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# Categorization through Sensory Codes

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## Abstract

The central premise of concept empiricism is the denial of unique *cognitive* mental representations. The negative thesis applies as well to classic empiricists as it does to current ones. John Locke's (1690) refusal to accept 'abstract ideas' is one way of denying unique and distinct cognitive representations. Jesse J. Prinz's (2002) multi-modality hypothesis, according to which cognition functions on a multi-sensory code instead of a central 'amodal' one, is another. Both empiricist models have a common foil in a theory that posits one unique kind of 'intellectualist' mental representation to account for human cognitive achievements. For Locke, it was Descartes' abstract mental medium for clear and distinct ideas and for Prinz it is Jerry Fodor's *Language of Thought*. In this paper, I explore the empiricists' denial of unique cognitive representations and argue that both Locke's and Prinz's theories privilege a unique representational medium – a spatial 'code.' As such, this tacit assumption does not entail that cognition runs on a unique medium. It does not lead to a 'common code rationalism,' to use Prinz's terms, or support computational theories of the mind that privilege innate linguistic structures over sensory ones. To incorporate the idea of a spatial code more smoothly within empiricist intellectual resources, I interpret it through Lakoff's experientialist account of categorical cognition. Through Lakoff's embodied experientialist account – embodied neo-empiricism – the spatiality of cognition becomes founded in a broader and more plausible sensory matrix. I further suggest that Lakoff's ideas on and use of spatial codes can be given a largely externalist reading. Lakoff's space is not a unique cognitive one. This way, current neo-empiricism can be saved from assuming any unique internal posits including a language of thought.

## Introduction

The central premise of concept empiricism is the denial of unique cognitive mental representations.<sup>1</sup> The negative thesis applies as well to classic empiricists as it does to current ones. Locke's (1690) refusal to accept 'abstract ideas' is one way of denying unique and distinct cognitive representations. Prinz's (2002) multi-modality hypothesis, according to which cognition functions on a multi-sensory code instead of a central 'amodal' one, is another. Both empiricist models have a common foil in a theory that posits one unique kind of 'intellectualist' mental representation to account for human cognitive achievements. For Locke, it was Descartes' abstract mental medium for clear and distinct ideas and for Prinz it is Jerry Fodor's *Language of Thought*.

In this paper, I will explore the empiricists' denial of unique cognitive representations and argue that both Locke's and Prinz's theories privilege a unique representational medium – a spatial 'code.' As such, this tacit assumption does not entail that cognition runs on a unique medium. It does not lead to a 'common code rationalism,' to use Prinz's terms, or support computational theories of the mind that privilege innate linguistic structures over sensory ones. Yet the assumption of a privileged code does strain empiricist learning-theory which is always externalist in orientation: cognition must be based in the senses and, often, senses significantly based in the world. To incorporate the idea of a spatial code more smoothly within empiricist intellectual resources, I will interpret it through Lakoff's experientialist account of categorical cognition. Through Lakoff's embodied experientialist account – embodied neo-empiricism – the spatiality of cognition becomes founded in a broader and more plausible sensory matrix. I will further suggest that Lakoff's ideas on and use of spatial codes can be given a largely externalist reading. Lakoff's space is not a unique cognitive one. This way, current neo-empiricism can be saved from assuming any unique internal posits including a language of thought.

The order of discussion is the following. In the first section, I will develop the current foil for concept empiricists by sketching the role of a central code of cognition, LOT, in a standard computational theory of mind. I will motivate the rival concept empiricist account by some of the philosophically problematic "realistic" ideas on categorization and similarity associated with LOT including the general mind-world isomorphism. I will then turn to concept empiricists and start with Locke's version that cleans the slate of all natural kinds and abstract cognitive media including their isomorphic fit with and replaces it with a nominalistic metaphysics and mechanical cognitive processes intended to create concepts and similarity (complex ideas) from sensory information couched and remaining in diverse sensory media. I will argue that a uniform spatial framework must exist in the mind for Lockean mental operations to be possible. This spatial code allows for 'translating' different kinds of complex information, comparing, compounding, and abstracting. I will then turn to the neo-Lockean Prinz and show how his imagistic "proxytype" model for concepts is based on a similar spatial code to that of Locke. I will relate Prinz's cognitive mechanisms for proxytype concepts, "link types" including the hierarchy and transformation link, to Locke's psychology of similarity and argue that such links fail to create similarities if the information linked is couched in different sensory media as Prinz maintains. The role of one spatial code among arch-empiricist models of the mind poses a problem for their theories that may even lead to a bifurcation of the distinction between amodal cognitivists with LOT-like posits and genuine empiricism. In the next section, I solve this problem by using the central concepts of Lakoff's embodied experientialist account of categorization to sketch a version of concept empiricism that respects the nominalist and multimodal premises of concept empiricism and is able to dissipate any amodalist worries that may be associated with privileging spatially coded representations in our cognitive lives.

## Codes and Computation

Computational theories of the mind are in opposition to concept empiricism in terms of the codes of cognition. Computational theories posit an amodal, central code. Mental representations are coded symbols and are manipulated according to a combinatorial syntax and semantics.<sup>2</sup> The symbols of the code are non-perceptual in nature even if connected to perceptual states or representations.<sup>3</sup> The fundamental difference between coding amodalists and multi-modalists concerns the codes of cognition – the symbolic sensory codes themselves or the amodal symbolic code into which the sensory codes are translated into.<sup>4</sup> The debate is about the kinds of representations used in cognition.

Jerry Fodor is the most famous amodalist. According to him, cognition takes place in a language of thought – ‘Mentalese’ or ‘LOT’ (Fodor, 1975). Sensory representations are translated into LOT and cognition is characterized by operations on mental symbols. There is no similarity between LOT and perceptual representations. For example, the word ‘tiger’ is equally dissimilar to actual tigers as the mental LOT symbol [tiger]. For Fodor, there is a deep similarity between language and Mentalese.

The primitives of LOT are concepts which are assumed to refer to the objects, kinds, or categories in the world insofar as those objects, kinds, or categories cause token instances of those concepts. Under such causal conditions, the mental symbol is present in cognitive processing.<sup>5</sup> The sentence-like posits in turn are true or false based on isomorphism between mental symbols and their referents. This isomorphism idea fits popular ideas of natural and formal languages. An isomorphism between natural/formal languages and their referent allows for an explanation of the productivity and systematicity of thought and language. For Fodor, this is the explanatory strength of LOT.<sup>6</sup>

According to amodal theories, similarity itself is based on a deep, universal psychological grammar including its syntactical mechanisms characterized by translation rules. Human categorization is a function of this grammar and is isomorphic with reality and its pre-conceptual categorization. In short, mental symbols refer to kinds in reality. More specifically, correct combinations form isomorphic relationships between the mind and the structure of the world. The internal grammar is a guide for correct isomorphic combinations. Because the grammar’s combination rules ‘carve nature at its joints,’ LOT’s similarity base is in the world. The resultant system with concepts as primitives and a combinatorial syntax ‘mirrors’ the world’s pre-conceptual order and is isomorphically represented in natural language. This isomorphic ‘tripartite model’ between the mind, the world, and language, is the broader paradigm of the amodal hypothesis about cognition. That is why the debate regarding the code(s) of cognition matters.

Criticisms of the computational theory of the mind derive from a number of disciplines. Empirical findings of psychology suggest that categorization is not amodal.<sup>7</sup> Linguistics suggests that categorization cannot be described by the set-theoretical models assumed by the isomorphism. Typicality effects in categorization and basic-level categories go against it.<sup>8</sup> In Philosophy proper, nominalists from Locke (1690) to Goodman (1967, 1972, 1978, 1979) have argued against the assumptions of natural kind realism and the tripartite mind-world-language relationship it supports. Together, these critiques motivate an account of cognition based on perceptual representations and its associated multi-modality hypothesis.

### Locke's Empiricism about the Mind

In *An Essay Concerning Human Understanding*, Locke articulates a theory of a multi-modal mind, motivated by a nominalist metaphysics. The Lockean mind is largely passive. This is summed up by his famous dictum that the mind is an originally empty tabula rasa – except for the mechanisms needed to store and combine perceptual representations. According to Locke, foundational information consists of a small set of perceptual primitives, simple ideas, given by the world. The overall structure of reality is described by his nominalism: ‘all thing that exist [are] particulars’ (*Essay* III.iii.1).<sup>9</sup> Locke’s particularism regarding the structure of reality is mirrored in his view of the mind – he is against abstract ideas and an abstract cognitive medium.<sup>10</sup> Locke’s mind does not come with innate combining principles or rules by which we group disparate perceptual representations. Groupings are created via cognitive mechanisms (and experience’s causal conditions).

Locke posits four basic cognitive mechanisms: discernment, comparing, compounding, and abstraction. Each mechanism has simple or complex ideas as its primitives.<sup>11</sup> Discernment is the breaking down of complex ideas into simple ideas and ‘distinguishing between the several ideas’ that constitute those complexes (*Essay* II.xi.1). It provides for the recognition of the fundamental building blocks of the mind.<sup>12</sup> Compounding produces complex ideas. For example, [red] and [sphere] are compounded to create the complex idea [red sphere]. Comparing is the placing together of simple ideas without conjoining them. Abstraction produces general ideas. It consists of a sort of ‘selective attention’ to certain simple or complex ideas while ignoring others.<sup>13</sup> The abstracted simple or complex idea is taken to signify all other simple or complex ideas which resemble it in a significant way.<sup>14</sup> Both simple and complex ideas are mental particulars for Locke. They are made general insofar as they are designated to stand in a one-many relation to other mental particulars.<sup>15</sup>

The source of similarity and the basis for generality and categorization for Locke lies at the level of cognitive mechanisms. Discernment and abstraction play the most important role. But Locke's theory is weak in its ability to provide an explanation of the creation of individual mental particulars which have the potential for combination. This is due to the use of disparate codes or 'media' in cognizing a mental particular. An amodal code could ground those disparate representations under a single symbol (according to some specific formation rules). It is in this way that general ideas/concepts could be individuated. If concepts are not adequately individuated, it is unclear which representations make up distinct concepts. If distinctions cannot be made, then particulars cannot be created. Nothing in Locke's theory explains how representations from different modalities can be instantiated in the same mental particular. Without an amodal code, the visual, haptic, olfactory, and gustatory representations, to name a few, cannot be compared or compounded. Ideas that reside in different media cannot be used to form mental particulars.<sup>16</sup>

I believe that Locke actually avoids this 'information catastrophe' by thinking about all of the specific representations as occurring in a kind of mental space. He salvages a representationally weak or chaotic mind by adopting an amodal spatial code. Let us see how.

This is seen from Locke's master-metaphor. For him, mental operations are analogous to 'physical' or bodily operations of the same name.<sup>17</sup> Comparing, compounding, and abstraction are analogous to setting two objects close to one another, joining them by some mechanical act or process, or taking away material parts from them. These physical manipulations can be performed only insofar as the components are spatially related. Some analogous spatial framework must exist for the mental operations to be possible. One can imagine how this can work by building a mental particular on a spatial grid. The spatiality of the Lockean mind provides the opportunity for 'translating' different kinds of sensory representations into a spatial code and comparing, compounding, and abstracting them within it.<sup>18</sup>

But a spatial code only provides the possibility for similarity and categorization – it is not able to explain all of the details. For example, sensory representations are differently spatial. Transferring auditory, visual, or haptic representations is seemingly a natural process, i.e. we can judge spatial relations by what we hear (knowing that a sound is coming from behind), see, and feel. But gustatory or olfactory representations are weak spatial indicators.<sup>19</sup> These do not seem to embody a well-ordered spatial code in/for humans. Rather than explain away these problems in a Lockean account, it will be useful to analyze an updated version of Lockean empiricism and ground the discussion of sensory categorization in the contemporary debate.

## Prinz's Concepts as Proxytypes

Prinz resuscitates a Lockean theory of concepts through contemporary explanatory tools of cognitive science. Prinz's goal is to argue against a language of thought. He does this by arguing for what he calls the Modal-Specificity Hypothesis (MSH) - 'concepts are couched in representational codes that are specific to our perceptual systems' (FTM, 119). He describes the senses as dedicated input systems and establishes that sensory systems are separate neural pathways.<sup>20</sup> Prinz understands sensory input systems as simply those which receive inputs external to the brain. This includes inputs from either 'the external environment (as with audition, sight, and the pheromone system) or from within the body (as with proprioception, interoception, hunger, and thirst)' (FTM, 116).

Prinz's notion of dedicated input system means that they '[respond] to a proprietary input class...[and] that [sense] modalities use different kinds of representations' (FTM, 117). This entails that each modality is affected by different physical magnitudes.<sup>21</sup> These different physical magnitudes are represented in distinct codes. Prinz holds that these codes are not only used in storage but also during cognition. Because cognition is the recall of perceptual representations in an 'untranslated' perceptual code, cognition does not take place in an amodal code or LOT.

The perceptual primitives in Prinz's theory are similar to Lockean simple ideas. Objects are initially visually recognized as 'geons,' or geometric ions. Geons are the constituents of visual images. Imagine a human being as being comprised of a group of three-dimensional geometric particles. A wide cylinder could constitute the torso; four curved cylinders would constitute the arms and legs, and a sphere the head. This 'low-level' recognition of a human being is what Prinz calls an 'object-model.' Prinz follows Marr's (1982) idea that such object models can be highly structured. When moving closer to the object, what was once a sphere becomes filled with facial features. Getting even closer, the facial features become specific, even to the point of contours, hair, freckles, etc. This continuum of perceptual representations 'can be grouped together into a hierarchical representation' (FTM, 142). Even the motion of objects can be perceptually represented using similar geons in spatial sequencing. In all, an object model provides long-term memory with a visually represented constituent of a concept.

Concepts for Prinz are structured detection mechanisms which can act as proxies (proxytypes) for groupings of perceptual representations. They can stand in for those groupings during cognition. Proxytypes for Prinz are not qualitative sensory images like Locke's primitives. They are detection mechanisms which can be shown to reliably detect the objects of which those concepts refer. Proxytypes are formed through Prinz's version of Lockean cognitive mechanisms. These are 'link types.' A vague sphere-like image becomes a person's face via a hierarchy link. Actions or movements of those representations are grouped by a transformation link. Representations given from

different sense modalities of one object are grouped by the binding link. Representations from the surrounding environment are grouped by the situational link. The predicative link groups together old representations of certain objects with new representations of those objects. This new grouping allows for the modification and updating of the old combination of perceptual representations. Combinations which are the results of the linking processes are stored in long term memory but can be activated during working memory. It is these combinations of 'primitive' perceptual representations which act as detection mechanisms that Prinz designates as concepts.

Prinz's theory is vulnerable to a similar criticism to Locke's. It has two main problems. There is no explanation of how different perceptual representations can be joined together to form mental particulars, and the use of geons to represent the visual sense modality suggests the use of a spatial code - for if Prinz's theory is not qualitative like Locke's (and doesn't use mental pictures), how are we to understand geons at all?

This is the role of the links to be able to co-instantiate different representations, facilitate concept individuation, and produce similarity groupings. But Prinz's 'links' only provide the possibility of combining similar perceptual representations. What is left open is the rules that govern the grouping processes. Because the links 'do all the representational work,' Prinz needs to give an explanation of its rules without assuming the existence of an amodal code (see Sarnecki, 2004). To answer this question, Prinz unfortunately couples his empiricism with a 'faith in the reality of natural kinds' (FTM, 281). But including realism into the model contradicts the mental model he is trying to create. The categories and concepts that can possibly be created are determined independent of perception. Thus, the isomorphism spectre is raised. In short, this 'language of ontology' acts as the amodal code to determine categorization. This makes the syntax and semantics of his mental mechanism predetermined - just as they are within LOT.

But some of Prinz's theory's weaknesses can be ignored by focusing more closely on the natures and role of spatiality in cognition, to which I will now turn. I will argue that Prinz's claim that 'our representation of [an object] is just a collection of interlinked images' is too weak to provide an adequate account of concept categorization (Prinz, 2004). I will also argue that a spatial code must be posited to influence the representational links and provide for a model of categorization. Lakoff's 'neo-empiricist' or 'experientialist' theory of embodiment provides the bases for this argumentation.

## Lakoff's Theory of Embodiment

Lakoff's expansive neo-empiricist theory of cognition is based on findings concerning prototypes, particulars, and the role of basic level categories. Importantly for my purposes, he provides an articulation of an embodied yet adequately internal spatial code by which multiple types of representations can be related.

In *Women, Fire, and Dangerous Things* (1987), George Lakoff argues that categorization is heavily influenced by the kinds of creatures we are. He calls this the principle of embodiment. Lakoff proposes that we conceptualize according to a spatial code. Our creature-type is based on how we spatially interact with the environment. This results in a 'spatial syntax.' Humans' perceptual apparatus is fitted to our shape, size, and motor movements and, together, this motor-perceptual matrix has a deep influence on the way we categorize our experience. There are two basic ways these factors influence our categorization: 1) They allow for perception of basic-level categories<sup>22</sup> and 2) by providing kinesthetic image schemas.

According to the idea of basic level categorization, the most 'immediate' categories, those most easily produced and subsequently reproduced in cognition, are at an intermediate level of complexity. For example, 'it is at this level that we distinguish tigers from elephants, chairs from tables...etc. One level down in complexity, things are much more difficult' (Lakoff, 269).<sup>23</sup> In Lakoff's terms, our experience is pre-conceptually structured at the basic level. Yet, for Lakoff, this does not entail that there are kinds in the world that match our concepts. The perceptual apparatus of our moving bodies are tuned to recognize similarities in shape, size, and movement and to categorize accordingly. And basic level objects have such higher-order identity/individuation conditions.<sup>24</sup> We recognize basic-level categories as gestalts, perceptual wholes which are more basic for our cognitive lives than their decompositional elements.<sup>25</sup>

Lakoff adds kinesthetic image schemas to the above neo-empiricist 'foundation' to account for further conceptual structure. The basic idea can be seen through example. One of the most basic structures and most frequently used image schema in cognition is what he calls the 'container schema.' It 'consist[s] of a boundary distinguishing an interior from an exterior' (Lakoff, 271).<sup>26</sup> The model is used in countless conceptual representations of objects in the world. For example, I may have woken out of a deep sleep, crawled out of bed, gone into the bathroom, rinsed out my mouth, put water into a glass that was pouring out of a faucet, etc. All of these are conceptually structured by the container schema.

Image schemas also provide structure for cognitive mechanisms, transformations, or syntax. This happens through the 'logic' of metaphor. For example, before I went to

bed I could have worked out or figured out what to write. The container image schema is used in conceptualization because we experience our bodies as containers and, thus, map that conceptual structure onto other parts of experienced reality. The kinesthetic origin of these metaphors is created by the abstraction of a source domain and the application of the 'syntax' given by the image schema.

The syntax provided by this example's metaphoric model is straightforward. Concepts are combined according to the container schema as being the container or being in or out of that container. Certain syntactically based logical rules can be used to characterize the syntax. For example, 'if container A is in container B and X is in A, then X is in B – which is the basis for *modus ponens*' (Lakoff, 272). Further logical rules can be formulated according to the other specific image schemas.

Lakoff's reason for introducing basic-level categories and image schemas concern the semantics of concepts. For him, 'both basic-level and image-schematic concepts are directly meaningful' (Lakoff, 279). This is because of his empirical 'foundation' of embodiment which allows for reference. But he resists the idea of a primitive. For Lakoff, 'primitive' indicates a lack of structure, intrinsic properties of such entities as Lockean simple ideas. Basic-level and image-schematic concepts are already highly structured, but pre-conceptually or pre-cognitively. Yet once all of Lakoff's posits are in place, the model provides a compositional syntax and a procedure for creating more complex concepts from less complex ones.<sup>27</sup>

Lakoff's theory is based on an amodal spatial code. This organizes representations across disparate sensory media. It also answers how our representational links/cognitive mechanisms are created and influenced. We group perceptual representations into distinct categories because of pre-conceptual information – our size, shape, perceptual apparatus, and motor movements. The spatial code provides a syntax in which, for example, we conceptualize our bodies as containers and order concepts according to such a spatial code.<sup>28</sup> To mix Prinz's technical terminology with Lakoff's, here highly-structured 'proxytypes' can be viewed as the 'primitives' of the cognitive syntax and are understood in relation to other concepts on the basis of certain kinesthetic image schemas.

## Concluding Remarks

The empiricist's classic problem of mental mechanics or syntax, combining sense-based perceptual representations represented in disparate codes, is alleviated by Lakoff's theory of embodied concepts that feature a spatial code. For example, proxytype concepts can be individuated as mental particulars if they represent basic-level categories. The empirical findings regarding these basic-level categories as well

as typicality effects in categorization can be accounted for. The set-theoretical models that the computational theory of the mind posits as an explanatory architecture of the mind are replaced by an embodiment structure. Because Lakoff's theory can be seen to harbor a spatial code, his model can be used to develop a spatial syntax based in the rules of basic-level propositions and decomposition into metaphoric mapping.

One last issue remains to be solved to base neo-empiricism on Lakoff's system. Concept empiricists are against a unique cognitive code. Often they deny an amodal code altogether. But what really matters is that the code of cognition is based in the senses even if it is just 'one' and thus, 'amodal' in some sense of the term. In short, what matters is that the code coheres with the fundamental externalist empiricist intellectual strategy. What about Lakoff's spatial code? It is clearly dispersed at least through its metaphoric extensions across all of cognition. If it is to be judged significantly internal, it may even be said to play a role similar to Fodor's LOT.

It is unclear whether Lakoff's spatial code should be seen as a deep psychological grammar by which categories are created or if it as a spatial structure of reality that allows for embodied concepts and a spatial syntax. This can be seen through the role of particulars that are essential for both Locke and Prinz. It is unclear whether or not the particular is created according to a grammar (as in LOT) or to external sources (as in Prinz) for Lakoff. Rather than arguing for a neo-empiricist theory of categorization and cognition, Lakoff could be seen as providing a formalizable syntax that could be assessed as an alternative LOT. To clearly distance concept empiricist from LOT, there needs to be an additional emphasis on external sources of similarity. These should be based in the role external particulars, objects at Lakoff's basic level, to produce a full alternative to LOT.

Another issue is that spatially coded categorization can only explain so much of our cognitive lives. Clearly only some of our categories are spatially determined. Lakoff never explicitly denies this fact. The limit of the spatial code is evident at the linguistic level of behavior and, maybe, cognition. This is an essential lacking for a theory of categorization, including the related syntax and semantics. A large part of our cognitive lives is left unexplained unless an account can be given of how a syntax is created for non-spatially determined categories as well as how those categories refer to objects in the world. I believe that further research regarding the external sources of similarity based on external particulars can account for these issues.<sup>29</sup>

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## Notes

<sup>1</sup> There are many kinds of empiricists in the domain of semantics broadly speaking. Concept empiricists are a minority in the landscape of 20th century semantic empiricism because they actually believe in the existence of concepts/mental representations. Logical positivists, empiricists, and other advocates of an empirically formulated verifiability criterion of meaning did not. Early modern philosophers and all advocates of the idea-idea in turn did. This paper is concerned only with concept empiricism, and so presupposes the existence of mental representations.

<sup>2</sup> A code is a set of mental representations (the primitives of cognition) along with combinatorial rules and cognitive mechanisms.

<sup>3</sup> Amodalists and mutli-modalists alike recognize that sensory systems may *store* representations in different codes. In *Languages of the Mind*, Ray Jackendoff (an advocate of amodalism) states that 'information *entering* the mind comes in many different forms, for example spatial arrays of light intensity provided by retinal receptors, temporal patterns of sounds frequencies provided by the ears...' etc (Jackendoff, 3). Likewise, in *Furnishing the Mind*, Prinz (the advocate of multi-modalism under discussion) states that 'modalities...represent by responding to different kinds of magnitudes' (FTM, 117).

<sup>4</sup> It is worth noting that because thought is couched in a *translation* of perceptual representations, the mechanisms of translation may be said to be the ultimate basis for similarity, for certain perceptual representations will be translated to specific and determinate symbols in Mentalese. The importance and possible influence of these mechanisms will be fundamental for the discussion of concept empiricism below.

<sup>5</sup> For instance, a tiger causes the mental symbol [tiger] just in case a tiger caused [tiger] to be occurent in thought.

<sup>6</sup> Productivity is understood as the ability to form an infinite number of discrete thoughts based on conceptual primitives. Systematicity is understood as the ability to understand the thought 'John ate the tiger' if 'the tiger ate John' is understood – this results from both thoughts being comprised of the same concepts and generated using the same rules.

<sup>7</sup> See Barsalou (1999) 1.2.2 for a brief over-view regarding these findings as well as Prinz (2002) 'Empiricism Reconsidered.'

<sup>8</sup> See Lakoff (1987) Chapters 11-13.

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<sup>9</sup> His nominalism is motivated by his familiarity with and proclivity for Boyle's corpuscular hypothesis. The corpuscular theory claims that the atoms which make up the world are infinitely divisible and the objects which are made of those corpuscles are infinitely malleable. His nominalism also precludes the possibility of worldly sources of similarity – there are no Aristotelian essences to do categorical work.

<sup>10</sup> This modal-specificity precludes the possibility of a deep psychological grammar such as LOT.

<sup>11</sup> A simple idea is one that, 'being each in it self uncompounded, contains in it nothing but *one uniform Appearance*, or Conception in the mind, and is not distinguishable into different ideas' (E II.ii.I. 18-20). Examples of simple ideas are 'Yellow, White, Heat, Cold, Soft, Hard, Bitter, Sweet,' etc (E II.i.3). Complex ideas are combinations of those simple ideas.

<sup>12</sup> Discernment is necessary because we most often perceive complex ideas – simple ideas in combination. It is 'a necessary condition of the efficiency of all other operations' because comparing, compounding, and abstracting are mechanisms which (mainly) operate on simple ideas (Stewart, 68).

<sup>13</sup> This is why abstraction is often understood *as* subtraction. A general idea can be seen as certain *recognition* of a specific idea and the designation of other ideas under that specific idea. 'Abstraction for Locke, was a matter not of the idea itself, but a matter in which the understanding regards it' (Waxman, 88). Note that this is different than understanding general ideas as novel ideas in which the law of non-contradiction does not apply (taking Locke literally when he says that 'the general idea of a Triangle...must be neither Oblique, nor Rectangle, neither Equilateral, Equicrural, nor Scalenon; but all and none of these at once' (E IV.vii.9). For a similar interpretation of Locke's account of abstraction, see Dancy (1987).

<sup>14</sup> Identifying groupings based on 'significant' resemblance is important, for resemblance is a relatively ubiquitous relationship. Significant resemblances can be ordinary (all red objects) as well as complex (types of sub-atomic particles).

<sup>15</sup> A general term such as 'dog' refers to all dogs in the same way 'Fido' refers to a particular dog. 'Dog' refers to the particular idea (the mental particular) which stands in a one-many relation to other mental particulars.

<sup>16</sup> Just imagine hypothetically trying to put a flavor in the middle of a written English sentence.

<sup>17</sup> This analogy is stated explicitly at II.xii.1: '[the way general ideas are made] shews Man's Power and its way of Operation to be muchwhat the same in the Material and Intellectual World.'

<sup>18</sup> Perhaps this is one additional reason Locke privileged simple ideas of space as ideas of primary qualities. They are not only primary for the 'Newtonian substance' but also for the mental substance.

<sup>19</sup> That is, they are weak spatial indicators for humans. Other species may be very adept at spatially organizing the world based on scent (e.g. bloodhounds).

<sup>20</sup> Defining the senses as 'consist[ing] of their own sets of operations and representations housed

in separate neural pathways' rather than in terms of sense organs avoids the objections that two sense organs can serve the same sense modality (e.g. interoception) and that the same sense organ can serve more than one sense modality (e.g. skin serving both heat and pressure detection; and proprioception).

<sup>21</sup> Examples are wavelengths of light [vision], frequency of molecular motion [audition], or frequency of molecular shape [smell].

<sup>22</sup> Basic level categories take the place of atomic information such as the simple ideas of the classical empiricists or Prinz's geons.

<sup>23</sup> Tigers, for example, are at the basic level. Features such as their color, stripe pattern, or texture reside at a lower level of complexity. Differences in those features determine differentiations between 'subordinate' categories such as different species of tiger.

<sup>24</sup> Understanding basic-level categories as having *higher-order* identity avoids the misunderstanding that those categories are ultimately created according to *perceptual* features – similarities in shape, size, or movement.

<sup>25</sup> This is important because, as it will be argued, proxytypes may be considered to take the place of basic-level concepts in the spatial matrix and spatial syntax.

<sup>26</sup> Lakoff also introduces the PART-WHOLE schema, the LINK schema, the CENTER-PERIPHERY schema, and the SOURCE-PATH-GOAL schema.

<sup>27</sup> Another important aspect of Lakoff's psychological syntax is metaphoric mapping. The mind moves from the immediate structures of embodied concepts to others, including abstract (non-pre-conceptually structured) ones, by *natural* metaphor. The metaphor's source domain, a pre-conceptual experiential structure, is paired with an abstract domain and a natural metaphor is one whose source is pre-conceptually structured through embodied experience. The example Lakoff uses to elucidate the idea concerns the metaphorical mapping of VERTICALITY to QUANTITY. We conceptualize crime rates, stock markets, and sales as *falling* or *rising* quantitatively because our embodied experience teaches us that an increase in quantity often leads to an increase in verticality. In pre-conceptual experience, when I add sand to a pile or water to a glass the level goes *up*.

<sup>28</sup> These concepts can be expanded metaphorically to account for other uses of spatial conceptualizations in new and even to *prima facie* abstract domains.

<sup>29</sup> One way to address this issue is via Nelson Goodman's 'theory' of symbol systems. I believe that it has the proper resources to address these issues and, in my view, in a manner consistent with the spirit of all of the three empiricist theories discussed. Goodman views categorization abstractly, yet relative to symbol systems, regardless of their origin. He, as all the above empiricists, emphasizes the role of the *particular* for relevant semantic processes and outcomes. But unlike Lakoff's articulation of a spatial code, Goodman is explicit about the externality of both the representational systems which create generality and the particulars imbedded in those representational systems which are endowed with semantic content.