainLiteral">specifically dependent continuant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
    ns#PlainLiteral">Reciprocal specifically dependent continuants: the function of this key to open this lock
    and the mutually dependent disposition of this lock: to be opened by this key</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">of
    one-sided specifically dependent continuants: the mass of this tomato</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">of
relational dependent continuants (multiple bearers): John's love for Mary, the ownership relation
between John and this statue, the relation of authority between John and his subordinates.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the color of a tomato</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of fish to decay</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of this fish to decay</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the function of the heart in the body: to pump blood, to receive de-oxygenated and
oxygenated blood, etc.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the function of this heart: to pump blood</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the liquidity of blood</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the mass of a cloud</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the mutual dependence of proton donors and acceptors in chemical reactions
[79</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the mutual dependence of the role predator and the role prey as played by two
organisms in a given interaction</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the pink color of a medium rare piece of grilled filet mignon at its center</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of being a doctor</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the shape of this hole.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the smell of mozzarella</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the smell of this portion of mozzarella</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
continuant that inheres in or is borne by other entities. Every instance of A requires some specific
instance of B which must always be the same.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

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    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/050-003</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is a specifically dependent continuant = Def. b is a continuant & there is some independent
continuant c which is not a spatial region and which is such that b s-dependes_on c at every time t during
the course of b's existence. (axiom label in BFO2 Reference: [050-003])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000005</IRI>
  </Annotation>
</Annotation>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">per discussion
with Barry Smith</Literal>
</Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Specifically dependent continuant doesn't have a closure axiom because the
subclasses don't necessarily exhaust all possibilities. We're not sure what else will develop
here, but for example there are questions such as what are promises, obligation, etc.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">mode</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">property</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">trope</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
</AnnotationAssertion>
<Annotation>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/050-003</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(iff
(SpecificallyDependentContinuant a) (and (Continuant a) (forall (t) (if (existsAt a t) (exists (b) (and
(IndependentContinuant b) (not (SpatialRegion b)) (specificallyDependsOnAt a b t)))))) // axiom label in
BFO2 CLIF: [050-003] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000020</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">&apos;VolSpecificallyDependentContinuant&apos;</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">role</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Role</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">role</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Johnâ€™s role of husband to Mary is dependent on Maryâ€™s role of wife to John, and
both are dependent on the object aggregate comprising John and Mary as member parts joined together
through the relational quality of being married.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the priest role</Literal>
</AnnotationAssertion>

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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
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ns#PlainLiteral">the role of a biological grandfather as legal guardian in the context of a system of
laws</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a boundary to demarcate two neighboring administrative territories</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a building in serving as a military target</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a chemical compound in an experiment</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a patient relative as defined by a hospital administrative form</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a person as a surgeon</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a stone in marking a property boundary</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a student in a university</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

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<IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a woman as a legal mother in the context of system of laws</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of ingested matter in digestion</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of subject in a clinical trial</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the student role</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
realizable entity the manifestation of which brings about some result or end that is not essential to a
continuant in virtue of the kind of thing that it is but that can be served or participated in by that kind of
continuant in some kinds of natural, social or institutional contexts.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: One major family of examples of non-rigid universals involves roles,
and ontologies developed for corresponding administrative purposes may consist entirely of
representatives of entities of this sort. Thus  $\hat{\sim}$ professor $\hat{\in}$ TM, defined as follows, b instance_of professor
at t =Def. there is some c, c instance_of professor role & c inheres_in b at t.denotes a non-rigid
universal and so also do  $\hat{\sim}$ nurse $\hat{\in}$ TM,  $\hat{\sim}$ student $\hat{\in}$ TM,  $\hat{\sim}$ colonel $\hat{\in}$ TM,  $\hat{\sim}$ taxpayer $\hat{\in}$ TM, and so forth.
(These terms are all, in the jargon of philosophy, phase sortals.) By using role terms in definitions, we can
create a BFO conformant treatment of such entities drawing on the fact that, while an instance of
professor may be simultaneously an instance of trade union member, no instance of the type professor
role is also (at any time) an instance of the type trade union member role (any more than any instance of
the type color is at any time an instance of the type length).If an ontology of employment positions should
be defined in terms of roles following the above pattern, this enables the ontology to do justice to the fact
that individuals instantiate the corresponding universals  $\hat{\in}$  professor, sergeant, nurse  $\hat{\in}$  only during
certain phases in their lives.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>

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<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/061-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is a role means: b is a realizable entity & b exists because there is some single bearer that is in some
special physical, social, or institutional set of circumstances in which this bearer does not have to
be& b is not such that, if it ceases to exist, then the physical make-up of the bearer is thereby
changed. (axiom label in BFO2 Reference: [061-001])</Literal>
  </AnnotationAssertion>
</AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/061-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(Role x) (RealizableEntity x))) // axiom label in BFO2 CLIF: [061-001] </Literal>
  </AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
</AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000023</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">&apos;VolRole&apos;</Literal>
  </AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">fiat-object-
part</Literal>
  </AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">FiatObjectPart</Literal>
  </AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>

```

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">or with divisions drawn by cognitive subjects for practical reasons, such as the division of a cake (before slicing) into (what will become) slices (and thus member parts of an object aggregate). However, this does not mean that fiat object parts are dependent for their existence on divisions or delineations effected by cognitive subjects. If, for example, it is correct to conceive geological layers of the Earth as fiat object parts of the Earth, then even though these layers were first delineated in recent times, still existed long before such delineation and what holds of these layers (for example that the oldest layers are also the lowest layers) did not begin to hold because of our acts of delineation. Treatment of material entity in BFO Examples viewed by some as problematic cases for the trichotomy of fiat object part, object, and object aggregate include: a mussel on (and attached to) a rock, a slime mold, a pizza, a cloud, a galaxy, a railway train with engine and multiple carriages, a clonal stand of quaking aspen, a bacterial community (biofilm), a broken femur. Note that, as Aristotle already clearly recognized, such problematic cases "need not invalidate these categories. The existence of grey objects does not prove that there are not objects which are black and objects which are white; the existence of mules does not prove that there are not objects which are donkeys and objects which are horses. It does, however, show that the examples in question need to be addressed carefully in order to show how they can be fitted into the proposed scheme, for example by recognizing additional subdivisions [29</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">the FMA:regional parts of an intact human body.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">the Western hemisphere of the Earth</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">the division of the brain into regions</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">the division of the planet into hemispheres</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">the dorsal and ventral surfaces of the body</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

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    <IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the upper and lower lobes of the left lung</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: Most examples of fiat object parts are associated with theoretically
drawn divisions</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/027-004</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is a fiat object part = Def. b is a material entity which is such that for all times t, if b exists at t then there
is some object c such that b proper continuant_part of c at t and c is demarcated from the remainder of c
by a two-dimensional continuant fiat boundary. (axiom label in BFO2 Reference: [027-004])</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/027-004</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(FiatObjectPart x) (and (MaterialEntity x) (forall (t) (if (existsAt x t) (exists (y) (and (Object y)
(properContinuantPartOfAt x y t)))))))) // axiom label in BFO2 CLIF: [027-004] </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>
    <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000024</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">fiat object part</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">1d-s-
region</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">OneDimensionalSpatialRegion</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">one dimensional region</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an edge of a cube-shaped part of space</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an edge of a cube-shaped portion of space.</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the part of space that is a line stretching from one end of absolute space to the
other</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
spatial region with one dimension.</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/038-001</IRI>
    </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
one-dimensional spatial region is a line or aggregate of lines stretching from one point in space to another.
(axiom label in BFO2 Reference: [038-001])</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/038-001</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(OneDimensionalSpatialRegion x) (SpatialRegion x))) // axiom label in BFO2 CLIF: [038-001]
  </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>
    <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">one dimensional region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000026</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">one-dimensional spatial region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">object-
aggregate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">ObjectAggregate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
collection of cells in a blood biobank.</Literal>
  </AnnotationAssertion>
  </AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
swarm of bees is an aggregate of members who are linked together through natural bonds</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
symphony orchestra</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an organization is an aggregate whose member parts have roles of specific types (for
example in a jazz band, a chess club, a football team)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">defined by fiat: the aggregate of members of an organization</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">defined through physical attachment: the aggregate of atoms in a lump of
granite</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">defined through physical containment: the aggregate of molecules of carbon dioxide in a
sealed container</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">defined via attributive delimitations such as: the patients in this hospital</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the aggregate of bearings in a constant velocity axle joint</Literal>
</AnnotationAssertion>
<AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the aggregate of blood cells in your body</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the nitrogen atoms in the atmosphere</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
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ns#PlainLiteral">the restaurants in Palo Alto</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">your collection of Meissen ceramic plates.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
<IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000011</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An entity a is an
object aggregate if and only if there is a mutually exhaustive and pairwise disjoint partition of a into
objects </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
<IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000301</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An entity a is an
object aggregate if and only if there is a mutually exhaustive and pairwise disjoint partition of a into
objects </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: object aggregates may gain and lose parts while remaining
numerically identical (one and the same individual) over time. This holds both for aggregates whose

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membership is determined naturally (the aggregate of cells in your body) and aggregates determined by fiat (a baseball team, a congressional committee).</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000300</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">ISBN:978-3-938793-98-5pp124-158#Thomas Bittner and Barry Smith, &apos;A Theory of Granular Partitions&apos;;, in K. Munn and B. Smith (eds.), Applied Ontology: An Introduction, Frankfurt/Lancaster: ontos, 2008, 125-158.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/025-004</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is an object aggregate means: b is a material entity consisting exactly of a plurality of objects as
member_parts at all times at which b exists. (axiom label in BFO2 Reference: [025-004])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/025-004</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(ObjectAggregate x) (and (MaterialEntity x) (forall (t) (if (existsAt x t) (exists (y z) (and (Object y)
(Object z) (memberPartOfAt y x t) (memberPartOfAt z x t) (not (= y z)))))) (not (exists (w t_1) (and
(memberPartOfAt w x t_1) (not (Object w))))))) // axiom label in BFO2 CLIF: [025-004] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000027</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">object aggregate</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>

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    <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">3d-s-
region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">ThreeDimensionalSpatialRegion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">three dimensional region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
cube-shaped part of space</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
cube-shaped region of space</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
sphere-shaped part of space</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
sphere-shaped region of space,</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
spatial region with three dimensions.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>

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<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/040-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
three-dimensional spatial region is a spatial region that is of three dimensions. (axiom label in BFO2
Reference: [040-001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/040-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(ThreeDimensionalSpatialRegion x) (SpatialRegion x))) // axiom label in BFO2 CLIF: [040-001]
</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">three dimensional region</Literal>
</AnnotationAssertion>
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000028</IRI>
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ns#PlainLiteral">three-dimensional spatial region</Literal>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">site</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Site</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

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    <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Manhattan Canyon)</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
hole in the interior of a portion of cheese</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
rabbit hole</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an air traffic control region defined in the airspace above an airport</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
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ns#PlainLiteral">the Grand Canyon</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the Piazza San Marco</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the cockpit of an aircraft</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the hold of a ship</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the interior of a kangaroo pouch</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
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ns#PlainLiteral">the interior of the trunk of your car</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the interior of your bedroom</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the interior of your office</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
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ns#PlainLiteral">the interior of your refrigerator</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the lumen of your gut</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">your left nostril (a fiat part â€“ the opening â€“ of your left nasal cavity)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/034-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is a site means: b is a three-dimensional immaterial entity that is (partially or wholly) bounded by a
material entity or it is a three-dimensional immaterial part thereof. (axiom label in BFO2 Reference: [034-
002])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/034-002</IRI>
  </Annotation>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(Site x) (ImmaterialEntity x))) // axiom label in BFO2 CLIF: [034-002] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000029</IRI>
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ns#PlainLiteral">site</Literal>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">object</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>
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ns#PlainLiteral">atom</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">cell</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">cells and organisms</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">engineered artifacts</Literal>
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  <AnnotationAssertion>
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ns#PlainLiteral">grain of sand</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>
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ns#PlainLiteral">molecule</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>
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ns#PlainLiteral">organelle</Literal>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>
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ns#PlainLiteral">organism</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
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ns#PlainLiteral">solid portions of matter</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">star</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: BFO rests on the presupposition that at multiple micro-, meso- and
macroscopic scales reality exhibits certain stable, spatially separated or separable material units,

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combined or combinable into aggregates of various sorts (for example organisms into what are called "populations"). Such units play a central role in almost all domains of natural science from particle physics to cosmology. Many scientific laws govern the units in question, employing general terms (such as "molecule" or "planet") referring to the types and subtypes of units, and also to the types and subtypes of the processes through which such units develop and interact. The division of reality into such natural units is at the heart of biological science, as also is the fact that these units may form higher-level units (as cells form multicellular organisms) and that they may also form aggregates of units, for example as cells form portions of tissue and organs form families, herds, breeds, species, and so on. At the same time, the division of certain portions of reality into engineered units (manufactured artifacts) is the basis of modern industrial technology, which rests on the distributed mass production of engineered parts through division of labor and on their assembly into larger, compound units such as cars and laptops. The division of portions of reality into units is one starting point for the phenomenon of counting.

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">BFO 2 Reference: Each object is such that there are entities of which we can assert unproblematically that they lie in its interior, and other entities of which we can assert unproblematically that they lie in its exterior. This may not be so for entities lying at or near the boundary between the interior and exterior. This means that two objects " for example the two cells depicted in Figure 3 " may be such that there are material entities crossing their boundaries which belong determinately to neither cell. Something similar obtains in certain cases of conjoined twins (see below).

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">BFO 2 Reference: To say that b is causally unified means: b is a material entity which is such that its material parts are tied together in such a way that, in environments typical for entities of the type in question, if c, a continuant part of b that is in the interior of b at t, is larger than a certain threshold size (which will be determined differently from case to case, depending on factors such as porosity of external cover) and is moved in space to be at t at a location on the exterior of the spatial region that had been occupied by b at t, then either b's other parts will be moved in coordinated fashion or b will be damaged (be affected, for example, by breakage or tearing) in the interval between t and t. causal changes in one part of b can have consequences for other parts of b without the mediation of any entity that lies on the exterior of b. Material entities with no proper material parts would satisfy these conditions trivially. Candidate examples of types of causal unity for material entities of more complex sorts are as follows (this is not intended to be an exhaustive list): CU1: Causal unity via physical covering Here the parts in the interior of the unified entity are combined together causally through a common membrane or other physical covering. The latter points outwards toward and may serve a protective function in relation to what lies on the exterior of the entity [13, 47

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">BFO 2 Reference: an object is a maximal causally unified material entity

</AnnotationAssertion>

<AnnotationAssertion>

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ns#PlainLiteral">BFO 2 Reference: "objects" are sometimes referred to as "grains"
[74</Literal>
</AnnotationAssertion>
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</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000030</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is an object means: b is a material entity which manifests causal unity of one or other of the types CUn
listed above & is of a type (a material universal) instances of which are maximal relative to this
criterion of causal unity. (axiom label in BFO2 Reference: [024-001])</Literal>
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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The entries in your database are patterns instantiated as quality instances in your hard

```


drive. The database itself is an aggregate of such patterns. When you create the database you create a particular instance of the generically dependent continuant type database. Each entry in the database is an instance of the generically dependent continuant type IAO: information content entity.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/BFO_0000031</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a certain PDF file that exists in different and in several hard drives</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000031</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">the pdf file on your laptop, the pdf file that is a copy thereof on my laptop</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000031</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">the sequence of this protein molecule; the sequence that is a copy thereof in that protein molecule.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A continuant that is dependent on one or other independent continuant bearers. For every instance of A requires some instance of (an independent continuant type) B but which instance of B serves can change from time to time.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

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</Annotation>

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<IRI>http://purl.obolibrary.org/obo/BFO_0000031</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b is a generically dependent continuant = Def. b is a continuant that g-depends_on one or more other entities. (axiom label in BFO2 Reference: [074-001])</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000031</IRI>

<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

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(GenericallyDependentContinuant a) (and (Continuant a) (exists (b t) (genericallyDependsOnAt a b t)))) //
axiom label in BFO2 CLIF: [074-001] </Literal>
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ns#PlainLiteral">&apos;InvestGenericallyDependentContinuant&apos;</Literal>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the function of a computer program to compute mathematical equations</Literal>
  </AnnotationAssertion>
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ns#PlainLiteral">the function of a hammer to drive in nails</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000034</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the function of a heart pacemaker to regulate the beating of a heart through
electricity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000034</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the function of a judge in a court of law</Literal>
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ns#PlainLiteral">the function of amylase in saliva to break down starch into sugar</Literal>
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  <AnnotationAssertion>
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ns#PlainLiteral">the function of the heart in the body: to pump blood, to receive de-oxygenated and
oxygenated blood, etc.</Literal>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000034</IRI>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A realizable entity the manifestation of which is an essentially end-directed activity of a continuant entity in virtue of that continuant entity being a specific kind of entity in the kind or kinds of contexts that it is made for.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000034</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">BFO 2 Reference: In the past, we have distinguished two varieties of function, artifactual function and biological function. These are not asserted subtypes of BFO:function however, since the same function “ for example: to pump, to transport “ can exist both in artifacts and in biological entities. The asserted subtypes of function that would be needed in order to yield a separate monoheirarchy are not artifactual function, biological function, etc., but rather transporting function, pumping function, etc.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000034</IRI>

<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

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<AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000034</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A function is a disposition that exists in virtue of the bearer’s physical make-up and this physical make-up is something the bearer possesses because it came into being, either through evolution (in the case of natural biological entities) or through intentional design (in the case of artifacts), in order to realize processes of a certain sort. (axiom label in BFO2 Reference: [064-001])</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if (Function x) (Disposition x))) // axiom label in BFO2 CLIF: [064-001] </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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ns#PlainLiteral">the temporal region during which a process occurs.</Literal>
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ns#PlainLiteral">BFO 2 Reference: A temporal interval is a special kind of one-dimensional temporal
region, namely one that is self-connected (is without gaps or breaks).</Literal>
  </AnnotationAssertion>
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one-dimensional temporal region is a temporal region that is extended. (axiom label in BFO2 Reference:
[103-001])</Literal>
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(OneDimensionalTemporalRegion x) (TemporalRegion x))) // axiom label in BFO2 CLIF: [103-001]
  </Literal>
  </AnnotationAssertion>

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  <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
photon</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
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puff of smoke</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
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sea wave</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
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ns#PlainLiteral">an aggregate of human beings.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
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ns#PlainLiteral">an energy wave</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
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ns#PlainLiteral">an epidemic</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the undetached arm of a human being</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An independent continuant that is spatially extended whose identity is independent of
that of other entities and can be maintained through time.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: Material entities (continuants) can preserve their identity even while
gaining and losing material parts. Continuants are contrasted with occurrents, which unfold themselves in
successive temporal parts or phases [60</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: Object, Fiat Object Part and Object Aggregate are not intended to be
exhaustive of Material Entity. Users are invited to propose new subcategories of Material
Entity.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: "Matter"™ is intended to encompass both mass and energy (we
will address the ontological treatment of portions of energy in a later version of BFO). A portion of matter
is anything that includes elementary particles among its proper or improper parts: quarks and leptons,
including electrons, as the smallest particles thus far discovered; baryons (including protons and neutrons)
at a higher level of granularity; atoms and molecules at still higher levels, forming the cells, organs,
organisms and other material entities studied by biologists, the portions of rock studied by geologists, the
fossils studied by paleontologists, and so on. Material entities are three-dimensional entities (entities
extended in three spatial dimensions), as contrasted with the processes in which they participate, which
are four-dimensional entities (entities extended also along the dimension of time). According to the FMA,
material entities may have immaterial entities as parts " including the entities identified below as sites;
for example the interior (or "lumen"™) of your small intestine is a part of your body. BFO 2.0
embodies a decision to follow the FMA here.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Examples: collection of random bacteria, a chair, dorsal surface of the body</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Material entity [snap:MaterialEntity] subsumes object [snap:Object], fiat object part

```


[snap:FiatObjectPart], and object aggregate [snap:ObjectAggregate], which assume a three level theory of granularity, which is inadequate for some domains, such as biology.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>

<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/019-002</IRI>

</Annotation>

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<IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A material entity is an independent continuant that has some portion of matter as proper or improper continuant part. (axiom label in BFO2 Reference: [019-002])</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

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<IRI>http://purl.obolibrary.org/obo/bfo/axiom/020-002</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Every entity which has a material entity as continuant part is a material entity. (axiom label in BFO2 Reference: [020-002])</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

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<IRI>http://purl.obolibrary.org/obo/bfo/axiom/021-002</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">every entity of which a material entity is continuant part is also a material entity. (axiom label in BFO2 Reference: [021-002])</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

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</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if (MaterialEntity x) (IndependentContinuant x))) // axiom label in BFO2 CLIF: [019-002] </Literal>

</AnnotationAssertion>

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<AnnotationAssertion>
  <Annotation>
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    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/021-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000040</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
  (and (Entity x) (exists (y t) (and (MaterialEntity y) (continuantPartOfAt x y t)))) (MaterialEntity x))) //
  axiom label in BFO2 CLIF: [021-002] </Literal>
</AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/020-002</IRI>
  </Annotation>
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  (and (Entity x) (exists (y t) (and (MaterialEntity y) (continuantPartOfAt y x t)))) (MaterialEntity x))) //
  axiom label in BFO2 CLIF: [020-002] </Literal>
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  ns#PlainLiteral">&apos;VolMaterialEntity&apos;</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000050</IRI>
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  ns#PlainLiteral">There is controversy about this relation intended to represent the relation between some
  arbitrary physical thing that is used as a representation/proxy/pointer to something else</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000050</IRI>
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  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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part of</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/BFO_0000052</IRI>

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    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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ns#PlainLiteral">participates in</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  <AnnotationAssertion>

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region t is to say that t is the temporal extension of s. (axiom label in BFO2 Reference: [080-
003])</Literal>
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boundary</Literal>
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is a continuant fiat boundary = Def. b is an immaterial entity that is of zero, one or two dimensions and
does not include a spatial region as part. (axiom label in BFO2 Reference: [029-001])</Literal>
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ns#PlainLiteral">BFO 2 Reference: In BFO 1.1 the assumption was made that the external surface of a
material entity such as a cell could be treated as if it were a boundary in the mathematical sense. The new
document propounds the view that when we talk about external surfaces of material objects in this way
then we are talking about something fiat. To be dealt with in a future version: fiat boundaries at different
levels of granularity. More generally, the focus in discussion of boundaries in BFO 2.0 is now on fiat
boundaries, which means: boundaries for which there is no assumption that they coincide with physical
discontinuities. The ontology of boundaries becomes more closely allied with the ontology of
regions.</Literal>
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        <IRI>http://purl.obolibrary.org/obo/BFO_0000140</IRI>
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ns#PlainLiteral">BFO 2 Reference: a continuant fiat boundary is a boundary of some material entity (for

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example: the plane separating the Northern and Southern hemispheres; the North Pole), or it is a boundary of some immaterial entity (for example of some portion of airspace). Three basic kinds of continuant fiat boundary can be distinguished (together with various combination kinds [29

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ns#PlainLiteral">Continuant fiat boundary doesn't have a closure axiom because the subclasses
don't necessarily exhaust all possibilities. An example would be the mereological sum of two-
dimensional continuant fiat boundary and a one dimensional continuant fiat boundary that doesn't
overlap it. The situation is analogous to temporal and spatial regions.</Literal>
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(ContinuantFiatBoundary a) (and (ImmaterialEntity a) (exists (b) (and (or
(ZeroDimensionalSpatialRegion b) (OneDimensionalSpatialRegion b) (TwoDimensionalSpatialRegion
b))) (forall (t) (locatedInAt a b t)))) (not (exists (c t) (and (SpatialRegion c) (continuantPartOfAt c a t))))))
// axiom label in BFO2 CLIF: [029-001] </Literal>
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sites, which bound, or are demarcated in relation, to material entities, and which can thus change location,
shape and size and as their material hosts move or change shape or size (for example: your nasal passage;
the hold of a ship; the boundary of Wales (which moves with the rotation of the Earth) [38, 7,
10</Literal>
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    <IRI>http://purl.obolibrary.org/obo/BFO_0000142</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">OneDimensionalContinuantFiatBoundary</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000142</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The Equator</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000142</IRI>

```

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">all geopolitical boundaries</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000142</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">all lines of latitude and longitude</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000142</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the line separating the outer surface of the mucosa of the lower lip from the outer
surface of the skin of the chin.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000142</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the median sulcus of your tongue</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/032-001</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000142</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
one-dimensional continuant fiat boundary is a continuous fiat line whose location is defined in relation to
some material entity. (axiom label in BFO2 Reference: [032-001])</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/032-001</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000142</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(iff
(OneDimensionalContinuantFiatBoundary a) (and (ContinuantFiatBoundary a) (exists (b) (and
(OneDimensionalSpatialRegion b) (forall (t) (locatedInAt a b t)))))) // axiom label in BFO2 CLIF: [032-
001] </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000142</IRI>
    <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
  </AnnotationAssertion>
</AnnotationAssertion>

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<AnnotationProperty abbreviatedIRI="rdfs:label"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000142</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">one-dimensional continuant fiat boundary</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000144</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">process-
profile</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000144</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">ProcessProfile</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000144</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">On a somewhat higher level of complexity are what we shall call rate process profiles,
which are the targets of selective abstraction focused not on determinate quality magnitudes plotted over
time, but rather on certain ratios between these magnitudes and elapsed times. A speed process profile, for
example, is represented by a graph plotting against time the ratio of distance covered per unit of time.
Since rates may change, and since such changes, too, may have rates of change, we have to deal here with
a hierarchy of process profile universals at successive levels</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000144</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">One important sub-family of rate process profiles is illustrated by the beat or frequency
profiles of cyclical processes, illustrated by the 60 beats per minute beating process of Johnâ€™s heart, or
the 120 beats per minute drumming process involved in one of Johnâ€™s performances in a rock band,
and so on. Each such process includes what we shall call a beat process profile instance as part, a subtype
of rate process profile in which the salient ratio is not distance covered but rather number of beat cycles
per unit of time. Each beat process profile instance instantiates the determinable universal beat process
profile. But it also instantiates multiple more specialized universals at lower levels of generality, selected
from rate process profilebeat process profileregular beat process profile3 bpm beat process profile4 bpm
beat process profileirregular beat process profileincreasing beat process profileand so on.In the case of a
regular beat process profile, a rate can be assigned in the simplest possible fashion by dividing the number
of cycles by the length of the temporal region occupied by the beating process profile as a whole.
Irregular process profiles of this sort, for example as identified in the clinic, or in the readings on an
aircraft instrument panel, are often of diagnostic significance.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000144</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The simplest type of process profiles are what we shall call "quality process

```


profilesâ€™™, which are the process profiles which serve as the foci of the sort of selective abstraction that is involved when measurements are made of changes in single qualities, as illustrated, for example, by process profiles of mass, temperature, aortic pressure, and so on.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/093-002</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000144</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b is a process_profile =Def. there is some process c such that b process_profile_of c (axiom label in BFO2 Reference: [093-002])</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/094-005</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000144</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b process_profile_of c holds when b proper_occurent_part_of c&#amp; there is some proper_occurent_part d of c which has no parts in common with b &#amp; is mutually dependent on b&#amp; is such that b, c and d occupy the same temporal region (axiom label in BFO2 Reference: [094-005])</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/094-005</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000144</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x y) (if (processProfileOf x y) (and (properContinuantPartOf x y) (exists (z t) (and (properOccurentPartOf z y) (TemporalRegion t) (occupiesSpatioTemporalRegion x t) (occupiesSpatioTemporalRegion y t) (occupiesSpatioTemporalRegion z t) (not (exists (w) (and (occurrentPartOf w x) (occurrentPartOf w z)))))))))) // axiom label in BFO2 CLIF: [094-005] </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/093-002</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>

<IRI>http://purl.obolibrary.org/obo/BFO_0000144</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(iff (ProcessProfile a) (exists (b) (and (Process b) (processProfileOf a b)))) // axiom label in BFO2 CLIF: [093-002] </Literal>

</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000144</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000144</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">process profile</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000146</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">2d-cf-
boundary</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000146</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">TwoDimensionalContinuantFiatBoundary</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/033-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000146</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
two-dimensional continuant fiat boundary (surface) is a self-connected fiat surface whose location is
defined in relation to some material entity. (axiom label in BFO2 Reference: [033-001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/033-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000146</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(iff
(TwoDimensionalContinuantFiatBoundary a) (and (ContinuantFiatBoundary a) (exists (b) (and
(TwoDimensionalSpatialRegion b) (forall (t) (locatedInAt a b t)))))) // axiom label in BFO2 CLIF: [033-
001] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000146</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000146</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">two-dimensional continuant fiat boundary</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000147</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">0d-cf-
boundary</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000147</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">ZeroDimensionalContinuantFiatBoundary</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000147</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the geographic North Pole</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000147</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the point of origin of some spatial coordinate system.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000147</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the quadripoint where the boundaries of Colorado, Utah, New Mexico, and Arizona
meet</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000001</IRI>
  </Annotation>
  <Annotation>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">requested by
Melanie Courtot</Literal>
  </Annotation>
  <Annotation>
    <AnnotationProperty abbreviatedIRI="rdfs:seeAlso"/>
    <IRI>https://groups.google.com/d/msg/bfo-owl-devel/s9Uug5QmAws/ZDRnpiLi_TUJ</IRI>
  </Annotation>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
<IRI>http://purl.obolibrary.org/obo/BFO_0000147</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">zero dimension continuant fiat boundaries are not spatial points. Considering the
example &apos;the quadripoint where the boundaries of Colorado, Utah, New Mexico, and Arizona
meet&apos; : There are many frames in which that point is zooming through many points in space.
Whereas, no matter what the frame, the quadripoint is always in the same relation to the boundaries of
Colorado, Utah, New Mexico, and Arizona.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/031-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000147</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
zero-dimensional continuant fiat boundary is a fiat point whose location is defined in relation to some
material entity. (axiom label in BFO2 Reference: [031-001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/031-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000147</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(iff
(ZeroDimensionalContinuantFiatBoundary a) (and (ContinuantFiatBoundary a) (exists (b) (and
(ZeroDimensionalSpatialRegion b) (forall (t) (locatedInAt a b t)))))) // axiom label in BFO2 CLIF: [031-
001] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000147</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000147</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">zero-dimensional continuant fiat boundary</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000148</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">0d-t-
region</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>

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    <IRI>http://purl.obolibrary.org/obo/BFO_0000148</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">ZeroDimensionalTemporalRegion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000148</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
temporal region that is occupied by a process boundary</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000148</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">right now</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000148</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the moment at which a child is born</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000148</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the moment at which a finger is detached in an industrial accident</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000148</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the moment of death.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000148</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">temporal instant.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/102-001</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000148</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
zero-dimensional temporal region is a temporal region that is without extent. (axiom label in BFO2
Reference: [102-001])</Literal>
  </AnnotationAssertion>

```

```

<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/102-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000148</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(ZeroDimensionalTemporalRegion x) (TemporalRegion x))) // axiom label in BFO2 CLIF: [102-001]
</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000148</IRI>
  <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000148</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">zero-dimensional temporal region</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000179</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Relates an entity in the ontology to the name of the variable that is used to represent it in
the code that generates the BFO OWL file from the lisp specification.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000232"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000179</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Really of interest to developers only</Literal>
</AnnotationAssertion>
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000179</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO OWL specification label</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000180</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Relates an entity in the ontology to the term that is used to represent it in the the CLIF
specification of BFO2</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/BFO_0000180</IRI>

```

```

    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Person:Alan
Ruttenberg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000232"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000180</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Really of interest to developers only</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000180</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO CLIF specification label</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000182</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">history</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000182</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">History</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/138-001</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000182</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
history is a process that is the sum of the totality of processes taking place in the spatiotemporal region
occupied by a material entity or site, including processes on the surface of the entity or within the cavities
to which it serves as host. (axiom label in BFO2 Reference: [138-001])</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000182</IRI>
    <IRI>http://purl.obolibrary.org/obo/bfo.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/BFO_0000182</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">history</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/CHEBI_33250</IRI>

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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">atom</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/CHEBI_33250</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A chemical entity
constituting the smallest component of an element having the chemical properties of the
element.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/CHEBI_33250</IRI>
    <IRI>http://purl.obolibrary.org/obo/chebi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/CHEBI_33250</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/CHEBI_33250</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">atom</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000001</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">conditional specification</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000001</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000001</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
directive information entity that specifies what should happen if the trigger condition is fulfilled</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000001</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PlanAndPlannedProcess Branch</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000001</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">OBI branch derived</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000001</IRI>
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ns#PlainLiteral">OBI_0000349</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000001</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000001</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">conditional specification</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000003</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">measurement unit label</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000003</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Examples of measurement unit labels are liters, inches, weight per volume.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000003</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000003</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">A
data item label that denotes a unit of measure.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000003</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2009-03-16: review of this term done during during the OBI workshop winter 2009 and
the current definition was considered acceptable for use in OBI. If there is a need to modify this definition
please notify OBI.</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000003</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Alan Ruttenberg</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000003</IRI>
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ns#PlainLiteral">PERSON: Melanie Courtot</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000003</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000003</IRI>
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ns#PlainLiteral">measurement unit label</Literal>
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ns#PlainLiteral">objective specification</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000005</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000005</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
directive information entity that describes an intended process endpoint. </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000005</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Answers the question, why did you do this experiment?</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000005</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Alan Ruttenberg</Literal>

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</AnnotationAssertion>
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ns#PlainLiteral">PERSON: Barry Smith</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000005</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Bjoern Peters</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000005</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Jennifer Fostel</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000005</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">OBI Plan and Planned Process/Roles Branch</Literal>
</AnnotationAssertion>
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ns#PlainLiteral">OBI_0000217</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000005</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000005</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">objective specification</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000007</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">action specification</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000007</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Pour the contents of flask 1 into flask 2</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000007</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000007</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
directive information entity that describes an action the bearer will take</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000007</IRI>
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ns#PlainLiteral">Alan Ruttenberg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000007</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">OBI Plan and Planned Process branch</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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ns#PlainLiteral">action specification</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000009</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">data item label</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000009</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000009</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An information content entity that is part of some data item and is used to partially
define the denotation of that data item.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000009</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://www.golovchenko.org/cgi-bin/wsearch?q=label#4n</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000009</IRI>
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ns#PlainLiteral">GROUP: IAO</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000009</IRI>
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label</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000009</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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ns#PlainLiteral">data item label</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
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ns#PlainLiteral">data item</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Data items include counts of things, analyte concentrations, and statistical
summaries.</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>

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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
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ns#PlainLiteral">An information content entity that is intended to be a truthful statement about something
(modulo, e.g., measurement precision or other systematic errors) and is constructed/acquired by a method
that reliably tends to produce (approximately) truthful statements.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2/2/2009 Alan and Bjoern discussing FACS run output data. This is a data item because
it is about the cell population. Each element records an event and is typically further composed a set of
measurment data items that record the fluorescent intensity stimulated by one of the lasers.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2009-03-16: data item deliberately ambiguous: we merged data set and datum to be one
entity, not knowing how to define singular versus plural. So data item is more general than
datum.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2009-03-16: removed datum as alternative term as datum specifically refers to singular
form, and is thus not an exact synonym.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Alan Ruttenberg</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Chris Stoeckert</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Jonathan Rees</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>

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    <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">data</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000027</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">data item</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000028</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">symbol</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000028</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A written proper
name such as "OBI"; a serial number such as "12324X"; a stop sign.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000028</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000028</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An information content entity that is a mark or character used as a conventional
representation of another entity.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000028</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">20091104, MC: this needs work and will most probably change</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000028</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Jonathan Rees</Literal>
</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000028</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">based on Oxford
English Dictionary</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000028</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000028</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">symbol</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000030</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">information content entity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000030</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Examples of information content entites include journal articles, data, graphical layouts,
and graphs.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000030</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000030</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an information content entity is an entity that is generically dependent on some material
entity and stands in relation of aboutness to some entity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000030</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Chris Stoeckert</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000030</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">OBI_0000142</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000030</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000030</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">information content entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000032</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scalar measurement datum</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000032</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">10 feet. 3 ml.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000032</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000032</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
scalar measurement datum is a measurement datum that is composed of two parts, numerals and a unit
label.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000032</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Would write this as: has_part some &apos;measurement unit label&apos; and has_part
some numeral and has_part exactly 2, except for the fact that this won&apos;t let us take advantage of
OWL reasoning over the numbers. Instead use has measurement value property to represent the same. Use
has measurement unit label (subproperty of has_part) so we can easily say that there is only one of
them.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000032</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Alan Ruttenberg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000032</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Melanie Courtot</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000032</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000032</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scalar measurement datum</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000033</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">directive information entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000033</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000033</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An information content entity whose concretizations indicate to their bearer how to
realize them in a process.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000033</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">8/6/2009 Alan Ruttenberg: Changed label from &quot;information entity about a
realizable&quot;; after discussions at ICBO</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000033</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Philly2013 - AR:
What differentiates a directive information entity from an information concretization is that it can have
concretizations that are either qualities or realizable entities. The concretizations that are realizable

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entities are created when an individual chooses to take up the direction, i.e. has the intention to (try to) realize it.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000033</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Werner pushed back on calling it realizable information entity as it isn't realizable. However this name isn't right either. An example would be a recipe. The realizable entity would be a plan, but the information entity isn't about the plan, it, once concretized, *is* the plan. -Alan</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000033</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">PERSON: Alan Ruttenberg</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000033</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">PERSON: Bjoern Peters</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000033</IRI>

<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000033</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">directive information entity</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000037</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">dot plot</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000037</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Dot plot of SSC-H and FSC-H.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000037</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A dot plot is a report graph which is a graphical representation of data where each data point is represented by a single dot placed on coordinates corresponding to data point values in particular dimensions.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000037</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">person:Allyson Lister</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000037</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">person:Chris Stoeckert</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000037</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">OBI_0000123</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000037</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">group:OBI</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000037</IRI>

<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000037</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">dot plot</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000038</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">graph</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000038</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A diagram that presents one or more tuples of information by mapping those tuples in to a two dimensional space in a non arbitrary way.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000038</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">PERSON: Lawrence Hunter</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000038</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">person:Alan Ruttenberg</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000038</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">person:Allyson Lister</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000038</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">OBI_0000240</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000038</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">group:OBI</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000038</IRI>

<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000038</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">graph</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>

<IRI>http://purl.obolibrary.org/obo/IAO_0000039</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">has measurement unit label</Literal>

</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000039</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A relation
between a value specification and its unit of measurement.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000039</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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ns#PlainLiteral">has measurement unit label</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000055</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">rule</Literal>
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ns#PlainLiteral">example to be added</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000124</IRI>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000055</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
rule is an executable which guides, defines, restricts actions</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000055</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">MSI</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000055</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PRS</Literal>

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ns#PlainLiteral">OBI_0500021</Literal>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">algorithm</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000064</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PMID: 18378114.Genomics. 2008 Mar 28. LINKGEN: A new algorithm to process data
in genetic linkage studies.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000064</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000064</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
plan specification which describes inputs, output of mathematical functions as well as workflow of
execution for achieving a predefined objective. Algorithms are realized usually by means of
implementation as computer programs for execution by automata.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000064</IRI>
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ns#PlainLiteral">Philippe Rocca-Serra</Literal>
  </AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000064</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PlanAndPlannedProcess Branch</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000064</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">OBI_0000270</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000064</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">adapted from discussion on OBI list (Matthew Pocock, Christian Cocos, Alan
Ruttenberg)</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000064</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000064</IRI>
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ns#PlainLiteral">algorithm</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">report</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">journal article, patent application, grant progress report, case report (not patient
record)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>

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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An information content entity assembled by an author for the purpose of providing
information for an audience, and that is meant to provide an accurate account of something that
happened.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2009-03-16: this was report of results with definition: A report is a narrative object that
is a formal statement of the results of an investigation, or of any matter on which definite information is
required, made by some person or body instructed or required to do so.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2009-03-16: work has been done on this term during during the OBI workshop winter
2009 and the current definition was considered acceptable for use in OBI. If there is a need to modify this
definition please notify OBI.</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2009-08-10 Alan Ruttenberg: Larry Hunter suggests that this be obsoleted and replaced
by &apos;document&apos;. Alan restored as there are OBI dependencies and this merits further
discussion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">disagreement about where reports go. alan: only some gene lists are reports. Is a report
all the content of some document? The example of usage suggests that a report may be part of some
article. Term needs clarification</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>
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ns#PlainLiteral">PERSON: Alan Ruttenberg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>
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ns#PlainLiteral">PERSON:Chris Stoeckert</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000088</IRI>
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ns#PlainLiteral">report</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000100</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">data set</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000100</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Intensity values in a CEL file or from multiple CEL files comprise a data set (as
opposed to the CEL files themselves).</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000100</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
data item that is an aggregate of other data items of the same type that have something in common.
Averages and distributions can be determined for data sets.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
<IRI>http://purl.obolibrary.org/obo/IAO_0000100</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2009/10/23 Alan Ruttenberg. The intention is that this term represent collections of like
data. So this isn't for, e.g. the whole contents of a cel file, which includes parameters, metadata etc.
This is more like java arrays of a certain rather specific type</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
<IRI>http://purl.obolibrary.org/obo/IAO_0000100</IRI>
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ns#PlainLiteral">person:Allyson Lister</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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<IRI>http://purl.obolibrary.org/obo/IAO_0000100</IRI>
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ns#PlainLiteral">person:Chris Stoeckert</Literal>
</AnnotationAssertion>
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<IRI>http://purl.obolibrary.org/obo/IAO_0000100</IRI>
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ns#PlainLiteral">OBI_0000042</Literal>
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<IRI>http://purl.obolibrary.org/obo/IAO_0000100</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">group:OBI</Literal>
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<AnnotationAssertion>
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<IRI>http://purl.obolibrary.org/obo/IAO_0000100</IRI>
<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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<IRI>http://purl.obolibrary.org/obo/IAO_0000100</IRI>
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ns#PlainLiteral">data set</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000101</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000101</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An image is an affine projection to a two dimensional surface, of measurements of some
quality of an entity or entities repeated at regular intervals across a spatial range, where the measurements
are represented as color and luminosity on the projected on surface.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000101</IRI>
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ns#PlainLiteral">person:Alan Ruttenberg</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000101</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">person:Allyson</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000101</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">person:Chris Stoeckert</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000101</IRI>
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ns#PlainLiteral">OBI_0000030</Literal>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000101</IRI>
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ns#PlainLiteral">image</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000104</IRI>
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ns#PlainLiteral">plan specification</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000104</IRI>
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ns#PlainLiteral">To lose weight, go running daily for at least 30 minutes. To isolate plasma from blood,
centrifuge tubes at 1100-1300 rpm for 15 minutes.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000104</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000104</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
directive information entity that, when concretized, is realized in a process in which the bearer tries to
achieve the objectives, in part by taking the actions specified.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000104</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2009-03-16: provenance: a term a plan was proposed for OBI (OBI_0000344) , edited
by the PlanAndPlannedProcess branch. Original definition was &quot; a plan is a specification of a
process that is realized by an actor to achieve the objective specified as part of the plan&quot;. It has been
subsequently moved to IAO where the objective for which the original term was defined was satisfied
with the definition of this, different, term.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000104</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alternative previous definition: a plan is a set of instructions that specify how an
objective should be achieved</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

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    <IRI>http://purl.obolibrary.org/obo/IAO_0000104</IRI>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000104</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000109</IRI>
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ns#PlainLiteral">measurement data item</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000109</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Examples of measurement data are the recoding of the weight of a mouse as
{40,mass,&quot;grams&quot;}, the recording of an observation of the behavior of the mouse
{,process,&quot;agitated&quot;}, the recording of the expression level of a gene as measured through the
process of microarray experiment {3.4,luminosity,}.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000109</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000109</IRI>

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data item that is a recording of the output of an assay.</Literal>
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ns#PlainLiteral">2/2/2009 is_specified_output of some assay?</Literal>
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datum</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000111</IRI>
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  </AnnotationAssertion>
  <AnnotationAssertion>

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    <IRI>http://purl.obolibrary.org/obo/IAO_0000111</IRI>
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  <AnnotationAssertion>
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ns#PlainLiteral">The concise, meaningful, and human-friendly name for a class or property preferred by
the ontology developers. (US-English)</Literal>
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  <AnnotationAssertion>
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  <AnnotationAssertion>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000112</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">example of usage</Literal>

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</AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000112</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
phrase describing how a class name should be used. May also include other kinds of examples that
facilitate immediate understanding of a class semantics, such as widely known prototypical subclasses or
instances of the class. Although essential for high level terms, examples for low level terms (e.g.,
Affymetrix HU133 array) are not</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000112</IRI>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000112</IRI>
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ns#PlainLiteral">has curation status</Literal>
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ns#PlainLiteral">PERSON:Alan Ruttenberg</Literal>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000114</IRI>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000115</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The official OBI definition, explaining the meaning of a class or property. Shall be
Aristotelian, formalized and normalized. Can be augmented with colloquial definitions.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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Aristotelian, formalized and normalized. Can be augmented with colloquial definitions.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000115</IRI>
    <IRI>http://purl.obolibrary.org/obo/iao.owl</IRI>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An administrative note intended for its editor. It may not be included in the publication version of the ontology, so it should contain nothing necessary for end users to understand the ontology.</Literal>

</AnnotationAssertion>

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</AnnotationAssertion>

<AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/IAO_0000116</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">GROUP:OBI:<http://purl.obfoundry.org/obo/obi></Literal>

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<IRI>http://purl.obolibrary.org/obo/IAO_0000116</IRI>

<IRI>http://purl.obolibrary.org/obo/iao.owl</IRI>

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<AnnotationAssertion>

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</AnnotationAssertion>

<AnnotationAssertion>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">20110707, MC: label update to term editor and definition modified accordingly. See
http://code.google.com/p/information-artifact-ontology/issues/detail?id=115.</Literal>
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ns#PlainLiteral">GROUP:OBI:&lt;http://purl.obolibrary.org/obo/obi&gt;</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000117</IRI>
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name (semantically equivalent)</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000118</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">GROUP:OBI:&lt;http://purl.obolibrary.org/obo/obi&gt;</Literal>

```

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000118</IRI>
  <IRI>http://purl.obolibrary.org/obo/iao.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000118</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">alternative term</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000119</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">definition source</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000119</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000119</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">formal citation, e.g. identifier in external database to indicate / attribute source(s) for the
definition. Free text indicate / attribute source(s) for the definition. EXAMPLE: Author Name, URI,
MeSH Term C04, PUBMED ID, Wiki uri on 31.01.2007</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000119</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON:Daniel Schober</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000119</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Discussion on obo-discuss
mailing-list, see http://bit.ly/hgm99w</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000119</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">GROUP:OBI:&lt;http://purl.obolibrary.org/obo/obi&gt;</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>

```

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    <IRI>http://purl.obolibrary.org/obo/IAO_0000119</IRI>
    <IRI>http://purl.obolibrary.org/obo/iao.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000119</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">definition source</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">metadata complete</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Class has all its metadata, but is either not guaranteed to be in its final location in the
asserted IS_A hierarchy or refers to another class that is not complete.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">metadata complete</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000121</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">organizational term</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000121</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">term created to ease viewing/sort terms for development purpose, and will not be
included in a release</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000121</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON:Alan
Ruttenberg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000121</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">organizational term</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">ready for release</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Class has undergone final review, is ready for use, and will be included in the next
release. Any class lacking &quot;ready_for_release&quot; should be considered likely to change place in
hierarchy, have its definition refined, or be obsoleted in the next release. Those classes deemed
&quot;ready_for_release&quot; will also derived from a chain of ancestor classes that are also
&quot;ready_for_release.&quot;</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">ready for release</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">metadata incomplete</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Class is being worked on; however, the metadata (including definition) are not complete
or sufficiently clear to the branch editors.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">metadata incomplete</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000124</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">uncurated</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>http://purl.obolibrary.org/obo/IAO_0000124</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Nothing done yet beyond assigning a unique class ID and proposing a preferred
term.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty abbreviatedIRI="rdfs:label"/>
<IRI>http://purl.obolibrary.org/obo/IAO_0000124</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">uncurated</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
<IRI>http://purl.obolibrary.org/obo/IAO_0000129</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">version number</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
<IRI>http://purl.obolibrary.org/obo/IAO_0000129</IRI>
<IRI>http://purl.obolibrary.org/obo/IAO_0000124</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>http://purl.obolibrary.org/obo/IAO_0000129</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
version number is an information content entity which is a sequence of characters borne by part of each of
a class of manufactured products or its packaging and indicates its order within a set of other products
having the same name.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
<IRI>http://purl.obolibrary.org/obo/IAO_0000129</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Note: we feel that at the moment we are happy with a general version number, and that
we will subclass as needed in the future. For example, see 7. genome sequence version</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
<IRI>http://purl.obolibrary.org/obo/IAO_0000129</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">GROUP: IAO</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
<IRI>http://purl.obolibrary.org/obo/IAO_0000129</IRI>
<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty abbreviatedIRI="rdfs:label"/>

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    <IRI>http://purl.obolibrary.org/obo/IAO_0000129</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">version number</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000136</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">is
about</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000136</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">This document is about information artifacts and their representations</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000136</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">is_about is a (currently) primitive relation that relates an information artifact to an
entity.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000136</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">person:Alan Ruttenberg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000136</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Smith, Ceusters, Ruttenberg, 2000 years of philosophy</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000136</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000136</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">is
about</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000144</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">conclusion textual entity</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000144</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">that fucoidan has a small statistically significant effect on AT3 level but no useful
clinical effect as in-vivo anticoagulant, a paraphrase of part of the last paragraph of the discussion section
of the paper &apos;Pilot clinical study to evaluate the anticoagulant activity of fucoidan&apos;, by
Lowenthal et. al.PMID:19696660</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000144</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000144</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
textual entity that expresses the results of reasoning about a problem, for instance as typically found
towards the end of scientific papers.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000144</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2009/09/28 Alan Ruttenberg. Fucoidan-use-case</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000144</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2009/10/23 Alan Ruttenberg: We need to work on the definition still</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000144</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Person:Alan Ruttenberg</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000144</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000144</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">conclusion textual entity</Literal>
</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000184</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scatter plot</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000184</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Comparison of gene expression values in two samples can be displayed in a scatter
plot</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000184</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000184</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
scatterplot is a graph which uses Cartesian coordinates to display values for two variables for a set of
data. The data is displayed as a collection of points, each having the value of one variable determining the
position on the horizontal axis and the value of the other variable determining the position on the vertical
axis.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000184</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON:Chris Stoeckert</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000184</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON:James Malone</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000184</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON:Melanie Courtot</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000184</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scattergraph</Literal>
</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000184</IRI>
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ns#PlainLiteral">WEB: http://en.wikipedia.org/wiki/Scatterplot</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000184</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000184</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scatter plot</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000219</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">denotes</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000219</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
person's name denotes the person. A variable name in a computer program denotes some piece of
memory. Lexically equivalent strings can denote different things, for instance "Alan" can
denote different people. In each case of use, there is a case of the denotation relation obtaining, between
"Alan" and the person that is being named.</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000219</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">denotes is a primitive, instance-level, relation obtaining between an information content
entity and some portion of reality. Denotation is what happens when someone creates an information
content entity E in order to specifically refer to something. The only relation between E and the thing is
that E can be used to pick out the thing. This relation connects those two together.
Freedictionary.com sense 3: To signify directly; refer to specifically</Literal>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000219</IRI>
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ns#PlainLiteral">person:Alan Ruttenberg</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000219</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Conversations with Barry Smith, Werner Ceusters, Bjoern Peters, Michel Dumontier,
Melanie Courtot, James Malone, Bill Hogan</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000219</IRI>
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ns#PlainLiteral">denotes</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000232</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">curator note</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000232</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000232</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An administrative note of use for a curator but of no use for a user</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000232</IRI>
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  </AnnotationAssertion>
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    <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000232</IRI>
    <IRI>http://purl.obolibrary.org/obo/iao.owl</IRI>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000232</IRI>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000300</IRI>
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ns#PlainLiteral">textual entity</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000300</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Words, sentences, paragraphs, and the written (non-figure) parts of publications are all
textual entities</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000300</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
textual entity is a part of a manifestation (FRBR sense), a generically dependent continuant whose
concretizations are patterns of glyphs intended to be interpreted as words, formulas, etc.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000300</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">AR, (IAO call 2009-09-01): a document as a whole is not typically a textual entity,
because it has pictures in it - rather there are parts of it that are textual entities. Examples: The title,
paragraph 2 sentence 7, etc.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000300</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">MC, 2009-09-14 (following IAO call 2009-09-01): textual entities live at the FRBR
(http://en.wikipedia.org/wiki/Functional_Requirements_for_Bibliographic_Records) manifestation level.
Everything is significant: line break, pdf and html versions of same document are different textual
entities.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000300</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Lawrence Hunter</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000300</IRI>
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ns#PlainLiteral">text</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

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ns#PlainLiteral">textual entity</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000306</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">table</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000306</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
textual entity that contains a two-dimensional arrangement of texts repeated at regular intervals across a
spatial range, such that the spatial relationships among the constituent texts expresses
propositions</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000306</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Lawrence Hunter</Literal>
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ns#PlainLiteral">figure</Literal>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Any picture, diagram or table</Literal>
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<AnnotationAssertion>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An information content entity consisting of a two dimensional arrangement of
information content entities such that the arrangement itself is about something.</Literal>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000308</IRI>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000309</IRI>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000309</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
molecular structure ribbon cartoon showing helices, turns and sheets and their relations to each other in
space.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000309</IRI>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000400</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
cartesian spatial coordinate datum is a representation of a point in a spatial region, in which equal changes
in the magnitude of a coordinate value denote length qualities with the same magnitude</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000400</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2009-08-18 Alan Ruttenberg - question to BFO list about whether the BFO sense of the
lower dimensional regions is that they are always part of actual space (the three dimensional sort)
http://groups.google.com/group/bfo-discuss/browse_thread/thread/9d04e717e39fb617</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000400</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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discuss/browse_thread/thread/9d04e717e39fb617</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000401</IRI>
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ns#PlainLiteral">one dimensional cartesian spatial coordinate datum</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000401</IRI>
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    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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cartesian spatial coordinate datum that uses one value to specify a position along a one dimensional
spatial region</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000407</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">relating a cartesian spatial coordinate datum to a unit label that together with the values
represent a point</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000407</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">has coordinate unit label</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000412</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">imported from</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000412</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">For external terms/classes, the ontology from which the term was imported</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000412</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON:Alan Ruttenberg</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000412</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON:Melanie Courtot</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000412</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">GROUP:OBI:&lt;http://purl.obolibrary.org/obo/obi&gt;</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000412</IRI>
  <IRI>http://purl.obolibrary.org/obo/iao.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000412</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">imported from</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000413</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">is
duration of</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000413</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000413</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">relates a process to a time-measurement-datum that represents the duration of the
process</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000413</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Person:Alan Ruttenberg</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000413</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000413</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">is
duration of</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000414</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">mass measurement datum</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000414</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000414</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
scalar measurement datum that is the result of measurement of mass quality</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000414</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2009/09/28 Alan Ruttenberg. Fucoidan-use-case</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000414</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Person:Alan Ruttenberg</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000414</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000414</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">mass measurement datum</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000416</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">time measurement datum</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000416</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000416</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A scalar measurement datum that is the result of measuring a temporal interval</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000416</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">2009/09/28 Alan Ruttenberg. Fucoidan-use-case</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000416</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Person:Alan Ruttenberg</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000416</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000416</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">time measurement datum</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000423</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">to
be replaced with external ontology term</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000423</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Terms with this status should eventually replaced with a term from another
ontology.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000423</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alan Ruttenberg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000423</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">group:OBI</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000423</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">to
be replaced with external ontology term</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000428</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">requires discussion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000428</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
term that is metadata complete, has been reviewed, and problems have been identified that require
discussion before release. Such a term requires editor note(s) to identify the outstanding issues.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000428</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alan Ruttenberg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000428</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">group:OBI</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000428</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">requires discussion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000572</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">documenting</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000572</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Recording the current temperature in a laboratory notebook. Writing a journal article.
Updating a patient record in a database. Copying the readout from an instrument into a
spreadsheet.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000572</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000572</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
planned process in which input information is used to create or add to a report</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000572</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">6/11/9: Edited at OBI workshop. We need to be able identify a child form of
information artifact which corresponds to something enduring (not brain like). This used to be restricted
to physical document or digital entity as the output, but that excludes e.g. an audio cassette tape</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000572</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Bjoern Peters</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000572</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">wikipedia http://en.wikipedia.org/wiki/Documenting</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000572</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000572</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">documenting</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000573</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">line graph</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000573</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000573</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON:Chris Stoeckert</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000573</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON:Melanie Courtot</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000573</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">line chart</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000573</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">GROUP:OBI</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

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    <IRI>http://purl.obolibrary.org/obo/IAO_0000573</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">WEB: http://en.wikipedia.org/wiki/Line_chart</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000573</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000573</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">line graph</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000577</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">CRID</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000577</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PubMed identifier â€œPMID:12345â€• </Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000577</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000577</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
symbol that is sufficient to look up information about the corresponding entity from its CRID (centrally
registered identifier) registry.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000577</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">IAO call, 20101124: 12345 is not a CRID symbol. To be a CRID symbol you need to
have some information about the registry within which the CRID is recorded.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000577</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Alan Ruttenberg</Literal>

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</AnnotationAssertion>
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ns#PlainLiteral">PERSON: Bill Hogan</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000577</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Bjoern Peters</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000577</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Melanie Courtot</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000577</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">centrally
registered identifier</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000577</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Original proposal from Bjoern, discussions at IAO calls</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000577</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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ns#PlainLiteral">CRID</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000579</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">CRID registry</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000579</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">PubMed and
    GenBank both have CRID registries as parts of their database systems.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000579</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000579</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
    data set that consists of CRIDs (centrally registered identifier) and additional information about their
    corresponding entities, that were recorded in the dataset through an assigning a centrally registered
    identifier process.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000579</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
    ns#PlainLiteral">IAO call, 20101124: PubMed registry is an instance of CRID registry</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000579</IRI>
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    ns#PlainLiteral">PERSON: Alan Ruttenberg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000579</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
    ns#PlainLiteral">PERSON: Bill Hogan</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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    ns#PlainLiteral">PERSON: Bjoern Peters</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000579</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
    ns#PlainLiteral">PERSON: Melanie Courtot</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000579</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">centrally
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  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000579</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">CRID registry</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000581</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">has time stamp</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000581</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000581</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">relates a time stamped measurement datum to the time measurement datum that denotes the time when the measurement was taken</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000581</IRI>
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  </AnnotationAssertion>
<AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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ns#PlainLiteral">time stamped measurement datum</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000582</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000582</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000582</IRI>
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ns#PlainLiteral">has measurement datum</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000583</IRI>
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ns#PlainLiteral">relates a time stamped measurement datum to the measurement datum that was
measured</Literal>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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  <AnnotationAssertion>
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ns#PlainLiteral">has measurement datum</Literal>
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  <AnnotationAssertion>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">time sampled measurement data set</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000584</IRI>
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ns#PlainLiteral">pmid:20604925 - time-lapse live cell microscopy</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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  </AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000584</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
data set that is an aggregate of data recording some measurement at a number of time points. The time
series data set is an ordered list of pairs of time measurement data and the corresponding measurement
data acquired at that time.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000584</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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ns#PlainLiteral">experimental time series</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000601</IRI>
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ns#PlainLiteral">has associated axiom(nl)</Literal>
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ns#PlainLiteral">has associated axiom(fol)</Literal>
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  <IRI>http://purl.obolibrary.org/obo/iao.owl</IRI>
</AnnotationAssertion>
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ns#PlainLiteral">has axiom label</Literal>
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  <IRI>http://purl.obolibrary.org/obo/NCBITaxon_32524</IRI>
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  &lt;Metazoa&gt;</Literal>
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ns#PlainLiteral">planned process</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000011</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Injecting mice with a vaccine
in order to test its efficacy</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000011</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
processual entity that realizes a plan which is the concretization of a plan specification.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000011</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">&apos;Plan&apos; includes a
future direction sense. That can be problematic if plans are changed during their execution. There are
however implicit contingencies for protocols that an agent has in his mind that can be considered part of
the plan, even if the agent didn&apos;t have them in mind before. Therefore, a planned process can
diverge from what the agent would have said the plan was before executing it, by adjusting to problems
encountered during execution (e.g. choosing another reagent with equivalent properties, if the originally
planned one has run out.)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000011</IRI>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000011</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">branch derived</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000011</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">6/11/9: Edited at workshop.
Used to include: is initiated by an agent</Literal>
</AnnotationAssertion>

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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000011</IRI>
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ns#PlainLiteral">This class merges the previously separated objective driven process and planned
process, as they the separation proved hard to maintain. (1/22/09, branch call)</Literal>
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ns#PlainLiteral">processed material</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000047</IRI>
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ns#PlainLiteral">Examples include gel matrices, filter paper, parafilm and buffer solutions, mass
spectrometer, tissue samples</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000047</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000047</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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  </AnnotationAssertion>
  <AnnotationAssertion>
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emitted by excited Neon atoms. Count of geese flying over a house.</Literal>
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planned process with the objective to produce information about the material entity that is the evaluant,
by physically examining it or its proxies.</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000070</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">12/3/12: BP: the
reference to the &apos;physical examination&apos; is included to point out that a prediction is not an
assay, as that does not require physical examination. </Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000070</IRI>
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ns#PlainLiteral">scientific observation</Literal>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000070</IRI>
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data item which is used to indicate the degree of uncertainty about a measurement.</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000071</IRI>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
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    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
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ns#PlainLiteral">quantitative confidence value</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">material processing</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A cell lysis, production of a
cloning vector, creating a buffer.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
planned process which results in physical changes in a specified input material</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Bjoern Peters</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Frank
Gibson</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Jennifer
Fostel</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Melanie
Courtot</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Philippe Rocca
Serra</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>
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ns#PlainLiteral">material transformation</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">OBI branch derived</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000094</IRI>
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  <AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000097</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">participant under investigation role</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000097</IRI>
<IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000097</IRI>
<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A role that is realized through
the execution of a study design in which the bearer of the role participates and in which data about that
bearer is collected.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000097</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A participant can
realize both &quot;specimen role&quot; and &quot;participant under investigation role&quot;, at the
same time. However &quot;participant under investigation role&quot; is distinct from &quot;specimen
role&quot;, since a specimen could somehow be involved in an investigation without being the thing that
is under investigation.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000097</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">GROUP: Role Branch</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
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<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">OBI</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000097</IRI>
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<IRI>http://purl.obolibrary.org/obo/OBI_0000097</IRI>
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</AnnotationAssertion>
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<IRI>http://purl.obolibrary.org/obo/OBI_0000112</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">specimen role</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000112</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">liver section; a portion of a
culture of cells; a nemotode or other animal once no longer a subject (generally killed); portion of blood
from a patient.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000112</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000112</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
role borne by a material entity that is gained during a specimen collection process and that can be realized
by use of the specimen in an investigation</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000112</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">22Jun09. The definition
includes whole organisms, and can include a human. The link between specimen role and study subject
role has been removed. A specimen taken as part of a case study is not considered to be a population
representative, while a specimen taken as representing a population, e.g. person taken from a cohort,
blood specimen taken from an animal) would be considered a population representative and would also
bear material sample role.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000112</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Note: definition is in
specimen creation objective which is defined as an objective to obtain and store a material entity for
potential use as an input during an investigation.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000112</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">GROUP: Role
Branch</Literal>
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  <AnnotationAssertion>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000112</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000112</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">specimen role</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000115</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">intervention design</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000115</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PMID: 18208636.Br J Nutr. 2008 Jan 22;:1-11.Effect of vitamin D supplementation on
bone and vitamin D status among Pakistani immigrants in Denmark: a randomised double-blinded
placebo-controlled intervention study.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000115</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An intervention design is a study design in which a controlled process applied to the
subjects (the intervention) serves as the independent variable manipulated by the experimentalist. The
treatment (perturbation or intervention) defined can be defined as a combination of values taken by
independent variable manipulated by the experimentalists are applied to the recruited subjects assigned
(possibly by applying specific methods) to treatment groups. The specificity of intervention design is the
fact that independent variables are being manipulated and a response of the biological system is evaluated
via response variables as monitored by possibly a series of assays.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000115</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Philippe Rocca-Serra</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000115</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">OBI branch derived</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000115</IRI>

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    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000115</IRI>
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ns#PlainLiteral">intervention design</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000124</IRI>
    <Literal
datatypeIRI="http://www.w3.org/2001/XMLSchema#string">is_supported_by_data</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000124</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">The relation between the
conclusion &quot;Gene tpbA is involved in EPS production&quot; and the data items produced using two
sets of organisms, one being a tpbA knockout, the other being tpbA wildtype tested in polysaccharide
production assays and analyzed using an ANOVA. </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000124</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000124</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">The relation between a data
item and a conclusion where the conclusion is the output of a data interpreting process and the data item
is used as an input to that process</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000124</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">OBI</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000124</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">OBI</Literal>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000124</IRI>
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workshop</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

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    <IRI>http://purl.obolibrary.org/obo/OBI_0000124</IRI>
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datatypeIRI="http://www.w3.org/2001/XMLSchema#string">is_supported_by_data</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">p-
value</Literal>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000121</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
quantitative confidence value that represents the probability of obtaining a result at least as extreme as
that actually obtained, assuming that the actual value was the result of chance alone.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Addition of restriction &apos;output of null hypothesis testing&apos; by AGB and PRS
while working on STATO</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">May be outside the scope of
OBI long term, is needed so is retained</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>

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    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Philippe Rocca-Serra</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">WEB:
http://en.wikipedia.org/wiki/P-value</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral"></Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000175</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">p-
value</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000181</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">population</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000181</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PMID12564891. Environ Sci Technol. 2003 Jan 15;37(2):223-8. Effects of historic
PCB exposures on the reproductive success of the Hudson River striped bass population.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000181</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
population is a collection of individuals from the same taxonomic class living, counted or sampled at a
particular site or in a particular area</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000181</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Philippe Rocca-Serra</Literal>
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ns#PlainLiteral">rem1: collection somehow always involve a selection process</Literal>
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ns#PlainLiteral">imaging assay</Literal>
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<IRI>http://purl.obolibrary.org/obo/OBI_0000185</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An imaging assay is an assay to produce a picture of an entity. definition_source:
OBI.</Literal>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PMID: 16353909.AAPS J. 2005 Sep 22;7(2):E274-80. Review. The joint food and
agriculture organization of the United Nations/World Health Organization Expert Committee on Food
Additives and its role in the evaluation of the safety of veterinary drug residues in foods.</Literal>
  </AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000245</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An entity that can bear roles, has members, and has a set of organization rules. Members
of organizations are either organizations themselves or individual people. Members can bear specific
organization member roles that are determined in the organization rules. The organization rules also
determine how decisions are made on behalf of the organization by the organization members.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000245</IRI>

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Serra</Literal>
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ns#PlainLiteral">PCR protocol, has objective specification, amplify DNA fragment of interest, and has
action specification describes the amounts of experimental reagents used (e..g. buffers, dNTPS, enzyme),
and the temperature and cycle time settings for running the PCR.</Literal>
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plan specification which has sufficient level of detail and quantitative information to communicate it
between investigation agents, so that different investigation agents will reliably be able to independently
reproduce the process.</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000272</IRI>
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  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
relation between a planned process and a continuant participating in that process that is not created during
the process. The presence of the continuant during the process is explicitly specified in the plan
specification which the process realizes the concretization of.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000293</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">8/17/09: specified inputs of
one process are not necessarily specified inputs of a larger process that it is part of. This is in contrast to
how &apos;has participant&apos; works.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

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https://wiki.cbil.upenn.edu/obiwiki/index.php/Chromium_Release_assay</Literal>
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specification which the process realizes the concretization of.</Literal>
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continuant at the end of the process is explicitly specified in the objective specification which the process
realizes the concretization of.</Literal>
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  <AnnotationAssertion>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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continuant at the end of the process is explicitly specified in the objective specification which the process
realizes the concretization of.</Literal>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
relation between continuant instances c1 and c2 where within an experiment/ protocol application,
measurement of c1 is used to determine what a measurement of c2 would be.</Literal>
</AnnotationAssertion>
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ns#PlainLiteral">Alan Ruttenberg</Literal>
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ns#PlainLiteral">drawing a conclusion based on data</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000338</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Concluding that a gene is
upregulated in a tissue sample based on the band intensity in a western blot. Concluding that a patient has
a infection based on measurement of an elevated body temperature and reported headache. Concluding
that there were problems in an investigation because data from PCR and microarray are conflicting.
Concluding that &apos;defects in gene XYZ cause cancer due to improper DNA repair&apos; based on
data from experiments in that study that gene XYZ is involved in DNA repair, and the conclusion of a
previous study that cancer patients have an increased number of mutations in this gene. </Literal>

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</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000338</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
planned process in which data gathered in an investigation is evaluated in the context of existing
knowledge with the objective to generate more general conclusions or to conclude that the data does not
allow one to draw general conclusion</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000338</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Bjoern
Peters</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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Fostel</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000339</IRI>

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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">The process of a scientist
    thinking about and deciding what reagents to use as part of a protocol for an experiment. Note that the
    scientist could be human or a &quot;robot scientist&quot;; executing software.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
    process of creating or modifying a plan specification</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000339</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">7/18/2011 BP: planning used
    to itself be a planned process. Barry Smith pointed out that this would lead to an infinite regression, as
    there would have to be a plan to conduct a planning process, which in itself would be the result of
    planning etc. Therefore, the restrictions on &apos;planning&apos; were loosened to allow for informal
    processes that result in an &apos;ad hoc plan &apos;. This required changing from
    &apos;has_specified_output some plan specification&apos; to &apos;has_participant some plan
    specification&apos;. </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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    Branch</Literal>
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ns#PlainLiteral">light emission function</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000367</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
light emission function is an excitation function to excite a material to a specific excitation state that it
emits light.</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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contain function is a function to constrain a material entities location in space</Literal>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000371</IRI>
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heat function is a function that increases the internal kinetic energy of a material</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000372</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
material separation function is a function that increases the resolution between two or more material
entities. The to distinction between the entities is usually based on some associated physical
quality.</Literal>
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excitation function is a function to inject energy by bombarding a material with energetic particles (e.g.,
photons) thereby imbuing internal material components such as electrons with additional energy. These
internal, &apos;excited&apos; particles may lead to the rupturing of covalent chemical bonds or may
quickly relax back to there unexcited state with an exponential time course thereby locally emitting
energy in the form of photons.</Literal>
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<AnnotationAssertion>
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filter function is a function to prevent the flow of certain entities based on a quality or qualities of the
entity while allowing entities which have different qualities to pass through</Literal>
  </AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
cool function is a function to decrease the internal kinetic energy of a material below the initial kinetic
energy of that type of material.</Literal>

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or molecularly bonded to a solid support</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
solid support function is a function of a device on which an entity is kept in a defined position and
prevented in its movement</Literal>
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ns#PlainLiteral">An environmental control function is a function that regulates a contained environment
within specified parameter ranges. For example the control of light exposure, humidity and
temperature.</Literal>
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sort function is a function to distinguish material components based on some associated physical quality
or entity and to partition the separate components into distinct fractions according to a defined
order.</Literal>
</AnnotationAssertion>
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  </AnnotationAssertion>
  <AnnotationAssertion>
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achieves the objective specification &apos;material separation objective&apos;</Literal>
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a planned process and a objective specification when the criteria specified in the objective specification
are met at the end of the planned process.</Literal>
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  <AnnotationAssertion>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

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thread from 1/23/09 in accordance with DT and PPPB branch</Literal>
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  <AnnotationAssertion>
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ns#PlainLiteral">Up-regulation of inflammatory signalings by areca nut extract and role of
cyclooxygenase-2 -1195G&gt;a polymorphism reveal risk of oral cancer. Cancer Res. 2008 Oct
15;68(20):8489-98. PMID: 18922923</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000423</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an extract is a material entity which results from an extraction process</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000423</IRI>
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Serra</Literal>

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Branch</Literal>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
mean calculation which has averaging objective is a descriptive statistics calculation in which the mean is
calculated by taking the sum of all of the observations in a data set divided by the total number of
observations. It gives a measure of the ‘center of gravity’ for the data set. It is also known as
the first moment.</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000425</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000425</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An averaging objective is a data transformation objective where the aim is to perform
mean calculations on the input of the data transformation.</Literal>
</AnnotationAssertion>

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<AnnotationAssertion>
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with LCM virus</Literal>
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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">is the specification of an objective to add a material into a target material. The adding is asymmetric in the sense that the target material largely retains its identity</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000434</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">BP</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000434</IRI>

<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000434</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">adding material objective</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000437</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">analyte measurement objective</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000437</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">The objective to measure the concentration of glucose in a blood sample</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000437</IRI>

<IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000437</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">an assay objective to determine the presence or concentration of an analyte in the evaluant</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

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<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Bjoern Peters</Literal>

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ns#PlainLiteral">assay objective</Literal>
</AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000441</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">the objective to determine the
weight of a mouse.</Literal>
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</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000441</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000441</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an objective specification to determine a specified type of information about an
evaluated entity (the material entity bearing evaluant role)</Literal>
</AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000451</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">normalized data set</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000451</IRI>
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data set that is produced as the output of a normalization data transformation.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000451</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: James
Malone</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Melanie
Courtot</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000451</IRI>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000453</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">measure function</Literal>
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  <AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000453</IRI>
<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A glucometer measures blood
glucose concentration, the glucometer has a measure function.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000453</IRI>
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</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000453</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Measure function is a function that is borne by a processed material and realized in a
process in which information about some entity is expressed relative to some reference.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Daniel
Schober</Literal>
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<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Helen
Parkinson</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000456</IRI>
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mouse infected with LCM virus. The objective to create a defined solution of PBS.</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000456</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000456</IRI>
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ns#PlainLiteral">an objective specification that creates an specific output object from input
materials.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000456</IRI>
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Peters</Literal>
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  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Frank
Gibson</Literal>
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Fostel</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000456</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Melanie
Courtot</Literal>
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Serra</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000456</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">artifact creation objective</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000456</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">GROUP: OBI
PlanAndPlannedProcess Branch</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000456</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000456</IRI>
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ns#PlainLiteral">material transformation objective</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000471</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">study design
execution</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000471</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">injecting a mouse with PBS
solution, weighing it, and recording the weight according to a study design.</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000471</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000471</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">a planned process that
realizes the concretization of a study design</Literal>
  </AnnotationAssertion>
</AnnotationAssertion>

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<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">removed axiom has_part
some (assay or &apos;data transformation&apos;) per discussion on protocol application mailing list to
improve reasoner performance. The axiom is still desired.</Literal>
</AnnotationAssertion>
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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000471</IRI>
<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">branch derived</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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<IRI>http://purl.obolibrary.org/obo/OBI_0000471</IRI>
<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">6/11/9: edited at workshop.
Used to be: study design execution is a process with the objective to generate data according to a
concretized study design. The execution of a study design is part of an investigation, and minimally
consists of an assay or data transformation.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000471</IRI>
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execution</Literal>
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<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">material separation
objective</Literal>
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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000639</IRI>
<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">The objective to obtain
multiple aliquots of an enzyme preparation. The objective to obtain cells contained in a sample of
blood.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">is an objective to transform a
material entity into spatially separated components.</Literal>
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objective</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
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  <AnnotationAssertion>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">the relation of the cells in the
finger of the skin to the finger, in which an indeterminate number of grains are parts of the whole by
virtue of being grains in a collective that is part of the whole, and in which removing one granular part
does not nec- essarily damage or diminish the whole. Ontological Whether there is a fixed, or nearly fixed
number of parts - e.g. fingers of the hand, chambers of the heart, or wheels of a car - such that there can
be a notion of a single one being missing, or whether, by contrast, the number of parts is indeterminate -
e.g., cells in the skin of the hand, red cells in blood, or rubber molecules in the tread of the tire of the
wheel of the car.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000643</IRI>
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ns#PlainLiteral">Discussion in Karlsruhe with, among others, Alan Rector, Stefan Schulz, Marijke Keet,

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Melanie Courtot, and Alan Ruttenberg. Definition take from the definition of granular parthood in the cited paper. Needs work to put into standard form</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PAPER: Granularity, scale and collectivity: When size does and does not matter, Alan Rector, Jeremy Rogers, Thomas Bittner, Journal of Biomedical Informatics 39 (2006) 333-349</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000643</IRI>

<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000643</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">has grain</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000649</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">data set of features</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000649</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A data set that is produced as the output of a descriptive statistical calculation data transformation and consists of producing a data set that represents one or more features of interest about the input data set.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/OBI_0000649</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: James

Malone</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000649</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Monnie

McGee</Literal>

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</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000650</IRI>
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ns#PlainLiteral">differential expression analysis data transformation</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000650</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000650</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
differential expression analysis data transformation is a data transformation that has objective differential
expression analysis and that consists of</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000650</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000650</IRI>
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ns#PlainLiteral">Melanie Courtot</Literal>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Monnie McGee</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000650</IRI>

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    <IRI>http://purl.obolibrary.org/obo/OBI_0000650</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000650</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">differential expression analysis data transformation</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000652</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">material
combination</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000652</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Mixing two fluids. Adding
salt into water. Injecting a mouse with PBS.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000652</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000652</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">is a material processing with
the objective to combine two or more material entities as input into a single material entity as
output.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000652</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">created at workshop as parent
class for &apos;adding material into target&apos;, which is asymmetric, while combination encompasses
all addition processes.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000652</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">bp</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000652</IRI>
<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">bp</Literal>
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<IRI>http://purl.obolibrary.org/obo/OBI_0000652</IRI>
<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty abbreviatedIRI="rdfs:label"/>
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combination</Literal>
</AnnotationAssertion>
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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000659</IRI>
<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">specimen collection</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000659</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">drawing blood
from a patient for analysis, collecting a piece of a plant for depositing in a herbarium, buying meat from a
butcher in order to measure its protein content in an investigation</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000659</IRI>
<IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
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<IRI>http://purl.obolibrary.org/obo/OBI_0000659</IRI>
<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A planned process with the
objective of collecting a specimen.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000659</IRI>
<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Note: definition is in
specimen creation objective which is defined as an objective to obtain and store a material entity for
potential use as an input during an investigation.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000659</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Philly2013: A
specimen collection can have as part a material entity acquisition, such as ordering from a bank. The
distinction is that specimen collection necessarily involves the creation of a specimen role. However

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ordering cell lines cells from ATCC for use in an investigation is NOT a specimen collection, because the cell lines already have a specimen role.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000659</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Philly2013: The specimen_role for the specimen is created during the specimen collection process.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000659</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Bjoern Peters</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000232"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000659</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">5/31/2012: This process is not necessarily an acquisition, as specimens may be collected from materials already in possession</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000232"/>

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<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">6/9/09: used at workshop</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000659</IRI>

<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000659</IRI>

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</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000662</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">error corrected data set</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000662</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A data set that is produced as the output of an error correction data transformation and consists of producing a data set which has had erroneous contributions from the input to the data transformation removed (corrected for).</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000662</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: James
Malone</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000662</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Monnie
McGee</Literal>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000662</IRI>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000662</IRI>
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  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000668</IRI>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000668</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An error correction data transformation is a data transformation that has the objective of
error correction, where the aim is to remove (correct for) erroneous contributions from the input to the
data transformation.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000668</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000668</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Monnie McGee</Literal>

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</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000668</IRI>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
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  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000673</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">&quot;A
statistical test provides a mechanism for making quantitative decisions about a process or
processes&quot;.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000673</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
statistical hypothesis test data transformation is a data transformation that has objective statistical
hypothesis test.</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000673</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Alejandra
Gonzalez-Beltran</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000673</IRI>

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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">James Malone</Literal>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000673</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Philippe Rocca-
Serra</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000673</IRI>
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ns#PlainLiteral">PERSON: James Malone</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000673</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://www.itl.nist.gov/div898/handbook/prc/section1/prc13.htm</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000673</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000673</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">NHST</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Null Hypothesis
Statistical Testing</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000673</IRI>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000673</IRI>
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  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000674</IRI>

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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000674</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
data item that is produced as the output of a center calculation data transformation and represents the
center value of the input data.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000674</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">[STATO Definition]
The median is that value of the variate which divides the total frequency into two halves.

```

The median is measure of central tendency of data. It is obtained by arranging the observations in order from smallest to largest value. If there is an odd number of observations, the median is the middle value. If there is an even number of observations, the median is the average of the two middle values.</Literal>

```

  </AnnotationAssertion>
  <AnnotationAssertion>
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quartile</Literal>
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Dictionary of Statistical Terms, 5th edition, prepared for the International Statistical Institute by F.H.C.
Marriott. Published for the International Statistical Institute by Longman Scientific and Technical.

```

and

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Wolfram Alpha</Literal>
  </AnnotationAssertion>
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  <AnnotationAssertion>
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data item that is produced as the output of an averaging data transformation and represents the average
value of the input data.</Literal>
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ns#PlainLiteral">[STATO definition]:

```

The arithmetic mean is defined as the sum of the numerical values of each and every observation divided by the total number of observations. S The arithmetic mean A is defined by the formula

$A = \frac{\sum[A_i]}{n}$ where i ranges from 1 to n and A_i represents the value of individual observations.

The arithmetic mean is significantly affected by extreme values and outliers. A better measure of central tendency is the median (http://purl.obolibrary.org/obo/OBI_0000674).</Literal>

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2013</Literal>
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output that is a material with parts of fewer types (modulo impurities).</Literal>
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obtain a material entity for potential use as an input during an investigation.</Literal>
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output material that contains several input materials.</Literal>
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transformation with the objective of a statistical hypothesis test in which the test statistic has a
Student's t distribution if the null hypothesis is true. It is applied when the population is assumed to
be normally distributed but the sample sizes are small enough that the statistic on which inference is
based is not normally distributed because it relies on an uncertain estimate of standard deviation rather
than on a precisely known value.</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000739</IRI>
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http://en.wikipedia.org/wiki/T-test</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000739</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000739</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral"></Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>

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<IRI>http://purl.obolibrary.org/obo/OBI_0000739</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">t.test(dependent variable ~ independant variable, data = dataset, var.equal = FALSE)
http://stat.ethz.ch/R-manual/R-patched/library/stats/html/t.test.html</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000739</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Student's t-
test</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000740</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">material sample
role</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000740</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">a role borne by a portion of
blood taken to represent all the blood in an organism; the role borne by a population of humans with HIV
enrolled in a study taken to represent patients with HIV in general.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000740</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A material sample role is a
specimen role borne by a material entity that is the output of a material sampling process.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000740</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">7/13/09: Note that this is a
relational role: between the sample taken and the 'sampled' material of which the sample is
thought to be representative of.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000740</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000740</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">material sample
role</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>

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    <IRI>http://purl.obolibrary.org/obo/OBI_0000744</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">material sampling
process</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000744</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000744</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A specimen gathering process
with the objective to obtain a specimen that is representative of the input material entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000744</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000744</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">material sampling
process</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">study design independent variable</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In a study in
which gene expression is measured in patients between 8 month to 4 years old that have mild or severe
malaria and in which the hypothesis is that gene expression in that age group is a function of disease
status, disease status is the independent variable.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
directive information entity that is part of a study design. Independent variables are entities whose values
are selected to determine its relationship to an observed phenomenon (the dependent variable). In such an

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experiment, an attempt is made to find evidence that the values of the independent variable determine the values of the dependent variable (that which is being measured). The independent variable can be changed as required, and its values do not represent a problem requiring explanation in an analysis, but are taken simply as given. The dependent variable on the other hand, usually cannot be directly controlled</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">2/2/2009 Original definition - In the design of experiments, independent variables are those whose values are controlled or selected by the person experimenting (experimenter) to determine its relationship to an observed phenomenon (the dependent variable). In such an experiment, an attempt is made to find evidence that the values of the independent variable determine the values of the dependent variable (that which is being measured). The independent variable can be changed as required, and its values do not represent a problem requiring explanation in an analysis, but are taken simply as given. The dependent variable on the other hand, usually cannot be directly controlled.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In the Philly 2013 workshop the label was chosen to distinguish it from "dependent variable" as used in statistical modelling. See: http://en.wikipedia.org/wiki/Statistical_modeling</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Alan Ruttenberg</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Bjoern Peters</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Chris Stoeckert</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">experimental factor</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>


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    <IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>
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variable</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Web:
http://en.wikipedia.org/wiki/Dependent_and_independent_variables</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000232"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">2009-03-16: work has been
done on this term during during the OBI workshop winter 2009 and the current definition was considered
acceptable for use in OBI. If there is a need to modify thisdefinition please notify OBI.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>
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ns#PlainLiteral">explanatory variable</Literal>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000750</IRI>
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  </AnnotationAssertion>
  <AnnotationAssertion>
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ns#PlainLiteral">study design independent variable</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">study design dependent variable</Literal>
  </AnnotationAssertion>
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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In a study in
which gene expression is measured in patients between 8 month to 4 years old that have mild or severe
malaria and in which the hypothesis is that gene expression in that age group is a function of disease
status, the gene expression is the dependent variable. </Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PRS-AGB: a dependent variable is a variable which assumes only values set by the
operator according to a plan and are expected to influence the ranges of values assumed by a response
variable aka independent variable.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">dependent variable specification is part of a study design. The dependent variable is the
event studied and expected to change when the independent variable varies.</Literal>
</AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">2/2/2009 In the design of experiments, independent variables are those whose values are
controlled or selected by the person experimenting (experimenter) to determine its relationship to an
observed phenomenon (the dependent variable). In such an experiment, an attempt is made to find
evidence that the values of the independent variable determine the values of the dependent variable (that
which is being measured). The independent variable can be changed as required, and its values do not
represent a problem requiring explanation in an analysis, but are taken simply as given. The dependent
variable on the other hand, usually cannot be directly controlled.</Literal>
</AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In the Philly
2013 workshop the label was chosen to distinguish it from &quot;dependent variable&quot;, as used in
statistical modelling. See: http://en.wikipedia.org/wiki/Statistical\_modeling</Literal>
</AnnotationAssertion>
</AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Alan
Ruttenberg</Literal>

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  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Bjoern
Peters</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Chris
Stoekert</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">dependent
variable</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">WEB:
http://en.wikipedia.org/wiki/Dependent_and_independent_variables</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">2009-03-16: work has been
done on this term during during the OBI workshop winter 2009 and the current definition was considered
acceptable for use in OBI. If there is a need to modify thisdefinition please notify OBI.</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
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ns#PlainLiteral">response variable</Literal>
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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000751</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">study design dependent variable</Literal>
</AnnotationAssertion>
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objective</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000791</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Application of the Bonferroni
correction</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000791</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000791</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A multiple testing correction
objectives is a data transformation objective where the aim is to correct for a set of statistical inferences
considered simultaneously</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000791</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">multiple comparison
correction objective</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000791</IRI>
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datatypeIRI="http://www.w3.org/2001/XMLSchema#string">http://en.wikipedia.org/wiki/Multiple_Testi
ng_Correction</Literal>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000791</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">multiple testing correction
objective</Literal>
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objective</Literal>

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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000806</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">An objective specification
maintains some or all of the qualities of a material over time.</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000806</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Bjoern
Peters</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000806</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">PERSON:
Bjoern Peters</Literal>
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device</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000832</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A ruler, a microarray scanner,
a Geiger counter.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>

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function inheres.</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000832</IRI>
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workshop</Literal>
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device</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000846</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">is member of
organization</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000846</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000846</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Relating a legal person or
organization to an organization in the case where the legal person or organization has a role as member of
the organization.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000846</IRI>

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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">2009/10/01 Alan Ruttenberg.
    Barry prefers generic is-member-of. Question of what the range should be. For now organization. Is
    organization a population? Would the same relation be used to record members of a population</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000846</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">JZ: Discussed on May 7,
    2012 OBI dev call. Bjoern points out that we need to allow for organizations to be members of
    organizations. And agreed by the other OBI developers. So, human and organization were specified in
    &apos;Domains&apos;. The textual definition was updated based on it.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000846</IRI>
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    Ruttenberg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000846</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Person:Helen
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000846</IRI>
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    Fucoidan-use-case</Literal>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">is member of
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test</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000861</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000861</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000861</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Likelihood-ratio test is a statistical test which evaluates the goodness-of-fit between two
models and whether there is evidence of the need to move from a simple model to a more complicated
one (where the simple model is nested within the complicated one)</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000861</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">date: March 2013
AGB and PRS provide formal definition expressed the test in terms of output and input, specifying the
nature of the variables, the purpose of the test and the distribution used.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000861</IRI>
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ns#PlainLiteral">Alejandra Gonzales-Beltran</Literal>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000861</IRI>
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ns#PlainLiteral">Philippe Rocca-Serra</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">lrtest()
http://hosho.ees.hokudai.ac.jp/~kubo/Rdoc/library/lmtest/html/lrtest.html</Literal>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
survival curve is a report graph which is a graphical representation of data where the percentage of
survival is plotted as a function of time.</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0000889</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000889</IRI>
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ns#PlainLiteral">WEB: http://www.graphpad.com/www/book/survive.htm</Literal>
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3/1/2010</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0000931</IRI>
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intervention design study which is varied between two or more subjects in the study</Literal>
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Peters</Literal>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000953</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000953</IRI>
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that has been sliced and stained for a histology study.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000953</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">processed specimen</Literal>
  </AnnotationAssertion>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">categorical label</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000963</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">The labels
&apos;positive&apos; vs. &apos;negative&apos;, or &apos;left handed&apos;, &apos;right
handed&apos;, &apos;ambidexterous&apos;, or &apos;strongly binding&apos;, &apos;weakly
binding&apos;, &apos;not binding&apos;, or &apos;+++&apos;, &apos;++&apos;, &apos;+&apos;,
&apos;-&apos;, etc. form scales of categorical labels. </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000963</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000963</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A label that is part of a
categorical datum and that indicates the value of the data item on the categorical scale.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000963</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Bjoern Peters</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000963</IRI>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000967</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000967</IRI>
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restrict the location of material entities over time</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000967</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">03/21/2010: Added to allow
classification of children (similar to what we want to do for &apos;measurement device&apos;. Lookint
at what classifies here, we may want to reconsider a contain function assigned to a part of an entity is
necessarily also a function of the whole (e.g. is a centrifuge a container because it has test tubes as
parts?)</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000967</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Bjoern
Peters</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000967</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000968</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A voltmeter is a measurement
device which is intended to perform some measure function.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000968</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">An autoclave is a device that
sterilizes instruments or contaminated waste by applying high temperature and pressure.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000968</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000968</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A material entity that is
designed to perform a function in a scientific investigation, but is not a reagent.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0000968</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Helen
Parkinson</Literal>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0000968</IRI>
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12-17.</Literal>
  </AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0001032</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">light emission
device</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0001032</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A light source is an optical
subsystem that provides light for use in a distant area using a delivery system (e.g., fiber optics)</Literal>
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  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">a device which has a function
to emit light.</Literal>
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Parkinson</Literal>
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device</Literal>
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environmental control device.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001034</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0001034</IRI>
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device is a device which has the function to control some aspect of the environment such as temperature,
or humidity.</Literal>
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  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Helen Parkinson</Literal>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0001442</IRI>
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ns#PlainLiteral">Addition of restriction &apos;output of null hypothesis testing&apos; by AGB and PRS
while working on STATO</Literal>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0001442</IRI>
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ns#PlainLiteral">PERS:Philippe Rocca-Serra</Literal>
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datum</Literal>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0001554</IRI>
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peptide from a complex with an MHC molecule measured by the ratio of bound and unbound peptide per
unit of time.</Literal>
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that represents the number of events occurring over a time interval</Literal>
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Randi Vita</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0001755</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">selection criterion</Literal>
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ns#PlainLiteral">rats should be aged between 6 and 8 weeks and weight between 180-
250grams</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0001755</IRI>
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directive information entity which defines and states a principle of standard by which selection process
may take place.</Literal>
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ns#PlainLiteral">selection rule</Literal>
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ns#PlainLiteral">OBI discussion summarized under the following tracker item :
http://sourceforge.net/p/obi/obi-terms/678/</Literal>
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conclusion</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0001834</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A planned
process in which new information is inferred from existing information.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001834</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001834</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">drawing a
conclusion</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001847</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">ISA alternative term</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001847</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001847</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An alternative
term used by the ISA tools project (http://isa-tools.org).</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001847</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Person:
Alejandra Gonzalez-Beltran</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001847</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Person: Philippe
Rocca-Serra</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001847</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">ISA tools project
(http://isa-tools.org)</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>

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    <IRI>http://purl.obolibrary.org/obo/OBI_0001847</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">ISA alternative term</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001865</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">assay array</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001865</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001865</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A device made to
be used in an analyte assay for immobilization of substances that bind the analyte at regular spatial
positions on a surface.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001865</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">PERSON: Chris
Stoeckert, Jie Zheng, Alan Ruttenberg</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001865</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Penn
Group</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001865</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001865</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">assay array</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001909</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">conclusion based
on data</Literal>
</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001909</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001909</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An information
content entity that is inferred from data.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001909</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In the Philly
2013 workshop, we recognized the limitations of "conclusion textual entity", and we
introduced this as more general. The need for the 'textual entity' term going forward is up for
future debate. </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001909</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Group:2013
Philly Workshop group</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001909</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Group:2013
Philly Workshop group</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
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  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001909</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">conclusion based
on data</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001927</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">specifies value
of</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0001927</IRI>

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    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001927</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
relation between a value specification and an entity which the specification is about.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001927</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001927</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">specifies value
of</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001930</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">categorical value
specification</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001930</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001930</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A value
specification that is specifies one category out of a fixed number of nominal categories</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001930</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">PERSON:Bjoern
Peters</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001930</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0001930</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">categorical value
specification</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001931</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">scalar value
specification</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001931</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001931</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A value
specification that consists of two parts: a numeral and a unit label</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001931</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">PERSON:Bjoern
Peters</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001931</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001931</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">scalar value
specification</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001933</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">value
specification</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001933</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The value of
&apos;positive&apos; in a classification scheme of &quot;positive or negative&quot;; the value of
&apos;20g&apos; on the quantitative scale of mass.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001933</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001933</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An information
content entity that specifies a value within a classification scheme or on a quantitative scale.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001933</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">This term is
currently a descendant of &apos;information content entity&apos;, which requires that it &apos;is
about&apos; something. A value specification of &apos;20g&apos; for a measurement data item of the
mass of a particular mouse &apos;is about&apos; the mass of that mouse. However there are cases where
a value specification is not clearly about any particular. In the future we may change &apos;value
specification&apos; to remove the &apos;is about&apos; requirement.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001933</IRI>
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Peters</Literal>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0001933</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001933</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">value
specification</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001937</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">has specified
value</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001937</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001937</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A relation
between a value specification and a number that quantifies it.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001937</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A range of
&apos;real&apos; might be better than &apos;float&apos;. For now we follow &apos;has measurement
value&apos; until we can consider technical issues with SPARQL queries and reasoning.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001937</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">PERSON: James
A. Overton</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001937</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">OBI</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001937</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001937</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">has specified
value</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001938</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">has value
specification</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001938</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0001938</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A relation
between an information content entity and a value specification that specifies its value.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

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    <IRI>http://purl.obolibrary.org/obo/OBI_0001938</IRI>
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A. Overton</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0001938</IRI>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0001938</IRI>
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specification</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100026</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">organism</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0100026</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">animal</Literal>
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ns#PlainLiteral">fungus</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100026</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">plant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100026</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">virus</Literal>
</AnnotationAssertion>
</AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
<IRI>http://purl.obolibrary.org/obo/OBI_0100026</IRI>
<IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100026</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
material entity that is an individual living system, such as animal, plant, bacteria or virus, that is capable
of replicating or reproducing, growth and maintenance in the right environment. An organism may be
unicellular or made up, like humans, of many billions of cells divided into specialized tissues and
organs.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100026</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">10/21/09: This is a
placeholder term, that should ideally be imported from the NCBI taxonomy, but the high level hierarchy
there does not suit our needs (includes plasmids and &other organisms&)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100026</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">GROUP: OBI Biomaterial
Branch</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100026</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">WEB: http://en.wikipedia.org/wiki/Organism</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100026</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100026</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">organism</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100051</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">specimen</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

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<IRI>http://purl.obolibrary.org/obo/OBI_0100051</IRI>
<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Biobanking of blood taken
and stored in a freezer for potential future investigations stores specimen.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100051</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100051</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
material entity that has the specimen role.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100051</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Note: definition is in
specimen creation objective which is defined as an objective to obtain and store a material entity for
potential use as an input during an investigation.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100051</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: James
Malone</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100051</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Philippe Rocca-
Serra</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100051</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">GROUP: OBI Biomaterial Branch</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100051</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0100051</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">specimen</Literal>
</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">data transformation</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">The application of a
clustering protocol to microarray data or the application of a statistical testing method on a primary data
set to determine a p-value.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
planned process that produces output data from input data.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Elisabetta Manduchi</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Helen Parkinson</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">James Malone</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Melanie Courtot</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>

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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Philippe Rocca-
Serra</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Richard Scheuermann</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Ryan Brinkman</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Tina Hernandez-Boussard</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">data analysis</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">data processing</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Branch editors</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200000</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">data transformation</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200031</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">differential expression analysis objective</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200031</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Analyses implemented by the SAM (http://www-stat.stanford.edu/~tibs/SAM), PaGE
(www.cbil.upenn.edu/PaGE) or GSEA (www.broad.mit.edu/gsea/) algorithms and software</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200031</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200031</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
differential expression analysis objective is a data transformation objective whose input consists of
expression levels of entities (such as transcripts or proteins), or of sets of such expression levels, under
two or more conditions and whose output reflects which of these are likely to have different expression
across such conditions.</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200031</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Elisabetta Manduchi</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200031</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Elisabetta Manduchi</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200031</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200031</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">differential expression analysis objective</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>

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    <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">descriptive statistical calculation objective</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
descriptive statistical calculation objective is a data transformation objective which concerns any
calculation intended to describe a feature of a data set, for example, its center or its variability.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Elisabetta Manduchi</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">James Malone</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Melanie Courtot</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Monnie McGee</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Elisabetta Manduchi</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: James Malone</Literal>

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</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
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ns#PlainLiteral">PERSON: Melanie Courtot</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PERSON: Monnie McGee</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200078</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">descriptive statistical calculation objective</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200083</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">survival analysis objective</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200083</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Kaplan meier data
transformation</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200083</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200083</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A data transformation
objective which has the data transformation aims to model time to event data (where events are e.g. death
and or disease recurrence); the purpose of survival analysis is to model the underlying distribution of
event times and to assess the dependence of the event time on other explanatory variables</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

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    <IRI>http://purl.obolibrary.org/obo/OBI_0200083</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: James
Malone</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200083</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Tina
Boussard</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200083</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">survival analysis</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0200083</IRI>
    <Literal
datatypeIRI="http://www.w3.org/2001/XMLSchema#string">http://en.wikipedia.org/wiki/Survival_analy
sis</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200083</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200083</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">survival analysis objective</Literal>
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ns#PlainLiteral">multiple testing correction method</Literal>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A multiple testing correction
method is a hypothesis test performed simultaneously on M &gt; 1 hypotheses. Multiple testing
procedures produce a set of rejected hypotheses that is an estimate for the set of false null hypotheses
while controlling for a suitably define Type I error rate</Literal>

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  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PAPER: Dudoit, Sandrine
and van der Laan, Mark J. (2008) Multiple Testing Procedures with Applications to Genomics. New
York: Springer , p. 9-10.</Literal>
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logarithmic transformation is a data transformation consisting in the application of the logarithm function
with a given base a (where a>0 and a is not equal to 1) to a (one dimensional) positive real number
input. The logarithm function with base a can be defined as the inverse of the exponential function with
the same base. See e.g. http://en.wikipedia.org/wiki/Logarithm.</Literal>
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ns#PlainLiteral">Regression analysis is a descriptive statistics technique that examines the relation of a
dependent variable (response variable) to specified independent variables (explanatory variables).
Regression analysis can be used as a descriptive method of data analysis (such as curve fitting) without
relying on any assumptions about underlying processes generating the data.</Literal>
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ns#PlainLiteral">Date:2013-11-15
Person: AGB,PRS
Adding restrictions, specifying model + parameter estimation process
change of label from 'regression analysis method' to 'regression
analysis';</Literal>
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ns#PlainLiteral">BOOK: Richard A. Berk, Regression Analysis: A Constructive Critique, Sage
Publications (2004) 978-0761929048</Literal>
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mode calculation is a descriptive statistics calculation in which the mode is calculated which is the most
common value in a data set. It is most often used as a measure of center for discrete data.</Literal>
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doesn't exist yet - (editor note added by James Jan 2008)</Literal>
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median calculation is a descriptive statistics calculation in which the midpoint of the data set (the 0.5

```

quantile) is calculated. First, the observations are sorted in increasing order. For an odd number of observations, the median is the middle value of the sorted data. For an even number of observations, the median is the average of the two middle values.</Literal>

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<AnnotationAssertion>
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ns#PlainLiteral">Quantile transformation which has normalization objective can be used for expression
microarray assay normalization and it is referred to as &quot;quantile normalization&quot;, according to
the procedure described e.g. in PMID 12538238.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationAssertion>
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  <AnnotationAssertion>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
correction objective is a data transformation objective where the aim is to correct for error, noise or other
impairments to the input of the data transformation or derived from the data transformation
itself</Literal>
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<AnnotationAssertion>
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normalization data transformation is a data transformation that has objective normalization.</Literal>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0200170</IRI>
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mean calculation which has center calculation objective is a data transformation in which the center of the
input data is discovered through the calculation of a mean average.</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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center calculation objective is a data transformation objective where the aim is to calculate the center of
an input data set.</Literal>
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calculation.</Literal>
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descriptive statistical calculation data transformation is a data transformation that has objective
descriptive statistical calculation and which concerns any calculation intended to describe a feature of a
data set, for example, its center or its variability.</Literal>
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testing correction method</Literal>
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remove (correct for) erroneous contributions arising from the input data, or the transformation
itself.</Literal>
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  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">James Malone</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
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  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: James
Malone</Literal>
</AnnotationAssertion>
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  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">survival analysis data
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  <IRI>http://purl.obolibrary.org/obo/OBI_0200200</IRI>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200200</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0200200</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">The chi-square test is a data
transformation with the objective of statistical hypothesis testing, in which the sampling distribution of
the test statistic is a chi-square distribution when the null hypothesis is true, or any in which this is
asymptotically true, meaning that the sampling distribution (if the null hypothesis is true) can be made to
approximate a chi-square distribution as closely as desired by making the sample size large
enough.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200200</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">negociation with OBI hence definition and definition source are missing from this
class</Literal>
</AnnotationAssertion>
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Boussard</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200200</IRI>
  <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">chi square test</Literal>
</AnnotationAssertion>
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<IRI>http://purl.obolibrary.org/obo/OBI_0200201</IRI>
<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">ANOVA</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200201</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200201</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">ANalysis Of VAriance (ANOVA) is a data transformation in which a statistical test is
performed to evaluate the null hypothesis that the means computed over the different groups as specified
by the investigator do not differ. The test compares an F-statistics (a ratio of means) to an F-distribution
and produces a p-value, used to reject or accept the null hypothesis given a false positive rate. The test
assumes normality and equivariance of the data.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200201</IRI>
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ns#PlainLiteral">AGB and PRS augmented the class with formal definitions as part of STATO
extension</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0200201</IRI>
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ns#PlainLiteral">Philippe Rocca-Serra</Literal>
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Variance</Literal>
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    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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  <AnnotationAssertion>
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ns#PlainLiteral">stat.anova()</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0200201</IRI>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0300311</IRI>
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ns#PlainLiteral">observation design</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0300311</IRI>
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ns#PlainLiteral">PMID: 12387964.Lancet. 2002 Oct 12;360(9340):1144-9.Deficiency of antibacterial
peptides in patients with morbus Kostmann: an observation study.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
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ns#PlainLiteral">observation design is a study design in which subjects are monitored in the absence of
any active intervention by experimentalists.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">extraction</Literal>
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  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A material separation in which a desired component of an input material is separated from the remainder</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0302884</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Person:Bjoern Peters</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0400065</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0400065</IRI>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0400065</IRI>
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light source is an optical subsystem that provides light for use in a distant area using a delivery system
(e.g., fiber optics). Light sources may include one of a variety of lamps (e.g., xenon, halogen, mercury).
Most light sources are operated from line power, but some may be powered from batteries. They are
mostly used in endoscopic, microscopic, and other examination and/or in surgical procedures. The light
source is part of the optical subsystem. In a flow cytometer the light source directs high intensity light at
particles at the interrogation point. The light source in a flow cytometer is usually a laser.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/OBI_0400065</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Elizabeth M. Goralczyk</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0400065</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">John Quinn</Literal>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0400065</IRI>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0400065</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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13: 978-0471411253</Literal>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0400065</IRI>
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ns#PlainLiteral">light source</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0400078</IRI>
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ns#PlainLiteral">obscuration bar</Literal>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0400078</IRI>
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ns#PlainLiteral">obscuration bar in a flow cytometer</Literal>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0400078</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0400078</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An obscuration bar is a an optical subsystem which is a strip of metal or other material
that serves to block out direct light from the illuminating beam. The obscuration bar prevents the bright
light scattered in the forward directions from burning out the collection device.</Literal>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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ns#PlainLiteral">Daniel Schober</Literal>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Flow Cytometry: First
Principles, by Alice Longobardi Givan, ISBN-10: 0471382248, ISBN-13: 978-0471382249</Literal>

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ns#PlainLiteral">An optical filter is an optical subsystem that selectively transmits light having certain
properties (often, a particular range of wavelengths, that is, range of colours of light), while blocking the
remainder. They are commonly used in photography, in many optical instruments, and to colour stage
lighting Optical filters can be arranged to segregate and collect light by wave length.</Literal>
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photomultiplier tube, a photo diode</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0400082</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0400082</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
photodetector is a device used to detect and measure the intensity of radiant energy through photoelectric
action. In a cytometer, photodetectors measure either the number of photons of laser light scattered on
impact with a cell (for example), or the fluorescence emitted by excitation of a fluorescent dye.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0400082</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">John Quinn</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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ns#PlainLiteral">http://einstein.stanford.edu/content/glossary/glossary.html</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0400110</IRI>
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ns#PlainLiteral">Glass Array Hybridization Cassette</Literal>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000120</IRI>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0400110</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
device which is used to maintain constant contact of a liquid on an array. This can be either a glass vial
or slide.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0400110</IRI>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0400147</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">microarray</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0400147</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">An affymetrix U133 array is
a microarray. Microarrays include 1 and 2-color arrays, custom and commercial arrays (e.g, Affymetrix,
Agilent, Nimblegen, Illumina, etc.) for expression profiling, DNA variant detection, protein binding, and
other genomic and functional genomic assays.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0400147</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0400147</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
processed material that is made to be used in an analyte assay. It consists of a physical immobilisation
matrix in which substances that bind the analyte are placed in regular spatial position.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0400147</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Daniel Schober</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0400147</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">PERSON: Chris
Stoekert</Literal>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0400147</IRI>

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  </AnnotationAssertion>
  <AnnotationAssertion>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">study design</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0500000</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
matched pairs study design describes criteria by which subjects are identified as pairs which then undergo
the same protocols, and the data generated is analyzed by comparing the differences between the paired
subjects, which constitute the results of the executed study design.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0500000</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0500000</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A plan specification
comprised of protocols (which may specify how and what kinds of data will be gathered) that are
executed as part of an investigation and is realized during a study design execution.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0500000</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Editor note: there is at least
an implicit restriction on the kind of data transformations that can be done based on the measured data
available.</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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Stoekert</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0500000</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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    <IRI>http://purl.obolibrary.org/obo/OBI_0500000</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">rediscussed at length (MC/JF/BP). 12/9/08). The definition was clarified to differentiate
it from protocol.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_0500000</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
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  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_0500006</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PMID: 17408389-Purpose: Proliferative vitreoretinopathy (PVR) is the most important
reason for blindness following retinal detachment. Presently, vitreous tamponades such as gas or silicone
oil cannot contact the lower part of the retina. A heavier-than-water tamponade displaces the
inflammatory and PVR-stimulating environment from the inferior area of the retina. The Heavy Silicone
Oil versus Standard Silicone Oil Study (HSO Study) is designed to answer the question of whether a
heavier-than-water tamponade improves the prognosis of eyes with PVR of the lower retina. Methods:
The HSO Study is a multicentre, randomized, prospective controlled clinical trial comparing two
endotamponades within a two-arm parallel group design. Patients with inferiorly and posteriorly located
PVR are randomized to either heavy silicone oil or standard silicone oil as a tamponading agent. Three
hundred and fifty consecutive patients are recruited per group. After intraoperative re-attachment, patients
are randomized to either standard silicone oil (1000 cSt or 5000 cSt) or Densiron((R)) as a tamponading
agent. The main endpoint criteria are complete retinal attachment at 12 months and change of visual
acuity (VA) 12 months postoperatively compared with the preoperative VA. Secondary endpoints include
complete retinal attachment before endotamponade removal, quality of life analysis and the number of

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retina affecting re-operation within 1 year of follow-up. Results: The design and early recruitment phase of the study are described. Conclusions: The results of this study will uncover whether or not heavy silicone oil improves the prognosis of eyes with PVR.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A

parallel group design or independent measure design is a study design which uses unique experimental unit each experimental group, in other word no two individuals are shared between experimental groups, hence also known as parallel group design. Subjects of a treatment group receive a unique combination of independent variable values making up a treatment</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Philippe Rocca-Serra</Literal>

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<IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>

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</AnnotationAssertion>

<AnnotationAssertion>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">PMID: 14744830-Microarrays are powerful tools for surveying the expression levels of many thousands of genes simultaneously. They belong to the new genomics technologies which have important applications in the biological, agricultural and pharmaceutical sciences. There are myriad sources of uncertainty in microarray experiments, and rigorous experimental design is essential for fully realizing the potential of these valuable resources. Two questions frequently asked by biologists on the brink of conducting cDNA or two-colour, spotted microarray experiments are 'Which mRNA samples should be competitively hybridized together on the same slide?' and 'How many times should each slide be replicated?' Early experience has shown that whilst the field of classical experimental design has much to offer this emerging multi-disciplinary area, new approaches which accommodate features specific to the microarray context are needed. In this paper, we propose optimal designs for factorial and time course experiments, which are special designs arising quite frequently in microarray experimentation. Our criterion for optimality is statistical efficiency based on a new notion of admissible designs; our approach enables efficient designs to be selected subject to the information available on the effects of most interest to biologists, the number of arrays available for the experiment, and other resource or practical constraints, including limitations on the amount of mRNA probe. We show that our designs are superior to both the popular reference designs, which are highly inefficient, and to designs incorporating all possible direct pairwise comparisons. Moreover, our proposed designs represent a substantial practical improvement over classical experimental designs which work in terms of standard interactions and main effects. The latter do not provide a basis for meaningful inference on the effects of most interest to biologists, nor make the most efficient use of valuable and limited resources.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://purl.obolibrary.org/obo/OBI_0500020</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Groups of assays that are related as part of a time series.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/OBI_0500020</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">PRS-AGB adding formal restriction on independent variable specification about time (march 2013) and making time series design class a defined class.</Literal>

</AnnotationAssertion>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Philippe Rocca-Serra on behalf of MO</Literal>

</AnnotationAssertion>

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ns#PlainLiteral">material component separation</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0600014</IRI>
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ns#PlainLiteral">Using a cell sorter to separate a mixture of T cells into two fractions; one with surface
receptor CD8 and the other lacking the receptor, or purification</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/OBI_0600014</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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material processing in which components of an input material become segregated in space</Literal>
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ns#PlainLiteral">Bjoern Peters</Literal>
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term</Literal>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_9991118</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_9991118</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">An alternative term used by
the IEDB.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_9991118</IRI>
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Greenbaum, Bjoern Peters</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/OBI_9991118</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">IEDB</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/OBI_9991118</IRI>
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term</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/RO_0001000</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">derives from</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/RO_0001000</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/RO_0001000</IRI>
    <IRI>http://purl.obolibrary.org/obo/ro.owl</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/RO_0001000</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">derives from</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000001</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">property to indicate that a design declares a variable; the inverse property is &apos;is
declared by&apos;</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Alejandra Gonzalez-
Beltran</Literal>
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  <AnnotationAssertion>
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Serra</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000001</IRI>
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ns#PlainLiteral">declares</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000002</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">digital images may be stored as electronic file in TIFF format on mass memory storage
devices</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000002</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000002</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an electronic file is an information content entity which conforms to a specification or
format and which is meant to hold data and information in digital form, accessible to software
agents</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000002</IRI>
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Beltran</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000002</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Philippe Rocca-
Serra</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000002</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">STATO</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000002</IRI>
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ns#PlainLiteral">digital file</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000004</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">property to indicate the variables declared by a design; the inverse property is
&apos;declares&apos;</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

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    <IRI>http://purl.obolibrary.org/obo/STATO_0000004</IRI>
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Beltran</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000004</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Orlaith Burke</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000004</IRI>
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Serra</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000004</IRI>
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declared by</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000006</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000006</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">x-
axis is a cartesian coordinate axis which is orthogonal to the y-axis and the z-axis</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000006</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Alejandra Gonzalez-
Beltran</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000006</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Orlaith Burke</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Philippe Rocca-
Serra</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000006</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">STATO</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000006</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">x-
axis</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000007</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000007</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an axis is a line graph used as reference line for the measurement of
coordinates.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000007</IRI>
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Beltran</Literal>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Orlaith Burke</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000007</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Philippe Rocca-
Serra</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000007</IRI>
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ns#PlainLiteral">http://www.oxforddictionaries.com/definition/english/axis</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000007</IRI>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000008</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">y-
axis is a cartesian coordinate axis which is orthogonal to the x-axis and the z-axis</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000008</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Alejandra Gonzalez-
Beltran</Literal>
</AnnotationAssertion>
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</AnnotationAssertion>
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Serra</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000008</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">y-
axis</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000009</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000009</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A Cartesian
coordinate system is a coordinate system that specifies each point uniquely in a plane by a pair of

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numerical coordinates, which are the signed distances from the point to two fixed perpendicular directed lines, measured in the same unit of length.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000009</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Alejandra

Gonzalez-Beltran</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000009</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Orlaith Burke</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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Serra</Literal>

</AnnotationAssertion>

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</AnnotationAssertion>

<AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/STATO_0000009</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral"></Literal>

</AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/STATO_0000009</IRI>

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<AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000010</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In geometry, a coordinate system is a system which uses one or more numbers, or coordinates, to uniquely determine the position of a point or other geometric element on a manifold such as Euclidean space.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

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Gonzalez-Beltran</Literal>
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  <AnnotationAssertion>
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Serra</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000010</IRI>
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ns#PlainLiteral">http://en.wikipedia.org/wiki/Coordinate_system</Literal>
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  <AnnotationAssertion>
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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral"></Literal>
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  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000010</IRI>
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ns#PlainLiteral">coordinate system</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000011</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000011</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
cartesian axis is one of 3 the axis in a cartesian coordinate system defining a referential in 3 dimensions.
each of the axis is orthogonal to the other 2</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000011</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Alejandra Gonzalez-
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  <AnnotationAssertion>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000011</IRI>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Philippe Rocca-
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000011</IRI>
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ns#PlainLiteral">rectangular coordinate axis</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000011</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">adapted from Wolfram Alpha:
https://www.wolframalpha.com/input/?i=cartesian+coordinates&lk=4&num=6&lk=4&am
p;num=6
  </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000011</IRI>
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ns#PlainLiteral">cartesian coordinate axis</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000012</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">z-
axis is a cartesian coordinate axis which is orthogonal to the x-axis and the y-axis</Literal>
  </AnnotationAssertion>
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Beltran</Literal>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Orlaith Burke</Literal>
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Serra</Literal>
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axis</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000013</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral"> a 2 dimensional
cartesian coordinate system is a cartesian coordinate system which defines 2 orthogonal one dimensional
axes and which may be used to describe a 2 dimensional spatial region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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Gonzalez-Beltran</Literal>
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Serra</Literal>
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  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000013</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">two dimensional cartesian coordinate system</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000016</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In mathematics,
the polar coordinate system is a two-dimensional coordinate system in which each point on a plane is
determined by a distance from a fixed point and an angle from a fixed direction.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000016</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Alejandra
Gonzalez-Beltran</Literal>
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Serra</Literal>
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ns#PlainLiteral">http://en.wikipedia.org/wiki/Polar_coordinate_system</Literal>
  </AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000016</IRI>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000017</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Wilks&apos; lambda distribution (named for Samuel S. Wilks), is a probability
distribution used in multivariate hypothesis testing, especially with regard to the likelihood-ratio test and
Multivariate analysis of variance. It is a multivariate generalization of the univariate F-distribution, and
generalizes the F-distribution in the same way that the Hotelling&apos;s T-squared distribution
generalizes Student&apos;s t-distribution.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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ns#PlainLiteral">wikipedia:
last accessed: 2013-09-11
http://en.wikipedia.org/wiki/Wilks%27_lambda_distribution</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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ns#PlainLiteral">Wilk&apos;s lambda distribution</Literal>
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cartesian spatial coordinate datum chosen as a fixed point of reference in a three dimensional spatial
region.</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000019</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">
normal distribution hypothesis is a goodness of fit hypothesis stating that the distribution computed from
the sample population fits a normal distribution</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000019</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Alejandra Gonzalez-
Beltran</Literal>
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cartesian spatial coordinate datum chosen as a fixed point of reference in a two dimensional spatial
region.</Literal>
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Serra</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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confidence interval which covers 90% of the sampling distribution, meaning that there is a 90% risk of
false positive (type I error)</Literal>
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  <AnnotationAssertion>
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Gonzalez-Beltran</Literal>
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Serra</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationAssertion>
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dimensional cartesian coordinate system is a cartesian coordinate system which defines 3 orthogonal one
dimensional axis and which may be used to describe a 3 dimensional spatial region</Literal>
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Gonzalez-Beltran</Literal>
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The distribution of the statistic

$$\frac{(\bar{x}_{(k)} - \bar{x}_{(1)}) / (s \sqrt{\ln 2})}{s \sqrt{\ln 2}}$$

where random samples of size n have been taken from k independent and identically distributed normal populations, with $\bar{x}_{(1)}$ and $\bar{x}_{(k)}$ being, respectively, the smallest and largest of the k sample means, and s^2 being the pooled estimate of the common variance. This statistic is particularly used in multiple comparison tests.</Literal>

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<http://www.oxfordreference.com/view/10.1093/acref/9780199541454.001.0001/acref-9780199541454-e-1588>

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an association between a predictor variable assuming discrete values and a response variable also
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measure of central tendency is a data item which attempts to describe a set of data by identifying the
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cast members of a set into 2 disjoint groups depending on whether the element have a given
property/feature or not.</Literal>
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last accessed: 2013-11-21</Literal>

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  <IRI>http://purl.obolibrary.org/obo/STATO_0000032</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">an alternative term used for STATO statistical ontology and ISA team</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000032</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
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ns#PlainLiteral">The mode is a data item which corresponds to the most frequently occurring number in
a set of numbers.</Literal>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scipy.stats.mode(a, axis=0)

http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.mode.html#scipy.stats.mode

source:
https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L586</Literal>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
model parameter is a data item which is part of a model and which is meant to characterize an theoritecal
or unknown population. a model parameter may be estimated by considering the properties of samples
presumably taken from the theoritecal population</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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Serra</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000035</IRI>
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measure of variation which describes the difference between the lowest score and the highest score in a
set of numbers (a data set)</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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Gonzalez-Beltran</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000035</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">range(..., na.rm = FALSE)
http://stat.ethz.ch/R-manual/R-patched/library/base/html/range.html</Literal>
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  <AnnotationAssertion>
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ns#PlainLiteral">Outliers are deviant scores that have been legitimately gathered and are not due to
equipment failures.</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://stats.stackexchange.com/questions/50623/r-calculating-mean-and-standard-error-
of-mean-for-factors-with-lm-vs-direct</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  </AnnotationAssertion>

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ns#PlainLiteral">The standard error of the mean (SEM) is data item denoting the standard deviation of
the sample-mean's estimate of a population mean.
It is calculated by dividing the sample standard deviation (i.e., the sample-based estimate of the standard
deviation of the population) by the square root of n , the size (number of observations) of the
sample.</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000037</IRI>
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ns#PlainLiteral">adapted from wikipedia (https://en.wikipedia.org/wiki/Standard\_error)</Literal>
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ns#PlainLiteral">scipy.stats.sem(a, axis=0, ddof=1)

```

<http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.sem.html#scipy.stats.sem>

source:

```

https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L1928</Literal>
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statistic is a measurement datum to describe a dataset or a variable. It is generated by a calculation on set
of observed data.</Literal>
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R command syntax or link to a R documentation in support of Statistical Ontology Classes or Data
Transformations</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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command</Literal>
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false positive rate whose value is 5 per cent</Literal>
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ns#PlainLiteral">Following discussion with OBCS, deprecated of class STATO_0000043 and creation of
instance</Literal>
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associated with the factor levels of only one independent variable. The null hypothesis is an absence of
difference between the means calculated for each of the groups. The test assumes normality and
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associated the factor levels of exactly 2 independent variables. The null hypothesis is an absence of
difference between the means calculated for each of the groups. The test assumes normality and
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entity</Literal>
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are associated to the factor levels of more than 2 independent variables. The null hypothesis is an absence
of difference between the means calculated for each of the groups. The test assumes normality and
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ns#PlainLiteral">signal to noise ratio is a measurement datum comparing the amount of meaningful,
useful or interesting data (the signal) to the amount of irrelevant or false data (the noise). Depending on
the field and domain of application, different variables will be used to determinate a 'signal to noise
ratio'. In statistics, the definition of signal to noise ratio is the ratio of the mean of a measurement
to its standard deviation. It thus corresponds to the inverse of the coefficient of variation</Literal>
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last accessed: 2013-10-18</Literal>
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ns#PlainLiteral">Poisson distribution is a probability distribution used to model the number of events
occurring within a given time interval. It is defined by a real number ( $\hat{\lambda}$ ) and an integer k representing
the number of events and a function.
The expected value of a Poisson-distributed random variable is equal to  $\hat{\lambda}$  and so is its
variance.</Literal>
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http://stat.ethz.ch/R-manual/R-patched/library/stats/html/Poisson.html</Literal>
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poisson</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000052</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Z-test is a statistical test which evaluate the null hypothesis that the means of 2
populations are equal and returns a p-value.</Literal>
  </AnnotationAssertion>

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</AnnotationAssertion>
<AnnotationAssertion>
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ns#PlainLiteral">simple.z.test(x, sigma, conf.level=0.95)
http://www.inside-r.org/packages/cran/UsingR/docs/simple.z.test</Literal>
</AnnotationAssertion>
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000052</IRI>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000053</IRI>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a false positive rate is a data item which accounts for the proportion of incorrect rejection of a true null hypothesis.

</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

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</AnnotationAssertion>

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</AnnotationAssertion>

<AnnotationAssertion>

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</AnnotationAssertion>

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</AnnotationAssertion>

<AnnotationAssertion>

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</AnnotationAssertion>

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</AnnotationAssertion>

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</AnnotationAssertion>

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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
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ns#PlainLiteral">homoskedasticity is a null hypothesis stating that all variances under consideration are
homogenous</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000054</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000056</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
null hypothesis which states that no linkage exists between 2 categorical variables</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000056</IRI>
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independent</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>

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  <IRI>http://purl.obolibrary.org/obo/STATO_0000057</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000057</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
null hypothesis is a statistical hypothesis that is tested for possible rejection under the assumption that it is
true (usually that observations are the result of chance). The concept was introduced by R. A. Fisher.
The hypothesis contrary to the null hypothesis, usually that the observations are the result of a real effect,
is known as the alternative hypothesis.[wolfram alpha]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000057</IRI>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000058</IRI>
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ns#PlainLiteral">goodness of fit hypothesis is a null hypothesis stating that the distribution computed
from the sample population fits a theoretical distribution or that a dataset can be correctly explained by a
model</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000058</IRI>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000059</IRI>
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ns#PlainLiteral">the Student's t distribution is a continuous probability distribution which arises
when estimating the mean of a normally distributed population in situations where the sample size is
small and population standard deviation is unknown.</Literal>
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ns#PlainLiteral">STATO, adapted from wikipedia (http://en.wikipedia.org/wiki/Student's\_t-
distribution)</Literal>
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distribution</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000059</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">dt(x, df, ncp, log = FALSE)

http://stat.ethz.ch/R-manual/R-patched/library/stats/html/TDist.html</Literal>
</AnnotationAssertion>

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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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is a null hypothesis stating that there are no differences observed between group of subjects.</Literal>
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ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000062</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">is
a null hypothesis stating that there are no difference observed across a series of measurements made one
same subject.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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statistics, a statement that can be tested.[wolfram alpha]</Literal>
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ns#PlainLiteral">Cleveland dot plot is a dot plot which plots points that each belong to one of several
categories. They are an alternative to bar charts or pie charts, and look somewhat like a horizontal bar
chart where the bars are replaced by a dots at the values associated with each category. Compared to
(vertical) bar charts and pie charts, Cleveland argues that dot plots allow more accurate interpretation of
the graph by readers by making the labels easier to read, reducing non-data ink (or graph clutter) and
supporting table look-up.which</Literal>
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ns#PlainLiteral">adapted from Wikipedia:
http://en.wikipedia.org/wiki/Dot_plot_(statistics)

```

and

Cleveland, William S. (1993). Visualizing Data. Hobart Press. ISBN 0-9634884-0-6.
hdl:2027/mdp.39015026891187.</Literal>

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</AnnotationAssertion>
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dotchart(x, labels = NULL, groups = NULL, gdata = NULL,
  cex = par(&quot;cex&quot;), pch = 21, gpch = 21, bg = par(&quot;bg&quot;),
  color = par(&quot;fg&quot;), gcolor = par(&quot;fg&quot;), lcolor = &quot;gray&quot;,
  xlim = range(x[is.finite(x)]),
  main = NULL, xlab = NULL, ylab = NULL, ...)</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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continuousprobability distribution is a probability distribution which is defined by a probability density
function</Literal>
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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">adapted from Wikipedia

http://en.wikipedia.org/wiki/Probability_distribution#Continuous_probability_distribution

last accessed:

14/01/2014</Literal>

</AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>

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<IRI>http://purl.obolibrary.org/obo/STATO_0000068</IRI>

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</AnnotationAssertion>

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http://hosho.ees.hokudai.ac.jp/~kubo/Rdoc/library/e1071/html/skewness.html</Literal>
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calculation that can vary. In statistics, the number of degrees of freedom  $\hat{P}/2$  is equal to N-1 in the case of
the direct measurement of a quantity estimated by the arithmetic mean of N independent
observations.</Literal>
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association/linkage/independence of 2 dichotomous variables while introducing a correction for using the
continous Chi-squared distribution for the test.
To reduce the error in approximation, Frank Yates, an English statistician, suggested a correction for
continuity that adjusts the formula for Pearson&apos;s chi-squared test by subtracting 0.5 from the
difference between each observed value and its expected value in a 2 Å— 2 contingency table. This
reduces the chi-squared value obtained and thus increases its p-value.</Literal>
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<IRI>http://purl.obolibrary.org/obo/STATO_0000070</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">STATO, adapted from wikipedia
(http://en.wikipedia.org/wiki/Yates&apos;s_correction_for_continuity) polled in June 2013</Literal>
</AnnotationAssertion>
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<IRI>http://purl.obolibrary.org/obo/STATO_0000070</IRI>
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</AnnotationAssertion>
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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000070</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">chisq.test(x, y =
NULL, correct = TRUE)
http://stat.ethz.ch/R-manual/R-patched/library/stats/html/chisq.test.html</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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<IRI>http://purl.obolibrary.org/obo/STATO_0000070</IRI>

```

```

    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Yate's corrected Chi-Squared test</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000071</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000071</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">reaction rate is a measurement datum which represents the speed of a chemical reaction
turning reactive species into product species of event (i.e the number of such conversions)s occurring over
a time interval</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000071</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
  </AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000071</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Orlaith Burke</Literal>
  </AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000071</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Philippe Rocca-Serra</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000071</IRI>
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ns#PlainLiteral">reaction rate</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000073</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>

```

```

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000073</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Fisher's exact test is a statistical test used to determine if there are nonrandom
associations between two categorical variables.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000073</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">duplicate with OBI_0200176. so either MIREOT and add metadata and axioms or move
from OBI</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000073</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
</AnnotationAssertion>
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<AnnotationAssertion>
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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Philippe Rocca-Serra</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000073</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://mathworld.wolfram.com/FishersExactTest.html</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000073</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral"></Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000073</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">fisher.test(x) function, where x is a matrix</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000391"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000073</IRI>

```

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">scipy.stats.fisher_exact(table, alternative='two-sided')</Literal>

http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.fisher_exact.html#scipy.stats.fisher_exact

source:

<https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L2485></Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000073</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Fisher's exact test</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>

<IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The Mann-Whitney U-test is a non-parametric statistical testing procedure which allows two groups (or conditions or treatments) to be compared without making the assumption that values are normally distributed.

The Mann-Whitney test is the non-parametric equivalent of the t-test for independent samples</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>

<Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Orlaith Burke</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Philippe Rocca-Serra</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">U test</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
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<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Wilcoxon rank-
sum test</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">rank-sum test for the comparison of two samples</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">adapted from http://udel.edu/~mcdonald/statkruskalwallis.html
and from http://en.wikipedia.org/wiki/Mann%E2%80%93Whitney_U
last accessed [2014-03-04]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>
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ns#PlainLiteral">Wilcoxon Rank-Sum test</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">wilcox.test(dependent variable ~ independant variable, data = dataset)
http://stat.ethz.ch/R-manual/R-patched/library/stats/html/wilcox.test.html</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000391"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scipy.stats.mannwhitneyu(x, y, use_continuity=True)
http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.mannwhitneyu.html#scipy.stats.mannwhitn
eyu
source:
https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L4049</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000391"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scipy.stats.ranksums(x, y)

```


<http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.ranksums.html#scipy.stats.ranksums>

source:

<https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L4103>

```

</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000076</IRI>
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ns#PlainLiteral">Mann-Whitney U-test</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000080</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000080</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the Brown Forsythe test is a statistical test which evaluates if the variance of different
groups are equal. It relies on computing the median rather than the mean, as used in the Levene&apos;s
test for homoschedacity.
This test maybe used to, for instance, ensure that the conditions of applications of ANOVA are
met.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000080</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000080</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Orlaith Burke</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000080</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000080</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">adapted from Wikipedia and Brown, M. B., and A. B. Forsythe. 1974a. The small
sample behavior of some statistics which test the equality of several means. Technometrics, 16, 129-
132.</Literal>
</AnnotationAssertion>

```

```

<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000080</IRI>
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ns#PlainLiteral"></Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000080</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://www.statmethods.net/stats/anovaAssumptions.html

```

The `hovPlot()` function in the `HH` package provides a graphic test of homogeneity of variances based on Brown-Forsyth. In the following example, `y` is numeric and `G` is a grouping factor. Note that `G` must be of type factor.

```

# Homogeneity of Variance Plot
library(HH)
hov(y~G, data=mydata)
hovPlot(y~G,data=mydata)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000080</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Brown Forsythe test</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000081</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Pearson's Chi-Squared test is a statistical null hypothesis test which is used to
either evaluate goodness of fit of dataset to a Chi-Squared distribution or used to test independence of 2
categorical variables (ie absence of association between those variables).</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000081</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000081</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Orlaith Burke</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000081</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Philippe Rocca-Serra</Literal>
</AnnotationAssertion>

```

```

<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000081</IRI>
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ns#PlainLiteral">Chi2 test for independence</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000081</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">adapted from:

```

<http://stat.ethz.ch/R-manual/R-patched/library/stats/html/chisq.test.html>

and

```

http://en.wikipedia.org/wiki/Pearson&apos;s_chi-squared_test</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000081</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral"></Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000081</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://stat.ethz.ch/R-manual/R-patched/library/stats/html/chisq.test.html

```

```

chisq.test(x, y = NULL, correct = TRUE,
  p = rep(1/length(x), length(x)), rescale.p = FALSE,
  simulate.p.value = FALSE, B = 2000)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000081</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://www.inside-r.org/packages/cran/nortest/docs/pearson.test

```

```

pearson.test(x) function, where x is a numeric vector</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000391"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000081</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.chi2_contingency.html#s
cipy.stats.chi2_contingency</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000081</IRI>

```

```

    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Pearson's Chi square test of independence between categorical
variables</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000428</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000082</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
fixed effect model is a statistical model which represents the observed quantities in terms of explanatory
variables that are treated as if the quantities were non-random.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000082</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PRS: this is a stub and more work is needed to reconcile conflicting
definitions</Literal>
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that a sample is drawn from a population that follows a specific continuous probability
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test</Literal>
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ns#PlainLiteral">scipy.stats.kstwobign = &lt;scipy.stats._continuous_distns.kstwobign_gen object at
0x7f6169f842d0&gt;

http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.kstwobign.html#scipy.stats.kstwobign

source:
https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/_continuous_distns.py</Literal>
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ns#PlainLiteral">scipy.stats.mstats.ks_twosamp(data1, data2,alternative='two-sided')

http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.mstats.ks_twosamp.html

source code:
https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/mstats_basic.py#L821</Literal>
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ns#PlainLiteral">an F-test is a statistical test which evaluates that the computed test statistics follows an
F-distribution under the null hypothesis. The F-test is sensitive to departure from normality. F-test arise
when decomposing the variability in a data set in terms of sum of squares.</Literal>
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possible values</Literal>
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case-control study design is a observation study design which assess the risk of particular outcome (a trait
or a disease) associated with an event (either an exposure or endogenous factor). A case-control study
design therefore declares an exposure variable which is dichotomous in nature (exposed/non-exposed)
and an outcome variable, which is also dichotomous (case or control), thus giving the name to the design.
During the execution of the design, a case control study defines a population and counts the events to
determine their frequency.</Literal>
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part&apos; exactly 1 (&apos;categorical measurement datum&apos;
and (&apos;has category label&apos; exactly 2 &apos;categorical label&apos;))</Literal>
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ns#PlainLiteral">The Wilcoxon signed rank test is a statistical test which tests the null hypothesis that the
median difference between pairs of observations is zero. This is the non-parametric analogue to the paired
t-test, and should be used if the distribution of differences between pairs may be non-normally distributed.

```

The procedure involves a ranking, hence the name. The absolute value of the differences between observations are ranked from smallest to largest, with the smallest difference getting a rank of 1, then next larger difference getting a rank of 2, etc. Ties are given average ranks. The ranks of all differences in one direction are summed, and the ranks of all differences in the other direction are summed. The smaller of these two sums is the test statistic, *W* (sometimes symbolized *T*_s). Unlike most test statistics, smaller values of *W* are less likely under the null hypothesis.</Literal>

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ns#PlainLiteral">scipy.stats.wilcoxon(x, y=None, zero_method=&apos;wilcox&apos;, correction=False)

```

<http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.wilcoxon.html#scipy.stats.wilcoxon>

source:

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https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L4103</Literal>
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ns#PlainLiteral">paired t-test is a statistical test which is specifically designed to analysis differences
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  <AnnotationAssertion>
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ns#PlainLiteral">http://stat.ethz.ch/R-manual/R-patched/library/stats/html/t.test.html
t.test(dependent variable ~ independant variable, data = dataset, var.equal = FALSE, paired= TRUE)
</Literal>
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ns#PlainLiteral">scipy.stats.ttest_rel(a, b, axis=0)
http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.ttest_rel.html#scipy.stats.ttest_rel
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https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L3389</Literal>
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a statistical sample required to reach a desired significance level given a particular statistical
test</Literal>
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ns#PlainLiteral">Hotelling&apos;s T2 test is a statistical test which is a generalization of Student&apos;s
T-test to a assess if the means of a set of variables remains unchanged when studying 2 populations. It is a
type of multivariate analysis</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000098</IRI>
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It assumes that the dataset being analysed consists of a hierarchy of different populations whose
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ns#PlainLiteral">standardized mean difference is data item computed by forming the difference between
two means, divided by an estimate of the within-group standard deviation.
It is used to provide an estimation of the effect size between two treatments when the predictor
(independent variable) is categorical and the response(dependent) variable is continuous</Literal>
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DOI: 10.1111/j.1469-185X.2007.00027.x</Literal>
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numerator</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000102</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">relationship between a planned process and the plan specification that it carries out; it is
defined as equivalent to the composed relationship (realizes o concretizes)</Literal>
  </AnnotationAssertion>
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Beltran</Literal>
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Serra</Literal>
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ns#PlainLiteral">the multinomial distribution is a probability distribution which gives the probability of
any particular combination of numbers of successes for various categories defined in the context of n
independent trials each of which leads to a success for exactly one of k categories, with each category
having a given fixed success probability.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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ns#PlainLiteral">adapted from
http://mathworld.wolfram.com/MultinomialDistribution.html
and
http://en.wikipedia.org/wiki/Multinomial_distribution</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000103</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">dmultinom(x, size = NULL, prob, log = FALSE)

http://stat.ethz.ch/R-manual/R-patched/library/stats/html/Multinom.html</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000103</IRI>

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z-score (also known as z-value, standard score, or normal score) is a measure of the divergence of an
individual experimental result from the most probable result, the mean. Z is expressed in terms of the
number of standard deviations from the mean value.</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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ns#PlainLiteral">https://controls.engin.umich.edu/wiki/index.php/Basic_statistics:_mean,_median,_avera
ge,_standard_deviation,_z-scores,_and_p-value#Z-Scores</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scipy.stats.zscore(a, axis=0, ddof=0)

```

<http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.zscore.html#scipy.stats.zscore>

source:

```

https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L1977</Literal>
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statistical model is an information content entity which is a formalization of relationships between
variables in the form of mathematical equations. A statistical model describes how one or more random
variables are related to one or more other variables. The model is statistical as the variables are not
deterministically but stochastically related.</Literal>
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ns#PlainLiteral">adapted from Wikipedia:
http://en.wikipedia.org/wiki/Statistical_model
last accessed: 14/01/2014</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000428</IRI>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000108</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">linear regression model is a model which attempts to explain data distribution associated
with response/dependent variable in terms of values assumed by the independent variable uses a linear
function or linear combination of the regression parameters and the predictor/independent variable(s).
linear regression modeling makes a number of assumptions, which includes homoskedasticity (constance
of variance)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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ns#PlainLiteral">STATO, adapted from wikipedia (http://en.wikipedia.org/wiki/Linear_regression)
polled in June 2013</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
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ns#PlainLiteral">linear regression for analysis of continuous dependent variable</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000110</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">This is the
inverse of &apos;specifies value of&apos; and it is intended to say things such as
&apos;compound&apos; &apos;assumes values specified by&apos; &apos;independent variable
specification&apos;</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
relation between an entity and a value specification, where the value specification is about the
entity.</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000113</IRI>
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ns#PlainLiteral">variance is a data item about a random variable or probability distribution. it is
equivalent to the square of the standard deviation. It is one of several descriptors of a probability
distribution, describing how far the numbers lie from the mean (expected value).The variance is the
second moment of a distribution.</Literal>
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http://stat.ethz.ch/R-manual/R-patched/library/stats/html/cor.html</Literal>
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member of</Literal>
  </AnnotationAssertion>
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the data say&quot;.</Literal>
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https://www.stat.fi/isi99/proceedings/arkisto/varasto/roya0578.pdf</Literal>
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discrete probability distribution is a probability distribution which is defined by a probability mass

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function where the random variable can only assume a finite number of values or infinitely countable values</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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http://en.wikipedia.org/wiki/Probability_distribution#Discrete_probability_distribution

last accessed:

14/01/2014</Literal>

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</AnnotationAssertion>

<AnnotationAssertion>

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ns#PlainLiteral">model parameter estimation is a data transformation that finds parameter values (the
model parameter estimates) most compatible with the data as judged by the model.</Literal>
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https://github.com/ISA-tools/stato/issues/18</Literal>
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ns#PlainLiteral">the objective of a data transformation to evaluate a null hypothesis of absence of linkage
between variables.</Literal>
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is a correlation coefficient which is computed over the frequency of 2 dichotomous variable and is used as
a measure of Linkage Disequilibrium and as input data item to the creation of an LD plot</Literal>
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stratification rule/criteria is a criteria used to determine population strata so that a stratification process
implementing the rule can result in any member of the total population being assigned to one and only
one stratum</Literal>
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polled on June 7th,2013</Literal>
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on a simple scale. Dot plots are used for continuous, quantitative, univariate data. Data points may be
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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">adapted from Wikipedia:

Wilkinson, Leland (1999). "Dot plots". The American Statistician (American Statistical Association) 53 (3): 276–281. doi:10.2307/2686111</Literal>

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relationship (data property) between an entity and its value.</Literal>
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sphericity test is a null hypothesis statistical testing procedure which posits a null hypothesis of equality
of the variances of the differences between levels of the repeated measures factor</Literal>
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ns#PlainLiteral">Hotelling T squared distribution is a probability distribution used in multivariate
hypothesis testing, which is a univariate distribution proportional to the F-distribution and arises
importantly as the distribution of a set of statistics which are natural generalizations of the statistics
underlying Student&apos;s t-distribution.
In particular, the distribution arises in multivariate statistics in undertaking tests of the differences
between the (multivariate) means of different populations, where tests for univariate problems would
make use of a t-test.
The distribution is named for Harold Hotelling, who developed it[1] as a generalization of
Student&apos;s t-distribution.
This distribution is commonly used to describe the sample Mahalanobis distance between two
populations.</Literal>
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&quot;http://en.wikipedia.org/wiki/Hotelling&apos;s_T-squared_distribution&quot;
last polled: 2013-11-09</Literal>
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post-hoc analysis is a statistical test carried out following an analysis of variance which ruled out the null
hypothesis of absence of difference between group which allows identifying which groups
differ.</Literal>
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last accessed: 2013-11-15
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ns#PlainLiteral">strictly standardized mean difference (SSMS) is a standardized mean difference which
corresponds to the ratio of mean to the standard deviation of the difference between two groups.
SSMD directly measures the magnitude of difference between two groups.
SSMD is widely used in High Content Screen for hit selection and quality control.

```

When the data is preprocessed using log-transformation as normally done in HTS experiments, SSMD is the mean of log fold change divided by the standard deviation of log fold change with respect to a negative reference.

In other words, SSMD is the average fold change (on the log scale) penalized by the variability of fold change (on the log scale).

For quality control, one index for the quality of an HTS assay is the magnitude of difference between a positive control and a negative reference in an assay plate. For hit selection, the size of effects of a compound (i.e., a small molecule or an siRNA) is represented by the magnitude of difference between the compound and a negative reference. SSMD directly measures the magnitude of difference between two groups. Therefore, SSMD can be used for both quality control and hit selection in HTS experiments.</Literal>

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several random samples are similar</Literal>
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2x2 contingency table is a contingency table build for 2 dichotomous variables (i.e. 2 categorical
variables, each with only 2 possible outcomes). It is the simplest of contingency tables</Literal>
</AnnotationAssertion>
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ns#PlainLiteral">xtabs(formula = ~., data = parent.frame(), subset, sparse = FALSE,
na.action, exclude = c(NA, NaN), drop.unused.levels = FALSE)

```

<http://stat.ethz.ch/R-manual/R-patched/library/stats/html/xtabs.html>

flat contingency tables:

`fable(x, ...)`

```

http://stat.ethz.ch/R-manual/R-patched/library/stats/html/fable.html</Literal>
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```

contingency table is a data item which displays the (multivariate) frequency distribution of the possible values of categorical variables.

The first row of the table corresponds to categories of one categorical variable, the first column of the table corresponds to categories of the other categorical variable, the cells corresponding to each combination of categories is filled with the observed occurrences in the sample being considered.

The table also contains marginal total (marginal sums) and grand total of the occurrences

The term contingency table was first used by Karl Pearson in "On the Theory of Contingency and Its Relation to Association and Normal Correlation", part of the Drapers' Company Research Memoirs Biometric Series I published in 1904.</Literal>

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</AnnotationAssertion>
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na.action, exclude = c(NA, NaN), drop.unused.levels = FALSE)

```

<http://stat.ethz.ch/R-manual/R-patched/library/stats/html/xtabs.html>

flat contingency tables:

`fable(x, ...)`

<http://stat.ethz.ch/R-manual/R-patched/library/stats/html/fable.html></Literal>

```

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linearly related.</Literal>
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Bayesian model selection is a data transformation which is based on Bayesian statistics to compute Bayes
factor in order to evaluate which model best explains data.</Literal>
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ns#PlainLiteral">for example , model parameter estimates could be produced using regression analysis
(used in a model estimation process) , which attempts to express the response variable in terms of
function of predictor variable and model parameters.</Literal>
</AnnotationAssertion>

```

```

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model parameter estimate is a data item which results from a model parameter estimation process and
which provides a numerical value about a model parameter.</Literal>
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https://github.com/ISA-tools/stato/issues/18</Literal>
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ns#PlainLiteral">the geometric distribution is a negative binomial distribution where r is 1.
It is useful for modeling the runs of consecutive successes (or failures) in repeated independent trials of a
system.

```

The geometric distribution models the number of successes before one failure in an independent succession of tests where each test results in success or failure.

The geometric distribution with prob = p has density

$$p(x) = p (1-p)^x$$

for $x = 0, 1, 2, \dots$; $0 < p < 1$.

If an element of x is not integer, the result of dgeom is zero, with a warning.

The quantile is defined as the smallest value x such that $F(x) \geq p$, where F is the distribution function.</Literal>

```

</AnnotationAssertion>
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ns#PlainLiteral">dgeom(x, prob, log = FALSE)
http://stat.ethz.ch/R-manual/R-patched/library/stats/html/Geometric.html</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
minimum value is a data item which denotes the smallest value found in a dataset or resulting from a
calculation.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000150</IRI>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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resulting from a calculation.</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000152</IRI>
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quartile is a quantile which splits data into sections accrued of 25% of data, so the first quartile delineates
25% of the data, the second quartile delineates 50% of the data and the third quartile, 75 % of the
data</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000152</IRI>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000152</IRI>
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ns#PlainLiteral">STATO, adapted from wikipedia (http://en.wikipedia.org/wiki/Quartile)</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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```

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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000153</IRI>
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  <AnnotationAssertion>
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ns#PlainLiteral">Hotelling&apos;s T2 test is a statistical test which is a generalization of Student&apos;s
T-test to a assess if the means of a set of variables remains unchanged when studying 2 populations. It is a
type of multivariate analysis</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000153</IRI>
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```

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  <IRI>http://purl.obolibrary.org/obo/STATO_0000153</IRI>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000153</IRI>
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ns#PlainLiteral">one sample Hotelling T2 test</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000154</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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violin plot is a plot combining the features of box plot and kernel density plot. The violin plot is therefore
similar to box plot but it incorporated in the display the probability density of the data at different values.
Typically violin plots will include a marker for the median of the data and a box indicating the
interquartile range, as in standard box plots.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000154</IRI>
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Gonzalez-Beltran</Literal>
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<AnnotationAssertion>
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  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Philippe Rocca-
Serra</Literal>
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```

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<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://en.wikipedia.org/wiki/Violin_plot

```

and

Hintze, J. L. and R. D. Nelson (1998). Violin plots: a box plot-density trace synergism. *The American Statistician*, 52(2):181-4.</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
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ns#PlainLiteral">http://www.inside-r.org/packages/cran/vioplot/docs/vioplot

```

```

vioplot( x, ..., range=1.5, h, ylim, names, horizontal=FALSE,
col="magenta", border="black", lty=1, lwd=1, rectCol="black",
colMed="white", pchMed=19, at, add=FALSE, wex=1,
drawRect=TRUE)</Literal>

```

```

</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000154</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">violin
plot</Literal>

```

```

</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000155</IRI>
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ns#PlainLiteral">meta-analysis is a data transformation which uses the effect size estimates from several
independent quantitative scientific studies addressing the same question in order to assess finding
consistency. </Literal>

```

```

</AnnotationAssertion>
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<http://en.wikipedia.org/wiki/Metaanalysis>

last accessed: 2013-11-15</Literal>

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  <IRI>http://purl.obolibrary.org/obo/STATO_0000159</IRI>
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ns#PlainLiteral">Stacked bar chart is a bar which is used to compare overall quantities across items while
showing the contribution of category to the total amount. Stacked bar chart can be used for highlighting
the total as they visually aggregate all of the categories in a group while indicating a part to whole
relationship. The downside is that it becomes harder to compare the sizes of the individual categories.
</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000159</IRI>
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Gonzalez-Beltran</Literal>
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ns#PlainLiteral">adapter from
http://www2.le.ac.uk/offices/ld/resources/numeracy/bar-charts
and
http://blog.visual.ly/how-groups-stack-up-when-to-use-grouped-vs-stacked-column-charts/
[last accessed: 2014-03-04]</Literal>
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  <AnnotationAssertion>
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set argument &quot; beside = FALSE &quot;

http://stat.ethz.ch/R-manual/R-patched/library/graphics/html/barplot.html</Literal>
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chart</Literal>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The exponential distribution (a.k.a. negative exponential distribution) is the probability
distribution that describes the time between events in a Poisson process, i.e. a process in which events
occur continuously and independently at a constant average rate. It is the continuous analogue of the
geometric distribution, and it has the key property of being memoryless. </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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ns#PlainLiteral">variable distribution is data item which denotes the spatial resolution of data point
making up a variable. variable distribution may be compared to a known probability distribution using
goodness of fit test or plotting a quantile-quantile plot for visual assessment of the fit.</Literal>
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ns#PlainLiteral">trimmed mean or truncated mean is a measure of central tendency which involves the
calculation of the mean after discarding given parts of a probability distribution or sample at the high and
low end, and typically discarding an equal amount of both</Literal>
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ns#PlainLiteral">scipy.stats.tmean(a, limits=None, inclusive=(True, True))
http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.tmean.html#scipy.stats.tmean
source:
https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L684</Literal>
</AnnotationAssertion>
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ns#PlainLiteral">The interquartile range is a data item which corresponds to the difference between the
upper quartile (3rd quartile) and lower quartile (1st quartile).
The interquartile range contains the second quartile or median.
The interquartile range is a data item providing a measure of data dispersion
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  <AnnotationAssertion>
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statistics</Literal>
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http://stat.ethz.ch/R-manual/R-patched/library/stats/html/IQR.html</Literal>
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pie chart is a graph in which a circular graph is divided into sector illustrating numerical proportion,
meaning that the arc length of each sector (and consequently its central angle and area), is proportional to
the quantity it represents.</Literal>
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ns#PlainLiteral">pie(x, labels = names(x), edges = 200, radius = 0.8,
clockwise = FALSE, init.angle = if(clockwise) 90 else 0,
density = NULL, angle = 45, col = NULL, border = NULL,
lty = NULL, main = NULL, ...)
https://stat.ethz.ch/R-manual/R-devel/library/graphics/html/pie.html</Literal>
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appropriate to represent counts of data.</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000166</IRI>
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represent.</Literal>
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2013</Literal>
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ns#PlainLiteral">homogeneity testing objective is the objective of a data transformation to test a null
hypothesis that two or more sub-groups of a population share the same distribution of a single categorical
variable.
For example, do people of different countries have the same proportion of smokers to non-
smokers</Literal>
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ns#PlainLiteral">confidence interval calculation is a data transformation which determines a confidence
interval for a given statistical parameter</Literal>
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    statistic is a statistic computed from observations and used to produce a p-value in statistical test when
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ns#PlainLiteral">the beta distribution is a continuous probability distributions defined on the interval [0,
1] parametrized by two positive shape parameters, denoted by  $\hat{\mu}$  and  $\hat{\sigma}^2$ , that appear as exponents of the
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http://en.wikipedia.org/wiki/Beta_distribution</Literal>
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dbeta(x, shape1, shape2, ncp = 0, log = FALSE)
pbeta(q, shape1, shape2, ncp = 0, lower.tail = TRUE, log.p = FALSE)
qbeta(p, shape1, shape2, ncp = 0, lower.tail = TRUE, log.p = FALSE)
rbeta(n, shape1, shape2, ncp = 0)</Literal>
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kurtosis</Literal>
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population means of a dependent variable are equal across levels of a categorical independent variables
while controlling for the effects of other continuous variable s, known as covariates. Therefore, when
performing ANCOVA, we are adjusting the dependent variable means to what they would be if all groups
were equal on the covariates.
It augments the ANOVA model with one or more additional quantitative variables, called covariates,
which are related to the response variable. The covariates are included to reduce the variance in the error
terms and provide more precise measurement of the treatment effects. ANCOVA is used to test the main
and interaction effects of the factors, while controlling for the effects of the covariate</Literal>
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mean=0</Literal>
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ns#PlainLiteral">sphericity testing objective is a statistical objective of a data transformation which aims
to test a null hypothesis of sphericity holds.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000183</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000183</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Orlaith Burke</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000183</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Philippe Rocca-Serra</Literal>
</AnnotationAssertion>
<AnnotationAssertion>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000183</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">STATO</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000183</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">sphericity testing objective</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000183</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">sphericity testing objective</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000184</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
ratio is a data item which is formed with two numbers r and s is written r/s, where r is the numerator and s
is the denominator. The ratio of r to s is equivalent to the quotient r/s.
</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000184</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">review formal definition as both numerator and denominator should be of the same type,
not just some data item</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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Beltran</Literal>
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  <AnnotationAssertion>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000184</IRI>
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ns#PlainLiteral">adapted from Wolfram Alpha:
https://www.wolframalpha.com/share/clip?f=d41d8cd98f00b204e9800998ecf8427efdcsig76g7</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000184</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">ratio</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000185</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000185</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
2 by n contingency table is a contingency table built for one dichotomous variable (a categorical variable
with only 2 outcomes) and one polychotomous variable (a polychotomous variable with at least 2
outcomes)</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000185</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Philippe Rocca-
Serra</Literal>
  </AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000185</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">STATO</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000185</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral"></Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000185</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">xtabs(formula = ~., data = parent.frame(), subset, sparse = FALSE,
na.action, exclude = c(NA, NaN), drop.unused.levels = FALSE)

```

<http://stat.ethz.ch/R-manual/R-patched/library/stats/html/xtabs.html>

flat contingency tables:

`fable(x, ...)`

<http://stat.ethz.ch/R-manual/R-patched/library/stats/html/fable.html></Literal>

```

</AnnotationAssertion>
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000185</IRI>
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by n contingency table</Literal>

```

```

</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000428</IRI>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000189</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
mixed model is a statistical model containing both fixed effects and random effects</Literal>

```

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000189</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">PRS: this is a stub and more work is needed to reconcile conflicting
definitions</Literal>

```

```

</AnnotationAssertion>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>

```

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</AnnotationAssertion>
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</AnnotationAssertion>

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ns#PlainLiteral">adapted from wikipedia</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000189</IRI>
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ns#PlainLiteral"></Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000189</IRI>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000191</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
goodness of fit statistical test is a statistical test which aim to evaluate if a sample distribution can be
considered equivalent to a theoretical distribution used as input</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000191</IRI>
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ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
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```

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ns#PlainLiteral"></Literal>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000191</IRI>
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statistical test</Literal>
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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a cartesian
product is a data transformation which operates on a n Sets to produce a set of all possible ordered n-
tuples where each element of the tuple comes from a Set</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000192</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000192</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Orlaith Burke</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000192</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">PERSON:
Philippe Rocca-Serra</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000192</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">adapted from
math wolfram (http://mathworld.wolfram.com/CartesianProduct.html)</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

```



```

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ns#PlainLiteral">cartesian product</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000193</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000193</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">is a population
whose individual members realize (may be expressed as) a combination of inclusion rule values
specifications or resulting from a sampling process (e.g. recruitment followed by randomization to group)
on which a number of measurements will be carried out, which may be used as input to statistical tests
and statistical inference.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000193</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  </AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000193</IRI>
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Burke</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000193</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Philippe Rocca-
Serra</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000193</IRI>
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ns#PlainLiteral">STATO</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>

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    <IRI>http://purl.obolibrary.org/obo/STATO_0000193</IRI>
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  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000193</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">study group
population</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000194</IRI>
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ns#PlainLiteral">self explanatory</Literal>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  <AnnotationAssertion>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000194</IRI>
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ns#PlainLiteral">cartesian product 2 sets</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

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ns#PlainLiteral">http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2689604/</Literal>
</AnnotationAssertion>
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<IRI>http://purl.obolibrary.org/obo/STATO_0000196</IRI>
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confidence interval is a data item which defines an range of values in which a measurement or trial falls
corresponding to a given probability.</Literal>
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ns#PlainLiteral">the Mauchly&apos;s test for sphericity is a statistical test which evaluates if the variance

```

of the differences between all combinations of the groups are equal, a property known as 'sphericity' in the context of repeated measures. It is used for instance prior to repeated measure ANOVA.

The test works by assessing if a Wishart-distributed covariance matrix (or transformation thereof) is proportional to a given matrix.

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(http://en.wikipedia.org/wiki/Mauchly&apos;s_sphericity_test)
polled on june,10th, 2013
and from R manual:
http://stat.ethz.ch/R-manual/R-patched/library/stats/html/mauchly.test.html
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subtracting the false negative rate (type II error rate) to 1.
The power of a statistical test is the probability that it will correctly lead to the rejection of a false null
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nonparametric measure of statistical dependence between two ranked variables. It assesses how well the
relationship between two variables can be described using a monotonic function. If there are no repeated
data values, a perfect Spearman correlation of +1 or  $\hat{1}$  occurs when each of the variables is a perfect
monotone function of the other.
Spearman&apos;s coefficient may be used when the conditions for computing Pearson&apos;s
correlation are not met (e.g linearity, normality of the 2 continuous variables) but may require a ranking
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```

<http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.spearmanr.html#scipy.stats.spearmanr>

source:

<https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L2643></Literal>

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cohort is a study group population where the members are human beings which meet inclusion criteria
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ns#PlainLiteral">df(x, df1, df2, ncp, log = FALSE)

http://stat.ethz.ch/R-manual/R-patched/library/stats/html/Fdist.html
</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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ns#PlainLiteral">http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.f</Lite
ral>
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ns#PlainLiteral">Inverse relation of &apos;denotes&apos;, where denotation is what happens when
someone creates an information content entity E in order to specifically refer to something (from
&apos;denotes&apos; definition).</Literal>
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planned process which establishes and states the different hypothesis to be evaluated during a null
hypothesis statistical test</Literal>
  </AnnotationAssertion>
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ns#PlainLiteral">An alternative hypothesis is an hypothesis defined in a statistical test that is the opposite
of the null hypothesis.</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000209</IRI>
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ns#PlainLiteral">PMID:12892658
  &quot;Two formulas for computation of the area under the curve represent measures of total hormone
concentration versus time-dependent change.&quot;</Literal>
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ns#PlainLiteral">area under curve is a measurement datum which corresponds to the surface define by
the x-axis and bound by the line graph represented in a 2 dimensional plot resulting from an integration or
integrative calculus. The interpretation of this measurement datum depends on the variables plotted in the
graph</Literal>
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variable by concretizing a set of discretization rules</Literal>
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(http://en.wikipedia.org/wiki/Discretization)</Literal>
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confidence interval which covers 50% of the sampling distribution, meaning that there is a 50% risk of
false positive (type I error)</Literal>
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matrix</Literal>
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represents a dataset. A model fitting process tests the goodness of fit of the model to the data</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000220</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000220</IRI>
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ns#PlainLiteral">the false negative rate is a data item which denotes the proportion of missed detection of
elements known to be meeting the detection criteria</Literal>
  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000220</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000221</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000221</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
random variable (or aleatory variable or stochastic variable) in probability and statistics, is a variable
whose value is subject to variations due to chance (i.e. randomness, in a mathematical sense)</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000221</IRI>
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  <AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000221</IRI>
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ns#PlainLiteral">wikipedia:
http://en.wikipedia.org/wiki/Random_variable</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000224</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A testing
objective to ensure that the sample used in a statistical test actually follows a normal
distribution.</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000224</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Alejandra
Gonzalez-Beltran</Literal>
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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Philippe Rocca-
Serra</Literal>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">STATO</Literal>
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  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000224</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000225</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
probability distribution is a information content entity that specifies the probability of the value of a
random variable.

```

For a discrete random variable, a mathematical formula that gives the probability of each value of the variable.

For a continuous random variable, a curve described by a mathematical formula which specifies, by way of areas under the curve, the probability that the variable falls within a particular interval.</Literal>

```

  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000225</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Alejandra
Gonzalez-Beltran</Literal>
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Serra</Literal>
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objective to ensure the variances of the different groups used in a statistical test are similar (i.e. not too
different). </Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000226</IRI>
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Gonzalez-Beltran</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000226</IRI>
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testing objective</Literal>

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  <IRI>http://purl.obolibrary.org/obo/STATO_0000226</IRI>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000227</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
normal distribution is a continuous probability distribution described by a probability distribution
function described here:
http://mathworld.wolfram.com/NormalDistribution.html</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000227</IRI>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000227</IRI>
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rm</Literal>
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ns#PlainLiteral">ordinal variable is a categorical variable where the discrete possible values are ordered
or correspond to an implicit ranking</Literal>
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probability distribution with k degrees of freedom is a theoretical probability distribution which
corresponds to the distribution of a sum of the squares of k independent standard normal random
variables.</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
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ns#PlainLiteral">dchisq(x, df, ncp = 0, log = FALSE)

http://stat.ethz.ch/R-manual/R-patched/library/stats/html/Chisquare.html</Literal>
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2</Literal>
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ns#PlainLiteral">the expected value (or expectation, mathematical expectation, EV, mean, or the first
moment) of a random variable is a data item which corresponds to the weighted average of all possible
values that this random variable can take on. The weights used in computing this average correspond to
the probabilities in case of a discrete random variable, or densities in case of a continuous random
variable. From a rigorous theoretical standpoint, the expected value is the integral of the random variable
with respect to its probability measure.</Literal>
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confidence interval which covers 95% of the sampling distribution, meaning that there is a 5% risk of
false positive (type I error). If the number of observations made is large enough, the sampling distribution
can be assumed to be normal, which entails that 95% of the sampling distributions falls within roughly2
(1.96) standard deviations from the mean.</Literal>
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computed by subtracting the false negative rate to the integral numeral 1</Literal>
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http://en.wikipedia.org/wiki/Sensitivity_and_specificity
and
http://mathworld.wolfram.com/Sensitivity.html</Literal>
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residual is a data item which is the output of an error estimate or model fitting process and which is an
observable estimate of the unobservable error</Literal>
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distribution of frequency distribution.</Literal>
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last accessed: 2013-10-18</Literal>

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http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.variation.html#scipy.stats.variation
source:
https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L951</Literal>
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ns#PlainLiteral">The standard deviation of a random variable, statistical population, data set, or
probability distribution is a measure of variation which correspond to the average distance from the mean
of the data set to any given point of that dataset. It also corresponds to the square root of its variance.
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ns#PlainLiteral">Kendall&apos;s correlation coefficient is a correlation coefficient between 2 ordinal
variables (natively or following a ranking procedure) and may be used when the conditions for computing
Pearson&apos;s correlation are not met (e.g linearity, normality of the 2 continuous variables)</Literal>
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ns#PlainLiteral">Kendall rank correlation coefficient</Literal>
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ns#PlainLiteral">Kendall&apos;s tau (τ,) coefficient</Literal>
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ns#PlainLiteral">STATO, adapted from wikipedia
(http://en.wikipedia.org/wiki/Kendall_tau_rank_correlation_coefficient), polled in june 2013
and from:
http://stamash.org/pearsons-correlation-coefficient/
http://stamash.org/kendalls-tau-correlation/</Literal>
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ns#PlainLiteral">cor(x, y = NULL, use = &quot;everything&quot;,method =
c(&quot;kendall&quot;))</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000240</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scipy.stats.kendalltau(x, y, initial_lexsort=True)

```

<http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.kendalltau.html#scipy.stats.kendalltau>

source:

```

https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L2827</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000241</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Q-Q plot or quantile-quantile plot is the output of a graphical method for comparing two
probability distributions by plotting their quantiles against each other</Literal>
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ns#PlainLiteral">PRS,AGB: need to add the notion of quantile</Literal>
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ns#PlainLiteral">qqplot(x, y, plot.it = TRUE, xlab = deparse(substitute(x)),
  ylab = deparse(substitute(y)), ...)
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http://stat.ethz.ch/R-manual/R-patched/library/stats/html/qnorm.html</Literal>
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ns#PlainLiteral">statistical error is an data item denoting the amount by which an observation differs
from the expected value, being based on the whole statistical population from which the statistical unit
was chosen randomly</Literal>
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<AnnotationAssertion>
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http://en.wikipedia.org/wiki/Errors_and_residuals_in_statistics
last accessed: 18-11-2013</Literal>
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whisker plot is appropriate to represent the characteristics oc a distribution.</Literal>
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box plot is a graph which plots datasets relying on their quartiles and the interquartile range to create the
box and the whiskers </Literal>
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Analysis. Reading, MA: Addison-Wesley, pp. 39-43, 1977.</Literal>
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  http://stat.ethz.ch/R-manual/R-patched/library/graphics/html/boxplot.html</Literal>
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ns#PlainLiteral">group comparison objective is a data transformation objective which aims to determine
if 2 or more study group differ with respect to the signal of a response variable</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
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Beltran</Literal>
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Serra</Literal>
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ns#PlainLiteral">&quot;Time to solve an anagram problem&quot; is continuous since it could take 2
minutes, 2.13 minutes etc. to finish a problem</Literal>
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possible.</Literal>
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categorical variable is a variable which that can only assume a finite number of value and cast
observation in a small number of categories</Literal>
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Gonzalez-Beltran</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
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within subject holds.</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000255</IRI>
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variable is a data item which can assume any of a set of values, either as determined by an agent or as
randomly occurring through observation.</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">adapted from wolfram-alpha (<http://www.wolframalpha.com/input/?i=variable>) definition 2.

and from Oxford English Dictionary:

<http://www.oed.com/view/Entry/221514?redirectedFrom=variable#eid>, definition B,1</Literal>

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</AnnotationAssertion>
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ns#PlainLiteral">the relationship between a fraction and the number below the line (or divisor)</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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ns#PlainLiteral">Bernoulli distribution is a binomial distribution where the number of trials is equal to 1.

```

notation: $B(1,p)$

The mean is p

The variance is $p*q$ </Literal>

```

  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000264</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
factor level combination is one a possible sets of factor levels resulting from the cartesian product of sets
of factor and their levels as defined in a factorial design</Literal>
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combination</Literal>
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factor level is data item which corresponds to one of the value assumed by a factor or independent
variable manipulated and set by the experimentalist. In the context of factorial design, a factor level is
assumed to be or treated as a category in a categorical variable</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000265</IRI>
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ns#PlainLiteral">Bayes factor is a ratio between 2 probabilities of observing data according 2 distinct
models. It is used in Bayes model selection to evaluate which model best explains the data. if  $K=0$ , the
model used in the denominator term is supported, if  $K>1$ , the model used in the numerator term is
supported.
The Bayes factor is about the plausibility of 2 different models</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000266</IRI>
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last accessed 2013-11-13</Literal>
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ns#PlainLiteral">grouped bar chart is a kind of bar chart which juxtaposes the discrete values for each of
the possible value of a given categorical variable, thus providing within group comparison. Grouped bar
charts are good for comparing between each element in the categories, and comparing elements across
categories. However, the grouping can make it harder to tell the difference between the total of each
group.</Literal>
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  <AnnotationAssertion>
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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">adapter from

<http://www2.le.ac.uk/offices/ld/resources/numeracy/bar-charts>

and

<http://blog.visual.ly/how-groups-stack-up-when-to-use-grouped-vs-stacked-column-charts/>

[last accessed: 2014-03-04]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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set argument " beside = TRUE "

<http://stat.ethz.ch/R-manual/R-patched/library/graphics/html/barplot.html></Literal>

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<IRI>http://purl.obolibrary.org/obo/STATO_0000268</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A gamma distribution is a general type of continuous statistical distribution (related to the beta distribution) that arises naturally in processes for which the waiting times between Poisson distributed events are relevant. Gamma distributions have two free parameters shape k and scale denoted θ .</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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ns#PlainLiteral">dgamma(x, shape, rate = 1, scale = 1/rate, log = FALSE)
http://stat.ethz.ch/R-manual/R-patched/library/stats/html/GammaDist.html</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000268</IRI>
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gamma</Literal>
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ns#PlainLiteral">permutation numbering is a data tranformation allowing to count the number of possible
permutations of elements in a set of size n, each element occurring exactly once. This number is factorial
n.</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000271</IRI>
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ns#PlainLiteral">receiver operational characteristics curve is a graphical plot which illustrates the
performance of a binary classifier system as its discrimination threshold (aka cut-off point) is varied by
plotting sensitivity vs (1 - specificity)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000274</IRI>
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ns#PlainLiteral">roc.from.table(table, graph = TRUE, add = FALSE, title = FALSE,
line.col = &quot;red&quot;, auc.coords = NULL, ...)
http://rss.acs.unt.edu/Rdoc/library/epicalc/html/roc.html</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000274</IRI>
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ns#PlainLiteral">The binomial distribution is a discrete probability distribution which describes the
probability of k successes in n draws with replacement from a finite population of size N.

```

The binomial distribution is frequently used to model the number of successes in a sample of size n drawn with replacement from a population of size N.

The binomial distribution gives the discrete probability distribution of obtaining exactly n successes out of N Bernoulli trials (where the result of each Bernoulli trial is true with probability p and false with probability q=1-p)

notation: B(n,p)

The mean is $N \cdot p$

The variance is $N \cdot p \cdot q$

```

</AnnotationAssertion>
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http://stat.ethz.ch/R-manual/R-patched/library/stats/html/Binomial.html</Literal>
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difference between the means computing for each of the study group populations</Literal>
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ns#PlainLiteral">The Pearson's correlation coefficient is a correlation coefficient which evaluates
two continuous variables for association strength in a data sample. It assumes that both variables are
normally distributed and linearity exists.
The coefficient is calculated by dividing their covariance with the product of their individual standard
deviations. It is a normalized measurement of how the two are linearly related.</Literal>
  </AnnotationAssertion>
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  </AnnotationAssertion>
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statistics</Literal>
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ns#PlainLiteral">STATO, adapted from
http://www.r-tutor.com/elementary-statistics/numerical-measures/correlation-coefficient
and from:
http://stamash.org/pearsons-correlation-coefficient/
http://stamash.org/kendalls-tau-correlation/</Literal>
  </AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000280</IRI>
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ns#PlainLiteral">cor(x, y = NULL, use = &quot;everything&quot;,method =
c(&quot;pearson&quot;))</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000280</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  </AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000391"/>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scipy.stats.pearsonr(x, y)

http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.pearsonr.html#scipy.stats.pearsonr

source:
https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L2427</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000281</IRI>
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false positive rate whose value is 1 per cent</Literal>
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instance</Literal>
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% false positive rate</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>

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statistic is a statistic computed from observations and used to produce a p-value in statistical test when
compared to a F distribution. the F statistic is the ratio of two scaled sums of squares reflecting different
sources of variability</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000283</IRI>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">negative binomial probability distribution is a discrete probability distribution of the number of successes in a sequence of Bernoulli trials before a specified (non-random) number of failures (denoted r) occur.</Literal>

The negative binomial distribution, also known as the Pascal distribution or Pálya distribution, gives the probability of $r-1$ successes and x failures in $x+r-1$ trials, and success on the $(x+r)$ th trial. </Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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ns#PlainLiteral">dnbinom(x, size, prob, mu, log = FALSE)
http://stat.ethz.ch/R-manual/R-patched/library/stats/html/NegBinomial.html</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000283</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.nbinom.html#scipy.stats.
nbinom</Literal>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000286</IRI>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000286</IRI>
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one-tailed test is a statistical test which, assuming an unskewed probability distribution, allocates all of
the significance level to evaluate only one hypothesis to explain a difference.
The one-tailed test provides more power to detect an effect in one direction by not testing the effect in the
other direction.
one-tailed test should be preceded by two-tailed test in order to avoid missing out on detecting alternate
effect explaining an observed difference. </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000286</IRI>
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ns#PlainLiteral">Added following a term request by Chris Mungall:
https://github.com/ISA-tools/stato/issues/6</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000286</IRI>

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http://www.ats.ucla.edu/stat/mult_pkg/faq/general/tail_tests.htm</Literal>
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ns#PlainLiteral">For example, we may wish to compare the mean of a sample to a given value x using a
t-test. Our null hypothesis is that the mean is equal to x. A two-tailed test will test both if the mean is
significantly greater than x and if the mean significantly less than x. The mean is considered significantly
different from x if the test statistic is in the top 2.5% or bottom 2.5% of its probability distribution,
resulting in a p-value less than 0.05.</Literal>
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  <AnnotationAssertion>

```



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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
two tailed test is a statistical test which assess the null hypothesis of absence of difference assuming a
symmetric (not skewed) underlying probability distribution by allocating half of the significance level
selected to each of the direction of change which could explain a difference (for example, a difference can
be an excess or a loss).</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000287</IRI>
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https://github.com/ISA-tools/stato/issues/6</Literal>
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http://www.ats.ucla.edu/stat/mult_pkg/faq/general/tail_tests.htm</Literal>
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null hypothesis which states that no difference exists between 2 or more groups being
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</AnnotationAssertion>

<AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/STATO_0000289</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-

ns#PlainLiteral">let's consider an experiment evaluating 2 compounds (aspirin & ibuprofen) at 3 distinct dose levels (low, medium, high) and 4 time points post exposure (0h, 6h, 12h, 24h).

Assuming the treatments are applied only once (no replication), the number of observation in a full factorial design is $2 \times 3 \times 4 = 24$ so the design matrix would have 24 rows and 3 columns (1 per factor (independent variable)).

</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/STATO_0000289</IRI>

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<AnnotationAssertion>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a design matrix is an information content entity which denotes a study design. The design matrix is a n by m matrix where n the number of rows, corresponds to the number of observations (4 rows if quadruplicates) and where m, the number of columns corresponds to the number of independent variables. Each element in the matrix correspond to a discretized value representing one of the factor levels for a given factor.

A design matrix can be used as input to statistical modeling or statistical analysis.

The design matrix contains data on the independent variables (also called explanatory variables) in statistical models which attempt to explain observed data on a response variable (often called a dependent variable) in terms of the explanatory variables. The theory relating to such models makes substantial use of matrix manipulations involving the design matrix: see for example linear regression. A notable feature of the concept of a design matrix is that it is able to represent a number of different experimental designs and statistical models, e.g., ANOVA, ANCOVA, and linear regression</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/STATO_0000289</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Added following a term request by Nolan Nichols: <https://github.com/ISA-tools/stato/issues/9></Literal>

</AnnotationAssertion>

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Design of Experiments: Principles and Applications

edited by Lennart Eriksson, 1999-2008 Umetrics. ISBN-13:978-91-973730-4-3

and

http://en.wikipedia.org/wiki/Design_matrix

[last accessed: 22-05-2014]</Literal>

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ns#PlainLiteral">model.matrix(object, data = environment(object),
      contrasts.arg = NULL, xlev = NULL, ...)

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<http://stat.ethz.ch/R-manual/R-patched/library/stats/html/model.matrix.html>

</Literal>

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quantile is a data item which corresponds to specific elements  $x$  in the range of a variate  $X$ .
the  $k$ -th  $n$ -tile  $P_k$  is that value of  $x$ , say  $x_k$ , which corresponds to a cumulative frequency of  $Nk/n$ 
(Kenney and Keeping 1962). If  $n=4$ , the quantity is called a quartile, and if  $n=100$ , it is called a
percentile.</Literal>
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decile is a quantile where n=10 and which splits data into sections accrued of 10% of data, so the first
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percentile is a quantile which splits data into sections accrued of 1% of data, so the first percentile
delineates 1% of the data, the second quartile delineates 2% of the data and the 99th percentile, 99 % of
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
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ns#PlainLiteral">absence of enrichment hypothesis</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">absence of depletion difference hypothesis is a hypothesis which assumes that the
representation of an element significantly less than a threshold does not exist.</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000297</IRI>
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  </AnnotationAssertion>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">STATO</Literal>
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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000298</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
binomial test is a statistical hypothesis test which evaluates if the observations made about a Bernoulli
experiment , that is an experiment which tests the statistical significance of deviations from a theoretically
expected distribution (the binomial distribution) of observations into 2 categories. It is a goodness of fit
test.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000298</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Added following a term request by Chris Mungall:
https://github.com/ISA-tools/stato/issues/6</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000298</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Orlaith Burke</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000298</IRI>

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```

    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000298</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">adapted from:

```

http://en.wikipedia.org/wiki/Binomial_test

```

</Literal>
</AnnotationAssertion>
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ns#PlainLiteral">binomial test</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000298</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">binom.test(x, n, p = 0.5,
    alternative = c("&quot;two.sided&quot;, &quot;less&quot;, &quot;greater&quot;"),
    conf.level = 0.95)

```

<http://stat.ethz.ch/R-manual/R-patched/library/stats/html/binom.test.html></Literal>

```

</AnnotationAssertion>
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  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000298</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scipy.stats.binom_test(x, n=None, p=0.5)

```

http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.binom_test.html#scipy.stats.binom_test

source:

<https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/morestats.py#L1605></Literal>

```

</AnnotationAssertion>
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ns#PlainLiteral">exact binomial test</Literal>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Evaluation of statistical inference on empirical resting state fMRI.

```

IEEE Trans Biomed Eng. 2014 Apr;61(4):1091-9. doi: 10.1109/TBME.2013.2294013.

```

http://www.ncbi.nlm.nih.gov/pubmed/24658234</Literal>
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  <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000299</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">statistical inference is a process of drawing conclusions following data analysis using
statistical methods (statistical tests) and evaluating whether to reject or accept null hypothesis</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000299</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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https://github.com/ISA-tools/stato/issues/12</Literal>
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```

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    <IRI>http://purl.obolibrary.org/obo/STATO_0000300</IRI>
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numerator and denominator are expressed in the same unit.</Literal>
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ns#PlainLiteral">dimensionless ratio</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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ratio</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000301</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>http://purl.obolibrary.org/obo/STATO_0000301</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The covariance is a measurement data item about the strength of correlation between a
set (2 or more) of random variables.
The covariance is obtained by forming:

$$\text{cov}(X,Y)=E([X-E(X)][Y-E(Y)])$$

where  $E(X)$ ,  $E(Y)$  is the expected value (mean) of variable  $X$  and  $Y$ 
respectively.

```

covariance is symmetric so $\text{cov}(X,Y)=\text{cov}(Y,X)$.

The covariance is usefull when looking at the variance of the sum of the 2 random variables since:
 $\text{var}(X+Y) = \text{var}(X) + \text{var}(Y) + 2\text{cov}(X,Y)$

The covariance $\text{cov}(x,y)$ is used to obtain the coefficient of correlation $\text{cor}(x,y)$ by normalizing (dividing) $\text{cov}(x,y)$ but the product of the standard deviations of x and y .

```

</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000301</IRI>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000301</IRI>
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</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000301</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">adapted from:
http://mathworld.wolfram.com/Covariance.html</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000301</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">covariance</Literal>

```

```

</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000301</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">cov(x, y =
NULL, use = &quot;everything&quot;;, method = c(&quot;pearson&quot;;, &quot;kendall&quot;;,
&quot;spearman&quot;;))

```

from:

```
http://stat.ethz.ch/R-manual/R-patched/library/stats/html/cor.html</Literal>
```

```

</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000301</IRI>
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ns#PlainLiteral">covariance</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000302</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">one sample t-test is a kind of Student&apos;s t-test which evaluates if a given sample
can be reasonably assumed to be taken from the population.
The test compares the sample statistic (m) to the population parameter (M).

```

The one sample t-test is the small sample analog of the z test, which is suitable for large samples.</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000302</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000302</IRI>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Philippe Rocca-Serra</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000302</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">adapted from various sources, including:

```


Practical Statistics for Medical Research by D.Altman.
ISBN: 0-412-27630-5

<http://www.psychology.emory.edu/clinical/bliwise/Tutorials/TOM/meanstests/tone.htm>

```

</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000302</IRI>
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ns#PlainLiteral">one sample t-test</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000302</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">t.test(x = NULL,
  alternative = c("&quot;two.sided&quot;," &quot;less&quot;," &quot;greater&quot;"),
  mu = 0, paired = FALSE, var.equal = FALSE,
  conf.level = 0.95, ...)
```

<http://stat.ethz.ch/R-manual/R-patched/library/stats/html/t.test.html>

```

</AnnotationAssertion>
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  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scipy.stats.ttest_1samp(a, popmean, axis=0)
```

http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.ttest_1samp.html#scipy.stats.ttest_1samp

source:

<https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L3194>

```

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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000303</IRI>
```

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">two sample t-test is a null hypothesis statistical test which is used to reject or accept the hypothesis of absence of difference between the means over 2 randomly sampled populations. It uses a t-distribution for the test and assumes that the variables in the population are normally distributed and with equal variances.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000303</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>

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<AnnotationAssertion>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Orlaith Burke</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/STATO_0000303</IRI>

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</AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000303</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">two sample t-test</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000303</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">adapted from:

http://en.wikipedia.org/wiki/Student's_t-test#Independent_.28unpaired.29_samples

and from:

<http://www.psychology.emory.edu/clinical/bliwise/Tutorials/TOM/meanstests/tind.htm>

</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000303</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">t-test for independent means assuming equal variance</Literal>

</AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000303</IRI>

```

    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">t.test(x, y = NULL,
    alternative = c("&quot;two.sided&quot;," &quot;less&quot;," &quot;greater&quot;),
    mu = 0, paired = FALSE, var.equal = TRUE,
    conf.level = 0.95, ...)
```

```

http://stat.ethz.ch/R-manual/R-patched/library/stats/html/t.test.html</Literal>
```

```
</AnnotationAssertion>
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<AnnotationAssertion>
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```

    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000391"/>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000303</IRI>
```

```

    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">scipy.stats.ttest_ind(a, b, axis=0, equal_var=True)
```

```

http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.ttest_ind.html#scipy.stats.ttest_ind
```

source:

```

https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L3271</Literal>
```

```
</AnnotationAssertion>
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<AnnotationAssertion>
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```

    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
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```

    <IRI>http://purl.obolibrary.org/obo/STATO_0000303</IRI>
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```

    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">two sample t-test with equal variance</Literal>
```

```
</AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000304</IRI>
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```

    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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</AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000304</IRI>
```

```

    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Welch t-test is a two sample t-test used when the variances of the 2 populations/samples
are thought to be unequal (homoskedasticity hypothesis not verified). In this version of the two-sample t-
test, the denominator used to form the t-statistics, does not rely on a 'pooled variance'
estimate.</Literal>
```

```
</AnnotationAssertion>
```

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<AnnotationAssertion>
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```

    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000304</IRI>
```

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
```

```
</AnnotationAssertion>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000304</IRI>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Orlaith Burke</Literal>
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</AnnotationAssertion>
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<AnnotationAssertion>
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</AnnotationAssertion>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Welch, B. L. (1947). &quot;The generalization of &quot;Student&apos;s&quot;
problem when several different population variances are involved&quot;. Biometrika 34 (1&acirc2):
28&acirc35. doi:10.1093/biomet/34.1-2.28</Literal>
</AnnotationAssertion>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">adapted from wikipedia:
http://en.wikipedia.org/wiki/Welch&apos;s_t_test

last accessed: 2014-05-06</Literal>
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test for independent means assuming unequal variance</Literal>
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ns#PlainLiteral">t.test(x, y = NULL,
  alternative = c(&quot;two.sided&quot;, &quot;less&quot;, &quot;greater&quot;),
  mu = 0, paired = FALSE, var.equal = FALSE,
  conf.level = 0.95, ...)

http://stat.ethz.ch/R-manual/R-patched/library/stats/html/t.test.html</Literal>
</AnnotationAssertion>
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ns#PlainLiteral">scipy.stats.ttest_ind(a, b, axis=0, equal_var=False)

```

http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.ttest_ind.html#scipy.stats.ttest_ind

source:

<https://github.com/scipy/scipy/blob/v0.15.1/scipy/stats/stats.py#L3271></Literal>

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</AnnotationAssertion>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">two sample t-test with unequal variance</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO\_0000309</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Pearson's Chi-Squared test for goodness of fit is a statistical null hypothesis test which is used to either evaluate goodness of fit of dataset to a Chi-Squared distribution</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO\_0000309</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
</AnnotationAssertion>
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  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Orlaith Burke</Literal>
</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO\_0000309</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Chi2 test for goodness of fit</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO\_0000309</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">adapted from:

```

<http://stat.ethz.ch/R-manual/R-patched/library/stats/html/chisq.test.html>

and

```

http://en.wikipedia.org/wiki/Pearson&apos;s_chi-squared_test</Literal>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral"></Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000309</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://stat.ethz.ch/R-manual/R-patched/library/stats/html/chisq.test.html
chisq.test(x = NULL, correct = FALSE,
  p = rep(1/length(x), length(x)), rescale.p = FALSE,
  simulate.p.value = FALSE, B = 2000)</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000309</IRI>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000310</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Barnard&apos;s test is an exact statistical test used to determine if there are nonrandom
associations between two categorical variables. It was developed in 1949 by Barnard and is a test which
is, most times, more powerfull that the Fisher exact test</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000310</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">duplicate with OBI_0200176. so either MIREOT and add metadata and axioms or move
from OBI</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000310</IRI>
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ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000310</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://en.wikipedia.org/wiki/Barnard&apos;s_test
and
G A Barnard (1945) &quot;A New Test for 2X2 Tables&quot;, Nature, 156, 177 &amp; 783.</Literal>
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  <AnnotationAssertion>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">barnardw.test(n1, n2, n3, n4, dp = 0.001, verbose = FALSE)
from
http://www.inside-r.org/packages/cran/Barnard/docs/barnardw.test</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000310</IRI>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">upper confidence limit is a data item which is a largest value bounding a confidence
interval</Literal>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000315</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">lower confidence limit is a data item which is a lowest value bounding a confidence
interval</Literal>
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ns#PlainLiteral">Eta-squared is a biased estimator of the variance explained by the model in the
population (it estimates only the effect size in the sample). Eta-squared describes the ratio of variance
explained in the dependent variable by a predictor while controlling for other predictors, making it
analogous to the r2. This estimate shares the weakness with r2 that each additional variable will
automatically increase the value of  $\hat{\Gamma}^2$ . In addition, it measures the variance explained of the sample, not
the population, meaning that it will always overestimate the effect size, although the bias grows smaller as
the sample grows larger.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000317</IRI>
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ns#PlainLiteral">The Akaike information criterion (AIC) is a measure of the relative quality of a
statistical model for a given set of data. As such, AIC provides a means for model selection. AIC is
defined as:

```

$$\text{AIC} = 2K - 2\log(L)$$

where K is the number of predictors and L is the maximized likelihood value.

AIC deals with the trade-off between the goodness of fit of the model and the complexity of the model. It is founded on information theory: it offers a relative estimate of the information lost when a given model is used to represent the process that generates the data. AIC does not provide a test of a model in the sense of testing a null hypothesis; i.e. AIC can tell nothing about the quality of the model in an absolute sense. If all the candidate models fit poorly, AIC will not give any warning of that.

```

</Literal>
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and

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http://users.ecs.soton.ac.uk/jn2/teaching/aic.pdf</Literal>
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from:
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ns#PlainLiteral">Bayesian information criterion or Schwarz's Bayesian information criterion is a
criterion for model selection among a finite set of models. It is based, in part, on the likelihood function
and it is closely related to the Akaike information criterion (AIC).
Given any two estimated models, the model with the lower value of BIC is the one to be preferred. The
BIC is an increasing function of  $\sigma_e^2$  and an increasing function of k. That is, unexplained variation
in the dependent variable and the number of explanatory variables increase the value of BIC. Hence,
lower BIC implies either fewer explanatory variables, better fit, or both. </Literal>
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</AnnotationAssertion>

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of Statistics 6 (2): 461&#x2013;464. doi:10.1214/aos/1176344136.</Literal>
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density function (pdf) of the random variable.</Literal>
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and

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http://reference.wolfram.com/language/ref/SmoothKernelDistribution.html</Literal>
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distribution is the probability distribution of a random variable that is derived from a collection of other
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to given probabilities of selection, and then the value of the selected random variable is
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Cp is a data item which compares the precision and bias of the full model to models with a subset of the
predictors thus helping to choose between multiple regression models.

the mallows cp is a function of the number of parameter used in the model relying on the residuals sum of
squares to compute a score.
the smaller Cp is, the better the model fit is.</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000368</IRI>
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Gonzalez-Beltran</Literal>
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ns#PlainLiteral">http://support.minitab.com/en-us/minitab/17/topic-library/modeling-
statistics/regression-and-correlation/goodness-of-fit-statistics/what-is-mallows-cp</Literal>
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Cp</Literal>
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ns#PlainLiteral">repeated measure analysis is a kind of data transformation which deals with signals
measured in the same experimental units at different times and, possibly, under different conditions over a
period of time. Data produced by longitudinal studies qualify for such analysis. Since measurements are
made on the same experimental units a number of times, they are likely to be correlated. Repeated
measure analysis usually takes into consideration the possibility of correlation with time. It does so by
specifying covariance structure in the analysis</Literal>
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ns#PlainLiteral">the ordinary least squares estimation is a model parameter estimation for a linear
regression model when the errors are uncorrelated and equal in variance. Is the Best Linear Unbiased
Estimation (BLUE) method under these assumptions, Uniformly Minimum-Variance Unbiased Estimator
(UMVUE) with addition of a Gaussian assumption.</Literal>
</AnnotationAssertion>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the weighted least squares estimation is a model parameter estimation for a linear

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regression model with errors that independent but have heterogeneous variance. Difficult to use in practice, as weights must be set based on the variance which is usually unknown. If true variance is known, it is the Best Linear Unbiased Estimation (BLUE) method under these assumptions, Uniformly Minimum-Variance Unbiased Estimator (UMVUE) with addition of a Gaussian assumption.</Literal>

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ns#PlainLiteral">the generalized least squares estimation is a model parameter estimation for a linear
regression model with errors that are dependent and (possibly) have heterogeneous variance. Difficult to
use use in practice, as covariance matrix of the errors must known to &quot;whiten&quot; data and
model. If true covariance is known, it is the Best Linear Unbiased Estimation (BLUE) method under these
assumptions, Uniformly Minimum-Variance Unbiased Estimator (UMVUE) with addition of a Gaussian
assumption.</Literal>
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ns#PlainLiteral">the iteratively reweighted least squares estimation is a model parameter estimation
which is a practical implementation of Weighted Least Squares, where the heterogeneous variances of the
errors are estimated from the residuals of the regression model, providing an estimate for the weights.
Each successive estimate of the weights improves the estimation of the regression parameters, which in
turn are used to compute residuals and update the weights</Literal>
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generalized least squares estimation is a model parameter estimation which is a practical implementation
of Generalised Least Squares, where the covariance of the errors is estimated from the residuals of the
regression model, providing the information needed to whiten the data and model. Each successive
estimate of the whitening matrix improves the estimation of the regression parameters, which in turn are
used to compute residuals and update the whitening matrix.</Literal>
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square is a data item which is obtained by dividing the sum of squared residuals (SSR) by the number of
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statistic computed from observations and used to produce a p-value when compared to a Standard Normal
Distribution in a statistical test called the Z-test.</Literal>
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ns#PlainLiteral">Deviance is an indicator of fit and can be estimated by computing -2 times the log-
likelihood ratio of the fitted model compared to a saturated(full) model.
It is a generalization of the idea of using the sum of squares of residuals in ordinary least squares to cases
where model-fitting is achieved by maximum likelihood.</Literal>
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The deviance information criterion was published in 2002 by Spiegelhalter et al.

Spiegelhalter, D. J., N. G. Best, B. P. Carlin, and A. van der Linde, 2002. Bayesian measures of model complexity and fit. *Journal of the Royal Statistical Society, B*, 64, 583-639.</Literal>

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model selection. It was published in 2003 by Claeskens, G. and Hjort, N.L. (2003). &quot;The focused
information criterion&quot;. Journal of the American Statistical Association, volume 98, pp. 879&ac899.
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scatterplot matrix contains all the pairwise scatter plots of a set of variables on a single page in a matrix
format.</Literal>
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    <IRI>http://purl.obolibrary.org/obo/STATO_0000387</IRI>
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```

```

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ns#PlainLiteral">http://docs.scipy.org/doc/scipy/reference/generated/scipy.stats.alpha.html#scipy.stats.alp
ha</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000388</IRI>
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<IRI>http://purl.obolibrary.org/obo/STATO_0000389</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a power-law probability distribution is a probability distribution whose density function (or mass function in the discrete case) has the form

$$p(x) = L(x) \cdot x^{-\alpha}$$

where α is a parameter $\alpha > 1$ and $L(x)$ is a slowly varying function.

</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
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 <IRI>http://purl.obolibrary.org/obo/STATO_0000389</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">adapted from wikipedia and wolfram alpha:
https://en.wikipedia.org/wiki/Power-law#Power-law_probability_distributions

last accessed: 2015-11-03</Literal>

</AnnotationAssertion>
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 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A regression model is a statistical model used in a type of analysis known as regression analysis, whereby a function is used to determine the relation between a response variable and an independent variable, with a set of unknown parameters.</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000390</IRI>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000390</IRI>
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https://en.wikipedia.org/wiki/Regression_analysis#Regression_models

last accessed: 2015-11-03</Literal>
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ns#PlainLiteral">an annotation property to provide a canonical command to invoke a method
implementation using Python programming language</Literal>
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```

```

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The geometric mean of two numbers, say 2 and 8, is just the square root of their
product; that is  $\sqrt{2 \times 8}=4$ </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000396</IRI>
    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000396</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">
The geometric mean is defined as the nth root of the product of n numbers, i.e., for a set of numbers
 $\{x_i\}_{i=1}^N$ , the geometric mean is defined as  $\left(\prod_{i=1}^N x_i\right)^{1/N}$ .</Literal>
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  <AnnotationAssertion>
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  <AnnotationAssertion>
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https://en.wikipedia.org/wiki/Geometric_mean</Literal>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>

```

```

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://personality-project.org/r/html/geometric.mean.html

```

Usage: `>geometric.mean(x,na.rm=TRUE)`

Arguments: `x`, a vector or data.frame</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000396</IRI>
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0.13.0/reference/generated/scipy.stats.mstats.gmean.html</Literal>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000396</IRI>
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ns#PlainLiteral">The harmonic mean is a kind of mean which is calculated by dividing the total number
of observations by the reciprocal of each number in a series.

```

Harmonic Mean = $N/(1/a_1+1/a_2+1/a_3+1/a_4+\dots+1/a_N)$

where $a(i)$ = Individual score and N = Sample size (Number of scores)</Literal>

```

</AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000397</IRI>
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```

```

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">adapted from wikipedia and
https://www.easycalculation.com/statistics/learn-harmonic-mean.php

```

```
last accessed: 2015-11-04</Literal>
```

```

</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000397</IRI>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000397</IRI>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">http://personality-project.org/r/html/harmonic.mean.html

```

Usage: `> harmonic.mean(x,na.rm=TRUE)`

Arguments:

x, a vector, matrix, or data.frame

na.rm, na.rm=TRUE remove NA values before processing

```

</Literal>
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<AnnotationAssertion>
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0.13.0/reference/generated/scipy.stats.mstats.hmean.html</Literal>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000397</IRI>
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<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000398</IRI>
  <IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000398</IRI>
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ns#PlainLiteral">The weighted arithmetic mean is a kind of mean similar to an ordinary arithmetic mean
(the most common type of average), except that instead of each of the data points contributing equally to
the final average, some data points contribute more than others.

```

The weighted arithmetic mean is often used if one wants to combine average values from samples of the same population with different sample sizes.</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000398</IRI>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000398</IRI>
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```



```

</AnnotationAssertion>
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ns#PlainLiteral">The interquartile mean (IQM) (or midmean) is a statistical measure of central tendency
based on the truncated mean of the interquartile range.

```

In the calculation of the IQM, only the data in the second and third quartiles is used (as in the interquartile range), and the lowest 25% and the highest 25% of the scores are discarded. These points are called the first and third quartiles, hence the name of the IQM.</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>http://purl.obolibrary.org/obo/STATO_0000399</IRI>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000399</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Orlaith Burke</Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000399</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Philippe Rocca-Serra</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000399</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">IQM</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000399</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">https://en.wikipedia.org/wiki/Mean#Interquartile_mean</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000399</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">interquartile mean</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000400</IRI>

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    <IRI>http://purl.obolibrary.org/obo/IAO_0000122</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000400</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The root mean square (abbreviated RMS or rms), also known as the quadratic mean, in
statistics is a statistical measure of central tendency defined as the square root of the mean of the squares
of a sample.

```

(To find the root mean square of a set of numbers, square all the numbers in the set and then find the arithmetic mean of the squares. Take the square root of the result. This is the root mean square.)</Literal>

```

  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000400</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000400</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
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  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000400</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Philippe Rocca-Serra</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000400</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">RMS</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000400</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">root mean square</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>http://purl.obolibrary.org/obo/STATO_0000400</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">https://en.wikipedia.org/wiki/Root_mean_square
and
http://www.mathwords.com/r/root_mean_square.htm

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last accessed: 2015-11-04</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000400</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">quadratic mean</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000114"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000401</IRI>

<IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000401</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">the sample mean of sample of size n with n observations is an arithmetic mean computed over n number of observations on a statistical sample.

The sample mean, denoted \bar{x} and read "x-bar" is simply the average of the n data points x_1, x_2, \dots, x_n :

$$\bar{x} = \frac{x_1 + x_2 + \dots + x_n}{n} = \frac{1}{n} \sum_{i=1}^n x_i$$

The sample mean summarizes the "location" or "center" of the data.

the sample mean is a measure of dispersion of the observations made on the sample and provides an unbiased estimate of the population mean</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000401</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>

</AnnotationAssertion>

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</AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/STATO_0000401</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">adapted from:

<https://onlinecourses.science.psu.edu/stat414/node/66>
and
<http://mathworld.wolfram.com/SampleMean.html>

last accessed: 2015-11-05</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000401</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">sample mean</Literal>

</AnnotationAssertion>

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<IRI>http://purl.obolibrary.org/obo/IAO_0000123</IRI>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000402</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">the population mean or distribution mean is a parameter of a probability distribution or population indicative of the data dispersion. For continuous probability distribution, the population mean is computed using the probability density function, for discrete probability distributions, a mass density function is used instead.

A population mean can be estimated by computing a sample mean</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000117"/>

<IRI>http://purl.obolibrary.org/obo/STATO_0000402</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Alejandra Gonzalez-Beltran</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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</AnnotationAssertion>

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</AnnotationAssertion>

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<http://mathworld.wolfram.com/PopulationMean.html>

```

last accessed: 2015-11-05</Literal>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">population mean</Literal>
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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000403</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Relationship between a quantity and a parameter, where the quantity used or evaluated
as an estimate of the value of a parameter.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000403</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">estimator of</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000404</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the most common series or system of written mathematical symbols used to represent
the entity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000404</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">AGB</Literal>
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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.obolibrary.org/obo/STATO_0000404</IRI>
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ns#PlainLiteral">preferred mathematical notation</Literal>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
  <IRI>http://purl.obolibrary.org/obo/UO_0000001</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">length unit</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://purl.obolibrary.org/obo/UO_0000001</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A unit which is a standard
measure of the distance between two points.</Literal>
</AnnotationAssertion>

```

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<AnnotationAssertion>
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  </AnnotationAssertion>
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    <IRI>http://purl.obolibrary.org/obo/UO_0000001</IRI>
    <IRI>http://purl.obolibrary.org/obo/uo.owl</IRI>
  </AnnotationAssertion>
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
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    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">length unit</Literal>
  </AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>http://purl.obolibrary.org/obo/UO_0000003</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">time unit</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://purl.obolibrary.org/obo/UO_0000003</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">A unit which is a standard
measure of the dimension in which events occur in sequence.</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
    <IRI>http://purl.obolibrary.org/obo/UO_0000003</IRI>
    <IRI>http://purl.obolibrary.org/obo/obi.owl</IRI>
  </AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000412"/>
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    <IRI>http://purl.obolibrary.org/obo/uo.owl</IRI>
  </AnnotationAssertion>
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  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.obolibrary.org/obo/UO_0000003</IRI>
    <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">time unit</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://purl.obolibrary.org/obo/bfo.owl#VolcanicEruption</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Moderate to
violent ejection of solid or very viscous hot fragments of new lava in short-lived, cannon-like bursts. Ash
and fine ash are emitted with gases and ascend to form a cauliflower-like eruption cloud.</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
    <IRI>http://purl.org/dc/elements/1.1/contributor</IRI>

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    <IRI>http://purl.org/dc/elements/1.1/</IRI>
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    <IRI>http://purl.org/dc/elements/1.1/contributor</IRI>
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  <AnnotationAssertion>
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  <AnnotationAssertion>
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    <IRI>http://purl.org/dc/elements/1.1/</IRI>
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    <IRI>http://purl.org/dc/elements/1.1/creator</IRI>
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    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
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    <Literal xml:lang="en-us" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Creator</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
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    <IRI>http://purl.org/dc/elements/1.1/date</IRI>
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  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
    <IRI>http://purl.org/dc/elements/1.1/date</IRI>
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  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://purl.org/dc/elements/1.1/description</IRI>
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ns#PlainLiteral">An account of the content of the resource.</Literal>

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</AnnotationAssertion>
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  <IRI>http://purl.org/dc/elements/1.1/description</IRI>
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ns#PlainLiteral">Description</Literal>
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ns#PlainLiteral">Description</Literal>
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  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://purl.org/dc/elements/1.1/format</IRI>
  <Literal xml:lang="en-us" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The physical or digital manifestation of the resource.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
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ns#PlainLiteral">Format</Literal>
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  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://purl.org/dc/elements/1.1/subject</IRI>
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ns#PlainLiteral">The topic of the content of the resource.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.org/dc/elements/1.1/subject</IRI>
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</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
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Keywords</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://purl.org/dc/elements/1.1/subject</IRI>
  <Literal xml:lang="en-us" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Subject and Keywords</Literal>
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  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://purl.org/dc/elements/1.1/title</IRI>
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ns#PlainLiteral">A name given to the resource.</Literal>
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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:isDefinedBy"/>
  <IRI>http://purl.org/dc/elements/1.1/title</IRI>
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  <IRI>http://purl.org/dc/elements/1.1/title</IRI>
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ns#PlainLiteral">Title</Literal>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Constituent forms finer-grained material interstitial to a framework constituent.
  &quot;The finer-grained material enclosing, or filling the interstices between, the larger grains or
  particles of a sediment or sedimentary rock...The term refers to the relative size and disposition of the
  particles, and no particular particle size is implied&quot; (Jackson, 1997, p. 393). May be classifiable
  into orthomatrix, protomatrix, epimatrix, pseudomatrix, and unclassified matrix.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/humanDecision.owl#LocationAllocation</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Spatial allocation is primarily concerned with designating what kinds of activities can or
  will be done where on the landscape. Land-use zoning is a typical example of a spatial allocation problem

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in which the landscape is divided up into a set of multiple alternative uses such as industrial, commercial, residential, etc. Allocation to a particular use usually depends on intrinsic properties of the individual parcels as well as adjacency constraints.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/humanDecision.owl#ResourceAllocation></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Resource allocation has two meanings. One meaning refers to allocating a resource such as forest land to two or more designated uses. For example, forest land units could be allocated to timber production, recreation, etc. The second meaning is in the sense of allocating management resources. This second meaning is concerned with allocating time, materials, personnel, budget to landscape elements to accomplish management objectives such as protection, restoration, timber production, etc.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geodesy></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Geodesy is the scientific discipline that deals with the measurement and representation of a planet, including its gravity field, in a three-dimensional time varying space. Besides the gravity field, geodesists study also geodynamical phenomena such as crustal motion, tides, and polar motion. For this they design global and national Control networks, using Space and terrestrial techniques while relying on datums and coordinate systems</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Geophysics></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Geophysics, a branch of Earth sciences, is the study of the Earth by quantitative physical methods, especially by seismic, electromagnetic, and radioactivity methods. The theories and techniques of geophysics are employed extensively in the planetary sciences in general.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Neotectonics></IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Neotectonics is a subdiscipline of tectonics. It is the study of the motions and deformations of the Earth's crust (geological and geomorphological processes) which are current or recent in geologic time.[1] The term may also refer to the motions/deformations in question themselves. The corresponding time frame is referred to as the neotectonic period.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#PlanetaryScience></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Planetary science, also known as planetology and closely related to planetary astronomy, is the science of planets, or planetary systems, and the solar system. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#PlateTectonics></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In plate tectonic theory earth history, at its simplest, is one of plates rifting into pieces diverging apart and new ocean basins being born, followed by motion reversal, convergence back together, subduction of the oceanic crust, plate collision, and mountain building. This cycle of opening and closing ocean basins is the Wilson Cycle . [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Seismology</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Seismology (from the Greek seismos = earthquake and ἔπος, logos = knowledge) is the scientific study of earthquakes and the propagation of elastic waves through the Earth. The field also includes studies of earthquake effects, such as tsunamis as well as diverse seismic sources such as volcanic, tectonic, oceanic, atmospheric, and artificial processes (such as explosions).

</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/humanKnowledgeDomain.owl#Tectonics</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Tectonics is a field of study within geology concerned generally with the structures within the crust of the Earth (or other planets) and particularly with the forces and movements that have operated in a region to create these structures. Tectonics is concerned with the orogenies and tectonic development of cratons and tectonic terranes as well as the earthquake and volcanic belts which directly affect much of the global population. Tectonic studies are also important for understanding erosion patterns in geomorphology and as guides for the economic geologist searching for petroleum and metallic ores. A subfield of tectonics that deals with tectonic phenomena in the geologically recent period is called neotectonics. </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matr.owl#Chemical</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Chemical substance, in chemistry, are material objects that can undergo various transformations related to artificial or natural phenomena [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matr.owl#Mixture</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In chemistry, a mixture is when two or more different substances are mixed together but not combined chemically. The molecules of two or more different substances are mixed in the form of solutions, suspensions, and colloids. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matr.owl#Solution</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In chemistry, a solution is a homogeneous mixture composed of two or more substances. In such a mixture, a solute is dissolved in another substance, known as a solvent. All solutions are characterized by interactions between the solvent phase and solute molecules or ions that result in a net decrease in free energy. [Wikipedia]</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrAerosol.owl#Ash</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Fine particles of
pulverized rock.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrAerosol.owl#Particulate</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The term for solid or liquid particles found in a gas. Some particles are large or dark
enough to be seen as soot or smoke.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#Compound</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
chemical compound is a pure chemical substance consisting of two or more different chemical
elements[1][2][3] that can be separated into simpler substances by chemical reactions[4] and that have a
unique and defined chemical structure. Chemical compounds consist of a fixed ratio of atoms[3] that are
hold together in a defined spatial arrangement by chemical bonds. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrCompound.owl#NaCl</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
salt is defined as the product formed from the neutralization reaction of acids and bases. Salts are ionic
compounds composed of cations (positively charged ions) and anions (negative ions) so that the product
is electrically neutral (without a net charge). [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Ch</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Cr</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Chalcophile</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An element such as copper that forms sulphide minerals if sufficient sulphur is
available.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Element</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
chemical element is a pure chemical substance consisting of one type of atom distinguished by its atomic
number, which is the number of protons in its nucleus. The term is also used to refer to a pure chemical
substance composed of atoms with the same number of protons. [Wikipedia]</Literal>
</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrElement.owl#Metal</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
metal is a chemical element whose atoms readily lose electrons to form positive ions (cations), and form
metallic bonds between other metal atoms and ionic bonds between nonmetal
atoms.[Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrElementalMolecule.owl#O3</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
nearly colorless gas, it is a very strong absorber of ultraviolet radiation, and the presence of the ozone
layer in the upper atmosphere provides an ozone shield that prevents dangerous radiation from reaching
the earth's surface.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrEquipment.owl#Aircraft</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An aircraft is a
vehicle which is able to fly through the air (or through any other atmosphere). All the human activity
which surrounds aircraft is called aviation. (Most rocket vehicles are not aircraft because they are not
supported by the surrounding air).</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrEquipment.owl#Borehole</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A borehole is the
generalised term for any narrow shaft drilled in the ground, either vertically or horizontally. A borehole
may be constructed for many different purposes including the extraction of water or fluid (such as oil) or
gases (such as natural gas or methane), as part of a geotechnical investigation or environmental site
assessment, for mineral exploration, or as a pilot hole for installing piers or underground utilities.
</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrEquipment.owl#Well</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
bored, drilled or driven shaft, or a dug hole, whose depth is greater than the largest surface dimension.
</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrIon.owl#Anion</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An anion is an ion that has more electrons than protons such that the atom or molecule
is negatively charged. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrIon.owl#Cation</IRI>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An cation is an ion that has more protons than electrons such that the atom or molecule is positively charged. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrIon.owl#Ion</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An ion is an atom or molecule where the total number of electrons is not equal to the total number of protons, giving it a net positive or negative electrical charge. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Feldspar</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Feldspars (KAlSi₃O₈ â NaAlSi₃O₈ â CaAl₂Si₂O₈) are a group of rock-forming tectosilicate minerals that make up about 41% of the Earth's continental crust by weight [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Glass</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In the scientific sense the term glass is often extended to all amorphous solids (and melts that easily form amorphous solids), including plastics, resins, or other silica-free amorphous solids. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Hematite</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Hematite, also spelled as hÁmatite, is the mineral form of Iron(III) oxide (Fe₂O₃), one of several iron oxides. Hematite crystallizes in the rhombohedral system, and it has the same crystal structure as ilmenite and as corundum. Hematite is a mineral, colored black to steel or silver-gray, brown to reddish brown, or red. It is mined as the main ore of iron [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Magnetite</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Magnetite is a ferrimagnetic mineral with chemical formula Fe₃O₄, one of several iron oxides and a member of the spinel group. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Mineral</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A mineral is a naturally occurring solid formed through geological processes that has a characteristic chemical composition, a highly ordered atomic structure, and specific physical properties [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<AnnotationProperty abbreviatedIRI="rdfs:comment"/>
<IRI>http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Mineraloid</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
mineraloid is a mineral-like substance that does not demonstrate crystallinity. Mineraloids possess
chemical compositions that vary beyond the generally accepted ranges for specific minerals. For example,
obsidian is an amorphous glass and not a crystal. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Olivine</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Olivine is a magnesium iron
silicate with the formula (Mg2+, Fe2+)2SiO4. Thus it is a type of nesosilicate or orthosilicate. It is a
common mineral in Earth's subsurface but weathers quickly on the surface [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Pyroxine</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The pyroxenes (commonly abbreviated to Px) are a group of important rock-forming
inosilicate minerals found in many igneous and metamorphic rock [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Pyroxine</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Pyroxine</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Pyroxine</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Pyroxene</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrMineral.owl#Quartz</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Quartz is a mineral composed of silicon and oxygen atoms in a continuous framework
of SiO4 silicon-oxygen tetrahedra, with each oxygen being shared between two tetrahedra, giving an
overall chemical formula of SiO2. Quartz is the second most abundant mineral in Earth's
continental crust, behind feldspar [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrParticle.owl#GammaRay</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Gamma rays are
a form of electromagnetic radiation or light emission of frequencies produced by sub-atomic particle
interactions, such as electron-positron annihilation or radioactive decay. Gamma rays are generally
characterized as electromagnetic radiation having the highest frequency and energy, and also the shortest
wavelength, within the electromagnetic spectrum, i.e. high energy photons. Due to their high energy
content, they can cause serious damage when absorbed by living cells.</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrParticle.owl#Nucleon</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A collective
name for the two baryons: neutron and the proton. </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRock.owl#HeterogenousRock</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
heterogeneous or conglomerate is a rock consisting of individual stones that have become cemented
together. Conglomerates are sedimentary rocks consisting of rounded fragments and are thus
differentiated from breccias, which consist of angular clasts.[1] Both conglomerates and breccias are
characterized by clasts larger than sand (&gt;2 mm). [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRock.owl#MetamorphicRock</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">One of the major groups of rock that makes up the crust of the Earth; consists of pre-
existing rock mass in which new minerals or textures are formed at higher temperatures and greater
pressures than those present on the Earth's surface [wictionary]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRock.owl#Rock</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Rock is a naturally occurring solid aggregate of minerals and/or mineraloids. In general
rocks are of three types, namely, igneous, sedimentary, and metamorphic. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRock.owl#SedimentaryRock</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">One of the major groups of rock that makes up the crust of the Earth; formed by the
deposition of either the weathered remains of other rocks, the results of biological activity, or
precipitation from solution [wictionary]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Aa</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">One of three basic types of flow lava. Aa is basaltic lava characterized by a rough or
rubbly surface composed of broken lava blocks called clinker. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Andesite</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Andesite is an extrusive igneous, volcanic rock, of intermediate composition, with

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aphanitic to porphyritic texture. In a general sense, it is the intermediate type between basalt and granite, and ranges from 57 to 63% silicon dioxide (SiO₂) as illustrated in TAS diagrams. The mineral assemblage is typically dominated by plagioclase plus pyroxene or hornblende. Magnetite, zircon, apatite, ilmenite, biotite, and garnet are common accessory minerals.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#AnorogenicIgneousRock></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Anorogenic granites are formed above volcanic "hot spot" activity and have peculiar mineralogy and geochemistry. These granites are formed by melting of the lower crust under conditions that are usually extremely dry. The rhyolites of the Yellowstone caldera are examples of volcanic equivalents of A-type granite. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Basalt></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Basalt is the most common extrusive volcanic rock. It is usually grey to black and fine-grained due to rapid cooling of lava at the surface of a planet. It may be porphyritic containing larger crystals in a fine matrix, or vesicular, or frothy scoria. Unweathered basalt is black or grey. On Earth, most basalt magmas have formed by decompression melting of the mantle. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#CinderCone></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Pyroclastic Cone</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#CinderCone></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Scoria Cone</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#CinderCone></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A cinder cone or scoria cone is a steep conical hill of loose pyroclastic fragments, such as either volcanic clinkers, cinders, volcanic ash, or scoria that has been built around a volcanic vent [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#CompositeCone></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A steep volcanic cone built by both lava flows and pyroclastic eruptions</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Dacite></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Dacite is an igneous, volcanic rock. It has an aphanitic to porphyritic texture and is intermediate in composition between andesite and rhyolite [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#ExtrusiveRock</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Magma that has erupted onto the surface of the earth and cooled sufficiently to form solid rock. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Felsic</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Felsic refers to silicate minerals, magma, and rocks which are enriched in the lighter elements such as silicon, oxygen, aluminium, sodium, and potassium. The term combines the words "feldspar" and "silica." Felsic minerals are usually light in color and have specific gravities less than 3. Common felsic minerals include quartz, muscovite, orthoclase, and the sodium-rich plagioclase feldspars. The most common felsic rock is granite. On the opposite side of the rock spectrum are the iron and magnesium-rich mafic and ultramafic minerals and rocks. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Hypabyssal</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Hypabyssal or subvolcanic rock are igneous rocks formed at a depth in between the plutonic and volcanic rocks. They are characterized by their porphyritic nature (porphyry). They consist of phenocrysts embedded in a fine-grained groundmass. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IgneousRock</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">By definition, all igneous rock is formed from magma [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#IntrusiveRock</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Beneath the surface magma tends to cool slowly which allows for the growth of large crystals within the rock. Rocks formed in this way are intrusive or plutonic rocks. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Kimberlite</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Kimberlite is a type of potassic volcanic rock best known for sometimes containing diamonds. The general consensus reached on kimberlites is that they are formed deep within the mantle, at between 150 and 450 kilometres depth, from anomalously enriched exotic mantle compositions, and

are erupted rapidly and violently, often with considerable carbon dioxide and other volatile components. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Lava</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Magma that extrudes onto the surface of earth is called lava. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Mafic</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Mafic is an adjective describing a silicate mineral or rock that is rich in magnesium and iron; the term was derived by contracting "magnesium" and "ferric". Most mafic minerals are dark in color and the specific gravity is greater than 3. Common rock-forming mafic minerals include olivine, pyroxene, amphibole, and biotite. Common mafic rocks include basalt and gabbro. In terms of chemistry, mafic rocks are on the other side of the rock spectrum from the felsic rocks. The term roughly corresponds to the older basic rock class. Mafic lava, before cooling, has a low viscosity, in comparison to felsic lava, due to the lower silica content in mafic magma. Water and other volatiles can more easily and gradually escape from mafic lava, so eruptions of volcanoes made of mafic lavas are less explosively violent than felsic lava eruptions. Most mafic lava volcanoes are oceanic volcanoes, like Hawaii. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Magma</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Magma is molten rock that is found beneath the surface of the Earth. Magma is a complex high-temperature fluid substance in 3 phases; a system of silicate liquid, solid minerals, and perhaps a vapor phase. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Obsidian</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Obsidian, a type of quenched lava, is a silicic black volcanic glass [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Pahoehoe</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Pahoehoe is basaltic lava that has a smooth, billowy, undulating, or ropy surface. These surface features are due to the movement of very fluid lava under a congealing surface crust. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#PillowLava</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Pillow lava is the lava structure typically formed when lava emerges from an underwater volcanic vent or subglacial volcano or a lava flow enters the ocean. However, pillow lava can also form when lava is erupted beneath thick glacial ice. The viscous lava gains a solid crust on contact with the water, and this crust cracks and oozes additional large blobs or "pillows" as more lava emerges from the advancing flow. Since water covers the majority of Earth's surface and most volcanoes are situated near or under bodies of water, pillow lava is very common. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Pluton</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A pluton is an intrusive igneous rock body that crystallized from a magma slowly cooling below the surface of the Earth. Plutons include batholiths, dikes, sills, laccoliths, lopoliths, and other igneous bodies. In practice, "pluton" usually refers to a distinctive mass of igneous rock, typically kilometers in dimension, without a tabular shape like those of dikes and sills. Batholiths commonly are aggregations of plutons. The most common rock types in plutons are granite, granodiorite, tonalite, and quartz diorite. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Pumice</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Light-colored, frothy volcanic rock, usually of dacite or rhyolite composition, formed by the expansion of gas in erupting lava. Commonly seen as lumps or fragments of pea-size and larger, but can also occur abundantly as ash-sized particles.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Pyroclastic</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A descriptive term, usually for rock, which results from explosive magma ejection [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Rhyolite</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Rhyolite is an igneous, volcanic rock, of felsic (silica-rich) composition (typically > 69% SiO₂). It may have any texture from glassy to aphanitic to porphyritic. The mineral assemblage is usually quartz, sanidine and plagioclase. Biotite and hornblende are common accessory minerals. It is the extrusive equivalent to granite [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#SpatterCone</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A low, steep-sided cone of spatter built up on a fissure or vent. It is usually of basaltic material.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tephra</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Tephra is a collective term (generally plural) used for all material -- regardless of size-- ejected during an explosive volcanic eruption.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyandesite</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Trachyandesite is an extrusive igneous rock with a composition between trachyte and andesite. It has little or no free quartz, but is dominated by alkali feldspar and sodic plagioclase along with one or more of the following mafic minerals: amphibole, biotite or pyroxene. Small amounts of nepheline may be present and apatite is a common accessory mineral [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachybasalt</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An extrusive rock intermediate in composition between trachyte and basalt.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Trachyte</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Trachyte is an igneous volcanic rock with an aphanitic to porphyritic texture. It is the volcanic equivalent of syenite. The mineral assemblage consists of essential alkali feldspar; relatively minor plagioclase and quartz or a feldspathoid such as nepheline may also be present. Biotite, clinopyroxene and olivine are common accessory minerals [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tuff</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Rock formed of pyroclastic material.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Tuff</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Tuff (from the Italian tufo) is a type of rock made of volcanic ash ejected from a vent during a volcanic eruption. Following ejection and deposition, the ash is compacted into a solid rock in a process called consolidation. Tuff is sometimes erroneously called "tufa", particularly when used as construction material, but properly speaking tufa is a limestone precipitated from groundwater. Rock that contains greater than 50% tuff is considered tuffaceous [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#TuffCone</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A type of volcanic cone formed by the interaction of basaltic magma and water. Smaller and steeper than a tuff ring.</Literal>

</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#TuffRing</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
wide, low-rimmed, well-bedded accumulation of hyalo-clastic debris built around a volcanic vent located
in a lake, coastal zone, marsh, or area of abundant ground water.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Ultramaphic</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Ultramafic (also referred to as ultrabasic rocks, although the terms are not wholly
equivalent) are igneous and meta-igneous rocks with a very low silica content (less than 45%), generally
&gt;18% MgO, high FeO, low potassium, and are composed of usually greater than 90% mafic minerals
(dark colored, high magnesium and iron content) [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Ultramaphic</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Ultramafic</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicCone</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
mound of loose material that was ejected ballistically.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicNeck</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
massive pillar of rock more resistant to erosion than the lavas and pyroclastic rocks of a volcanic
cone.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#VolcanicRock</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Volcanic rock is an igneous rock produced by extrusion from a volcano. It has various
subtypes based on chemical composition and whether the extrusion was violent (pyroclastic) or slow
(laval). [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Xenocryst</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
xenocryst is an individual foreign crystal included within an igneous body. Examples of xenocrysts are
quartz crystals in a silica-deficient lava and diamonds within kimberlite diatremes. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>

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<AnnotationProperty abbreviatedIRI="rdfs:comment"/>
<IRI>http://sweet.jpl.nasa.gov/2.3/matrRockIgneous.owl#Xenolith</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
xenolith is a rock fragment which becomes enveloped in a larger rock during the latter&apos;s
development and hardening. The term xenolith is almost exclusively used to describe inclusions in
igneous rock during magma emplacement and eruption [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#AshFlow</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
turbulent mixture of gas and rock fragments, most of which are ash-sized particles, ejected violently from
a crater or fissure. The mass of pyroclastics is normally of very high temperature and moves rapidly down
the slopes or even along a level surface.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Ashfall</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Volcanic ash that has fallen through the air from an eruption cloud. A deposit so formed
is usually well sorted and layered.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Block</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Angular chunk of solid rock ejected during an eruption.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Bomb</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Fragment of molten or semi-molten rock, 2 1/2 inches to many feet in diameter, which
is blown out during an eruption. Because of their plastic condition, bombs are often modified in shape
during their flight or upon impact.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#DebrisAvalanche</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
rapid and unusually sudden sliding or flowage of unsorted masses of rock and other material. As applied
to the major avalanche involved in the eruption of Mount St. Helens, a rapid mass movement that
included fragmented cold and hot volcanic rock, water, snow, glacier ice, trees, and some hot pyroclastic
material. Most of the May 18, 1980 deposits in the upper valley of the North Fork Toutle River and in the
vicinity of Spirit Lake are from the debris avalanche.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#DebrisFlow</IRI>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A mixture of water-saturated rock debris that flows downslope under the force of gravity (also called lahar or mudflow).</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Ejecta</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In volcanology, particles that came out of a volcanic vent, traveled through the air or under water, and fell back on the ground surface or on the ocean floor. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Hypoclastite</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A deposit formed by the flowing or intrusion of lava or magma into water, ice, or water-saturated sediment and its consequent granulation or shattering into small angular fragments.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Lahar</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A torrential flow of water-saturated volcanic debris down the slope of a volcano in response to gravity. A type of mudflow.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Mudflow</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A flowage of water-saturated earth material possessing a high degree of fluidity during movement. A less-saturated flowing mass is often called a debris flow. A mudflow originating on the flank of a volcano is properly called a lahar.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#Varve</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A varve is an annual layer of sediment or sedimentary rock.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/matrSediment.owl#VolcanicDeposit</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Volcanic deposits are molten rock (lava), solid rocks and ash which surround a volcano crater. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phen.owl#PlanetaryPhenomena</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">
 Planetary phenomena are the movements of planets and the sun, including for example orbits,
 alignments, eclipses day and night cycles, and the change of seasons. </Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenAtmo.owl#OrographicLifting</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
 ns#PlainLiteral">Ascending air flow caused by mountains. Mechanisms that produce the lifting fall into
 two broad categories: 1) the upward deflection of horizontal larger-scale flow by the orography acting as
 an obstacle or barrier; or 2) the daytime heating of mountain surfaces to produce anabatic flow along the
 slopes and updrafts in the vicinity of the peaks.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenEnvirImpact.owl#AirPollution</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The presence of
 substances in the atmosphere, particularly those that do not occur naturally</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:label"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenEnvirImpact.owl#AirPollution</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Air
 Pollution</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenFluidInstability.owl#ConvectiveInstability</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
 ns#PlainLiteral">An instability due to the buoyancy force of heavy fluid over light fluid overcoming the
 stabilizing influence of viscous forces.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenFluidInstability.owl#Inversion</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In
 meteorology, a departure from the usual decrease or increase with altitude of the value of an atmospheric
 quantity; also, the layer through which this departure occurs (the inversion layer), or the lowest altitude at
 which the departure is found (the base of the inversion).</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenFluidTransport.owl#Advection</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The process of
 transport solely by the mass motion (velocity field); also, the rate of change of the value of the advected
 property at a given point.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenFluidTransport.owl#Buoyancy</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">That property of an object that enables it to float on the surface of a liquid, or ascend through and remain freely suspended in a compressible fluid such as the atmosphere.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenFluidTransport.owl#Convection</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In general, mass motions within a fluid resulting in transport and mixing of the properties of that fluid. Convection, along with conduction and radiation, is a principal means of energy transfer.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenFluidTransport.owl#Deposition</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Phenomena by which traces gases or particles are transferred from atmosphere to a surface.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenFluidTransport.owl#Plume</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Buoyant jet in which the buoyancy is supplied from a point source; the buoyant region is continuous. 2. A mostly horizontal (sometimes initially vertical) stream of pollutant that is being blown downwind from a smokestack.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenFluidTransport.owl#SlantWiseConvection</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A form of convection driven by a combination of gravitational and centrifugal forces.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenFluidTransport.owl#StackEffect</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An effect due to heat sources within a local exhaust enclosure (stack) producing convective air currents with vertical velocities proportional to the rate of heat transferred to the surrounding air and to the height of rise of the heated air.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenGeol.owl#Igneous</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">One of 3 processes in the Rock Cycle. Igneous refers to the process whereby hot material from the mantle is squeezed upward toward the earth's surface. If it has not reached the surface then the material is described as an intrusive structure and the rocks it creates are called Intrusive Rock. If it extrudes from the surface the material is described as a volcano and the rock it creates is known as Extrusive Rock. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeol.owl#OrogenicCollapse></IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The process in which mountains begin to collapse under their own weight and spread out laterally.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeol.owl#Orogeny></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Orogeny refers to natural mountain building, and may be studied as (a) a tectonic structural event, (b) as a geographical event, and (c) a chronological event. Orogenic events (a) cause distinctive structural phenomena and related tectonic activity, (b) affect certain regions of rocks and crust, and (c) happen within a specific period of time. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeol.owl#RockCycle></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The rock cycle is a fundamental concept that describes the dynamic transitions through geologic time among the three main rock types: sedimentary, metamorphic, and igneous. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeol.owl#WilsonCycle></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The Wilson cycle (a plate tectonics based rock cycle) was developed by J. Tuzo Wilson during the 1960s and 1970s. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolGeomorphology.owl#Compaction></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Compaction, part of the process of lithification involving mechanical dewatering of a sediment by progressive loading under several km of geomaterial [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolGeomorphology.owl#Diagenesis></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In geology and oceanography, diagenesis is any chemical, physical, or biological change undergone by a sediment after its initial deposition and during and after its lithification, exclusive of surface alteration (weathering) and metamorphism. These changes happen at relatively low temperatures and pressures and result in changes to the rock's original mineralogy and texture. The boundary between diagenesis and metamorphism, which occurs under conditions of higher temperature and pressure, is gradational. After deposition, sediments are compacted as they are buried beneath successive layers of sediment and cemented by minerals that precipitate from solution. Grains of sediment, rock fragments and fossils can be replaced by other minerals during diagenesis. Porosity usually decreases during diagenesis, except in rare cases such as dissolution of minerals and dolomitization.</Literal>
 </AnnotationAssertion>
 </AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolGeomorphology.owl#Landslide></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A landslide (or landslip) is a geological phenomenon which includes a wide range of ground movement, such as rock falls, deep solifluction of slopes and shallow debris flows, which can occur in offshore, coastal and onshore environments. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolGeomorphology.owl#Sedimentation></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The process of depositing material by water, wind, or glaciers.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolGeomorphology.owl#Subsidence></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Subsidence is the motion of a surface (usually, the Earth's surface) as it shifts downward relative to a datum such as sea-level. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolGeomorphology.owl#Weathering></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Weathering is the decomposition of rocks, soils and their minerals through direct contact with the Earth's atmosphere. Weathering occurs in situ, or with no movement, and thus should not to be confused with erosion, which involves the movement and disintegration of rocks and minerals by agents such as water, ice, wind and gravity.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolSeismicity.owl#Earthquake></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Earthquakes are caused by energy release during rapid slippage along a fault. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolSeismicity.owl#LoveWave></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A type of seismic surface wave having a horizontal motion that is shear or transverse to the direction of propagation. Its velocity depends only on density and rigidity modulus, and not on bulk modulus. It is named after A. E. H. Love, the English mathematician who discovered it.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolSeismicity.owl#PWave></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">P waves are longitudinal or compressional waves, which means that the ground is alternately compressed and dilated in the direction of propagation. In solids these waves generally travel slightly less than twice as fast as S waves and can travel through any type of material. In air, these pressure waves take the form

of sound waves, hence they travel at the speed of sound. Typical speeds are 330 m/s in air, 1450 m/s in water and about 5000 m/s in granite. P waves are sometimes called primary waves. When generated by an earthquake they are less destructive than the S waves and surface waves that follow them, due to their lesser amplitudes. </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolSeismicity.owl#SWave></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">S waves are transverse or shear waves, which means that the ground is displaced perpendicularly to the direction of propagation. In the case of horizontally polarized S waves, the ground moves alternately to one side and then the other. S waves can travel only through solids, as fluids (liquids and gases) do not support shear stresses. Their speed is about 60% of that of P waves in a given material. S waves are sometimes called secondary waves, and are several times larger in amplitude than P waves for earthquake sources.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolSeismicity.owl#SeismicBodyWave></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Body waves are seismic waves that travel through the lithosphere. Two kinds of body waves exist: P-waves and S-waves. </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolSeismicity.owl#SeismicSurfaceWave></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Surface waves are analogous to water waves and travel just under the Earth's surface. They travel more slowly than body waves. Because of their low frequency, long duration, and large amplitude, they can be the most destructive type of seismic wave. There are two types of surface waves: Rayleigh waves and Love waves. Theoretically, surface waves can be understood as systems of interacting P and/or S waves.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolSeismicity.owl#SeismicWave></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Seismic waves are phenomena that travel through the Earth or other elastic body, for example as the result of an earthquake, explosion, or some other process that imparts forces to the body. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolSeismicity.owl#Tremor></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Low amplitude, continuous earthquake activity often associated with magma movement.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#AsymmetricHeatFlow></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Asymmetric heat flow in geology is an observation that the heat from upwelling mantle does not spread symmetrically away from the hot spot or rift due to differences in crust composition.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#ContinentalDrift</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Continental drift is the movement of the Earth's continents relative to each other. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#ExtensionEvent</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An extension event occurs when a seismic event causes an extension in the crust. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#IsostaticRebound</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Post-glacial rebound (sometimes called continental rebound, isostatic rebound, isostatic adjustment or post-ice-age isostatic recovery) is the rise of land masses that were depressed by the huge weight of ice sheets during the last glacial period, through a process known as isostatic depression. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#PlateConvergence</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Plate convergence is the phenomena of two plates moving toward one another. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#PlateDivergence</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Plate divergence is the phenomena of plates drifting apart [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#Spreading</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A spreading event occurs whenever plates drift apart (Plate Divergence). [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#TectonicAssemblage</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A tectonic ssemblage is a geological term for an accreted terrane of heterogeneous rocks.

[Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#TectonicForce</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The tectonic force is the force created by one tectonic plate pushing against another due to upwellings of the mantle, [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#TectonicPhenomena</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The tectonic phenomena is the observable motions of the tectonic plates in the Earth's Lithosphere. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolTectonic.owl#Terrane</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A terrane in geology is a fragment of crustal material formed on, or broken off from, one tectonic plate and accreted "sutured" to crust lying on another plate. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#EruptionCloud</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The column of gases, ash, and larger rock fragments rising from a crater or other vent. If it is of sufficient volume and velocity, this gaseous column may reach many miles into the stratosphere, where high winds will carry it long distances.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#LavaOfTephra</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Tephra is air-fall material (of any size) produced by a volcanic eruption regardless of composition or fragment size. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#Magmatic</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Eruption Type 1 - produce juvenile clasts during explosive decompression from gas release.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#MantlePlume</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A mantle plume is an upwelling of abnormally hot rock within the Earth's mantle. As the heads of mantle plumes can partly melt when they reach shallow depths, they are thought to be the cause of volcanic centers known as hotspots and probably also to have caused flood basalts.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#PeleanEruption</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In a Peléan eruption or nuée ardente (glowing cloud) eruptions a large amount of gas, dust, ash, and lava fragments are blown out of a central crater, fall back, and form avalanches that move downslope at speeds as great as 160 km per hour. These eruptions are usually associated with silicic magmas. A name for some pyroclastic flows is nuée ardente (French for "glowing cloud"); this was first used to describe the disastrous 1902 eruption of Mount Pelé on Martinique. These pyroclastic flows glowed red in the dark.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#PhreaticEruption</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Phreatic eruption is an explosion that follows the transformation of groundwater into steam. No incandescent or juvenile material is erupted.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#PhreatomagmaticEruption</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Eruption Type 2 - Ejection of entrained particles during steam eruptions.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#PlinianEruption</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Plinian eruptions are characterized by paroxysmal ejection of large volume of ash and pumice as a well-defined eruption column or "jet"; often precedes caldera collapse. The resulting tephra fallout covers an area of more than 500 square kilometers.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#SteamBlastEruption</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A series of hundreds of steam explosions preceding an eruption of the volcano A less intense geothermal event may result in a mud volcano. In 1949, Thomas Jaggar described this kind of activity as steam-blast eruptions.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#StrombolianEruption</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Strombolian eruptions are relatively mild blasts with a volcanic explosivity index of about 2 to 3. They are named for the Italian volcano Stromboli. Strombolian eruptions consist of ejection

of incandescent cinder, lapilli, and lava bombs, to altitudes of tens to a few hundreds of metres. The eruptions are small to medium in volume, with sporadic violence.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#Surge</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A ring-shaped cloud of gas and suspended solid debris that moves radially outward at high velocity as a density flow from the base of a vertical eruption column accompanying a volcanic eruption or crater formation.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#VolcanicActivity</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A geophysical phenomena involving the extrusion of rock that tends to form mountains or features like mountains over a period of time. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenGeolVolcano.owl#VolcanicPlume</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An eruption column of hot volcanic ash and gas emitted into the atmosphere during an explosive volcanic eruption.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenOceanDynamics.owl#Tsunami</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Waves generated by seismic activity.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Ablation</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">all processes that remove material from an object, such as a glacier</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Ablation</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Ablation</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Conchoidal</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The most common fracture type is conchoidal. This is a smoothly curved fracture that is familiar to people who have examined broken glass. </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<AnnotationProperty abbreviatedIRI="rdfs:comment"/>
<IRI>http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Earthy</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
fracture that produces a texture similar to broken children&apos;s clay. It is found in minerals that are
generally massive and loosely consolidated.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Erode</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Erosion is
displacement of solids (soil, mud, rock and other particles) usually by the agents of currents such as,
wind, water, or ice by downward or down-slope movement in response to gravity or by living organisms
(in the case of bioerosion).</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Fault</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In
geology, a fault or fault line is a planar rock fracture, which shows evidence of relative movement. Large
faults within the Earth&apos;s crust are the result of shear motion and active fault zones are the causal
locations of most earthquakes. Earthquakes are caused by energy release during rapid slippage along
faults. The largest examples are at tectonic plate boundaries but many faults occur far from active plate
boundaries. Since faults do not usually consist of a single, clean fracture, the term fault zone is used when
referring to the zone of complex deformation that is associated with the fault plane.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Fold</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The term fold is used in geology when one or a stack of originally flat and planar
surfaces, such as sedimentary strata, are bent or curved as a result of plastic (i.e. permanent)
deformation.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Jagged</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Jagged has sharp points or edges that catch on a finger that&apos;s rubbed across the
surface.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Spintery</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Splintery is a fracture type that occurs in fibrous or finely acicular minerals and in
minerals that have a relatively stronger structure in one direction than the other two.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/phenSolid.owl#Subconchoidal</IRI>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Similar to conchoidal, just not as curved, but still smooth.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenSystem.owl#Interaction</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">process that multiple substances are in contact and have some consequence</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenSystem.owl#Perturbation</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Any departure introduced into an assumed steady state of a system. The magnitude is often assumed to be small so that product terms in the dependent variables may be neglected.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenSystem.owl#System</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral"> System is a set of interacting or interdependent entities, real or abstract, forming an integrated whole.
 </Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenSystem.owl#Vacillation</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Oscillation, usually of a small amplitude, about a reference state.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenSystemComplexity.owl#SystemDynamics</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">System dynamics is an approach to understanding the behaviour of complex systems over time. It deals with internal feedback loops and time delays that affect the behaviour of the entire system. What makes using system dynamics different from other approaches to studying complex systems is the use of feedback loops and stocks and flows. These elements help describe how even seemingly simple systems display baffling nonlinearity </Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenWave.owl#LongitudinalWave</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Longitudinal waves are waves that have vibrations along or parallel to their direction of travel. They include waves in which the motion of the medium is in the same direction as the motion of the wave. Mechanical longitudinal waves have been also referred to as compressional waves or pressure waves </Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/phenWave.owl#RayleighWave</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Rayleigh waves, also called ground roll, are surface waves that travel as ripples similar to those on the surface of water. The existence of these waves was predicted by John William Strutt, Lord Rayleigh, in 1885. They are slower than body waves, roughly 70% of the velocity of S waves, and have been asserted to be visible during an earthquake in an open space like a parking lot where the cars move up and down with the waves. Reports among seismologists suggest that the apparent motion may be due to distortion of the human eye during shaking. Anecdotally, placing people on shake tables causes the room to appear to ripple. In any case, waves of the reported amplitude, wavelength, and velocity of the visible waves have never been recorded instrumentally.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenWave.owl#Seiche</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A seiche is a standing wave in an enclosed or partially enclosed body of water. Seiches and seiche-related phenomena have been observed on lakes, reservoirs, bays and seas. The key requirement for formation of a seiche is that the body of water be at least partially bounded, allowing natural phenomena to form a standing wave.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenWave.owl#StandingWave</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A wave that is stationary with respect to the medium in which it is embedded, for example, two equal gravity waves moving in opposite directions.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/phenWave.owl#TransverseWave</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A transverse wave is a wave that causes vibration in the medium in a perpendicular direction to its own motion. For example: if a wave moves along the x-axis, its disturbances are in the yz-plane. In other words, it causes medium disturbances across the two-dimensional plane that it is travelling in. Contrary to popular belief, transversal waves do not necessarily move up and down.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Acidification</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Any process that decreases the pH value of a substance.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procChemical.owl#ChemicalProcess</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A chemical process is a method or means of somehow changing one or more chemicals or chemical compounds. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Crystallization</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Crystallization is the (natural or artificial) process of formation of solid crystals precipitating from a solution, melt or more rarely deposited directly from a gas. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Dissolution</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Dissolution or solvation is the process of dissolving a solid substance into a solvent to yield a solution. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Fluorescence</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Fluorescence is a luminescence that is mostly found as an optical phenomenon in cold bodies, in which the molecular absorption of a photon triggers the emission of another photon with a longer wavelength. The energy difference between the absorbed and emitted photons ends up as molecular vibrations or heat. Usually the absorbed photon is in the ultraviolet range, and the emitted light is in the visible range, but this depends on the absorbance curve and Stokes shift of the particular fluorophore. Fluorescence is named after the mineral fluorite, composed of calcium fluoride, which often exhibits this phenomenon.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Hydrolysis</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Hydrolysis is a chemical reaction during which molecules of water (H₂O) are split into hydrogen (H) and hydroxide anions (OH⁻) in the process of a chemical mechanism.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Nucleation</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Nucleation is the extremely localized budding of a distinct thermodynamic phase. Some examples of phases that may form via nucleation in liquids are gaseous bubbles, crystals, or glassy regions.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Oxidation</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Reaction of a substance with oxygen or incorporation of oxygen into a molecule.</Literal>

</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Phosphorescence</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Continues to glow after light source is removed</Literal>

</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Thermoluminescence</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Glows when heated</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/procChemical.owl#Titration</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Titration is a common laboratory method of quantitative chemical analysis that is used
to determine the unknown concentration of a known reactant.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/procPhysical.owl#CentrifugalForce</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Centrifugal
Force</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/procPhysical.owl#CentripetalForce</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Centripetal
Force</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/procPhysical.owl#Conduction</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Transport of energy (charge) solely as a consequence of random motions of individual
molecules (ions, electrons) not moving together in coherent groups.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/procPhysical.owl#ViscousForce</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The transport of mass motion momentum solely by the random motions of individual
molecules not moving together in coherent groups.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/procStateChange.owl#Freezing</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The phase transition of a substance passing from the liquid to the solid state;
solidification; the opposite of fusion.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/procStateChange.owl#Ionization</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Ionization is the physical process of converting an atom or molecule into an ion by

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changing the difference between the number of protons and electrons. This process works slightly differently depending on whether an ion with a positive or a negative electric charge is being produced. A positive electric charge is produced when an electron bond to an atom or molecule absorbs enough energy from an external source to escape from the electric potential barrier that originally confined it, where the amount of energy required is called the Ionization potential. A negative electric charge is produced when a free electron collides with an atom and is subsequently caught inside the electric potential barrier, releasing any excess energy.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procStateChange.owl#StateChange</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">change of state by state variable change</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procStateChange.owl#StateChange</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">State Change</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procStateChange.owl#Vaporization</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The physical process by which a liquid is transformed to the gaseous state; the opposite of condensation.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procWave.owl#Absorption</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The process in which incident radiant energy is retained by a substance.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procWave.owl#Absorption</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Absorption</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procWave.owl#LineOfSightPropagation</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Line-of-sight propagation refers to electromagnetic radiation or electromagnetic waves travelling in a straight line. The rays or waves are deviated or reflected by obstructions and cannot travel over the horizon or behind obstacles. Beyond that, material disperses the rays respectively the energy of the waves.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procWave.owl#Propagation</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Wave propagation is any of the ways in which waves travel through a medium (waveguide). With respect to the direction of the oscillation relative to the propagation direction, we can distinguish between longitudinal wave and transverse waves. Another useful parameter for describing the propagation is the wave velocity that mostly depends on some kind of density of the medium. For electromagnetic waves, propagation may occur in a vacuum as well as in a material medium.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procWave.owl#Refraction</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A change of direction and possibly amplitude of an electromagnetic, acoustic, or any other wave propagating in a material medium, homogeneous on the scale of the wavelength, as a consequence of spatial variation in the properties of the medium.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/procWave.owl#Scattering</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In a broad sense, the process by which matter is excited to radiate by an external source of electromagnetic radiation, as distinguished from emission of radiation by matter, which occurs even in the absence of such a source.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/prop.owl#Property</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">'VolProperty'</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/propChemical.owl#Solubility</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The total amount of solute species that will remain indefinitely in a solution maintained at constant temperature and pressure in contact with the solid crystals from which the solutes were derived.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/propChemical.owl#pH</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">pH is a measure of the acidity or basicity of a solution. It is defined as the cologarithm of the activity of dissolved hydrogen ions (H⁺). Hydrogen ion activity coefficients cannot be measured experimentally, so they are based on theoretical calculations. The pH scale is not an absolute scale; it is relative to a set of standard solutions whose pH is established by international agreement.

[Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/propDifference.owl#Amplitude</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Often the greatest magnitude at a given point of any spatially and temporally varying physical quantity governed by a wave equation; can also mean the spatial part of a time-harmonic wave function.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/propDimensionlessRatio.owl#RelativePermeability</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">

The ratio of the effective permeability for a given flow phase to the intrinsic permeability of the porous medium (WMO, 1974). The ratio of the effective and specific permeabilities.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/propDimensionlessRatio.owl#SpecificRetention</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-

ns#PlainLiteral">The ratio of the Volume of water which the porous medium, after being saturated, will retain against the pull of gravity to the volume of the porous medium.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/propEnergy.owl#AvailablePotentialEnergy</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-

ns#PlainLiteral">That portion of the total potential energy that may be converted to kinetic energy in an adiabatically enclosed system.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/propEnergy.owl#RadiantEnergy</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-

ns#PlainLiteral">Infrequently, any energy propagated by a physical quantity governed by a wave equation.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/propEnergyFlux.owl#BulkHeatFlux</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">>Heat flux

averaged over a layer of air, such as the boundary layer; heat-flux divergence or difference between the top and bottom of a layer.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/propIndex.owl#Turbidity</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-

ns#PlainLiteral">The effect of (primarily) aerosols, through their total optical depth, in reducing the transmission of direct solar radiation to the surface below that through a purely molecular atmosphere.

Turbidity is the cloudiness or haziness of a fluid, or of air, caused by individual particles (suspended solids) that are generally invisible to the naked eye, similar to smoke in air.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/propMass.owl#Density></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">1.
 The ratio of the mass of any substance to the volume occupied by it (usually expressed in kilograms per cubic meter, but any other unit system may be used); the reciprocal of specific volume.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/propMass.owl#PotentialDensity></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The density of a unit of water after it is raised by an adiabatic process to the surface, i.e., determined from in-situ salinity and potential temperature (AGI, 1980). Density that would be reached by a compressible fluid if it were adiabatically compressed or expanded to a standard pressure.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/propMass.owl#SpecificVolume></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">1.
 The ratio of the mass of any substance to the volume occupied by it (usually expressed in kilograms per cubic meter, but any other unit system may be used); the reciprocal of specific volume.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#ElectromagneticSpectrum></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The electromagnetic (EM) spectrum is the range of all possible electromagnetic radiation. The electromagnetic spectrum (usually just spectrum) of an object is the characteristic distribution of electromagnetic radiation from that object.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/propOrdinal.owl#Streak></IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Color of the powder of a substance.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/propPressure.owl#BarometricPressure></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The pressure exerted by the atmosphere as a consequence of gravitational attraction exerted upon the column of air lying directly above the point in question.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/propPressure.owl#PartialPressure></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The pressure that a component of a gaseous mixture would have if it alone occupied the same volume at the same temperature as the mixture.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/propPressure.owl#Pressure></IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Force per unit area.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/propPressure.owl#PressureGradient</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The derivative of pressure</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/propPressure.owl#PressureTendency</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The character and amount of atmospheric pressure change during a specified period of
time, often a three-hour period preceding an observation.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/propPressure.owl#SeaLevelPressure</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The atmospheric pressure at mean sea level, either directly measured or, most
commonly, empirically determined from the observed station pressure.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/propQuantity.owl#Flux</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The rate of flow
of some quantity, often used in reference to the flow of some form of energy.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/propSpace.owl#Shape</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Description of the form of an object</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/propSpaceDistance.owl#ExtinctionCoefficient</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The extinction
coefficient for a particular substance is a measure of how well it scatters and absorbs electromagnetic
radiation (EM waves). If the EM wave can pass through very easily, the material has a low extinction
coefficient. Conversely, if the radiation hardly penetrates the material, but rather quickly becomes extinct
within it, the extinction coefficient is high.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/propSpaceDistance.owl#ScatteringCoefficient</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
measure of the extinction due to scattering of monochromatic radiation as it traverses a medium
containing scattering particles.</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propSpaceHeight.owl#TopographicProminence</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In topography,
prominence, also known as autonomous height, relative height or shoulder drop (in America) or prime
factor (in Europe), is a concept used in the categorization of hills and mountains, also known as peaks. It
is a measure of the independent stature of a summit.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propSpaceMultidimensional.owl#RadarCrossSection</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Radar cross section (RCS) describes the extent to which an object reflects an incident
electromagnetic wave. It is a measure of the strength of the radar signal backscattered from a target object
for a given incident wave power.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propSpeed.owl#Acceleration</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The rate of
change with time of the velocity vector of a particle.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propSpeed.owl#Acceleration</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Acceleration</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propSpeed.owl#TangentialAcceleration</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The component of the acceleration directed along the velocity vector (streamline), with
magnitude equal to the rate of change of speed of the parcel  $dV/dt$ , where  $V$  is the speed.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propSpeed.owl#Velocity</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The time rate of change of a position vector; that is, a change of position expressed in
terms of speed and direction.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propTemperature.owl#EffectiveTemperature</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The temperature at which motionless saturated air would induce, in a sedentary worker
wearing ordinary indoor clothing, the same sensation of comfort as that induced by the actual conditions
of temperature, humidity, and air movement. Effective temperature is used as a guide in air-conditioning
practice, and, on the comfort chart (American Society of Heating and Air Conditioning Engineers), it
appears as a family of curves that serves as one coordinate in defining comfort zones.</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propTemperature.owl#PotentialTemperature</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The temperature that a parcel would have if brought adiabatically and reversibly from
its initial state to a standard reference pressure, typically 100 kPa.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propTemperatureGradient.owl#TemperatureGradient</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The derivative of temperature.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propTime.owl#GeologicTime</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The geologic time scale is a chronologic schema (or idealized model) relating
stratigraphy to time that is used by geologists, paleontologists and other earth scientists to describe the
timing and relationships between events that have occurred during the history of the Earth.
[Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propTime.owl#Repose</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The interval of time between volcanic eruptions.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propTimeFrequency.owl#Divergence</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The expansion or spreading out of a vector field; also, a precise measure
thereof.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propTimeFrequency.owl#Frequency</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The rate of recurrence of any periodic phenomenon, often associated with waves of all
kinds. Without qualification frequency often means temporal frequency, the rate of recurrence of a time-
varying function, but could mean spatial frequency, the rate of recurrence of a space-varying function.
Spatial frequency is the reciprocal of the repeat distance (sometimes the wavelength). The dimensions of
(temporal) frequency are inverse time. A common unit for frequency is cycle per second, formerly
abbreviated cps, but superseded by hertz, abbreviated as Hz.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/propTimeFrequency.owl#SpreadingRate</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The spreading rate is a measure of how fast plate divergence is occurring.
[Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realm.owl#Atmosphere</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An atmosphere is a layer of gases that may surround a material body of sufficient
mass,[1] by the gravity of the body, and are retained for a longer duration if gravity is high and the
atmosphere's temperature is low. [Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realm.owl#Geosphere</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The term Geosphere is often used to refer to the densest (solid) parts of a planet, which
consist mostly of rock and regolith [Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realm.owl#Hydrosphere</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
hydrosphere in physical geography describes the combined mass of water found on, under, and over the
surface of a planet. [Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realm.owl#Land</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The part of a planetary surface that is a solid</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realm.owl#Ocean</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An ocean is a major body of saline water, and a principal component of the
hydrosphere. [Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realm.owl#PlanetarySurface</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The surface of the planet defined by solid and/or liquid layers</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realm.owl#PlanetarySurfaceLevel</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
quasi-horizontal surface spanning all or part of a planet that corresponds to a constant value of some
parameter</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmAtmo.owl#Mesopause</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The top of the mesosphere and the base of the thermosphere. The mesopause is usually
located at heights of 85-95 km, and is the site of the coldest temperatures in the atmosphere.
Temperatures as low as 100 K (- 173°C) have been measured at the mesopause by rockets. See
atmospheric shell.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
</IRI>http://sweet.jpl.nasa.gov/2.3/realmAtmoBoundaryLayer.owl#AtmosphericBoundaryLayer</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The bottom layer of the troposphere that is in contact with the surface of the earth.
</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmAtmoBoundaryLayer.owl#ConstantFluxLayer</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
layer of air tens of meters thick at the bottom of the atmosphere where the variation of vertical turbulent
flux with altitude is less than 10% of its magnitude.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmAtmoBoundaryLayer.owl#InternalBoundaryLayer</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
layer within the atmosphere bounded below by the surface, and above by a more or less sharp
discontinuity in some atmospheric property. Internal boundary layers are associated with the horizontal
advection of air across a discontinuity in some property of the surface (e.g., aerodynamic roughness
length or surface heat flux) and can be viewed as layers in which the atmosphere is adjusting to new
surface properties. See thermal internal boundary layer, mechanical internal boundary layer.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
<IRI>http://sweet.jpl.nasa.gov/2.3/realmAtmoBoundaryLayer.owl#MechanicalInternalBoundaryLayer</I
RI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">(Abbreviated MIBL.) An internal boundary layer caused by advection of air across a
discontinuity in surface roughness. When the new surface is rougher than the old one, the MIBL depth
grows roughly as the 0.8 power of the ratio of the two roughness lengths. In this example, the MIBL
grows to include the whole surface layer.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmAtmoBoundaryLayer.owl#PlanetaryBoundaryLayer</IRI>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The bottom layer of the troposphere that is in contact with the surface of the earth. It is often turbulent and is capped by a statically stable layer of air or temperature inversion.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmAtmoBoundaryLayer.owl#ResidualLayer</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The middle portion of the nocturnal atmospheric boundary layer characterized by weak sporadic turbulence and initially uniformly mixed potential temperature and pollutants remaining from the mixed layer of the previous day.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmAtmoBoundaryLayer.owl#RoughnessSublayer</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Same as transition layer. The lowest atmospheric layer immediately adjacent to a surface covered with relatively large roughness elements such as stones, vegetation, trees, or buildings.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmAtmoBoundaryLayer.owl#WellMixedLayer</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A type of atmospheric boundary layer characterized by vigorous turbulence tending to stir and uniformly mix, primarily in the vertical, quantities such as conservative tracer concentrations, potential temperature, and momentum or wind speed.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmCryo.owl#IceSheet</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An ice sheet is a mass of glacier ice that covers surrounding terrain and is greater than 50,000 square km (19,305 square mile).</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Asthenosphere</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The asthenosphere is a portion of the upper mantle just below the lithosphere. Seismic waves pass relatively slowly through the asthenosphere, compared to the overlying lithospheric mantle, thus it has been called the low-velocity zone. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Batholith</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A batholith is a large emplacement of igneous intrusive (also called plutonic) rock that forms from cooled magma deep in the Earth's crust. Batholiths are almost always made mostly of felsic or intermediate rock-types, such as granite, quartz monzonite, or diorite (see also granite dome). There is also an important geographic usage of the term batholith. For a geographer, a batholith is an exposed area of

mostly continuous plutonic rock that covers an area larger than 100 square kilometers.

[Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#BrittleDuctileTransitionZone</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">D_ layer is the layer which separates the mantle from the core. D_ may consist of material from subducted slabs that descended and came to rest at the core-mantle boundary and/or from a new mineral polymorph discovered in perovskite called post-perovskite.[Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Core</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The central most structure inside the earth. The core does not allow shear waves to pass through it, while the speed of travel (seismic velocity) is different in the other layers.

[Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Crust</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The crust is the outermost solid shell of a rocky planet or moon, which is chemically distinct from the underlying mantle. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#DLayer</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">D_ layer is the layer which separates the mantle from the core. D_ may consist of material from subducted slabs that descended and came to rest at the core-mantle boundary and/or from a new mineral polymorph discovered in perovskite called post-perovskite.[Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Dike</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Dikes, long, planar (sheet) igneous intrusions, enter along cracks, and therefore often form in large numbers in areas that are being actively deformed. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#GeologicFeature</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">or Surface Feature is a distinct recognizable structure within a larger context such as a stream bed, fissure, dike, etc.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#GeologicProvince</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">
 A geologic or geomorphic province is a spatial entity with common geologic/geomorphic attributes. A province may include a single dominant structural element such as a basin or a fold belt, or a number of contiguous related elements. Most commonly, provinces are classified by age, origin, or mineral resource. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#GuttenburgDiscontinuity</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The core-mantle boundary. This discontinuity is due to the differences between the acoustic impedances of the solid mantle and the molten outer core. P-wave velocities are much slower in the outer core than in the deep mantle while S-waves do not exist at all in the liquid portion of the core. Corresponds to top of D"". [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#InnerCore</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The solid inner core was discovered in 1936 by Inge Lehmann and is generally believed to be composed primarily of iron and some nickel.[Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Laccolith</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral"> [Pluton] Igneous intrusion - A laccolith is an igneous intrusion (or concordant pluton) that has been injected between two layers of sedimentary rock. The pressure of the magma is high enough that the overlying strata are forced upward, giving the laccolith a dome or mushroom-like form with a generally planar base.Laccoliths tend to form at relatively shallow depths and are typically formed by relatively viscous magmas, such as those that crystallize to diorite, granodiorite, and granite.[Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#LehmannDiscontinuity</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Boundary between Asthenosphere and Lithosphere. It is the discontinuity in seismic velocity near a depth of 220 km. It appears beneath continents, but not usually beneath oceans, and does not readily appear in globally-averaged studies [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Lithosphere</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In the Earth, the lithosphere includes the crust and the uppermost mantle, which constitute the hard and rigid outer layer of the planet. The division of Earth's outer layers into lithosphere and asthenosphere should not be confused with the chemical subdivision of the outer Earth into mantle, and crust. All crust is in the lithosphere, but lithosphere generally contains more mantle than crust. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Lopolith></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">[Pluton] Igneous intrusion - A lopolith is a large igneous intrusion which is lenticular in shape with a depressed central region. Lopoliths are generally concordant with the intruded strata with dike or funnel-shaped feeder bodies below the body. Lopoliths typically consist of large ultramafic to mafic layered intrusions that range in age from Archean to Eocene. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#LowerMantle></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Very little is known about the lower mantle apart from that it appears to be relatively seismically homogeneous. The lower mantle is under tremendous pressure and therefore has a higher viscosity than the upper mantle.[Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Mantle></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The mantle is a highly viscous layer between the crust and the outer core. Earth's mantle is an approximately 2,970 km thick (~1,800 mi) rocky shell that constitutes approximately 84 percent of Earth's volume. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Mesosphere></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The mesosphere refers to the mantle in the region between the asthenosphere and the outer core. The upper boundary is defined as the sharp increase in seismic wave velocities and density at a depth of 660 km. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Moho></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The boundary between the crust and mantle is conventionally placed at the Mohorovičić discontinuity, a boundary defined by a contrast in seismic velocity. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#OuterCore></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The liquid outer core surrounds the inner core and is believed to be composed of iron mixed with nickel and trace amounts of lighter elements. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#SeismicZone></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Seismic Zones are broad elongated regions along a fault line where earthquakes take place. [Wikipedia]</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#Sill</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">[Pluton] Igneous intrusion - A sill is a tabular pluton that has intruded between older
layers of sedimentary rock, beds of volcanic lava or tuff, or even along the direction of foliation in
metamorphic rock. The term sill is synonymous with concordant intrusive sheet. This means that the sill
does not cut across preexisting rocks, in contrast to dikes, which do cut across older rocks.
[Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#TransitionalCrust</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Transitional crust is crust that is thinned by the upwelling of mantle.
[Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#UpperMantle</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The mantle is divided into sections based upon results from seismology. The upper
mantle is the region from 33â€“410 km (20 to 254 miles). The upper part of the mantle is composed
mostly of peridotite, a rock denser than rocks common in the overlying crust. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeol.owl#UpperMantleRigid</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The uppermost mantle plus overlying crust are relatively rigid and form the lithosphere,
an irregular layer with a maximum thickness of perhaps 200 km. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolBasin.owl#BackArcBasin</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Back-arc basins (or retro-arc basins) are geologic features, submarine basins associated
with island arcs and subduction zones. They are found at some convergent plate boundaries, presently
concentrated in the Western Pacific ocean. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolBasin.owl#ForeArcBasin</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
forearc is a depression (basin) in the sea floor located between a subduction zone and an associated
volcanic arc. It is typically filled with sediments from the adjacent landmass and the island arc in addition
to trapped oceanic crustal material. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

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<IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolBasin.owl#ForelandBasin></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A foreland basin is a depression that develops adjacent and parallel to a mountain belt. Foreland basins form because the immense mass created by crustal thickening associated with the evolution of a mountain belt causes the lithosphere to bend, by a process known as lithospheric flexure. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolBasin.owl#IntraArcBasin></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Intra-arc basins are basins that occur between Fore-arc basins and back-arc basins [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolBasin.owl#RetroarcForelandBasin></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Retroarc (Retro) foreland basins occur on the plate that overrides during plate convergence or collision (i.e. situated behind the magmatic arc that is linked with the subduction of oceanic lithosphere). [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolBasin.owl#TranspressionalBasin></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Transpression basins are formed during oblique collision of tectonic plates and during non-orthogonal subduction. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolBasin.owl#TranstensionalBasin></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Transtension basins are oblique tensional environments where stretching takes place. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#ArmouredRelictCrystal></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a crystal of an earlier rock that is prevented from further reaction in a later rock by a rim of reaction products</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#Chadacryst></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">the enclosed crystal in a poikilitic texture</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#CrystallineFramework></IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Constituent forms an interconnected network of discernible crystals</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#GranularFramework</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">"Constituent forms a rigid arrangement of particles that support one another at their points of contact...constituting a mechanically firm structure capable of supporting open pore spaces, although interstices may be occupied by cement or matrix"</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#Groundmass</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Constituent forms an interconnected network of material enclosing other constituents that are disguised by larger grain size.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#InterstitialConstituent</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Constituent is distributed through the material between other constituent particles</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#Megacryst</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">constituent occurs as a collection of particles that are characterized by average properties of the individual particles</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#ParticulateConstituent</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">any crystal in an igneous or metamorphic rock that is significantly larger than the surrounding groundmass. May be a phenocryst, xenocryst, porphyroblast or porphyroclast.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#Phenocryst</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A larger grain surrounded by smaller-sized grains</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#Porphyroblast</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Constituent occurs as crystals formed by metamorphic crystallization, set in a finer-grained groundmass.</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#Porphyroclast</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Relict crystal in metamorphic rock, in groundmass of relatively finer-grained material.
Connotes that groundmass is result of tectonic reduction in grain size.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#StructuralConfiguration</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Constituent occurs in a structural configuration integral to the rock, such as layering,
veinlets, overgrowths. The &apos;material&apos; composition of these parts will often be other rock
materials, not minerals, and &apos;ParticleGeometryDescription&apos; associated with these describes
the geometry of the constituent, not the particles the it is made of. These roles are mostly useful for
RockMaterial descriptions that apply to individual samples, because their distribution is unlikely to be
pervasive enough to be considered characteristic of a large mass of material.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolConstituent.owl#&apos;Idiomorphic-
GranularTexture&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Texture in which is dominated by more or less equant, euhedral grains</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#ActiveContinent</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
distinction of whether the continental margins are active (subducting). [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#ContinentalCrust</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The continental crust is typically from 30 km (20 mi) to 50 km (30 mi) thick, and it is
mostly composed of less dense rocks, such as granite, than is the oceanic crust. The continental crust has
an average composition similar to that of the igneous rock, andesite.[Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#ContinentalLithosphere</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">[Mechanical or Seismic Definition of Structure] In the Earth, the lithosphere includes
the crust and the uppermost mantle, which constitute the hard and rigid outer layer of the planet. The
[Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#ContinentalMargin</IRI>

```

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The continental margin is the zone of the ocean floor that separates the thin oceanic crust from thick continental crust. [Wikipedia]

</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#ContinentalPlatform</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The extensive central cratons of continents may consist of both shields and platforms, and the crystalline basement. A platform is that part of the craton for which the basement is overlain by horizontal or subhorizontal sediments. [Wikipedia]

</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#ContinentalRift</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A long, narrow fissure in the Earth marking a zone of the lithosphere that has become thinner due to extensional forces associated with plate tectonics. Continental rifts are thousands of kilometers in length and hundreds of kilometers in width, and they are associated with normal faults and with grabens. [FreeDictionary]

</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#Craton</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A craton is an old and stable part of the continental crust that has survived the merging and splitting of continents and supercontinents for at least 500 million years. Some are over two billion years old. Cratons are generally found in the interiors of continents and are characteristically composed of ancient crystalline basement crust of lightweight felsic igneous rock such as granite. They have a thick crust and deep roots that extend into the mantle beneath to depths of 200 km. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#Shield</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The extensive central cratons of continents may consist of both shields and platforms, and the crystalline basement. A shield is that part of a craton in which the usually Precambrian basement rocks crop out extensively at the surface. [Wikipedia]

</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#StableContinent</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A distinction of whether the continental is on a stable platform, i.e., over millions of years. [Wikipedia]</Literal>

</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolContinental.owl#Supercontinent></IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In geology, a supercontinent is a land mass comprising more than one continental core, or craton. The assembly of cratons and accreted terranes that form Eurasia qualifies as a supercontinent today.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolOrogen.owl#ArcAxis></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In a Back-arc basin the arc axis is the line where spreading occurs on the overlying plate of the subduction zone. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolOrogen.owl#BackArc></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Back-arc basins (or retro-arc basins) are geologic features, submarine basins associated with island arcs and subduction zones. They are found at some convergent plate boundaries, presently concentrated in the Western Pacific ocean. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolOrogen.owl#ForeArc></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A forearc is a depression in the sea floor located between a subduction zone and an associated volcanic arc. It is typically filled with sediments from the adjacent landmass and the island arc in addition to trapped oceanic crustal material. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmGeolOrogen.owl#RemnantArc></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The remnant arc is what is left on the rear side of the spreading zone as the basin broadens. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmLandFluvial.owl#Alluvial></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The process of depositing soil or sediments by a river or other running water. [Wikipedia]</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#AseismicRidge></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Are neighboring ridges on different tectonic plates which have similar seismic characteristics. "Based on similar seismic velocity gradients of the lavas of the Carnegie, Cocos and Malpelos Ridges there is evidence that the hotspot activity has been the result of a single long mantle melt rather than multiple periods of activity and dormancy." [Wikipedia]</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#ConvergentBoundary</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In
plate tectonics, a convergent boundary or convergent plate boundary, also known as a destructive plate
boundary (because of subduction), is an actively deforming region where two (or more) tectonic plates or
fragments of lithosphere move toward one another and collide and where crust is being destroyed.
[Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#Diapir</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
diapir is a type of geologic intrusion in which a more mobile and ductily deformable material is forced
into brittle overlying rocks [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#DivergentBoundary</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In
plate tectonics, a divergent boundary or divergent plate boundary (also known as a constructive boundary
or an extensional boundary) is a linear feature that exists between two tectonic plates that are moving
away from each other and new crust is being formed. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#FloodBasalt</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
flood basalt or trap basalt is the result of a giant volcanic eruption or series of eruptions that coats large
stretches of land or the ocean floor with basalt lava. Flood basalts have occurred on continental scales
(large igneous provinces) in prehistory, creating great plateaus and mountain ranges.
[Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#FossilPlateBoundary</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Are where similar plant and animal fossils are found around different continent shores,
suggesting that they were once joined. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#FractureZone</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
fracture zone is a linear oceanic feature--often hundreds, even thousands of kilometers long--resulting
from the action of offset mid-ocean ridge axis segments. They are a consequence of plate tectonics.
Lithospheric plates on either side of an active transform fault move in opposite directions; here, strike-slip
activity is possible. Fracture zones extend past the transform faults, away from the ridge axis; seismically
inactive (because both plate segments are moving in the same direction), they display evidence of past
transform fault activity. </Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#PlateBoundary</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The location where two plates meet is called a plate boundary. it is often a broad zone
where the plate interactions are not well understood. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#Rift</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
rift is a place where the Earth's crust and lithosphere are being pulled apart[1] and is an example of
extensional tectonics. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#RiftValley</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
rift valley is a linear-shaped lowland between highlands or mountain ranges created by the action of a
geologic rift or fault. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#StressRegime</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Stress regimes are shear zones. A shear zone or shear is a wide zone of distributed
shearing in rock. Typically this is a type of fault but it may be difficult to place a distinct fault plane into
the shear zone. Shear zones may form zones of much more intense foliation, deformation, and folding.
[Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#SubductionZone</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
subduction zone is an area on Earth where two tectonic plates move towards one another and subduction
occurs. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#SupraSubductionZoneComplex</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">There is increasing evidence that most ophiolites are generated when subduction begins
and thus represent fragments of fore-arc lithosphere. This led to introduction of the term &quot;supra-
subduction zone&quot; (SSZ) ophiolite in the 1980s to acknowledge that some ophiolites are more
closely related to island arcs than ocean ridges. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#Suture</IRI>

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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A suture is where a fragment of crustal material is accreted to crust lying on another plate.

[Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#ThrustSystem</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A thrust fault system is one in which the higher side of the fault moves upward. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#TransformBoundary</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A transform plate boundary is where two lithospheric plates slide past each other and where crust is neither produced or destroyed. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#TranspressionalStressRegime</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Transpression regimes are formed during oblique collision of tectonic plates and during non-orthogonal subduction. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#TranstensionalStressRegime</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Transtension regimes are oblique tensional environments where stretching takes place. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandTectonic.owl#TripleJunction</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The Galapagos Triple Junction is a geological area in the eastern Pacific Ocean several hundred miles west of the Galapagos Islands where three tectonic plates - the Cocos Plate, the Nazca Plate and the Pacific Plate - meet. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#Caldera</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A caldera is a large cauldron-like depression that forms following the evacuation of a magma chamber/reservoir. When large volumes of magma are erupted over a short time, structural support for the crust above the magma chamber is lost [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#CentralVolcano</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A volcano constructed by the ejection of debris and lava flows from a central point, forming a more or less symmetrical volcano.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#CompoundVolcano</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A volcano that consists of a complex of two or more vents, or a volcano that has an associated volcanic dome, either in its crater or on its flanks.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#Fumarole</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A fumarole is an opening in a planet's crust, often in areas surrounding volcanoes, which emits steam and gases such as carbon dioxide, sulfur dioxide, hydrogen chloride, and hydrogen sulfide. The steam forms when superheated water condenses as its pressure drops when it emerges from the ground [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#HotSpot</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In geology, a hotspot is a location on the Earth's surface that has experienced active volcanism for a long period of time. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#HotSpot</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Hotspot</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#LavaPlain</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A lava field, also called a lava plain or lava bed, is a large expanse of nearly flat-lying lava flows. Such features are generally composed of highly fluid basalt lava, and can extend for tens or even hundreds of miles across the underlying terrain. [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#LinearVolcanicChain</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Where this association of flood basalts with continental rifting is observed, it is not uncommon to find linear chains of volcanic islands [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#Monogenetic</IRI>

```

    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
volcano built by a single eruption.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#ShieldVolcano</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
shield volcano is a type of volcano usually built almost entirely of fluid lava flows. They are named for
their low profile, resembling a warrior's shield lying on the ground [Wikipedia].</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#Stratovolcano</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
stratovolcano, also known as a composite volcano, is a conical volcano built up by many layers (strata) of
hardened lava, tephra, pumice, and volcanic ash. Unlike shield volcanoes, stratovolcanoes are
characterized by a steep profile and periodic explosive eruptions and effusive eruptions, although some
have collapsed craters called calderas [Wikipedia].</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#VolcanicChain</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Island arcs that develop along the edges of a continent (for example, large parts of the
Andes/ Central American/ Canadian mountain chain) may be known as a volcanic arc or volcanic chain.
[Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#VolcanicField</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
volcanic field is a spot of the earth's crust that is prone to localized volcanic activity. They usually
contain 10 to 100 volcanoes, such as cinder cones and are usually in clusters. Lava flows may also occur.
They may occur as a monogenetic volcanic field or a polygenetic volcanic field. [Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandVolcanic.owl#Volcano</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
volcano is an opening, or rupture, in a planet's surface or crust, which allows hot, molten rock, ash,
and gases to escape from below the surface. Volcanic activity involving the extrusion of rock tends to
form mountains or features like mountains over a period of time. [Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/realmLandform.owl#Crater</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
volcanic crater is a roughly circular depression in the ground caused by volcanic activity
[Wikipedia].</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>

```

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmLandform.owl#Landform></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
 landform comprises a geomorphological unit, and is largely defined by its surface form and location in
 the landscape, as part of the terrain, and as such, is typically an element of topography. Landforms are
 categorised by features such as elevation, slope, orientation, stratification, rock exposure, and soil type.
 They include berms, mounds, hills, cliffs, valleys, rivers and numerous other elements.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmLandform.owl#Landscape></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
 landscape comprises the visible features of an area of land, including physical elements such as
 landforms, living elements of flora and fauna, abstract elements such as lighting and weather conditions,
 and human elements, for instance human activity or the built environment. Landscape may also signify
 the objects around one in a building. </Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmOcean.owl#PelagicZone></IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The pelagic zone
 is the part of the open sea or ocean that is not near the coast.
 </Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/realmOceanFloor.owl#MidOceanRidge></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
 mid-ocean ridge or mid-oceanic ridge is an underwater mountain range, formed by plate tectonics. This
 uplifting of the ocean floor occurs when convection currents rise in the mantle beneath the oceanic crust
 and create magma where two tectonic plates meet at a divergent boundary. The mid-ocean ridges of the
 world are connected and form a single global mid-oceanic ridge system that is part of every ocean,
 making the mid-oceanic ridge system the longest mountain range in the world.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/repr.owl#DependentVariable></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
 ns#PlainLiteral">Any variable considered as a function of other variables, the latter being called
 independent.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI><http://sweet.jpl.nasa.gov/2.3/repr.owl#Dimension></IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In common
 usage, a dimension is a parameter or measurement used to describe some relevant characteristic of an
 object. The most commonly used dimensions are the parameters describing the size of an object: length,
 width, and height, but dimensions can also be other physical parameters such as the mass and electric
 charge of an object, or even, in a context where cost is relevant, an economic parameter such as its
 price.</Literal>
 </AnnotationAssertion>

```

<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/reprMath.owl#Equation</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An equation is a mathematical statement, in symbols, that two things are exactly the
same (or equivalent). [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/reprMath.owl#Relation</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In
mathematics, the concept of a relation is a generalization of 2-place relations, such as the relation of
equality, less than, greater than, etc.. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/reprMath.owl#Vector</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Any quantity, such as force, velocity, or acceleration, that has both magnitude and
direction at each point in space, as opposed to a scalar that has magnitude only.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/reprMathFunction.owl#Discontinuous</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
point in the range of a function at which it is undefined or not continuous [Wiktionary]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/reprMathOperation.owl#Operation</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An operation is an action or procedure which produces a new value from one or more
input values. [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/reprSciModel.owl#Parcel</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An imaginary volume of fluid to which may be assigned various thermodynamic and
kinematic quantities.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/reprSpace.owl#Space</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">This concept is of space as an independent variable</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/reprTime.owl#Time</IRI>

```


<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">This concept is of time as an independent variable</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/stateChemical.owl#Acid</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">An acid as a compound which donates a hydrogen ion (H+) to another compound (called a base). [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/stateChemical.owl#Base</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A base is most commonly thought of as an aqueous substance that can accept hydrogen ions. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/statePhysical.owl#Droplet</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A small spherical particle of any liquid; in meteorology, particularly a water droplet. </Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/stateSpaceScale.owl#Mesoscale</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Pertaining to atmospheric phenomena having horizontal scales ranging from a few to several hundred kilometers, including thunderstorms, sordil lines, fronts, precipitation bands in tropical and extratropical cyclones, and topographically generated weather systems such as mountain waves and sea and land breezes. From a dynamical perspective, this term pertains to processes with timescales ranging from the inverse of the Brunt?V?is?l? frequency to a pendulum day, encompassing deep moist convection and the full spectrum of inertio-gravity waves but stopping short of synoptic-scale phenomena, which have Rossby numbers less than 1.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/stateSystem.owl#Complex</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A complex system is a system composed of interconnected parts that as a whole exhibit one or more properties (behavior among the possible properties) not obvious from the properties</Literal>

</AnnotationAssertion>

<AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
 <IRI>http://sweet.jpl.nasa.gov/2.3/stateSystem.owl#Equilibrium</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In mechanics, a state in which the vector sum of all forces, that is, the acceleration vector, is zero. In hydrodynamics, it is usually further required that a steady state exist throughout the atmospheric or fluid model. The equilibrium may be stable or unstable with respect to displacements therefrom. See also hydrostatic equilibrium, geostrophic equilibrium, instability. 2. In thermodynamics, any state of a system that would not undergo change if the system were to be isolated.</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/stateSystem.owl#Stable</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The characteristic of a system if sufficiently small disturbances have only small effects,
either decreasing in amplitude or oscillating periodically; it is asymptotically stable if the effect of small
disturbances vanishes for long time periods.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/stateSystem.owl#Unstable</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">property
describing unstable conditions, such as in the atmosphere</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/stateThermodynamic.owl#Adiabatic</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A process in
which a system does not interact with its surroundings by virtue of a temperature difference between
them.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/stateThermodynamic.owl#Adiabatic</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Adiabatic
Process</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/stateThermodynamic.owl#Pseudoadiabatic</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
moist-adiabatic process in which the liquid water that condenses is assumed to be removed as soon as it is
formed, by idealized instantaneous precipitation.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Age</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Epochs are divided into ages [millions of years] [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Eon</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Supereons are divided into eons. [billions of years] [Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Epoch</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Periods are divided into epochs [tens of millions of years] [Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Era</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Eons are divided into eras [several hundred million years] [Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/stateTime.owl#GeologicTimeUnit</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The subdivisions of geologic time. The table of geologic time spans are dates and
nomenclature defined by the International Commission on Stratigraphy. [Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Period</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Eras are divided into periods. [Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>http://sweet.jpl.nasa.gov/2.3/stateTime.owl#Supereon</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The largest defined unit of time is the supereon, composed of eons.]
[Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>#OidoinyoLengai</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">OI Doinyo Lengai is unique among active volcanoes in that it produces natrocarbonatite
lava, a unique occurrence of volcanic carbonatite [Wikipedia].</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;AlkaliBasalt&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Alkali basalt or alkali olivine basalt is a fine-grained, dark-coloured, volcanic rock
characterized by phenocrysts of olivine, titanium-rich augite, plagioclase feldspar and iron oxides
[Wikipedia].</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>#&apos;AlkaliFeldspar&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The alkali feldspar group are those feldspar minerals rich in the alkali elements,
potassium and sodium [Wikipedia].</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>#&apos;Allotriomorphic-GranularTexture&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Texture where anhedral crystals are dominant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;Amphibole&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Amphibole is an important group of generally dark-colored, inosilicate minerals,
forming prism or needlelike crystals, composed of double chain SiO
4 tetrahedra, linked at the vertices and generally containing ions of iron and/or magnesium in their
structures. [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;AmygdaloidalTexture&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Amygdules or amygdales form when the gas bubbles or vesicles in volcanic lava (or
other extrusive igneous rocks) are infilled with a secondary mineral such as calcite, quartz, chlorite or one
of the zeolites [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;Autolith&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An included rock of similar type is called an autolith or a cognate inclusion
[Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>#&apos;Banding&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Describing banding found in rock and rock units</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;Basaltic-Andesite&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Basaltic andesite is a black volcanic rock containing about 55% silica. It is distinct from
basalt and andesite in having a different percentage of silica content. Minerals in basaltic andesite include
olivine, augite and plagioclase. Basaltic andesite can be found in volcanoes around the world, including in
Central America and the Andes of South America [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;Basanite&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Basanite is an igneous, volcanic (extrusive) rock with aphanitic to porphyritic texture.
The mineral assembly is usually abundant feldspathoids (nepheline or leucite), plagioclase, and augite,

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together with olivine and lesser iron-titanium oxides such as ilmenite and magnetite-ulvospinel; minor alkali feldspar may be present. Clinopyroxene (augite) and olivine are common as phenocrysts and in the matrix. The augite contains significantly greater titanium, aluminium and sodium than that in typical tholeiitic basalt. Quartz is absent, as are orthopyroxene and pigeonite. Chemically, basanites are low in silica (42 to 45% SiO₂) and high in alkalis (3 to 5.5% Na₂O and K₂O) compared to basalt, which typically contains more SiO₂, as evident on the diagram used for TAS classification. Nephelinite is yet richer in Na₂O plus K₂O compared to SiO₂. Basanites occur both on continents and on ocean islands. For example, together with basalts, they are produced by hotspot volcanism in the Hawaiian and the Comoros Islands [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'BatchMelting'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Type of partial melting in which masses of magma repeatedly develop and then separate from a parent rock.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

<IRI>#'BatchMelting'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">[Raymond, 2002]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'Benmoreite'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Benmoreite is a silica-undersaturated volcanic rock of intermediate composition. It is a sodium-rich variety of trachyandesite and belongs to the alkalic suite of igneous rocks. An origin by fractionation from basanite through nepheline hawaiiite to nepheline benmoreite has been demonstrated for a volcanic suite in the McMurdo Volcanic Group of late Cenozoic age in McMurdo Sound area. Nepheline benmoreite magmas derived from mantle sources containing lherzolite xenoliths display similarities to some plutonic nepheline syenites [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'Boninite'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Boninite is a mafic extrusive rock high in both magnesium and silica, thought to be usually formed in fore-arc environments, typically during the early stages of subduction. The rock is named for its occurrence in the Izu-Bonin arc south of Japan. It is characterized by extreme depletion in incompatible trace elements that are not fluid mobile (e.g., the heavy rare-earth elements plus Nb, Ta, Hf) but variable enrichment in the fluid mobile elements (e.g., Rb, Ba, K). They are found almost exclusively in the fore-arc of primitive island arcs (that is, closer to the ocean trench) and in ophiolite complexes thought to represent former fore-arc settings or at least formed above a subduction zone [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'BowensReactionSeries'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Within the field of geology, Bowen's reaction series is the work of the petrologist, Norman L. Bowen who summarized, based on experiments and observations of natural rocks, the crystallization sequence of typical basaltic magma undergoing fractional crystallization (i.e., crystallization wherein early-formed crystals are removed from the magma by crystal settling, say, leaving behind a liquid of slightly different composition). Bowen's reaction series is able to explain why certain types of minerals tend to be found together while others are almost never associated with one another [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>

<IRI>#'CharacterizingAccessoryMineral'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">varietal mineral</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'Clinopyroxene'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Pyroxenes that crystallize in the monoclinic system are known as clinopyroxenes [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'ColumnarBasalt'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">During the cooling of a thick lava flow, contractional joints or fractures form. If a flow cools relatively rapidly, significant contraction forces build up. While a flow can shrink in the vertical dimension without fracturing, it can't easily accommodate shrinking in the horizontal direction unless cracks form; the extensive fracture network that develops results in the formation of columns [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'ColumnarJoint'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Columnar jointing is a geological structure where sets of intersecting closely spaced fractures, referred to as joints, result in the formation of a regular array of polygonal prisms, or columns [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'CongruentMelting'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Congruent melting occurs during melting of a compound when the composition of the liquid that forms is the same as the composition of the solid [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'ContinentalRiftVolcanism'</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The axis of the rift area may contain volcanic rocks, and active volcanism is a part of
many, but not all active rift systems [Wikipedia].</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>#&apos;ContinuousMelting&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Process in which melting and separation of magma from parentRock are coeval and
uninterrupted.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>#&apos;DecompressionMelting&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Decompression melting occurs because of a decrease in pressure. [Wikipedia]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;DiabasicTexture&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An igneous texture consisting of rectangular (lath-shaped) plagioclase feldspar crystals
with smaller, intergranular crystals of pyroxene and other minerals. Coarse-grained equivalent of the
intergranular textures found in volcanic rocks.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>#&apos;DiabasicTexture&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">{Raymond, 2002}</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;Dunite&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Dunite (also known as olivinite, not to be confused with the mineral olivenite) is an
igneous, plutonic rock, of ultramafic composition, with coarse-grained or phaneritic texture. The mineral
assemblage is greater than 90% olivine, with minor amounts of other minerals such as pyroxene,
chromite, magnetite, and pyrope. Dunite is the olivine-rich end-member of the peridotite group of mantle-
derived rocks. Dunite and other peridotite rocks are considered the major constituents of the Earth&apos;s
mantle above a depth of about 400 kilometers [Wikipedia].</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;EutecticPoint&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The lowest point on the liquidus curve. It represents the lowest possible equilibrium
temperature at which liquid can exist in the system.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

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    <IRI>#&apos;EutecticPoint&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">[Raymond, 2002]</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;Exsolution&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">When a solid solution becomes unstable due to a lower temperature, for
example exsolution occurs and the two phases separate into distinct microscopic to megascopic
lamellae. This is mainly caused by difference in cation size. Cations which have a large difference in radii
are not likely to readily substitute [Wikipedia]</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>#&apos;Fayalite&apos;</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Fayalite, also called iron
chrysolite, is the iron-rich end-member of the olivine solid-solution series [Wikipedia].</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>#&apos;Feldspathoid&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">The feldspathoids are a group of tectosilicate minerals which resemble feldspars but
have a different structure and much lower silica content. They occur in rare and unusual types of igneous
rocks, and are not found in rocks containing primary quartz [Wikipedia].</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>#&apos;FelsicMineral&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Felsic minerals are usually light in color and have specific gravities less than 3.
Common felsic minerals include quartz, muscovite, orthoclase, and the sodium-rich plagioclase feldspars.
[Wikipedia]</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;FlowBanding&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Flow banding is a geological term to describe bands or layers that can sometimes be
seen in rock that formed from the substance molten rock or magma [Wikipedia].</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>#&apos;FluxMelting&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In
igneous petrology, flux melting occurs when water and other volatile components are added to hot solid
rock. In engineering and metallurgy, flux is a substance, such as salt, that produces a low melting point
mixture with a metal oxide. In the same way, the addition of water and other volatile compounds to rocks
composed of silicate minerals lowers the melting temperature of those rocks. [Wikipedia]</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>#&apos;Foresterite&apos;</IRI>
  <Literal datatypeIRI="http://www.w3.org/2001/XMLSchema#string">Forsterite is the magnesium-
rich end-member of the olivine solid solution series [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;FractionalCrystallization&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Fractional crystallization, or crystal fractionation, is one of the most important
geochemical and physical processes operating within the Earth&apos;s crust and mantle. It is one of the
main processes of magmatic differentiation. Fractional crystallization is the removal and segregation from
a melt of mineral precipitates; except in special cases, removal of the crystals changes the composition of
the magma [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
  <IRI>#&apos;HawaiianEruption&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
Hawaiian eruption is a type of volcanic eruption where lava flows from the vent in a relatively gentle, low
level eruption; it is so named because it is characteristic of Hawaiian volcanoes. Typically they are
effusive eruptions, with basaltic magmas of low viscosity, low content of gases, and high temperature at
the vent. Very little amounts of volcanic ash are produced. This type of eruption occurs most often at
hotspot volcanoes such as K  lauea on Hawaii&apos;s big island and in Iceland, though it can occur
near subduction zones (e.g. Medicine Lake Volcano in California, United States) and rift zones.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;Hawaiiite&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Hawaiiite is an olivine basalt with a composition between alkali basalt and mugearite. It
was first used as a name for some lavas found on the island of Hawaii [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
  <IRI>#&apos;HomogeneousNucleation&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Process in which new crystal growth-centers form within a melt spontaneously and
independent of any preexisting crystal or surface.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;IcelandicEruption&apos;</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Icelandic
eruptions display similar activity [to Hawaiian eruptions], but from regional fissures such as those that
produced lava flows of the 1783 &quot;Laki fires&quot; eruption from Grimsvotn volcano. Icelandic
eruptions may also include explosive activity from often ice-covered summit craters of central
volcanos.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>
    <IRI>#&apos;IcelandicEruption&apos;</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">[Siebet, Simkin,
and Kimbely, 2010]</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;Icelandite&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Icelandite is a type of volcanic rock, an iron rich, aluminium lacking andesite.
Icelandites are between rhyodacite and tholeiitic basalt in composition and contain andesine, hypersthene
and augite, with a silica (SiO2) content greater than 60% [Wikipedia].</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;Ignimbrite&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Ignimbrites are igneous rocks made up of crystal and rock fragments in a glass-shard
groundmass, albeit the original texture of the groundmass might be obliterated due to high degrees of
welding. Ignimbrite is the deposit of a pyroclastic density current, or pyroclastic flow, which is a hot
suspension of particles and gases flowing rapidly from a volcano and driven by being denser than the
surrounding atmosphere [Wikipedia].</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;IncongruentMelting&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Incongruent melting occurs when a solid substance does not melt uniformly,
decomposing into another solid and a liquid with different compositions [Wikipedia].</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;IntermediateComposition&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In
igneous petrology an intermediate composition refers to the chemical composition of a rock that has 52-
63 wt% SiO2 being an intermediate between felsic and mafic compositions. Typical intermediate rocks
include andesite, dacite and trachyandesite among volcanic rocks and diorite and granodiorite among
plutonic rocks [Wikipedia].</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>#&apos;InvestContinuant&apos;</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Continuant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
heart</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
person</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
symphony orchestra</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the color of a tomato</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of blood to coagulate</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the lawn and atmosphere in front of our building</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the mass of a cloud</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An entity that exists in full at any time in which it exists at all, persists through time
while maintaining its identity and has no temporal parts.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: Continuant entities are entities which can be sliced to yield parts only
along the spatial dimension, yielding for example the parts of your table which we call its legs, its top, its
nails. â€ˆMy desk stretches from the window to the door. It has spatial parts, and can be sliced (in space)
in two. With respect to time, however, a thing is a continuant.â€™ [60, p. 240</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000007</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Continuant doesn't have a closure axiom because the subclasses don't
necessarily exhaust all possibilities. For example, in an expansion involving bringing in some of
Ceuster's other portions of reality, questions are raised as to whether universals are
continuants</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">endurant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/008-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
continuant is an entity that persists, endures, or continues to exist through time while maintaining its
identity. (axiom label in BFO2 Reference: [008-002])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/126-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">if
b is a continuant and if, for some t, c has _continuant_part b at t, then c is a continuant. (axiom label in
BFO2 Reference: [126-001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/009-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
  <IRI>#&apos;InvestContinuant&apos;</IRI>

```

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">if
b is a continuant and if, for some t, cis continuant_part of b at t, then c is a continuant. (axiom label in
BFO2 Reference: [009-002])</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/011-002</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>

<IRI>#'InvestContinuant'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">if
b is a material entity, then there is some temporal interval (referred to below as a one-dimensional
temporal region) during which b exists. (axiom label in BFO2 Reference: [011-002])</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/009-002</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>

<IRI>#'InvestContinuant'</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x y) (if
(and (Continuant x) (exists (t) (continuantPartOfAt y x t))) (Continuant y))) // axiom label in BFO2 CLIF:
[009-002] </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/126-001</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>

<IRI>#'InvestContinuant'</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x y) (if
(and (Continuant x) (exists (t) (hasContinuantPartOfAt y x t))) (Continuant y))) // axiom label in BFO2
CLIF: [126-001] </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/008-002</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>

<IRI>#'InvestContinuant'</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(Continuant x) (Entity x))) // axiom label in BFO2 CLIF: [008-002] </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/011-002</IRI>

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</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
<IRI>#&apos;InvestContinuant&apos;</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(Material Entity x) (exists (t) (and (TemporalRegion t) (existsAt x t)))) // axiom label in BFO2 CLIF:
[011-002] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
<IRI>#&apos;InvestDependentContinuant&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">dependent continuant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>#&apos;InvestDependentContinuant&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
continuant that is either dependent on one or other independent continuant bearers or inheres in or is
borne by other entities.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Disposition</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an atom of element X has the disposition to decay to an atom of element Y</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">certain people have a predisposition to colon cancer</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">children are innately disposed to categorize objects in certain ways.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the cell wall is disposed to filter chemicals in endocytosis and exocytosis</Literal>
</AnnotationAssertion>
<AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of a patient with a weakened immune system to contract
disease</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of a vase to brake if dropped</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of blood to coagulate</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of metal to conduct electricity</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of vegetables to decay when not refrigerated</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
realizable entity that essentially causes a specific process or transformation in the object in which it
inheres, under specific circumstances and in conjunction with the laws of nature. A general formula for
dispositions is: X (object has the disposition D to (transform, initiate a process) R under conditions
C.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: Dispositions exist along a strength continuum. Weaker forms of
disposition are realized in only a fraction of triggering cases. These forms occur in a significant number of
cases of a similar type.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
<IRI>http://purl.obolibrary.org/obo/bfo/axiom/062-002</IRI>

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</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is a disposition means: b is a realizable entity &amp; b&acircrTM's bearer is some material entity &amp; b is
such that if it ceases to exist, then its bearer is physically changed, &amp; b&acircrTM's realization occurs when
and because this bearer is in some special physical circumstances, &amp; this realization occurs in virtue
of the bearer&acircrTM's physical make-up. (axiom label in BFO2 Reference: [062-002])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
<IRI>http://purl.obolibrary.org/obo/bfo/axiom/063-002</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">If
b is a realizable entity then for all t at which b exists, b s-dependes_on some material entity at t. (axiom
label in BFO2 Reference: [063-002])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
<IRI>http://purl.obolibrary.org/obo/bfo/axiom/063-002</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x t) (if
(and (RealizableEntity x) (existsAt x t)) (exists (y) (and (MaterialEntity y) (specificallyDepends x y t))))))
// axiom label in BFO2 CLIF: [063-002] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
<IRI>http://purl.obolibrary.org/obo/bfo/axiom/062-002</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
<IRI>#&apos;InvestDispositon&apos;</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(Disposition x) (and (RealizableEntity x) (exists (y) (and (MaterialEntity y) (bearerOfAt x y t)))))) //
axiom label in BFO2 CLIF: [062-002] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
<IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">ic</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
<IRI>#&apos;InvestIndependentContinuant&apos;</IRI>

```



```

    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">IndependentContinuant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">independent continuant</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
chair</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
heart</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
leg</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
molecule</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
person</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
spatial region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
symphony orchestra</Literal>
  </AnnotationAssertion>

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```

<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an atom</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an orchestra.</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an organism</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the bottom right portion of a human torso</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the interior of your mouth</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the lawn and atmosphere in front of our building</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
continuant that is a bearer of quality and realizable entity entities, in which other entities inhere and
which itself cannot inhere in anything.</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/017-002</IRI>
    </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is an independent continuant = Def. b is a continuant which is such that there is no c and no t such that b
s-depends_on c at t. (axiom label in BFO2 Reference: [017-002])</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">substantial entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/134-001</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">For any independent continuant b and any time t there is some spatial region r such that
b is located_in r at t. (axiom label in BFO2 Reference: [134-001])</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/018-002</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">For every independent continuant b and time t during the region of time spanned by its
life, there are entities which s-depends_on b during t. (axiom label in BFO2 Reference: [018-
002])</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/134-001</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x t) (if
(IndependentContinuant x) (exists (r) (and (SpatialRegion r) (locatedInAt x r t)))) // axiom label in BFO2
CLIF: [134-001] </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/018-002</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>

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    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x t) (if
    (and (IndependentContinuant x) (existsAt x t)) (exists (y) (and (Entity y) (specificallyDependsOnAt y x
    t)))) // axiom label in BFO2 CLIF: [018-002] </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/017-002</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
    <IRI>#&apos;InvestIndependentContinuant&apos;</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(iff
    (IndependentContinuant a) (and (Continuant a) (not (exists (b t) (specificallyDependsOnAt a b t)))) //
    axiom label in BFO2 CLIF: [017-002] </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>
    <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
    ns#PlainLiteral">material</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
    ns#PlainLiteral">MaterialEntity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
    ns#PlainLiteral">material entity</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
    flame</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
    forest fire</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
    human being</Literal>
  </AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
hurricane</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
photon</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
puff of smoke</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
sea wave</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
tornado</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an aggregate of human beings.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an energy wave</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">an epidemic</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the undetached arm of a human being</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An independent continuant that is spatially extended whose identity is independent of
that of other entities and can be maintained through time.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: Material entities (continuants) can preserve their identity even while
gaining and losing material parts. Continuants are contrasted with occurrents, which unfold themselves in
successive temporal parts or phases [60</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: Object, Fiat Object Part and Object Aggregate are not intended to be
exhaustive of Material Entity. Users are invited to propose new subcategories of Material
Entity.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: "Matter"™ is intended to encompass both mass and energy (we
will address the ontological treatment of portions of energy in a later version of BFO). A portion of matter
is anything that includes elementary particles among its proper or improper parts: quarks and leptons,
including electrons, as the smallest particles thus far discovered; baryons (including protons and neutrons)
at a higher level of granularity; atoms and molecules at still higher levels, forming the cells, organs,
organisms and other material entities studied by biologists, the portions of rock studied by geologists, the
fossils studied by paleontologists, and so on. Material entities are three-dimensional entities (entities
extended in three spatial dimensions), as contrasted with the processes in which they participate, which
are four-dimensional entities (entities extended also along the dimension of time). According to the FMA,
material entities may have immaterial entities as parts " including the entities identified below as sites;
for example the interior (or "lumen"™) of your small intestine is a part of your body. BFO 2.0
embodies a decision to follow the FMA here.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Examples: collection of random bacteria, a chair, dorsal surface of the body</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

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<IRI>#&apos;InvestMaterialEntity&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Material entity [snap:MaterialEntity] subsumes object [snap:Object], fiat object part
[snap:FiatObjectPart], and object aggregate [snap:ObjectAggregate], which assume a three level theory of
granularity, which is inadequate for some domains, such as biology.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/019-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
material entity is an independent continuant that has some portion of matter as proper or improper
continuant part. (axiom label in BFO2 Reference: [019-002])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/020-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Every entity which has a material entity as continuant part is a material entity. (axiom
label in BFO2 Reference: [020-002])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/021-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">every entity of which a material entity is continuant part is also a material entity. (axiom
label in BFO2 Reference: [021-002])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/019-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(MaterialEntity x) (IndependentContinuant x))) // axiom label in BFO2 CLIF: [019-002] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>

```

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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/021-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
  (and (Entity x) (exists (y t) (and (MaterialEntity y) (continuantPartOfAt x y t)))) (MaterialEntity x))) //
  axiom label in BFO2 CLIF: [021-002] </Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/020-002</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
    <IRI>#&apos;InvestMaterialEntity&apos;</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
    (and (Entity x) (exists (y t) (and (MaterialEntity y) (continuantPartOfAt y x t)))) (MaterialEntity x))) //
    axiom label in BFO2 CLIF: [020-002] </Literal>
    </AnnotationAssertion>
  </AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
    <IRI>#&apos;InvestObject&apos;</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Object</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestObject&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
  ns#PlainLiteral">atom</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestObject&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
  ns#PlainLiteral">cell</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestObject&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
  ns#PlainLiteral">cells and organisms</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestObject&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
  ns#PlainLiteral">engineered artifacts</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>

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    <IRI>#&apos;InvestObject&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">grain of sand</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestObject&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">molecule</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestObject&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">organelle</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestObject&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">organism</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestObject&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">planet</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestObject&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">solid portions of matter</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestObject&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">star</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
  <IRI>#&apos;InvestObject&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: BFO rests on the presupposition that at multiple micro-, meso- and
macroscopic scales reality exhibits certain stable, spatially separated or separable material units,
combined or combinable into aggregates of various sorts (for example organisms into what are called
&acirc~populations&acirc~TM). Such units play a central role in almost all domains of natural science from particle
physics to cosmology. Many scientific laws govern the units in question, employing general terms (such
as &acirc~molecule&acirc~TM or &acirc~planet&acirc~TM) referring to the types and subtypes of units, and also to the types
and subtypes of the processes through which such units develop and interact. The division of reality into

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such natural units is at the heart of biological science, as also is the fact that these units may form higher-level units (as cells form multicellular organisms) and that they may also form aggregates of units, for example as cells form portions of tissue and organs form families, herds, breeds, species, and so on. At the same time, the division of certain portions of reality into engineered units (manufactured artifacts) is the basis of modern industrial technology, which rests on the distributed mass production of engineered parts through division of labor and on their assembly into larger, compound units such as cars and laptops. The division of portions of reality into units is one starting point for the phenomenon of counting.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>#'InvestObject'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">BFO 2 Reference: Each object is such that there are entities of which we can assert unproblematically that they lie in its interior, and other entities of which we can assert unproblematically that they lie in its exterior. This may not be so for entities lying at or near the boundary between the interior and exterior. This means that two objects “ for example the two cells depicted in Figure 3 “ may be such that there are material entities crossing their boundaries which belong determinately to neither cell. Something similar obtains in certain cases of conjoined twins (see below).</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>#'InvestObject'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">BFO 2 Reference: To say that b is causally unified means: b is a material entity which is such that its material parts are tied together in such a way that, in environments typical for entities of the type in question, if c, a continuant part of b that is in the interior of b at t, is larger than a certain threshold size (which will be determined differently from case to case, depending on factors such as porosity of external cover) and is moved in space to be at t at a location on the exterior of the spatial region that had been occupied by b at t, then either b’s other parts will be moved in coordinated fashion or b will be damaged (be affected, for example, by breakage or tearing) in the interval between t and t. causal changes in one part of b can have consequences for other parts of b without the mediation of any entity that lies on the exterior of b. Material entities with no proper material parts would satisfy these conditions trivially. Candidate examples of types of causal unity for material entities of more complex sorts are as follows (this is not intended to be an exhaustive list): CU1: Causal unity via physical covering Here the parts in the interior of the unified entity are combined together causally through a common membrane or other physical covering\). The latter points outwards toward and may serve a protective function in relation to what lies on the exterior of the entity [13, 47</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>#'InvestObject'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">BFO 2 Reference: an object is a maximal causally unified material entity</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>#'InvestObject'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">BFO 2 Reference: “ objects “ are sometimes referred to as “ grains “ [74</Literal>

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</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/024-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>#&apos;InvestObject&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is an object means: b is a material entity which manifests causal unity of one or other of the types CUn
listed above &amp; is of a type (a material universal) instances of which are maximal relative to this
criterion of causal unity. (axiom label in BFO2 Reference: [024-001])</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
  <IRI>#&apos;InvestOccurrent&apos;</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Occurrent</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestOccurrent&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
surgical operation as processual context for a nosocomical infection</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestOccurrent&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the life of an organism</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestOccurrent&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the most interesting part of Van Gogh&apos;s life</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestOccurrent&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the spatiotemporal context occupied by a process of cellular meiosis</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  <IRI>#&apos;InvestOccurrent&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the spatiotemporal region occupied by the development of a cancer tumor</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

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    <IRI>#&apos;InvestOccurent&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An entity that has temporal parts and that happens, unfolds or develops through time.
Sometimes also called perdurants.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>#&apos;InvestOccurent&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: every occurrent that is not a temporal or spatiotemporal region is s-
dependent on some independent continuant that is not a spatial region</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>#&apos;InvestOccurent&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: s-dependence obtains between every process and its participants in
the sense that, as a matter of necessity, this process could not have existed unless these or those
participants existed also. A process may have a succession of participants at different phases of its
unfolding. Thus there may be different players on the field at different times during the course of a
football game; but the process which is the entire game s-dependes_on all of these players nonetheless.
Some temporal parts of this process will s-depend_on on only some of the players.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000006</IRI>
    </Annotation>
    <Annotation>
      <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
      <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">per discussion
with Barry Smith</Literal>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>#&apos;InvestOccurent&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Occurent doesn&apos;t have a closure axiom because the subclasses don&apos;t
necessarily exhaust all possibilites. An example would be the sum of a process and the process boundary
of another process.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000012</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>#&apos;InvestOccurent&apos;</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Simons uses
different terminology for relations of occurents to regions: Denote the spatio-temporal location of a given
occurent e by &apos;spn[e]&apos; and call this region its span. We may say an occurent is at its span, in
any larger region, and covers any smaller region. Now suppose we have fixed a frame of reference so that

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we can speak not merely of spatio-temporal but also of spatial regions (places) and temporal regions (times). The spread of an occurrent, (relative to a frame of reference) is the space it exactly occupies, and its spell is likewise the time it exactly occupies. We write `'spr[e]'` and ``spl[e]'`; respectively for the spread and spell of e, omitting mention of the frame.

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</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  <IRI>#&apos;InvestOccurrent&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">perdurant</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/077-002</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>
  <IRI>#&apos;InvestOccurrent&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An occurrent is an entity that unfolds itself in time or it is the instantaneous boundary of
such an entity (for example a beginning or an ending) or it is a temporal or spatiotemporal region which
such an entity occupies_temporal_region or occupies_spatiotemporal_region. (axiom label in BFO2
Reference: [077-002])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/108-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
  <IRI>#&apos;InvestOccurrent&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Every occurrent occupies_spatiotemporal_region some spatiotemporal region. (axiom
label in BFO2 Reference: [108-001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/079-001</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000601"/>
  <IRI>#&apos;InvestOccurrent&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is an occurrent entity iff b is an entity that has temporal parts. (axiom label in BFO2 Reference: [079-
001])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/108-001</IRI>
  </Annotation>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
<IRI>#&apos;InvestOccurent&apos;</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if
(Occurent x) (exists (r) (and (SpatioTemporalRegion r) (occupiesSpatioTemporalRegion x r)))) // axiom
label in BFO2 CLIF: [108-001] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
<IRI>http://purl.obolibrary.org/obo/bfo/axiom/079-001</IRI>
</Annotation>
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<IRI>#&apos;InvestOccurent&apos;</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (iff
(Occurent x) (and (Entity x) (exists (y) (temporalPartOf y x)))) // axiom label in BFO2 CLIF: [079-001]
</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
<IRI>#&apos;InvestProcess&apos;</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Process</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestProcess&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
process of cell-division, \ a beating of the heart</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestProcess&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
process of meiosis</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestProcess&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">a
process of sleeping</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestProcess&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the course of a disease</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestProcess&apos;</IRI>

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    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the flight of a bird</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestProcess&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the life of an organism</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestProcess&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">your process of aging.</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/083-003</IRI>
    </Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;InvestProcess&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">p
is a process = Def. p is an occurrent that has temporal proper parts and for some time t, p s-dependes_on
some material entity at t. (axiom label in BFO2 Reference: [083-003])</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
    <IRI>#&apos;InvestProcess&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">BFO 2 Reference: The realm of occurrents is less pervasively marked by the presence of
natural units than is the case in the realm of independent continuants. Thus there is here no counterpart of
&acirc~object&acirc~TM. In BFO 1.0 &acirc~process&acirc~TM served as such a counterpart. In BFO 2.0 &acirc~process&acirc~TM is,
rather, the occurrent counterpart of &acirc~material entity&acirc~TM. Those natural &acirc~ as contrasted with
engineered, which here means: deliberately executed &acirc~ units which do exist in the realm of occurrents
are typically either parasitic on the existence of natural units on the continuant side, or they are fiat in
nature. Thus we can count lives; we can count football games; we can count chemical reactions
performed in experiments or in chemical manufacturing. We cannot count the processes taking place, for
instance, in an episode of insect mating behavior. Even where natural units are identifiable, for example
cycles in a cyclical process such as the beating of a heart or an organism&acirc~TMs sleep/wake cycle, the
processes in question form a sequence with no discontinuities (temporal gaps) of the sort that we find for
instance where billiard balls or zebrafish or planets are separated by clear spatial gaps. Lives of organisms
are process units, but they too unfold in a continuous series from other, prior processes such as
fertilization, and they unfold in turn in continuous series of post-life processes such as post-mortem
decay. Clear examples of boundaries of processes are almost always of the fiat sort (midnight, a time of
death as declared in an operating theater or on a death certificate, the initiation of a state of war)</Literal>
  </AnnotationAssertion>
  <AnnotationAssertion>
    <Annotation>
      <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
      <IRI>http://purl.obolibrary.org/obo/bfo/axiom/083-003</IRI>

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</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
<IRI>#&apos;InvestProcess&apos;</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(iff (Process a)
(and (Occurent a) (exists (b) (properTemporalPartOf b a)) (exists (c t) (and (MaterialEntity c)
(specificallyDependsOnAt a c t)))) // axiom label in BFO2 CLIF: [083-003] </Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000180"/>
<IRI>#&apos;InvestRole&apos;</IRI>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Role</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestRole&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">John&acircTM's role of husband to Mary is dependent on Mary&acircTM's role of wife to John, and
both are dependent on the object aggregate comprising John and Mary as member parts joined together
through the relational quality of being married.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestRole&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the priest role</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestRole&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a biological grandfather as legal guardian in the context of a system of
laws</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestRole&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a boundary to demarcate two neighboring administrative territories</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestRole&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a building in serving as a military target</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestRole&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a chemical compound in an experiment</Literal>
</AnnotationAssertion>

```



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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestRole&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a patient relative as defined by a hospital administrative form</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestRole&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a person as a surgeon</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestRole&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a stone in marking a property boundary</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestRole&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a student in a university</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestRole&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of a woman as a legal mother in the context of system of laws</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestRole&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of ingested matter in digestion</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestRole&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of subject in a clinical trial</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestRole&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the student role</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;InvestRole&apos;</IRI>

```

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A realizable entity the manifestation of which brings about some result or end that is not essential to a continuant in virtue of the kind of thing that it is but that can be served or participated in by that kind of continuant in some kinds of natural, social or institutional contexts.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>

<IRI>#'InvestRole'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">BFO 2 Reference: One major family of examples of non-rigid universals involves roles, and ontologies developed for corresponding administrative purposes may consist entirely of representatives of entities of this sort. Thus "professor"TM, defined as follows, b instance_of professor at t =Def. there is some c, c instance_of professor role & c inheres_in b at t.denotes a non-rigid universal and so also do "nurse"TM, "student"TM, "colonel"TM, "taxpayer"TM, and so forth. (These terms are all, in the jargon of philosophy, phase sortals.) By using role terms in definitions, we can create a BFO conformant treatment of such entities drawing on the fact that, while an instance of professor may be simultaneously an instance of trade union member, no instance of the type professor role is also (at any time) an instance of the type trade union member role (any more than any instance of the type color is at any time an instance of the type length).If an ontology of employment positions should be defined in terms of roles following the above pattern, this enables the ontology to do justice to the fact that individuals instantiate the corresponding universals " professor, sergeant, nurse " only during certain phases in their lives.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/061-001</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000600"/>

<IRI>#'InvestRole'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b is a role means: b is a realizable entity & b exists because there is some single bearer that is in some special physical, social, or institutional set of circumstances in which this bearer does not have to be& b is not such that, if it ceases to exist, then the physical make-up of the bearer is thereby changed. (axiom label in BFO2 Reference: [061-001])</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>

<IRI>http://purl.obolibrary.org/obo/bfo/axiom/061-001</IRI>

</Annotation>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>

<IRI>#'InvestRole'</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(forall (x) (if (Role x) (RealizableEntity x))) // axiom label in BFO2 CLIF: [061-001] </Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>

<IRI>#'InvestSpecificallyDependentContinuant'</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">sdc</Literal>

</AnnotationAssertion>

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<AnnotationAssertion>
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ns#PlainLiteral">SpecificallyDependentContinuant</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000111"/>
    <IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">specifically dependent continuant</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Reciprocal specifically dependent continuants: the function of this key to open this lock
and the mutually dependent disposition of this lock: to be opened by this key</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">of
one-sided specifically dependent continuants: the mass of this tomato</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">of
relational dependent continuants (multiple bearers): John&acircm's love for Mary, the ownership relation
between John and this statue, the relation of authority between John and his subordinates.</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the color of a tomato</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
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    <IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the disposition of fish to decay</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
    <IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
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ns#PlainLiteral">the disposition of this fish to decay</Literal>
  </AnnotationAssertion>
</AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the function of the heart in the body: to pump blood, to receive de-oxygenated and
oxygenated blood, etc.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the function of this heart: to pump blood</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the liquidity of blood</Literal>
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<AnnotationAssertion>
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ns#PlainLiteral">the mass of a cloud</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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<IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the mutual dependence of proton donors and acceptors in chemical reactions
[79</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the mutual dependence of the role predator and the role prey as played by two
organisms in a given interaction</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the pink color of a medium rare piece of grilled filet mignon at its center</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the role of being a doctor</Literal>
</AnnotationAssertion>
<AnnotationAssertion>

```

```

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the shape of this hole.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
<IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the smell of mozzarella</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
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<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">the smell of this portion of mozzarella</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
continuant that inheres in or is borne by other entities. Every instance of A requires some specific
instance of B which must always be the same.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
<IRI>http://purl.obolibrary.org/obo/bfo/axiom/050-003</IRI>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">b
is a specifically dependent continuant = Def. b is a continuant &amp; there is some independent
continuant c which is not a spatial region and which is such that b s-dependes_on c at every time t during
the course of b&euml;s existence. (axiom label in BFO2 Reference: [050-003])</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
<IRI>http://purl.obolibrary.org/obo/bfo/axiom/0000005</IRI>
</Annotation>
<Annotation>
<AnnotationProperty abbreviatedIRI="rdfs:comment"/>
<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">per discussion
with Barry Smith</Literal>
</Annotation>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000116"/>
<IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Specifically dependent continuant doesn&apos;t have a closure axiom because the

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subclasses don't necessarily exhaust all possibilities. We're not sure what else will develop here, but for example there are questions such as what are promises, obligation, etc.

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</AnnotationAssertion>
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  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">mode</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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  <IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
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ns#PlainLiteral">property</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
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ns#PlainLiteral">trope</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <Annotation>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0010000"/>
    <IRI>http://purl.obolibrary.org/obo/bfo/axiom/050-003</IRI>
  </Annotation>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000602"/>
  <IRI>#&apos;InvestSpecificallyDependentContinuant&apos;</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">(iff
(SpecificallyDependentContinuant a) (and (Continuant a) (forall (t) (if (existsAt a t) (exists (b) (and
(IndependentContinuant b) (not (SpatialRegion b)) (specificallyDependsOnAt a b t)))))) // axiom label in
BFO2 CLIF: [050-003] </Literal>
</AnnotationAssertion>
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  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;IsotopeRatio&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Stable isotope ratio is preferably used to refer to isotopes whose relative abundances are
affected by isotope fractionation in nature. This field is termed stable isotope geochemistry
[Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
  <IRI>#&apos;KimberlitePipe&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In
kimberlite pipes, the eruption ejects a column of overlying material directly over the magma column, and
does not form a large above-ground elevation as typical volcanoes do; instead, a low ring of ejecta known
as a tuff ring forms around a bowl-shaped depression over the subterranean column of magma. Over time,
the tuff ring may erode back into the bowl, leveling out the depression by filling it with washed-back
ejecta. Kimberlite pipes are the source of most of the world's commercial diamond production, and

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also contain other precious gemstones and semi-precious stones, such as garnets, spinels, and peridot [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'Komatiite'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Komatiite is a type of ultramafic mantle-derived volcanic rock. Komatiites have low silicon, potassium and aluminium, and high to extremely high magnesium content. Komatiite was named for its type locality along the Komati River in South Africa. True komatiites are very rare and essentially restricted to rocks of Archean age, with few Proterozoic or Phanerozoic komatiites known (although high-magnesian lamprophyres are known from the Mesozoic). This restriction in age is thought to be due to cooling of the mantle, which may have been up to 500 Å°C hotter during the early to middle Archean (3.8 to 2.8 billion years ago). The early Earth had much higher heat production, due to the residual heat from planetary accretion, as well as the greater abundance of radioactive elements [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>#'Lamprophyre'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Lamprophyres are uncommon, small volume ultrapotassic igneous rocks primarily occurring as dikes, lopoliths, laccoliths, stocks and small intrusions. They are alkaline silica-undersaturated mafic or ultramafic rocks with high magnesium oxide, >3% potassium oxide, high sodium oxide and high nickel and chromium [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>#'Lapilli'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">By definition lapilli range from 2 to 64 mm (0.08 to 2.52 in) in diameter [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'Latite'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Latite is an igneous, volcanic rock, with aphanitic-aphyric to aphyric-porphyritic texture. Its mineral assemblage is usually alkali feldspar and plagioclase in approximately equal amounts. Quartz is less than five percent and is absent in a feldspathoid-bearing latite, and olivine is absent in a quartz-bearing latite [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>#'LavaFlow'</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A lava flow is a moving outpouring of lava created during a non-explosive effusive eruption. When it has stopped moving, lava solidifies to form igneous rock. The term lava flow is commonly shortened to lava. Although lava can be up to 100,000 times more viscous than water, lava can flow great distances before cooling and solidifying because of its thixotropic and shear thinning properties.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>
 <IRI>#'LavaFountain'</IRI>
 <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A lava fountain is a volcanic phenomenon in which lava is forcefully but non-explosively ejected from a crater, vent, or fissure. The highest lava fountains recorded were during the 1999 eruption of Mount Etna in Italy, which reached heights of 2,000 m (6,562 ft). However, lava fountains observed during Mount Vesuvius' 1779 eruption are believed to have reached at least 3,000 m (9,843 ft). Lava fountains may occur as a series of short pulses, or a continuous jet of lava. They are commonly associated with Hawaiian eruptions.</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
 <IRI>#'LavaTube'</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A lava tube is a natural conduit formed by flowing lava which moves beneath the hardened surface of a lava flow. Tubes can drain lava from a volcano during an eruption, or can be extinct, meaning the lava flow has ceased, and the rock has cooled and left a long cave [Wikipedia].</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
 <IRI>#'Leucite'</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Leucite or leucite rock is an igneous rock containing leucite. It is scarce, many countries such as England being entirely without them. However, they are of wide distribution, occurring in every quarter of the globe. Taken collectively, they exhibit a considerable variety of types and are of great interest petrographically. For the presence of this mineral it is necessary that the silica percentage of the rock should be low, since leucite is incompatible with free quartz and reacts with it to form potassium feldspar. Because it weathers rapidly, leucite is most common in lavas of recent and Tertiary age, which have a fair amount of potassium, or at any rate have potassium equal to or greater than sodium; if sodium is abundant nepheline occurs rather than leucite [Wikipedia].</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
 <IRI>#'Liquidus'</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The liquidus is the temperature above which the substance is stable in a liquid state [Wikipedia].</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
 <IRI>#'Lithophysa'</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A lithophysa (plural lithophysae, from Greek lithos "stone" + physan "to blow") is a felsic volcanic rock with a small spherulitic cavity and concentric chambers. Its shape is spherical or lenticular [Wikipedia].</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
 <IRI>#'MaarDiatremeVolcanism'</IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A diatreme, sometimes known as a maar-diatreme volcano, is a volcanic pipe formed by a gaseous

explosion. When magma rises up through a crack in the Earth's crust and makes contact with a shallow body of ground water, rapid expansion of heated water vapor and volcanic gases can cause a series of explosions. A relatively shallow crater is left (known as a maar) and a rock filled fracture (the actual diatreme) in the Earth's crust. Diatremes breach the Earth's surface and produce a steep inverted cone shape [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'MaficMineral'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Most mafic minerals are dark in color and the specific gravity is greater than 3. Common rock-forming mafic minerals include olivine, pyroxene, amphibole, and biotite. Common mafic rocks include basalt and gabbro. In terms of chemistry, mafic rocks are on the other side of the rock spectrum from the felsic rocks. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'MagmaChamber'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A magma chamber is a large pool of liquid rock beneath the surface of the Earth. [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'Mica'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The mica group of sheet silicate (phyllosilicate) minerals includes several closely related materials having nearly perfect basal cleavage. All are monoclinic, with a tendency towards pseudohexagonal crystals, and are similar in chemical composition. The nearly perfect cleavage, which is the most prominent characteristic of mica, is explained by the hexagonal sheet-like arrangement of its atoms [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'MidOceanRidgeBasalt'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A type of tholeiitic basalt characteristic of midocean ridges</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

<IRI>#'MidOceanRidgeBasalt'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">[Raymond 2002]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'Mugearite'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Mugearite is a type of oligoclase-bearing basalt, comprising olivine, apatite, and opaque oxides. The main feldspar in mugearite is oligoclase [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

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<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>#&apos;Natrocarbonatite&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Natrocarbonatite is a rare carbonatite lava which erupts from the Ol Doinyo Lengai
volcano in Tanzania within the East African Rift of eastern Africa [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>#&apos;Nephelinite&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Nephelinite is a fine-grained or aphanitic igneous rock made up almost entirely of
nepheline and clinopyroxene (variety augite). If olivine is present, the rock may be classified as an olivine
nephelinite. Nephelinite is dark in color and may resemble basalt in hand specimen. However, basalt
consists mostly of clinopyroxene (augite) and calcic plagioclase [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty abbreviatedIRI="rdfs:comment"/>
<IRI>#&apos;NormativeMineralogy&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Normative mineralogy is a calculation of the composition of a rock sample that
estimates the idealised mineralogy of a rock according to the principles of geochemistry. Normative
mineral calculations can be achieved via either the CIPW Norm or the Barth-Niggli Norm (also known as
the Cation Norm). Normative calculations are used to produce an idealised mineralogy of a crystallized
melt. First, a rock is chemically analysed to determine the elemental constituents. Results of the chemical
analysis traditionally are expressed as oxides (e.g., weight percent Mg is expressed as weight percent
MgO). The normative mineralogy of the rock then is calculated, based upon assumptions about the order
of mineral formation and known phase relationships of rocks and minerals, and using simplified mineral
formulas. The calculated mineralogy can be used to assess concepts such as silica saturation of melts.
[Wikipedia]</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>#&apos;OceanIslandBasalt&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Ocean island basalts (OIB) are basaltic rocks found on many volcanic islands away
from tectonic plate boundaries, typically associated with hot spots [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>#&apos;Oikocryst&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In
poikilitic rocks, the contained smaller crystals are termed &apos;chadacrysts&apos; and the larger
phenocrysts are termed &apos;oikocrysts&apos; [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>#&apos;OphiticTexture&apos;</IRI>
<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
variety of this, known as ophitic is very characteristic of many diabases, in which large crystals of augite
enclose smaller laths of plagioclase feldspar.</Literal>
</AnnotationAssertion>

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<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;Orthopyroxene&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Those that crystallize in the orthorhombic system are known as orthopyroxenes
[Wikipedia]</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>#&apos;Oversaturated&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Rocks that have free silica (silica in excess of that needed to compose feldspars) and
hence contain quartz or another silica material</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>#&apos;PartialMelting&apos;</IRI>
    <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">anatexis</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
    <IRI>#&apos;PartialMelting&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">fractional melting</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
    <IRI>#&apos;PartialMelting&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Partial melting occurs when only a portion of a solid is melted. For mixed substances,
such as a rock containing several different minerals or a mineral that displays solid solution, this melt can
be different from the bulk composition of the solid. Partial melting occurs where the solidus and liquidus
temperatures are different. For single minerals this can happen when they exhibit solid solution, for
example in olivines between iron and magnesium. In rocks made up of several different minerals, some
will melt at lower temperatures than others. {Wikipedia}</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;PhaseBoundaries&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Common components of a phase diagram are lines of equilibrium or phase boundaries,
which refer to lines that mark conditions under which multiple phases can coexist at equilibrium. Phase
transitions occur along lines of equilibriu [Wikipedia].</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
    <IRI>#&apos;PhaseDiagram&apos;</IRI>
    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A
phase diagram in physical chemistry, engineering, mineralogy, and materials science is a type of chart

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used to show conditions (pressure, temperature, volume, etc.) at which thermodynamically distinct phases occur and coexist at equilibrium [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'PicriticBasalt'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Picrite basalt, microbasalt is a variety of high-magnesium olivine basalt that is very rich in the mineral olivine. It is dark with yellow-green olivine phenocrysts (20 to 50%) and black to dark brown pyroxene, mostly augite [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'PoikiliticTexture'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Poikilitic texture refers to igneous rocks where large component crystals contain smaller crystals of other minerals within them. In poikilitic rocks, the contained smaller crystals are termed 'chadacrysts' and the larger phenocrysts are termed 'oikocrysts'. A poikilitic texture is most easily observed in petrographic thin sections [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'PyroclasticBreccia'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A clastic volcanic rock dominated by angular clasts larger than 64 mm in diameter.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

<IRI>#'PyroclasticBreccia'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">[Raymond, 2002]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'Pyrolite'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Pyrolite is a theoretical rock considered to be the best approximation of the composition of Earth's upper mantle. The definition varies, but it is generally considered as being 1 part tholeiitic basalt and 3 parts dunite. If fused experimentally, this mix yields high pressure tholeiitic basaltic melts, and intermediate pressure alkaline basalts. The hypothetical pyrolite compositions are not compatible with trace element, isotopic and chondritic abundances data as well as evidence for mantle heterogeneity [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>#'QAPFClassification'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">QAPF diagram is a double ternary diagram which is used to classify igneous rocks based on mineralogic composition. The acronym, QAPF, stands for "Quartz, Alkali feldspar, Plagioclase, Feldspathoid (Foid)". These are the mineral groups used for classification in QAPF

diagram. Q, A, P and F percentages are normalized (recalculated so that their sum is 100%)

[Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>#'Seismometer'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A seismometer is an instrument that measures motion of the ground, caused by, for example, an earthquake, a volcanic eruption, or the use of explosives.[1] Records of seismic waves allow seismologists to map the interior of the Earth and to locate and measure the size of events like these {Wikipedia}.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'Shoshonite'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Shoshonite is a type of igneous rock. More specifically, it is a potassium-rich variety of basaltic trachyandesite, composed of olivine, augite and plagioclase phenocrysts in a groundmass with calcic plagioclase and sanidine and some dark-colored volcanic glass. Shoshonite gives its name to the shoshonite series and grades into absarokite with the loss of plagioclase phenocrysts and into bannakite with an increase in sanidine. Shoshonite was named by Iddings in 1895 for the Shoshone River in Wyoming [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'SolidSolution'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A solid solution is a solid-state solution of one or more solutes in a solvent. Such a multi-component system is considered a solution rather than a compound when the crystal structure of the solvent remains unchanged by addition of the solutes, and when the chemical components remain in a single homogeneous phase [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>#'SpheruliticTexture'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Texture in which fibers that radiate from a point are clustered in spherical groups</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'SpinifexTexture'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A common and distinctive texture is known as spinifex texture and consists of long acicular phenocrysts of olivine (or pseudomorphs of alteration minerals after olivine) or pyroxene which give the rock a bladed appearance especially on a weathered surface. Spinifex texture is the result of rapid crystallization of highly magnesian liquid in the thermal gradient at the margin of the flow or sill [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>#'SubglacialEruption'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Subglacial eruptions, those of ice-covered volcanoes, result in the interaction of magma with ice and snow, leading to meltwater formation, jÃ¶kulhlaups, and lahars. Flooding associated with meltwater is a significant hazard in some volcanic areas, including Iceland, Alaska, and parts of the Andes. JÃ¶kulhlaups, glacial outburst floods, have been identified as the most frequently occurring volcanic hazard in Iceland, with major events where peak discharges can reach 10 000 â€“ 100 000 m³/s occurring when there are large eruptions beneath glaciers.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>#'SubglacialVolcano'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Subglacial volcanoes develop underneath icecaps. They are made up of flat lava which flows at the top of extensive pillow lavas and palagonite. When the icecap melts, the lava on top collapses, leaving a flat-topped mountain. These volcanoes are also called table mountains, tuyas, or (uncommonly) mobergs. Very good examples of this type of volcano can be seen in Iceland, however, there are also tuyas in British Columbia. The origin of the term comes from Tuya Butte, which is one of the several tuyas in the area of the Tuya River and Tuya Range in northern British Columbia. Tuya Butte was the first such landform analyzed and so its name has entered the geological literature for this kind of volcanic formation. The Tuya Mountains Provincial Park was recently established to protect this unusual landscape, which lies north of Tuya Lake and south of the Jennings River near the boundary with the Yukon Territory.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>#'SubmarineEruption'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Submarine eruptions are those volcano eruptions which take place beneath the surface of water. These occur at constructive margins, subduction zones and within tectonic plates due to hotspots. This eruption style is far more prevalent than subaerial activity. For example, it is believed that 70 to 80% of the Earthâ€™s magma output takes place at mid-ocean ridges.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

<IRI>#'SubvolcanicTexture'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Specific terms for textures of subvolcanic rocks</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>#'SurtseyanEruption'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A Surtseyan eruption (or hydrovolcanic) is a type of volcanic eruption caused by shallow-water interactions between water and lava, named so after its most famous example, the eruption and formation of the island of Surtsey off the coast of Iceland in 1963. Surtseyan eruptions are the "wet" equivalent of ground-based Strombolian eruptions, but because of where they are taking place they are much more explosive. This is because as water is heated by lava, it flashes in steam and expands violently, fragmenting the magma it is in contact with into fine-grained ash. Surtseyan eruptions are the hallmark of shallow-water volcanic oceanic islands, however they are not specifically confined to them. Surtseyan eruptions can happen on land as well, and are caused by rising magma that comes into contact with an aquifer (water-bearing rock formation) at shallow levels under the volcano. The products of Surtseyan

eruptions are generally oxidized palagonite basalts (though andesitic eruptions do occur, albeit rarely), and like Strombolian eruptions Surtseyan eruptions are generally continuous or otherwise rhythmic.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>#'TASClassification'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The TAS classification can be used to assign names to many common types of volcanic rocks based upon the relationships between the combined alkali content and the silica content. These chemical parameters are useful, because the relative proportions of alkalis and silica play an important role in determining actual mineralogy and normative mineralogy. The classification appears to be and can be simple to use for rocks that have been chemically analyzed [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'Tephrite'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Tephrite is an igneous, volcanic (extrusive) rock, with aphanitic to porphyritic texture. Mineral content is usually abundant feldspathoids (leucite or nepheline), plagioclase, and lesser alkali feldspar. Pyroxenes (clinopyroxenes) are common accessory minerals. Quartz and olivine are absent. Occurrences include leucite nepheline tephrite from Hamberg bei Neckarelz near Heidelberg, Germany, tephritic phonolite to phonolite in lapilli of Mount Vesuvius, Italy, phonolite-tephrite at Monte Vulture, Basilicata, Italy and basaniteâledilute tephrite intrusions in Namibia [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>

<IRI>#'TholeiiticBasalt'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Tholeiite</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'UltramaphicRock'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Ultramafic (also referred to as ultrabasic rocks, although the terms are not wholly equivalent) are igneous and meta-igneous rocks with a very low silica content (less than 45%), generally >18% MgO, high FeO, low potassium, and are composed of usually greater than 90% mafic minerals (dark colored, high magnesium and iron content). The Earth's mantle is composed of ultramafic rocks [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:label"/>

<IRI>#'UltramaphicRock'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">UltramaficRock</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>#'UltraplinianEruption'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">According to the Volcanic Explosivity Index, a VEI of 6 to 8 is classified as "ultra-Plinian". Eruptions of this type are defined by ash plumes over 25 km (16 mi) high and a volume of erupted material 10 km³ (2 cu mi) to 1,000 km³ (200 cu mi) in size. Eruptions in the ultra-Plinian category include Lake Toba (approx 74000 years ago, VEI 8), Tambora (1815, VEI 7), Krakatoa (1883, VEI 6), Akahoya eruption of Kikai Caldera, Japan, and the 1991 Mount Pinatubo eruption in the Philippines (VEI 6)</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'VolcanicDome'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In volcanology, a lava dome or volcanic dome is a roughly circular mound-shaped protrusion resulting from the slow extrusion of viscous lava from a volcano [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>#'VolcanicExplosivityIndex'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The Volcanic Explosivity Index (VEI) is a relative measure of the explosiveness of volcanic eruptions. It was devised by Chris Newhall of the United States Geological Survey and Stephen Self at the University of Hawaii in 1982. Volume of products, eruption cloud height, and qualitative observations (using terms ranging from "gentle" to "mega-colossal") are used to determine the explosivity value. The scale is open-ended with the largest volcanoes in history given magnitude 8. A value of 0 is given for non-explosive eruptions, defined as less than 10,000 m³ (350,000 cu ft) of tephra ejected; and 8 representing a mega-colossal explosive eruption that can eject 1.0Å—1012 m³ (240 cubic miles) of tephra and have a cloud column height of over 20 km (12 mi). The scale is logarithmic, with each interval on the scale representing a tenfold increase in observed ejecta criteria, with the exception of between VEI 0, VEI 1 and VEI 2.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>

<IRI>#'VolcanicExplosivityIndex'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">VEI</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'VolcanicIsland'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">In geology (and sometimes in archaeology), a high island or volcanic island is an island of volcanic origin. The term can be used to distinguish such islands from low islands, which are formed from sedimentation or the uplifting of coral reefs (which have often formed on sunken volcanos) [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>#'VolcanicPipe'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Volcanic pipes are subterranean geological structures formed by the violent, supersonic eruption of deep-origin volcanoes. They are considered to be a type of diatrema. Volcanic pipes are composed of a deep, narrow cone of solidified magma (described as "carrot-shaped"), and are

usually largely composed of one of two characteristic rock types – kimberlite or lamproite. These rocks reflect the composition of the volcanoes’ deep magma sources, where the Earth is rich in magnesium. Volcanic pipes are relatively rare. They are well known as the primary source of diamonds, and are mined for this purpose [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://bhi.washington.edu/OPB#OPB_00103"/>

<IRI>#'VulcanianEruption'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Vulcanian eruptions are a type of volcanic eruption, named after the volcano Vulcano. It was named so following Giuseppe Mercalli’s observations of its 1888–1890 eruptions. In Vulcanian eruptions, intermediate viscous magma within the volcano make it difficult for vesiculate gases to escape. Similar to Strombolian eruptions, this leads to the buildup of high gas pressure, eventually popping the cap holding the magma down and resulting in an explosive eruption. However, unlike Strombolian eruptions, ejected lava fragments are not aerodynamic; this is due to the higher viscosity of Vulcanian magma and the greater incorporation of crystalline material broken off from the former cap. They are also more explosive than their Strombolian counterparts, with eruptive columns often reaching between 5 and 10 km (3 and 6 mi) high. Lastly, Vulcanian deposits are andesitic to dacitic rather than basaltic.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>#'WeldedTuff'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Welded tuff is a pyroclastic rock, of any origin, that was sufficiently hot at the time of deposition to weld together [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'Andesine'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Andesine is a silicate mineral, a member of the plagioclase feldspar solid solution series. Its chemical formula is (Ca, Na)(Al, Si)4O8, where Ca/(Ca + Na) (% anorthite) is between 30%-50%. The formula may be written as Na0.7-0.5Ca0.3-0.5Al1.3-1.5Si2.7-2.5O8 [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'AnhedralCrystal'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Composed of mineral grains that have no well-formed crystal faces.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'Anorthite'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Anorthite is the calcium endmember of plagioclase feldspar. Plagioclase is an abundant mineral in the Earth’s crust. The formula of pure anorthite is CaAl2Si2O8 [Wikipedia].</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Anorthoclase&apos;</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The mineral
anorthoclase ((Na,K)AlSi3O8) is a crystalline solid solution in the alkali feldspar series, in which the
sodium-aluminium silicate member exists in larger proportion. It typically consists of between 10 and 36
percent of KAlSi3O8 and between 64 and 90 percent of NaAlSi3O8 [Wikipedia].</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Aphanitic&apos;</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Crystalline
materials too small to be discerned with the naked eye</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Bytownite&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Bytownite is a calcium rich member of the plagioclase solid solution series of feldspar
minerals with composition between anorthite and labradorite. It is usually defined as having between 70
and 90 % An (formula: (Ca0.7-0.9,Na0.3-0.1)[Al(Al,Si)Si2O8]). Like others of the series, bytownite
forms grey to white triclinic crystals commonly exhibiting the typical plagioclase twinning and associated
fine striations {Wikipedia}.</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>
<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Carbonatite&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Carbonatite is a type of intrusive or extrusive igneous rock defined by mineralogic
composition consisting of greater than 50% carbonate minerals. Carbonatites may be confused with
marble and may require geochemical verification [Wikipedia].</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;CrystalTexture&apos;</IRI>
>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">An intermediate crystal with some crystal face-formation [Wikipedia]</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;CrystallineTexture&apos;</
IRI>

```

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Textures based on crystal appearance within rock</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'EuhedralCrystal'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Crystals are those that are well-formed, with sharp, easily recognized faces. [Wikipedia]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'HeterogeneousNucleation'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">The process in which a new crystal growth-center appears on a preexisting surface</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'HolocrystallineTexture'</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">All physical components are crystalline</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'HolohylineTexture'</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Composed entirely of glassy components</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'HypidiomorphicGranularTexture'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Texture dominated by subhedral crystals</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'HypocrystallineTexture'</IRI>

<Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Composed of crystal and glass components</Literal>

```

</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>
<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;IgneousTexture&apos;</IRI>
>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Textures for overall igneous rock descriptions</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;IntergranularTexture&apos;
</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Volcanic texture consisting of granular pyroxenes and other equant to subequant crystals filling the spaces between tabular plagioclase feldspar crystals</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;IntersertalTexture&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Volcanic rock texture consisting of crystals, especially phenocrysts, in a matrix of glass.</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Labradorite&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Labradorite ((Ca, Na)(Al, Si)4O8), a feldspar mineral, is an intermediate to calcic member of the plagioclase series. It has an anorthite percentage (%An) of between 50 and 70. It occurs as clear, white to gray, blocky to lath shaped grains in common mafic igneous rocks such as basalt and gabbro, as well as in anorthosites [Wikipedia].</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;MicroporphyriticTexture&apos;
</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Texture of igneous rocks where both groundmass and phenocrysts are aphanitic</Literal>
</AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;ParentalMagma&apos;</IRI>
  </IRI>

```

```

    <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Magmas that have given rise, in the liquid state, to other derivative magma</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

```

```

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Phaneritic&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Crystalline materials that can be discerned with the naked eye</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

```

```

  <IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Phaneritic-
PorphyriticTexture&apos;</IRI>
  <Literal datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Igneous texture
where both groundmass and phenocrysts are phaneritic</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

```

```

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;Phonolite&apos;</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Phonolite is an uncommon volcanic rock, of intermediate chemical composition
between felsic and mafic, with texture ranging from aphanitic (fine-grain) to porphyritic (mixed fine- and
coarse-grain) [Wikipedia].</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

```

```

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PlagioclaseFeldspar&apos;
</IRI>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Plagioclase is a series of tectosilicate (framework silicate) minerals within the feldspar
group. Rather than referring to a particular mineral with a specific chemical composition, plagioclase is a
continuous solid solution series, more properly known as the plagioclase feldspar series
[Wikipedia].</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

```

```

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PrimaryMagma&apos;</IRI>
>
  <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-
ns#PlainLiteral">Any chemically unchanged melt derived from any kind of preexisting rock.</Literal>
  </AnnotationAssertion>
<AnnotationAssertion>
  <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

```

```

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#&apos;PrimitiveMagma&apos;</I
RI>

```

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Unmodified magma that form through anatexis of mantle rocks that have not been melted or otherwise changed in composition since they formed.</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'PumieousTexture'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A term used to describe a texture or structure in volcanic rocks characterized by elongate, fine tubular vesicles</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000119"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'PumieousTexture'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">[Raymond, 2002]</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'QuartzLatite'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">A quartz latite is a volcanic rock or fine grained intrusive rock equivalent to a latite with a phenocryst modal composition containing 5-20% quartz. [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'Rhyodacite'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Rhyodacite is an extrusive volcanic rock intermediate in composition between dacite and rhyolite. It is the extrusive equivalent of granodiorite. Phenocrysts of sodium-rich plagioclase, sanidine, quartz, and biotite or hornblende are typically set in an aphanitic to glassy light to intermediate-colored matrix. Rhyodacite is a high silica rock containing 20% to 60% quartz with the remaining constituents being mostly feldspar. The feldspar is a mix of alkaline feldspar and plagioclase, with plagioclase forming 35% to 65% of the mix. Rhyodacite often exists as explosive pyroclastic volcanic deposits [Wikipedia].</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI>http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'RockTexture'</IRI>

<Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Descriptive terms for textures of rocks</Literal>

</AnnotationAssertion>

<AnnotationAssertion>

<AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'Sanidine'></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Sanidine is the high temperature form of potassium feldspar with a general formula $K(AlSi_3O_8)$. Sanidine is found most typically in felsic volcanic rocks such as obsidian, rhyolite and trachyte [Wikipedia].</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'TrachyticTexture'></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Volcanic rock texture in which the feldspars are aligned in subparallel arrangements</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'Undersaturated'></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Rocks with chemistry of low-silica rocks containing minerals such as nepheline that are incompatible with quartz or other silica materials</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'VesicularTexture'></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Texture to describe a volcanic rock in which the escape of gas has left holes</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty abbreviatedIRI="rdfs:comment"/>

<IRI><http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'VitrophyricTexture'></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Volcanic texture characterized by discrete phenocrysts in a glassy groundmass</Literal>
 </AnnotationAssertion>
 <AnnotationAssertion>
 <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000115"/>

<IRI><http://www.semanticweb.org/jom32/ontologies/2018/1/bfo.owl#'VolcanicTexture'></IRI>
 <Literal xml:lang="en" datatypeIRI="http://www.w3.org/1999/02/22-rdf-syntax-ns#PlainLiteral">Specific terms for textures of volcanic rocks</Literal>
 </AnnotationAssertion>
 <SubAnnotationPropertyOf>
 <AnnotationProperty IRI="http://purl.obolibrary.org/obo/BFO_0000179"/>

```

    <AnnotationProperty abbreviatedIRI="rdfs:label"/>
  </SubAnnotationPropertyOf>
  <SubAnnotationPropertyOf>
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  </SubAnnotationPropertyOf>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  </SubAnnotationPropertyOf>
  <SubAnnotationPropertyOf>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000032"/>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000118"/>
  </SubAnnotationPropertyOf>
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    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000041"/>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
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  <SubAnnotationPropertyOf>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/STATO_0000391"/>
    <AnnotationProperty IRI="http://purl.obolibrary.org/obo/IAO_0000112"/>
  </SubAnnotationPropertyOf>
</Ontology>

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