Antje Roßdeutscher (ed.)**:**

Ontology and Argument Structure in Nominalizations

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Dealing with sortal ambiguity of nominalizations by underspecification

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Abstract Based on data from German *-ung* nominalizations, I argue that selection restriction tests are not suitable as linguistic tools for ontological disambiguation. Consequently, I question the significance of ontology as a starting point for linguistic theorizing. Instead, I argue for an underspecified account of the ontology of nominalizations, in which disambiguation looses its central role in the commerce with ambiguity.

1 Ontology and ambiguity in German *-ung* nominalizations

1.1 Sortal Ambiguity

Consider the pair of sentences in (1a) and (1b).

(1) a. *Die Polizei sperrt   die Botschaft   ab.*
         The police   cordons the embassy.ACC off.

    b. *Die Absperrung   der   Botschaft   (durch die Polizei).*
         The cordon.UNG.NOM of the embassy.GEN (by   the police).

Lees (1960); Vendler (1967b) proposed that (1a) and (1b) are closely related in that "[t]he nominals [...] which we shall study herein are not themselves sentences but rather they are noun-like versions of sentences" (Lees, 1960, p. 54) and in that "the device of nominalization transforms a sentence into a noun phrase" (Vendler, 1967a, p. 125).

Nominalizations can be embedded into other sentences as noun phrases as in (2).

(2) *Die Absperrung der   Botschaft   (durch die Polizei) ist   erfolgt.*
     The cordon   of the embassy.GEN (by   the police) has happened.

But embedding of nominalizations into other sentences is restricted as in (3).

(3) a. **Das Absperren   wird bemalt.*
         The   cordon.INF.NOM is   painted.

    b. *Die Absperrung   wird bemalt.*
         The cordon.UNG.NOM is   painted.

Vendler set out to provide an explanation of these restrictions by asking the question for "[w]hat are the restrictions governing the insertion of a nominalized sentence into the host sentence"? Vendler (1967a)[p. 125]. Vendler proposed to identify the restrictions on

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nominalizations with tests based on the assumption that "container sentences are selective hosts". According to Vendler's hypothesis, *wird bemalt* (is painted) is a container that selects for a certain property of nominalizations, a property which *Absperrung* possesses but not *Absperren*. Vendler took this property to pertain to an **ontological** distinction in the denotation of nominalizations. (Lees (1960) investigates selection as a property of grammatical environments. It may be that because grammar is language-specific while ontology is to a large extent language-independent, Vendler's ontological approach has become a basic technique of theorizing in modern linguistics.)

Vendler's ontological interpretation of container selectivity assumes that the container *bemalen* (to paint) selects for a physical thing to be painted. Consequently, if *Absperren* can't be inserted into the *bemalen*-container, then it doesn't denote a physical object. In turn, because *Absperrung* can be inserted into the *bemalen* container, it denotes a physical object.

The main verb *absperren* (to cordon off) of sentence (1a) involves reference to an event, an agent of this event, a state caused by this event and an object brought into existence by this event. This verbal ontology is preserved in the *-ung* nominalized sentence (1b). Consequently, the nominalized sentence (1b) is ontologically ambiguous (while the base sentence (1a) is not) between an event, state and object denotation because the ontological configuration expressed by (1a) is now packed into one formally identical word, the *-ung* nominalization *Absperrung*, where the agent of the event is optionally realized with a *durch*(by)-PP .

If container sentences are ontologically selective for the nominalizations that they host, it is nearby to assume that the selection restrictions of containers can not only be used to explain restrictions on the embedding of nominalizations into container sentencens but that selection restrictions can also be used to disambiguate sortally ambiguous nominalizations. According to this assumption, in (4), the denotation of *Absperrung* is disambiguated when embedded into different container sentences.

(4) a. *Die Absperrung   der   Botschaft   wurde angestrichen.*
          The cordon.OBJECT of the embassy.GEN was   painted.

     b. *Die Absperrung   der   Botschaft   wurde behindert.*
          The cordon.EVENT of the embassy.GEN was   impeded.

     c. *Die Absperrung   der   Botschaft   wurde aufgehoben.*
          The cordon.STATE of the embassy.GEN was   lifted.

1.2   Ambiguity of genitive adjunct interpretation

In the literature on *-ung* nominalizations (e.g. the seminal Ehrich and Rapp (2000)), it is commonly assumed that there are three basic interpretation possibilities of the genitive adjunct that an *-ung* nominalizations can host: (a) a non-argument interpretation as e.g. a possessive (5a) (b) theme interpretation (5b), (c) theme (5d) or agent (5c) interpretation.

(5) a. *Die Absperrung   der   Botschaft   *(durch die Polizei)*
         The cordon.OBJECT of the embassy.POSS.GEN *(by   the police)
          wurde angestrichen.
          was   painted.

     b. *Die Absperrung   der   Botschaft   durch die*
         The cordon.EVENT of the embassy.THEME.GEN by   the
          Poilzei   wurde behindert.
          police.AGENT   was   impeded.

     c. *Die Kündigung   des   Kunden   *(durch die*
         The cancellation.EVENT of the customer.AGENT.GEN *(by   the
          Verwaltung)   wurde bestätigt.
          administration) was   approved.

     d. *Die Kündigung   des   Vertrags   durch den*
         The cancellation.EVENT of the contract.THEME.GEN by   the
          Kunden   wurde bestätigt.
          customer.AGENT   was   approved.

What determines the interpretation of the genitive adjunct?

Grimshaw (1990) argues that the interpretation of adjunct DPs hosted by nominalizations is closely related to the ontology of nominalizations. She claims that "nouns with a complex event interpretation have an argument structure, . . . , and other nouns do not." (Grimshaw, 1990, p. 53). In order to establish the ontological difference between complex events and other entities, Grimshaw (1990) draws upon an application of Vendler's container tests to the verbal domain. Vendler did not only employ selection restriction tests for the ontological classification of nominalizations, but also for the ontological classification of verbs. The insertion of verbs into container sentences is restricted by phrases and modifiers that select for ontological properties of the temporal profile denoted by the verb. E.g., *in-* or *for*-phrases allow to distinguish between verbs that denote bounded and verbs that denote unbounded temporal profiles, respectively. Grimshaw employs adverbs like *constant* and *frequent* that select for verbs denoting a complex event and argues that these adverbs do a similar job when applied to nominalizations, i.e. that these adverbs separate argument-taking from non-argument taking nominalizations. That is, Grimshaw explains the difference between the possessive interpretation of the genitive in (5a) and the thematic interpretation in (5b) - (5d) by drawing upon the ontological difference between nominalizations that denote complex events and nominalizations which do not denote complex events (e.g. nominalizations denoting physical objects or simple events for which aspectual modification tests fail). It should be noted that Grimshaw's other tests for argument structure in nominalizations (e.g. plural/indefinite/intentional subjects) have been argued to be not applicable to German (e.g. Bierwisch (1989)). Consequently, Ehrich and Rapp (2000) use only container tests for the denotation of nominalizations in their classification of *-ung* nominalizations.

1.3   Ontology in Linguistics

Tests involving container restrictions have become a standard in the explanation of nominalizations in general and *-ung* nominalizations in particular. Here is a small selection of literature that take ontological distinctions established by container tests as a starting point.

E.g. to motivate the difference between argument-taking and non-argument taking nominals:

- Ontology of the nominalization: "nouns with a complex event interpretation have an argument structure, ..., and other nouns do not." (Grimshaw, 1990, p. 53)

E.g. to motivate the interpretation of the genitive of *-ung* nominalizations.

- Ontology of the *-ung* nominalization: While eventive *-ung* nominalizations allow only for the theme theta role, process nominalizations allow also for the agent theta role. (Ehrich and Rapp, 2000, cf. p. 268)

- Ontology of the base verb: For telic base verbs of *-ung* nominalizations, the genitive relation is preferably interpreted as theme, atelic base verbs allow for theme and agent interpretation of the genitive relation. (Bücking, 2012, cf. p. 171)

E.g. to motivate the prediction of the formation of nominalizations:

- Ontology of the nominalization: "It has been noted in the literature that across languages event nominals are, when derived from transitive predicates, 'passive' and not transitive and that they are derived from unaccusative predicates, but not from unergative ones" (Alexiadou, 2001, p.78)

- Ontology of the base verb: "-ung formation constraint: A verbal construction has an -ung nominalization if and only if the verb is constructed bi-eventively." (Roßdeutscher, 2010, p. 106)

2   Ontological selection restrictions as tools for linguistic disambiguation?

In this paper, my investigation of the ontology of *-ung* nominalizations begins with the following question:

How reliable are the **ontological** distinctions established by container tests from a **linguistic** point of view?

Given that container tests have become basic methodical inventory in modern linguistics, the answer to this question may seem trivial at first glance, but it is not. Vendler's collection of articles introducing container tests is entitled "Linguistics in Philosophy" and not "Philosophy in Linguistics". It is decidedly about "the gradual introduction of a

new technique into analytic philosophy" (Vendler, 1967b, p. vii) and not about the introduction of methods from analytic philosophy (i.e. ontology) into linguistics. Vendler used container tests to account for philosophical problems: e.g. the question for the ontological status of facts (Vendler (1967a)) or the ontology of epistemic attitudes (Vendler (1957)). Shifting the application and usage domain of Vendler's container tests from a philosophical to a linguistic domain requires to justify the assumption that Vendler's tests do not only have a **philosophical** significance but also a **linguistic** significance. But the linguistic significance of container-based ontological disambiguation must be justfied on the basis of the potential of container disambiguation to deal with linguistic problems, e.g. argument structure, anaphora binding, word formation, theta role assignment, whereas Vendler only intended a justification of selection restrictions with respect to philosophical problems.

In the next section, I present data on argument structure, anaphora binding, word formation and theta role assignment involving German *-ung* nominalizations. The linguistic data strongly suggests that container tests fail to provide a suitable conception of ontological disambiguation in the linguistic domain and that the ontological distinctions established with container tests are not a reliable basis for linguistic theorizing. In short: the application of philosophical methods in linguistics is not similarly successful as the application of linguistic methods in philosophy.

Please don't get me wrong at this point: I do not argue against the significance of container restrictions as tests for a linguistic ontology (i.e. as instruments of natural language metaphysics in Bach (1986)'s sense), but I doubt that linguistic ontology is a reliable starting point for linguistic theorizing itself.

3 The linguistic significance of container disambiguation

3.1 Interpretation of the Genitive DP

Again, what is the grammatical status of the genitive DP in german *-ung* nominalizations?

(6) a. *Der Zaun   der   Botschaft   wird verschoben.*
         the fence.OBJECT of the embassy.GEN.POSS is   moved

     b. *Die Räumung   der   Botschaft   wird verschoben.*
         the evacuation.EVENT of the embassy.GEN is   postponed

     c. *Die Absperrung   der   Botschaft   wird*
         the cordon.EVENT∨OBJECT of the embassy.GEN.THEME∨POSS is
         verschoben.
         moved∨postponed

     d. *Die Absperrung   der   Botschaft   wird auf morgen*
         the cordon.EVENT   of the embassy.GEN.THEME is   to   tomorrow
         verschoben.
         postponed

e. *Die Absperrung   der   Botschaft   wird um zwei Meter*
   the   cordon.OBJECT of the embassy.GEN.POSS is   for 2   meters

   verschoben.
   moved

Following the Grimshaw tradition, the basic distinction between the non-argument status of the genitive DP in (6a) and the argument status of the genitive DP in (6b) is a matter of the ontological difference between object denotation of the nominalization in (6a) and complex event denotation in (6b). But if this ontological distinction is relevant to grammatical status and syntactic analysis, how should we determine the relevant ontological difference in cases where no sortal disambiguation is available as in (6c)? The container verb *verschieben* selects both complex events (6d) and physical objects (6e), and *Absperrung* is ambiguous between denoting a complex event and a physical object. Examples like (6c) are cases in which no ontological disambiguation can be achieved with selection restrictions and consequently no predictions on argument structure in the Grimshawian framework can be made.

4   Anaphora resolution

Even if an ambiguous *-ung* nominalization can be disambiguated with selection restrictions at the sentence-level as in (6d) or (6e), the imposed restriction can be overriden at the discourse level. Hamm and Solstad (2010) present data in which selection restrictions imposed on *-ung* Nominalization are overriden in the course of anaphora resolution if the selection restriction imposed on the anaphora differs from the selection restriction imposed on the antecedent ("transsentential sort clash").

(7) *Die Absperrung   des   Rathauses wurde vorgestern   von*
    The cordoning-off of the town hall was   the day before yesterday by

    Demonstranten behindert. Wegen anhaltender Unruhen wird <u>sie</u> heute
    protesters   impeded. Due to continuing   unrest, is   <u>it</u> today

    aufrecht erhalten.
    sustained.

    The cordoning-off of the town hall was impeded by protesters the day before yesterday. Due to continuing unrest, it is sustained today as well.

With respect to the question for argument structure in nominalizations, the dependency of ontology on discourse has as a consequence that even if a disambiguation is possible at the sentence level, argument structure is not fixed until the whole discourse is processed. According to the Grimshaw hypothesis, in examples like (7) and even more obvious in (8) and (9), the genitive DP has argument status in the first sentence because *Absperrung* denotes a complex event. But the same genitive DP has no argument status with respect to the second sentence because anaphora resolution requires *Absperrung* to denote an object resp. state, which according to Grimshaw does not involve the projection of argument structure.

(8) *Die Absperrung des Regierungsviertels erfolgte direkt nach*
    The cordon   of the government district took place immediately after
    der gestrigen Terrorwarnung. Nachdem sich herausgestellt hat, dass die
    the yesterday terror warning. After   it   became apparent, that the
    Warnung unbegründet war, wird <u>sie</u> heute   wieder abgebaut.
    warning unfounded   was, will <u>it</u> disassembled.

The cordon of the government district took place immediately after yesterday's terror warning. After it became apparent that the warning was unfounded, it will be disassembled today.

A similar phenomenon, where event denotation established by selection restrictions is overriden in discourse with an object denotation takes place in (9).

(9) *Die Abrechnung des Stromverbrauchs   erfolgt zum Ende des*
    The billing   of the electricity consumption takes place at the end of the
    jeweiligen Monats. <u>Sie</u> kann bei Bedarf   in ihrem Kundencenter
    respective month. <u>It</u> can if necessary in your   customer care center
    eingesehen werden.
    inspected be.

The billing of the electricity consumption takes places at the end of the respective month. If necessary, it can be inspected in your customer care center.

Semantically, how should we deal with the phenomenon exemplified by (7)? None of the existing proposals captures the data right. In a naive approach to disambiguation based on disjunction deletion, if the state reading is deleted by disambiguation in the first sentence, then the state reading is not available for pronoun binding in the second sentence (10a). In a lazy approach to disambiguation, where the ambiguity is not recognized at all, it would be predicted that pronoung binding is possible in (10b). In (Hamm and Solstad (2010))'s logic programming approach, where a non-monotonic inference to the sort which was deleted in disambiguation accounts for examples such as (7), it would be predicted that pronoun binding is not possible in (10c). Finally, in a coercion approach based on a head typing principle (Pustejovsky (1998); Asher (2011)), there is no local type clash ti trigger a coercion in (10a). Also, there are methodological problems with 'substantial change' (e.g. *zerstören* (to destroy sth.)) which is inherited from the underlying Aristotelian metaphysics.

(10) a. *Die Absperrung   des   Rathauses wurde vorgestern   von*
        The cordoning-off of the town hall   was   the day before yesterday by
        Demonstranten behindert. Wegen anhaltender Unruhen wird <u>sie</u>
        protesters   impeded. Due to continuing   unrest,   is   <u>it</u>
        heute aufrecht erhalten.
        today sustained.

    The cordoning-off of the town hall was impeded by protesters the day before yesterday. Due to continuing unrest, it is sustained today as well.

b. * *Die Absperrung des   Rathauses wurde heute   angestrichen. Sie war*
   The cordon   of the townhall   was   painted today.   It   has

   gestern   behindert worden.
   yesterday impeded   been.

   The barrier was painted today. Yesterday, it has been impeded.

c. *Die Absperrung des   Rathauses wurde gestern   von*
   The cordon   of the townhall]   was   yesterday prevented

   Demonstranten verhindert. Sie wird heute mit massivem
   by   protesters. It   will today by   massive

   Polizeieinsatz durchgesetzt.
   police forces   enforced.

   The cordoning-off of the townhall was prevented by protesters yesterday.
   Today, it will be enforced by massive police forces.

d. * *Die Absperrung des   Rathauses wurde gestern   von Demonstranten*
   The cordon   of the townhall   was   yesterday by   protesters

   zerstört.   Sie wird heute wieder aufgebaut.
   destroyed. It   will today rebuild.

   The cordon of the townhall was destroyed by protesters yesterday. Today, it
   will be rebuild.

4.1   Dispositional nominalizations

While container restrictions are too weak to fix the ontology of *-ung* nominalizations (and
consequently argument structure) in discourse, they are too strong to fix the ontology (and
consequently argument structure) of *-ung* nominalizations as in (11a)-(11c), for which I
argue in the other article of this volume argues that they denoted uninstantiated disposi-
tions instead of events in order to explain their formation and argument structure.

(11) a. *Die Wirkung   der Tablette (*durch-PP) wird behindert.*
        The effect.UNG.NOM of the pill.GEN *by-PP   is   hampered.
     b. *Die Blutung   der Wunde   (*durch-PP) wird*
        The bleeding.UNG.NOM of the wound.GEN *by-PP   is

        gestoppt.
        stopped
     c. *Die Strahlung   der Sonne (*durch-PP) wird gestoppt.*
        The radiation.UNG.NOM of the sun.GEN *by-PP   is   stopped

Dispositional nominalizations (DN) as in (11a) and (11b) are characterized by their
formation from base verbs which can not be classified unambiguously as either unergative
or unaccusative resp. mono- or bi-eventive and their argument structure: no theme in-
terpretation of the genitive adjunct is possible and no agent or causer can be introduced
with a *durch*-PP. The genitive adjuncts of DNs have argument status because DNs have
a complex event reading as shown by the possibility of aspectual modification accord-
ing to Grimshaw (1990); Ehrich and Rapp (2000). The existence of DNs constitutes a
serious challenge to established theories of nominalization in general and *-ung* nominal-
ization in particular. Lexicalist approaches to *-ung* nominalization (e.g. Ehrich and Rapp

(2000); Bücking (2012)) crucially rely on the assumption that a theme interpretation of the genitive argument of eventive *-ung* nominalizations is always possible, whereas word-syntactic approaches claim that "across languages, event nominals are [...] derived from unaccusative predicates, but not from unergative ones" (Alexiadou, 2001, p.78) and that a "verbal construction has an *-ung* nominalization if and only if the verb is constructed bi-eventively." (Roßdeutscher, 2010, p. 106). Pross (this volume) proposes a word-syntactic analysis of Dispositional Nominalizations by arguing that DNs pass tests for complex event structure accidentally, i.e. without actually denoting events. Instead, he proposes that DNs denote dispositional properties, where an object - somewhat simplified - is disposed to realize a property p given a stimulus e iff it would p if it were the case that e. That is, Pross proposes that in (11a) *Wirkung* refers to the dispositional property of the pill to take effect if ingested. But if *Wirkung der Tablette* is combined with *behindern* as in (11a) in order to test for complex event denotation, the selection restriction of *behindern* for a complex event enforces - instead of selecting - an event denotation of *Wirkung*: *behindern* presupposes the instantiation of the dispositional property and once instantiated, dispositional properties are complex events. On the one hand, the ontological distinction between dispositional properties and events allows to maintain Alexiadou (2001)'s generalization because DNs do not fall under the category of event nominalizations. On the other hand, the base verbs of DNs are semantically special in that they provide the possibility to infer an event from a disposition which makes them in fact verbs with a bi-eventive construction that outputs the denotation of a mono-eventive verbs construction, thus rehabilitating Roßdeutscher (2010)'s hypothesis.

5   Underspecification

Ambiguities in the sortal denotation of *-ung* nominalizations and the selection restrictions of verbs are no isolated phenomena in German. Quite the contrary, ambiguity is a pervasive feature of the natural language metaphysics of German. From this point of view and taking into account the problems with justifying the linguistic significance of container tests, the assumption that ontological disambiguation provides a reliable starting point for linguistic theorizing is questionable: disambiguation with selection restrictions is not possible in general, and may be too strong or too weak if available.

What I am going to propose in this section to deal with ontological ambiguity is a radical shift of perspective. The representations that I am going to devise are inspired by Underspecified Discourse Representation Theory (UDRT, Reyle (1993)). The radical underspecification of ontology is not just a technical alternative to other approaches to sortal ambiguity. Like theories of semantic underspecification (van Deemter and Peters (1996)), it implies a radically different conception of the relation between ontology and ambiguity. In Ludlow (1997)'s terminology, which I adopt here to ontology, radical underspecification implies an apostate view on ambiguity.

- The **orthodox view on ambiguity**: One-to-many mapping from form to ontology, disambiguation required.

- The **heretical view on ambiguity**: One-to-one mapping from form to ontology,

disambiguation required.

- The **apostate view on ambiguity**: One-to-one mapping from form to ontology, no disambiguation required.

That is, an apostate about ambiguity claims that we have thoughts that are ambiguous, and we communicate and reason with those ambiguous thoughts without the necessity of disambiguation. It is this perspective on ambiguity which I adopt in the following.

5.1 From disjunctions to underspecification

I develop my proposal for an underspecified approach to ontology against the anaphora resolution examples from section 4. I restrict myself to the discussion of the ontological interaction between sortally ambiguos *-ung* nominalizations and verbs. For the sake of convenience, I base my proposal on the lexical entry for *Absperrung* given by Hamm and Solstad (2010). However, nothing hinges on that particular representation format as long as the representation language is rich enough to distinguish between predications pertaining to events, states and events.

$$(12) \quad \left\langle \alpha, \begin{array}{|l|} \hline z \\ \alpha = e \stackrel{!}{\vee} \alpha = s \stackrel{!}{\vee} \alpha = y \\ Absperrung(\alpha) \\ e\ CAUSE\ s \\ s : have(y, z) \\ function - as - barrier(y) \\ \hline \end{array} \right\rangle$$

(12) implements the heretical view on ambiguity: the sortal ambiguity of *Absperrung* at the NP-level is represented with a (special) disjunction operator $\stackrel{!}{\vee}$ (Reyle et al. (2007)) which prompts for disambiguation of α at the VP-level via selection restrictions of the verbal container. The special status of α is indicated by its representation in a binding list store in front of the Discourse Representation Structure (DRS). Note that in the following, I distinguish between the identification of an object as a physical thing $object(x)$ and the identification of an object by its function ($f - object(x)$).

How can we get rid of the disjunction and the necessity for disambiguation in favour of an underspecified representation of *Absperrung* that provides a suitable basis for the processing of the anaphora resolution examples?

From a philosophical point of view in representations of the type exemplified by (12) *Absperrung* is **identified** in (12) by different (but standardized) representational means:

- thing (i.e. physical thing): identified via its properties/functions
  $$\boxed{function - as - barrier(y)}$$

- event (i.e. temporal thing): identified via its causal relationships
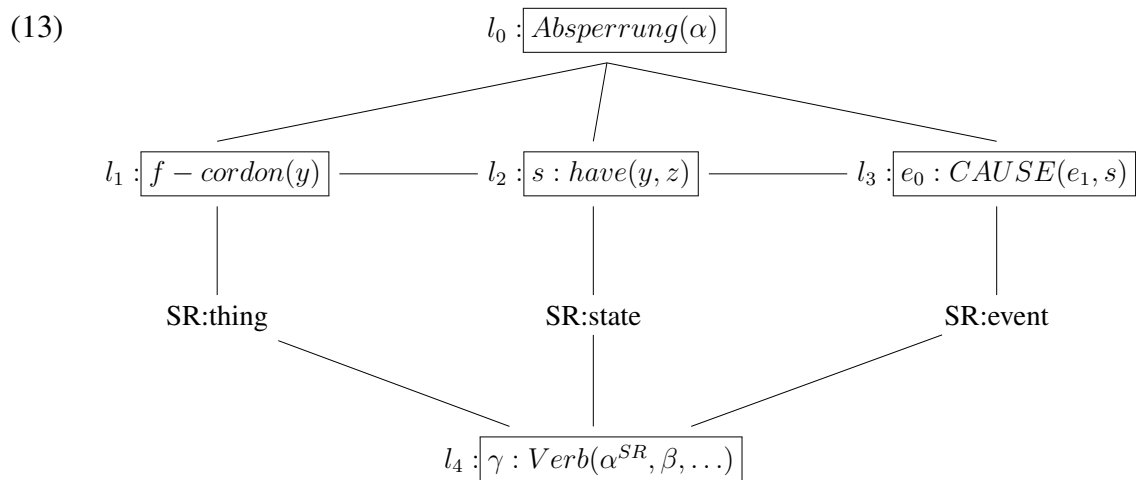 $$\boxed{e_0 : CAUSE(e_1, s)}$$

- state (i.e. properties): identified via its relating things and events with properties
  $$\boxed{s : have(y, z)}$$

The dual function of DRS-conditions as truth-conditional predicates and ontological identifiers of discourse referents can be employed to detach the ontological denotation of *Absperrung* from its semantic representation as follows:

- Break up the DRS into single identification conditions for α.

- Arrange the identification conditions for α in a lattice structure with a top and bottom element.

- Determine the lattice structure according to the ontological relations in which the identification conditions stand.

- One such basic ontological relation is causation: an event causes a state and that state is attributed to an object.

The separation of the sort of denotation of the nominalization from its identification possiblities results in a structural underspecification of the ontological identification of the nominalization. An underspecified representation of *Absperrung* is given in (13). In the following, I call the nodes l_1, l_2, l_3 representing the selection restrictions of the container the **access points** of the lattice. The additional nodes $SR : sort$ are only displayed for the sake of presentation.

(13)

$$l_0 : \boxed{Absperrung(\alpha)}$$

$$l_1 : \boxed{f - cordon(y)} \quad\quad l_2 : \boxed{s : have(y, z)} \quad\quad l_3 : \boxed{e_0 : CAUSE(e_1, s)}$$

$$SR{:}thing \quad\quad\quad SR{:}state \quad\quad\quad SR{:}event$$

$$l_4 : \boxed{\gamma : Verb(\alpha^{SR}, \beta, \ldots)}$$

5.2 Selection restrictions

If an underspecified representation of an *-ung* nominalization is combined with a verb, the selection restrictions of the verb determine possible structural und thus ontological specifications of α. That is, as in UDRT, the language of ontological underspecification imposes **meta-level constraints** on the ontological identification possibilities of an *-ung* nominalization. Consequently, in the present framework, selection restrictions appear as meta-level contraints on ontologically underspecified DRSs:

Constraint 1: Selection restrictions constrain possible identifications of the ontological sort of the arguments of the verb.

Selection restrictions are modelled via **templates** (substructures of the underspecification lattice) that represent possible identifications of an *-ung* nominalization.

5.2.1   Simple templates

5.2.2   behindern

behindern (to impede) selects for an event denotation of the nominalization. It identifies an event, the state it causes and a thing of which the function expressed by the state is predicated.

(14)
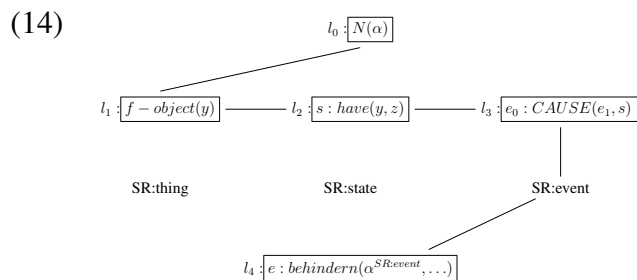
5.2.3   aufrecht erhalten

aufrecht erhalten (to sustain) selects for a state denotation of the nominalization. The state can be identified in two ways (the identification expressed by the template is ambiguous). First, the state may be identified with respect to a thing which holds that state (and thus receives its functioning, represented as $f - object$), then no reference to the event causing that state is involved. Second, the state may be identified with respect to the event which causes the state, then there is no reference to the holder of that state.

(15)
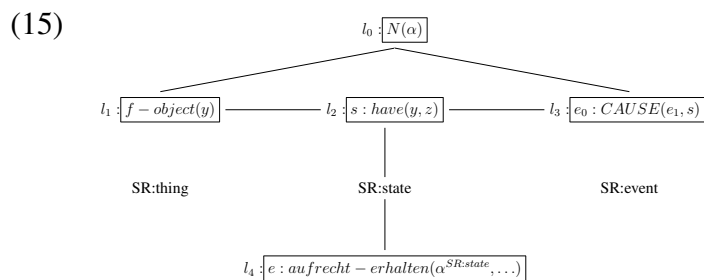
5.2.4   anstreichen

anstreichen (to paint) selects for a physical object denotation of the nominalization. No reference to temporal structures is involved in the identification.

(16)

$$l_0 : \boxed{N(\alpha)}$$

$$l_1 : \boxed{object(y)} \qquad l_2 : \boxed{s : have(y, z)} \qquad l_3 : \boxed{e_0 : CAUSE(e_1, s)}$$

SR:thing $\qquad$ SR:state $\qquad$ SR:event

$$l_4 : \boxed{e : anstreichen(\alpha^{SR:thing}, \ldots)}$$
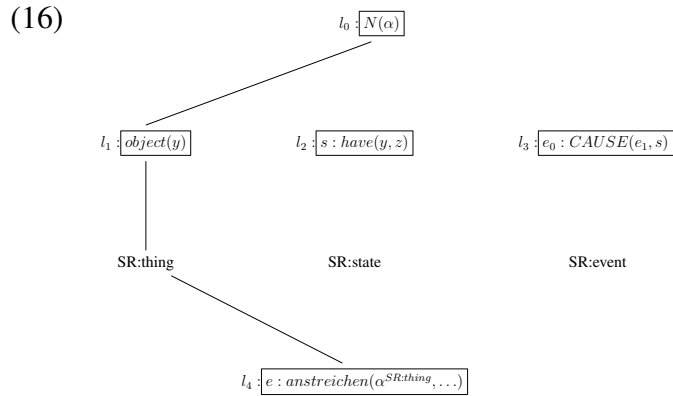
5.3 DRS dumps

When applied to an ontologically underspecified DRS, templates specify **identification paths** (resp. sets of paths if the identification is ambiguos). For each application, the conditions occuring at an identification path constitute a **DRS dump**.

Constraint 2: Selection restrictions constrain the set of appropriate semantic representations: DRS dumps can be constructed by collecting conditions and identifications of α occuring on identification paths.

Consider the following sentence (17):

(17) *Die Absperrung des Rathauses wurde gestern von Demonstranten*
The cordon of the town hall was yesterday by protesters
behindert.
hampered.

Application of (14) to (13) results in (18:)
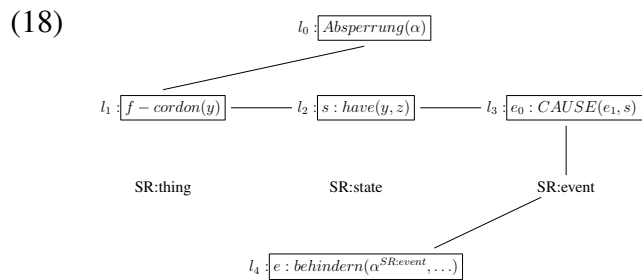
(18)

$$l_0 : \boxed{Absperrung(\alpha)}$$

$$l_1 : \boxed{f - cordon(y)} \text{———} l_2 : \boxed{s : have(y, z)} \text{———} l_3 : \boxed{e_0 : CAUSE(e_1, s)}$$

SR:thing $\qquad$ SR:state $\qquad$ SR:event

$$l_4 : \boxed{e : behindern(\alpha^{SR:event}, \ldots)}$$

Collecting the DRS conditions and instantiations of α along the path specified by the template (18) gives us the DRS dump:

(19)
$$\begin{array}{|l|}
\hline
\alpha, z, e, y, e_1, e_2, s \\
\hline
mainhall(z) \\
Absperrung(\alpha) \\
e : \mathbf{CAUSE}(e_0, s) \\
s : have(y, z) \\
f cordon(y) \\
e_1 : behindern(e_2, \ldots) \\
e_2 = e \\
e = \alpha \\
\hline
\end{array}$$

5.4 Reidentification and anaphora binding

In discourse settings, several templates are applied to one and the same underspecified representation of sortal ambiguity. I call the iterated application of templates a **reidentification** and a DRS dump K_2 resulting from a reidentification of a DRS dump K_1 the **extension** of the DRS dump of K_1.

The underspecified lattice can be employed for the control of reidentification. Previously identified DRS conditions "unlock" access points for reidentification and it is only via these access points that reidentification can be processed. A violation of this constraint results in a failure of anaphora resolution in the DRS dump.

Constraint 3: Reidentification is constrained by the availability of access point DRS conditions.

5.5 Examples

5.5.1 Antencendent: event; Anaphora: state

(20) *Die Absperrung des Rathauses wurde gestern von Demonstranten*
The cordon of the town hall was yesterday by protesters
behindert. Wegen anhaltender Unruhen wird <u>sie</u> heute aufrecht erhalten.
hampered. Due to continuing unrest, is <u>it</u> today sustained.

Application of (14) to (13) results in (21:)

(21)
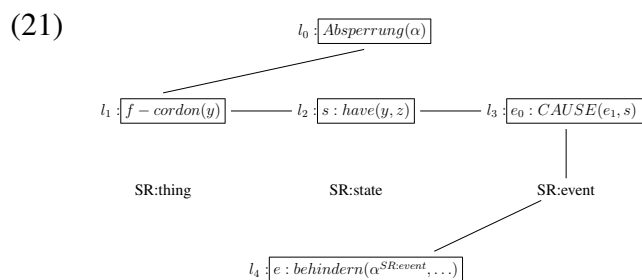
Collecting the DRS conditions and instantiations of α along the paths specified by the template (14) gives us the DRS dump:

(22)
$$\boxed{\begin{array}{l} \alpha, z, e, y, e_1, e_2, s \\ townhall(z) \\ Absperrung(\alpha) \\ e : \textbf{CAUSE}(e_0, s) \\ s : have(y, z) \\ f - cordon(y) \\ e_1 : behindern(e_2, \ldots) \\ e_2 = e \\ e = \alpha \end{array}}$$
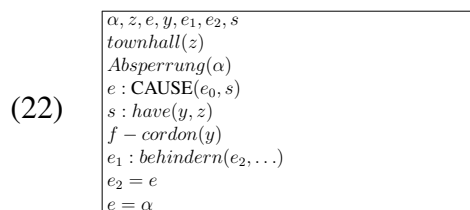
Application of (15) to (21) results in (23):

(23)

$$l_0 : \boxed{Absperrung(\alpha)}$$

$$l_1 : \boxed{cordon(y)} \cdots\cdots l_2 : \boxed{s : have(y,z)} \cdots\cdots l_3 : \boxed{e_0 : CAUSE(e_1,s)}$$

SR:thing   SR:state   SR:event

$$l_4 : \boxed{e : behindern(\alpha^{SR:event}, \ldots)}$$
$$l_5 : \boxed{s : aufrechterhalten(\alpha^{SR:state}, \ldots)}$$
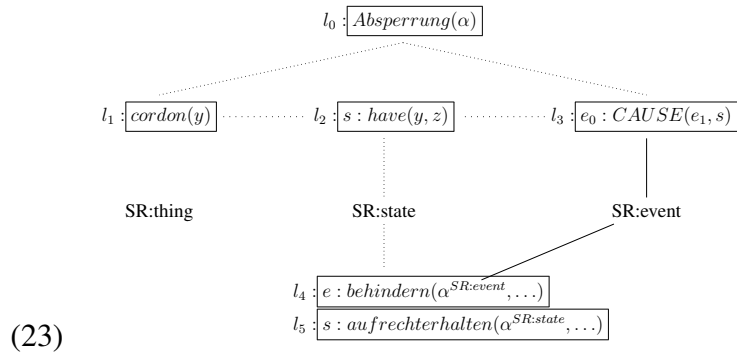
Collecting the DRS conditions along the dotted substructure specified by reidentification with the template (15) gives us an extension of the DRS dump in which the anaphora can be bound.

(24)

$$\boxed{\begin{array}{l} e, \alpha, s, y, e, e_0, e_2, z, e_1, s_1 \\ townhall(z) \\ Absperrung(\alpha) \\ e : \mathbf{CAUSE}(e_0, s) \\ s : have(y, z) \\ f - cordon(y) \\ e : behindern(e_2, \ldots) \\ e_2 = e \\ e = \alpha \\ e_1 : aufrecht - erhalten(s_1, \ldots) \\ s_1 = s \\ s = \alpha \end{array}}$$
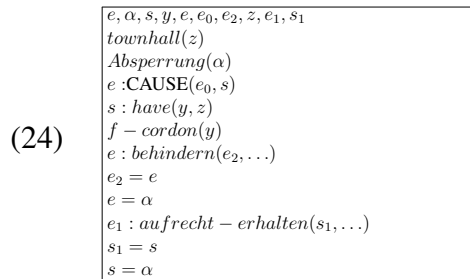
5.5.2 Reidentification failure

(25) *Die Absperrung des Rathauses wurde heute angestrichen. Sie wurde*
The cordoning-off the town hall was fortified today. It was
gestern behindert.
hampered yesterday.

Application of (16) to (13):

(26)

$$l_0 : \boxed{N(\alpha)}$$

$$l_1 : \boxed{object(y)} \qquad l_2 : \boxed{s : have(y,z)} \qquad l_3 : \boxed{e_0 : CAUSE(e_1,s)}$$

SR:thing   SR:state   SR:event

$$l_4 : \boxed{e : anstreichen(\alpha^{SR:thing}, \ldots)}$$
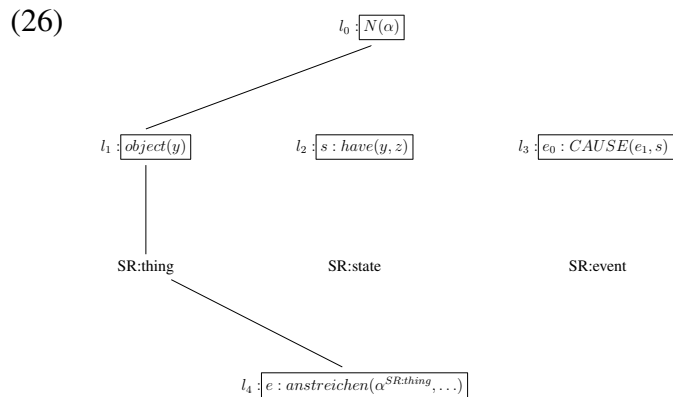
DRS dump derived from (26)

(27)
$$\boxed{\begin{array}{l} \alpha, y, e, z \\ townhall(z) \\ Absperrung(\alpha) \\ cordon(y) \\ e : anstreichen(y) \\ y = \alpha \end{array}}$$

Application of (14) to (26) leads to a reidentification failure. Because no event has been identified with *anstreichen*, there is no eventive DRS access point through which *behindern* could reidentify *Absperrung*.

(28)

The violation of the reidentification constraint results in an extended DRS Dump in which the anaphora can not be resolved (28).

(29)
$$\boxed{\begin{array}{l} y, e, y_1, z, e_0, e_1, \alpha \\ mainhall(z) \\ s : have(y, z) \\ Absperrung(\alpha) \\ cordon(y) \\ e : anstreichen(y) \\ y = \alpha \\ e_0 : behindern(e_1, \ldots) \\ e_1 =? \end{array}}$$
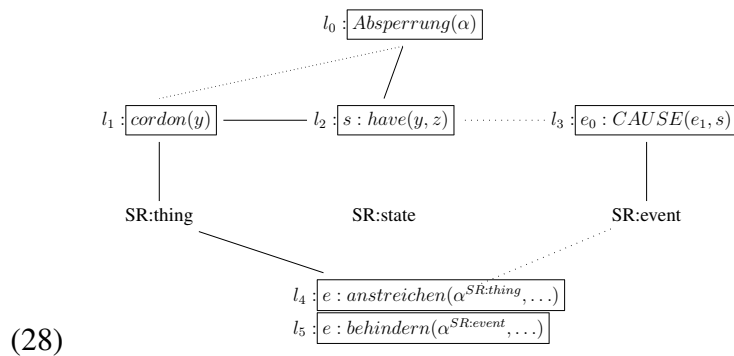
5.6   More examples

5.6.1   Complex templates

There is a close relation between ontology and lexical semantics. Some verbs do not only select for a certain ontology but they also modify a given ontological configuration with respect to ontological categories such as existence, possibility, time, space etc.. This is the basic assumption underlying lexical semantics.

5.6.2   *zerstören*

zerstören (to destroy) selects for a physical object and presupposes a state in which this object exists. It then adds a condition to the effect that following the existence state there is a state in which the object does not exist.

(30)

$$l_0 : \boxed{N(\alpha)}$$

$$l_1 : \{s_0 : exists(y)\}, \boxed{\begin{array}{l} object(y) \\ s_1 : \neg exists(y) \\ s_0 \prec s_1 \end{array}} \qquad l_2 : \boxed{s : have(y, z)} \qquad l_3 : \boxed{e_0 : CAUSE(e_1, s)}$$

SR:thing   SR:state   SR:event

$$l_4 : \boxed{e : zerstoeren(\alpha^{SR:thing}, \dots)}$$
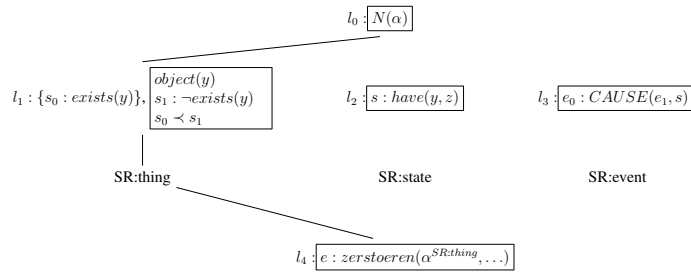
5.6.3   aufbauen

wieder aufbauen (to rebuild) is, from an ontological point of view, the inverse ontological operation to *zerstören*. It presupposes a state of non-existence and adds a condition to the effect that the object exists in a state following the non-existent state.

(31)

$$l_0 : \boxed{N(\alpha)}$$

$$l_1 : \{s_0 : \neg exists(y)\} \boxed{\begin{array}{l} object(y) \\ s_1 : exists(y) \\ s_0 \prec s_1 \end{array}} \qquad l_2 : \boxed{s : have(y, z)} \qquad l_3 : \boxed{e_0 : CAUSE(e_1, s)}$$

SR:thing   SR:state   SR:event

$$l_4 : \boxed{e : aufbauen(\alpha^{SR:thing}, \dots)}$$
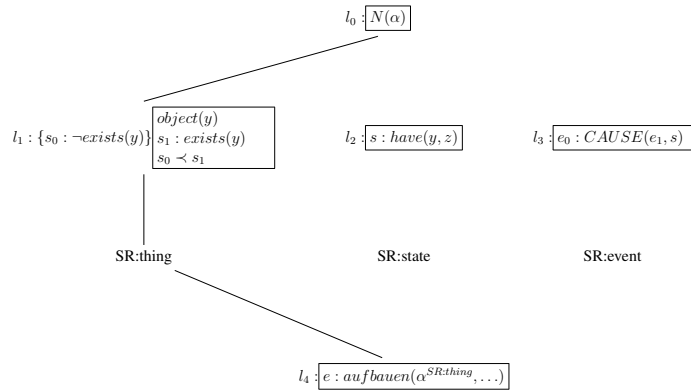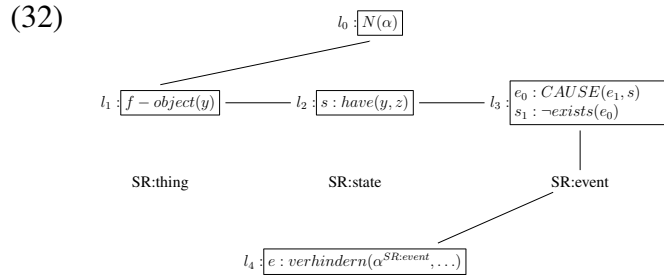
5.6.4   verhindern

Similar to modifications of the existence of objects, verbs can deny or presuppose the existence of events. The ontological consequences of event negation are, however, more complex than for object negation. The complexity results from the fact that an event is inseparably tied to its causes but in turn these causes depend on the existence of the event. If the event is negated, then it has no causes. But in order to identify the negated event, we must assume that it would have had causes if it happened. Consequently, even a negated event comes with a full identification path explicated by the template for e.g. *verhindern*.

What a serious implementation of the causal consequences of event negation would require is a mechanism that allows to propagate the causal chain reactions that result from events through the ontological dependency lattice: if no event of cordoning-off has happened, then there is no cordon. However, it must be ensured, that **this** (intended) cordon can be realized at a later point. In the following, I present a simple account of the problem, where causal chain reactions are captured by distinguishing between locked and unlocked access points. A negated access point locks the access point in that no reidentification can take place. In turn, a negated access points must be explicitly unlocked by a template in order to be accessed.

verhindern (to prevent) adds a condition to the lattice to the effect that the event which *verhindern* takes as an argument has not been realized. It locks access to the event identification.

(32)

$$l_0 : \boxed{N(\alpha)}$$

$$l_1 : \boxed{f - object(y)} \text{——} l_2 : \boxed{s : have(y, z)} \text{——} l_3 : \boxed{\begin{array}{l} e_0 : CAUSE(e_1, s) \\ s_1 : \neg exists(e_0) \end{array}}$$

SR:thing   SR:state   SR:event

$$l_4 : \boxed{e : verhindern(\alpha^{SR:event}, \ldots)}$$

5.6.5   *durchsetzen*

durchsetzen (to enforce) is the ontological inverse to the operation specified by *verhindern*. It presupposes that the execution of an event has been prevented or hampered and thus unlocks the access to event identification by updating the previous ontological status of the event.

(33)

$$l_0 : \boxed{N(\alpha)}$$

$$l_1 : \boxed{f - object(y)} \text{——} l_2 : \boxed{s : have(y, z)} \text{——} l_3 : \boxed{s_1 : \neg exists(e_0)} \boxed{\begin{array}{l} e_0 : CAUSE(e_1, s) \\ s_2 : exists(e_0) \\ s_1 \prec s_2 \end{array}}$$

SR:thing   SR:state   SR:event

$$l_4 : \boxed{e : durchsetzen(\alpha^{SR:event}, \ldots)}$$
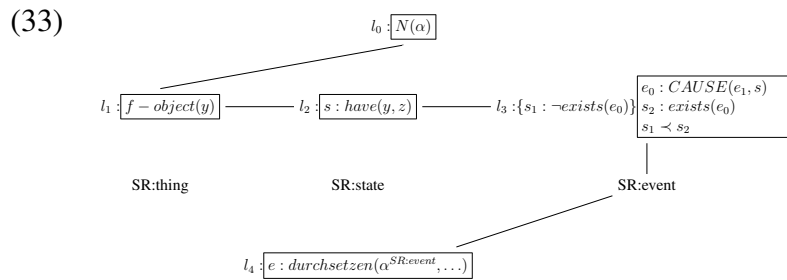
5.6.6   *Underspecified selection restrictions*

Finally, there are cases in which a verb selects for more than one sort. In this case, the template itself is underspecified, in that it allows to access the lattice in more than one way.

$$l_0 : \boxed{Absperrung(\alpha)}$$

$$l_1 : \boxed{function - barrier(y)} \text{——} l_2 : \boxed{s : have(y, z)} \text{——} l_3 : \boxed{e_0 : CAUSE(e_1, s)}$$

SR:thing   SR:state   SR:event

$$l_4 : \boxed{e : verschieben(\alpha^{SR:event;thing}, \ldots)}$$

(34)
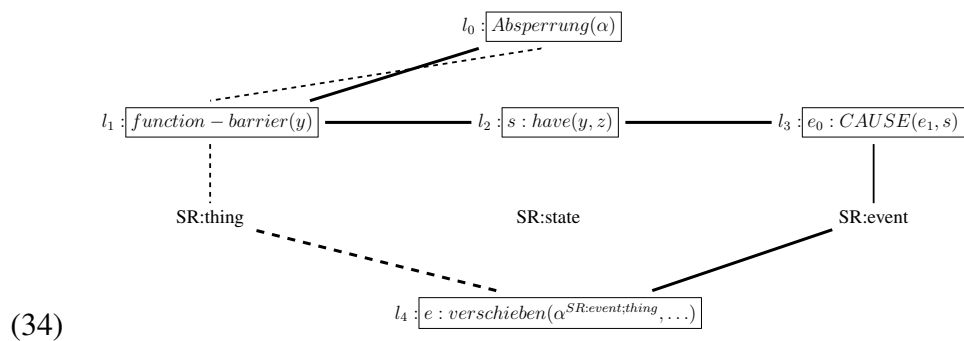
5.7 Complex examples

5.7.1 Antecedent: non-existing event Anaphora: existing event

(35) *Die Absperrung des   Rathauses wurde gestern   von*
The cordon   of the townhall] was   yesterday prevented
Demonstranten verhindert. <u>Sie</u> wird heute mit massivem Polizeieinsatz
by   protesters. <u>It</u>   will today by massive   police forces
durchgesetzt.
enforced.

The cordoning-off of the townhall was prevented by protesters yesterday. Today, it will be enforced by massive police forces.

Apply (32) to (13):
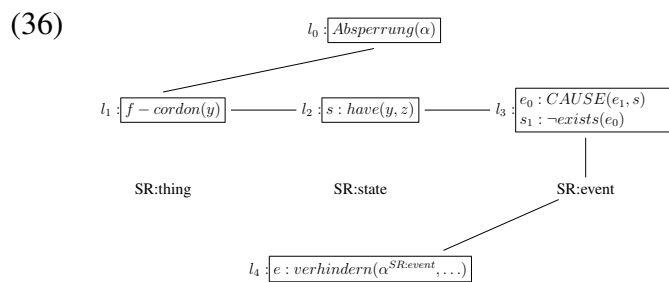
(36)

Collecting the DRS conditions and instantiations of α along the path specified by the template (14) gives us a DRS dump:

(37)

$$
\begin{array}{|l|}
\hline
\alpha, z, e, y, e_1, e_2, s \\
townhall(z) \\
Absperrung(\alpha) \\
e : \mathbf{CAUSE}(e_0, s) \\
s : have(y, z) \\
f - cordon(y) \\
e_1 : verhindern(e_2, \ldots) \\
\neg exists(e_2)\ e_2 = e \\
e = \alpha \\
\hline
\end{array}
$$
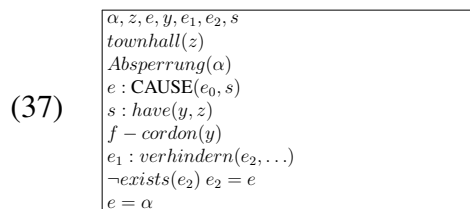
Application of (33) to the current specification of (13) unlocks the event access point:

(38)

$$l_0 : \boxed{Absperrung(\alpha)}$$

$$l_1 : \boxed{f - object(y)} \quad\text{———}\quad l_2 : \boxed{s : have(y, z)} \quad\text{———}\quad l_3 : \boxed{\begin{array}{l} e_0 : CAUSE(e_1, s) \\ s_1 : \neg exists(e_0) \\ e_2 : CAUSE(e_3, s) \\ s_2 : exists(e_2) \\ s_1 \prec s_2 \end{array}}$$

SR:thing   SR:state   SR:event

$$l_4 : \boxed{\begin{array}{l} \boxed{e : verhindern(\alpha^{SR:event}, \dots)} \\ \boxed{e : durchsetzen(\alpha^{SR:event}, \dots)} \end{array}}$$

DRS dump:

(39)

$$\boxed{\begin{array}{l} \alpha, z, e, y, e_1, e_2, s \\ townhall(z) \\ Absperrung(\alpha) \\ e : \textbf{CAUSE}(e_0, s) \\ s : have(y, z) \\ f - cordon(y) \\ e_1 : verhindern(e_2, \dots) \\ \neg exists(e_2) \; e_2 = e \\ e = \alpha \\ e_4 : \textbf{CAUSE}(e_5, s) \\ e_2 : durchsetzen(e_3, \dots) \\ exists(e_3) \\ e_4 = \alpha \end{array}}$$
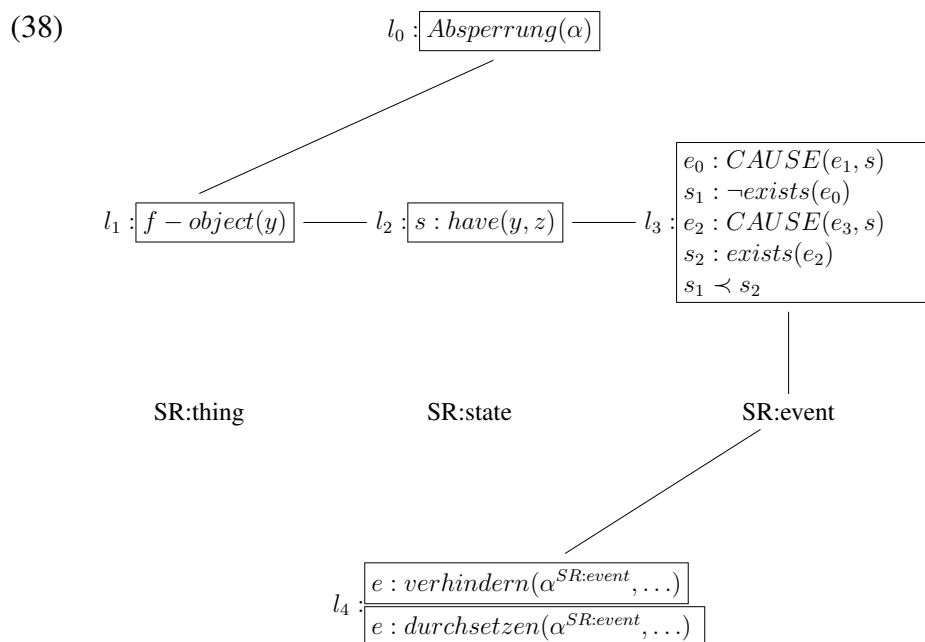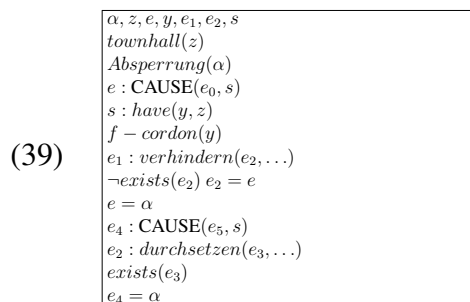
5.7.2 Antecendent: non-existent object; Anaphora: existent object

(40) *Die Absperrung des Rathauses wurde gestern von Demonstranten*
      The barrier   was today   fortified. <u>It</u>   has yesterday
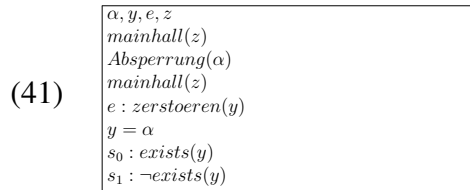   The barrier   was fortified today.   Yesterday, <u>it</u> has

      zerstört. <u>Sie</u>   wird heute wieder aufgebaut.
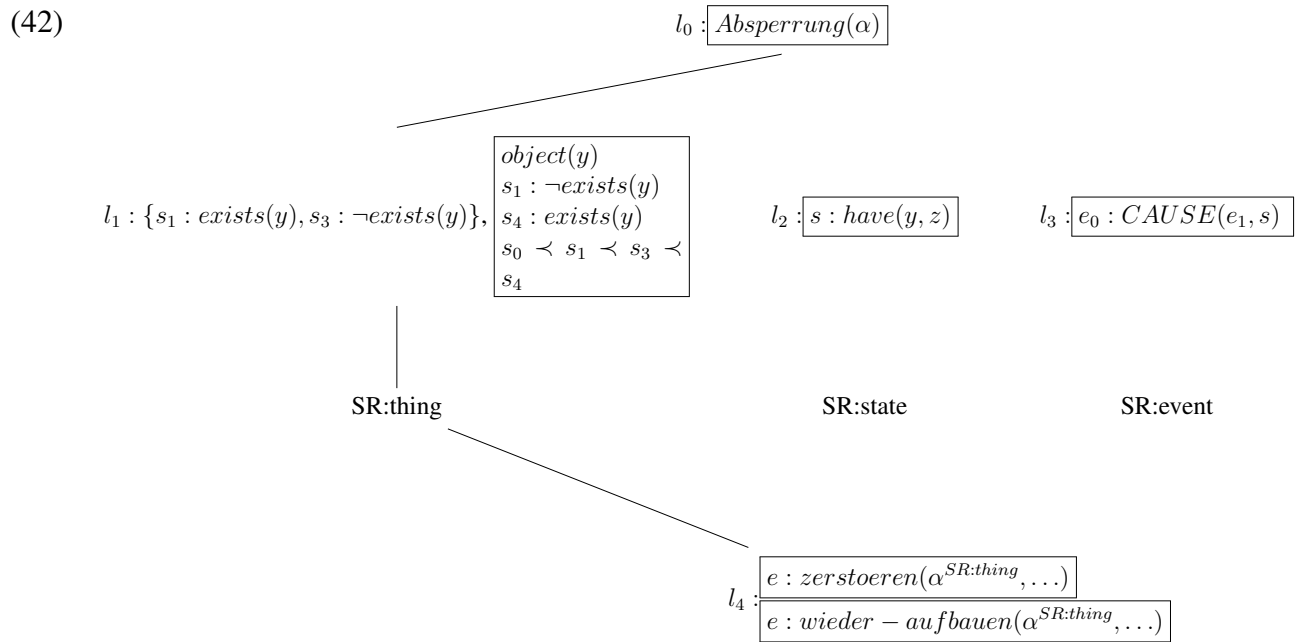   impeded been.
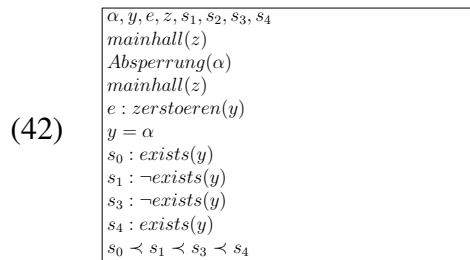   been   impeded.

Application of (30) to (13):

(41)

$l_0 : \boxed{Absperrung(\alpha)}$

$l_1 : \{s_0 : exists(y)\}, \boxed{\begin{array}{l} object(y) \\ s_1 : \neg exists(y) \\ s_0 \prec s_1 \end{array}}$ $l_2 : \boxed{s : have(y, z)}$ $l_3 : \boxed{e_0 : CAUSE(e_1, s)}$

SR:thing   SR:state   SR:event

$l_4 : \boxed{e : zerstoeren(\alpha^{SR:thing}, \dots)}$

DRS dump:

(41)
$$\boxed{\begin{array}{l} \alpha, y, e, z \\ mainhall(z) \\ Absperrung(\alpha) \\ mainhall(z) \\ e : zerstoeren(y) \\ y = \alpha \\ s_0 : exists(y) \\ s_1 : \neg exists(y) \end{array}}$$
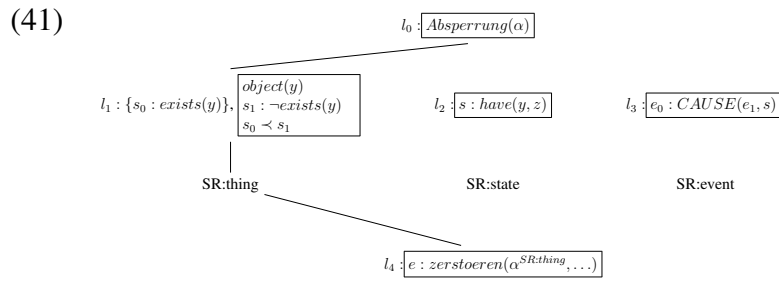
Application of (15) to the current specification of (13) unlocks the object access point.

(42)

$l_0 : \boxed{Absperrung(\alpha)}$

$l_1 : \{s_1 : exists(y), s_3 : \neg exists(y)\}, \boxed{\begin{array}{l} object(y) \\ s_1 : \neg exists(y) \\ s_4 : exists(y) \\ s_0 \prec s_1 \prec s_3 \prec \\ s_4 \end{array}}$ $l_2 : \boxed{s : have(y, z)}$ $l_3 : \boxed{e_0 : CAUSE(e_1, s)}$

SR:thing   SR:state   SR:event

$l_4 : \boxed{\begin{array}{l} e : zerstoeren(\alpha^{SR:thing}, \dots) \\ \hline e : wieder - aufbauen(\alpha^{SR:thing}, \dots) \end{array}}$

DRS dump:

(42)
$$\boxed{\begin{array}{l} \alpha, y, e, z, s_1, s_2, s_3, s_4 \\ mainhall(z) \\ Absperrung(\alpha) \\ mainhall(z) \\ e : zerstoeren(y) \\ y = \alpha \\ s_0 : exists(y) \\ s_1 : \neg exists(y) \\ s_3 : \neg exists(y) \\ s_4 : exists(y) \\ s_0 \prec s_1 \prec s_3 \prec s_4 \end{array}}$$

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German medium verbs and their *-ung* nominalizations

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Abstract The focus of this paper is on a class of verbs – I call them medium verbs (MV) – that exhibit a strikingly unique behaviour. Although intransitive, medium verbs can not be classified unambiguosly as either unergative or unaccusative. Even more interesting, these medium verbs allow for *-ung* nominalizations that pass tests for argument-taking nominals and project an argument slot for which no theme interpretation is possible. In this paper, I propose an analysis of the formation and interpretation of MVs and their *-ung* nominalizations at the syntax-semantics interface in which a functional v layer selects for a root merged VoiceP to the end that MVs denote events while their *-ung* nominalizations denote dispositional properties.

1   Data

The focus of this paper is on a class of intransitive verbs which I call medium verbs (MV) and their *-ung* nominalizations, which I call dispositional nominalizations (DN). The data in this paper was identified in the SdeWaC corpus (Faaß (2013)) and amounts to approximately 50 non-prefixed dispositional *-ung* nominalizations, a characteristic selection of which will be discussed in this paper. According to the Unaccusativity Hypothesis Perlmutter (1978), intransitive verbs do not form a homogenous class. Instead, intransitive verbs divide into two subclasses, unaccusative or unergative verbs. The unaccusative/unergative distinction in German can be borne out by a number of well-established linguistic tests.

1.1   Perfect auxiliary selection

Like unergatives (1a), MVs select *haben* as an auxiliary in perfect formation (1b)-(1d).

(1)   a.   *Peter   hat   gesungen.*
           Peter   have.AUX   sing.PRES.PERF

   b.   *Die   Tablette   hat   gewirkt.*
        the   pill   have.AUX   take effect.PRES.PERF

   c.   *Die   Wunde   hat   geblutet.*
        the   wound   have.AUX   bleed.PRES.PERF

   d.   *Das   Uran   hat   gestrahlt.*
        the   uran   have.AUX   radiate.PRES.PERF

1.2   Impersonal Passive

Unlike unergatives (2a) but like unaccusatives (2b), no impersonal passive can be formed (2c)-(2e)

Roßdeutscher, A. (ed(s).): Ontology and Argument Structure (SinSpec10)
Working Papers of the SFB 732 *Incremental Specification in Context*,
University of Stuttgart, 2013: 24 – 37

(2) a. *Es wurde   gesungen.*
         it   be.AUX.PASS   sing

     b. **Es wurde   gebrochen.*
         it   be.AUX.PASS   broken

     c. **Es wurde   gewirkt.*
         it   be.AUX.PASS   taken effect

     d. **Es wurde   geblutet.*
         it   be.AUX.PASS   bleed

     e. **Es wurde   gestrahlt.*
         it   be.AUX.PASS   radiate

1.3   No middles

Unlike unergatives (3a), no middle construction is possible (3b)-(3d)

(3) a. *Das Lied singt sich   leicht.*
         the   song sings REFL   easily.

     b. **Die Tablette wirkt   sich   leicht.*
         The   pill   takes effect REFL   easily.

     c. **Die Wunde blutet sich   leicht.*
         The   wound bleeds REFL   easily

     d. **Das Uran strahlt sich   leicht.*
         The   uran   radiates REFL   easily.

1.4   Adjectival use of the perfect participle

Like unergatives (4a), no adjectival use of the perfect participle is possible (4b) - (4d)

(4) a. **Der gesungene Peter*
         the   sung   Peter

     b. **Die gewirkte Tablette*
         the   effected   pill

     c. **Die geblutete Wunde*
         the   bleeded   wound

     d. **Das gestrahlte Uran*
         the   radiated   uran

1.5   Resultative constructions

Unlike unergatives (5a), a reflexive in object position does not allow for a resultative construction (5b)-(5d)

(5) a. *Peter sang sich   heiser.*
         Peter sang REFL hoarse.

     b. **Die Tablette wirkte   sich   gesund.*
         The pill   took effect REFL healthy.

     c. **Die Wunde blutete   sich   voll.*
         The wound bleeded REFL full.

     d. **Das Uran strahlte sich   tot.*
         The uran   radiated REFL dead.

Unlike unaccusatives (6a), no resultative construction is possible (6b)-(6d), (7a)-(7d)

(6) a. *Die Schachtel brach auf.*
         The box   broke open.

     b. **Die Tablette wirkte   aus.*
         The pill   took effect out.

     c. **Die Wunde blutete   aus.*
         The wound bleeded out.

     d. **Das Uran strahlte tot.*
         The uran   radiated dead.

(7) a. *Peter brach die Schachtel auf.*
         Peter broke the box   open.

     b. **Die Tablette wirkte   den Patienten gesund   .*
         The pill   took effect the   patient   healthy.

     c. **Der Metzger blutete   das Tier   aus.*
         The butcher bleeded the animal out.

     d. **Das Uran strahlte den Arbeiter tot.*
         The uran   radiated the   worker   dead.

   But: a dispositional "result state" can be diagnosed with a dispositional adjective

(8) a. *Die Tablette wirkte   tödlich.*
         The pill   took effect lethally.

     b. *Die Wunde blutete gefährlich.*
         The wound bleeded dangerously.

     c. *Das Uran strahlt   gefährlich.*
         The uran   radiated dangerously.

That no result state can be diagnosed suggests that MVs are mono-eventive.

1.6 Nominalization

Unlike unergatives (9a) but like unaccusatives (9b), eventive *-ung* nominalizations can be formed (9c)

(9) a. **Die** *Singung   des   Lieds*
       The sing.UNG the.GEN song

   b. **Die** *häufige Fütterung des   Löwen*
      The frequent feed.UNG the.GEN lion

   c. **Die** *konstante Wirkung   der   Tablette*
      The constant   effect.UNG the.GEN pill

This stands in contrast to the predictions that have been made in the literature for the formation of event nominalizations in general and *-ung* nominalizations in particular. On the one hand, "[i]t has been noted in the literature that across languages event nominals are [. . .] derived from unaccusative predicates, but not from unergative ones" (Alexiadou, 2001, p.78), on the other hand, "a verbal construction has an *-ung* nominalization if and only if the verb is constructed bi-eventively." (Roßdeutscher, 2010, p. 106).

1.7   Genitive interpretation in nominalization

Unlike *-ung* nominalizations formed from unaccusatives no theme interpretation of the genitive adjunct is possible.

(10) a. **Die** *Fütterung des   Löwen   durch den Pfleger   wird*
        The feed.UNG the.GEN lion.THEME by   the carer.AGENT is
        unterbrochen.
        interrupted.

   b. **Die** *Wirkung   der   Tablette (*durch-PP) wird behindert.*
      The effect.UNG the.GEN pill   (*by-PP)   is   impeded.

   c. **Die** *Blutung   der   Wunde (*durch-PP) wird gestoppt.*
      The bleed.UNG the.GEN wound (*by-PP)   is   stopped.

   d. **Die** *konstante Strahlung   des   Urans (*durch-PP)*
      The constant   radiate.UNG the.GEN uran   (*by-PP)

The genitive adjuncts in (10b)-(10d) have argument status because the nominalizations have a complex event reading as shown by the possibility of aspectual modification according to Grimshaw (1990); Ehrich and Rapp (2000). *behindern, stoppen, konstant* select for complex events. No theme interpretation of the genitive adjunct is possible and no agent or causer can be introduced with a *durch*-PP, contra lexicalist predictions Ehrich and Rapp (2000); Solstad (2010); Bücking (2012); Dölling (2013). E.g., it has been argued that event (i.e. telic) *-ung* nominalizations allow only for the theme theta role, process (i.e. atelic) nominalizations allow also for the agent theta role (Ehrich and Rapp, 2000, cf. p. 268). Or, with respect to the base verbs, for telic base verbs of *-ung* nominalizations the genitive relation is preferably interpreted as theme, atelic base verbs allow for theme and agent interpretation of the genitive relation (Bücking, 2012, cf. p. 171)

1.8   Productivity

-ung formation from MVs is productive as exemplified in (11)

(11) a. *Für mein Brot mache ich eine Kühlschrank"Gehung" über Nacht.*
          for my bread make I a fridge-prove.UNG over night

   http://bfriends.brigitte.de/foren/rezeptideen/55358-was-kocht-und-backt-ihr-zu-ostern-6.html

2 Dispositions

The non-uniform behaviour of medium verbs with respect to the unaccusative/unergative distinction raises the question for why they seem to escape this central distinction. I propose to approach the data on MVs presented in section 1 under the assumption that the unaccusative/unergative distinction does not take into account that there is another type of causality than the dichotomic split between internal and external causation which is central to the unaccusative/unergative distinction. That is, the DP argument of unergative verbs is an agent or causer wrt. to the eventuality described by the verb whereas the DP argument in unaccusative verbs is a theme or patient wrt. the eventuality described by the verb. Both agents and themes pertain to a type of unconditional causality; an agent or causer causes an event which affects a theme or patient and a theme or patient undergoes a change of state initated by an agent or causer. But in MVs there is a type of conditional causality involved which is usually expressed by adjectives such as *fragile*. A vase is fragile it it has the disposition to break when shuttered. Or, more general, x has the disposition to p if C iff it would p if C were the case. (Simple Conditional Analysis (SCA) of Dispositions, Choi (2012)). As internal dispositional causal powers such as the effect of a pill depend on external causal powers, arguments in medium verbs are neither exclusively agentive nor thematic. Instead, they conflate both types of causality and theta roles in what I call a *medium*. E.g., for the case of *wirken*, a pill "causes an event or change of state in another participant"(Dowty, 1991, p. 572) – the effect of the pill – while at the same time a pill is "causally affected by another participant" (Dowty, 1991, p. 572) – it takes effect only when ingested. Dispositions straightforwardly explain why medium verbs fall square within the distinction between unergative and unaccusative verbs when this distinction is based on the different role that the DP argument of these verbs realizes: in Kratzerian jargon (Kratzer (1996)), the argument of a medium verb is both external to the dispositional property which it bears and internal to the instantiation of the disposition as an event. Teasing apart these two functions of medium arguments in a principled manner that gets the data right and preserving the distinction between unergatives and unaccusatives at the syntax-semantics interface is the goal of the next sections.

## 2.1 Syntax of medium verb and their nominalizations

In frameworks such as Distributed Morphology (Halle and Marantz (1993)), it is assumed that verbs have a syntactic structure which is built from a combination of two distinct functional layers with a root. A root is a terminal node that is responsible for the introduction of a core lexical meaning and is represented as $\sqrt{root}$. The "verbalizer" v-layer that is responsible for the introduction of events to the verb semantics (Harley (1995)) and the syntactic localization of internal arguments in the specifier position of the complement of vP. The $Voice$-layer is responsible for the introduction of external arguments

in its specifier position via the principle of event identification (Kratzer (1996)). Then, the distinction between unaccusative and unergative verbs corresponds to a difference in construction. Unaccusative verbs host only a v merging with root but unergative verbs host a v-layer which is selected by Voice. The data in section 1 suggests that none of these two options is right for medium verbs. Instead, the syntactic structure that I propose for medium verb such as *wirken* is the one given in (12). In (12), vP selects for VoiceP and consequently, the argument DP is in a position in which both vP and Voice assign their theta roles. A uniqueness constraint of theta-role assignment however, is not implied by the split vP hypothesis. Consequently, the structure in (12) gives rise to a novel theta role which I call the medium theta role. It is defined as follows.

- A medium theta role is assigned to DPs which are in the specifier of Voice *and* in the specifier of the complement XP of vP.

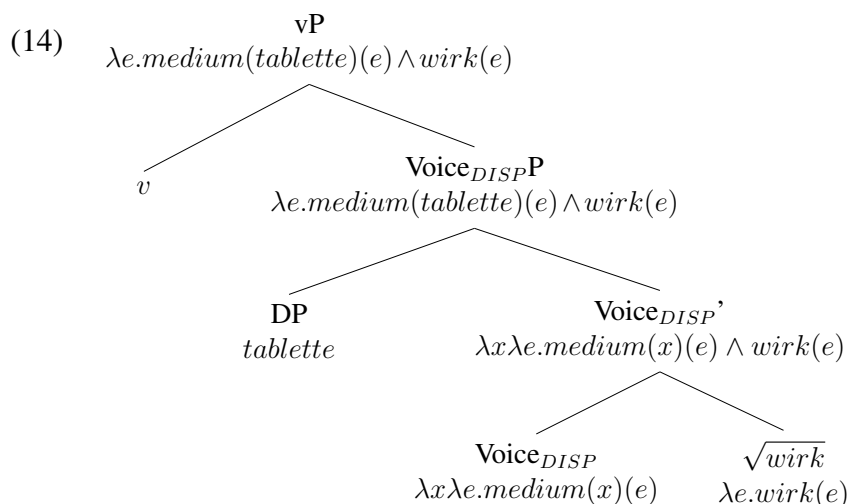(12)
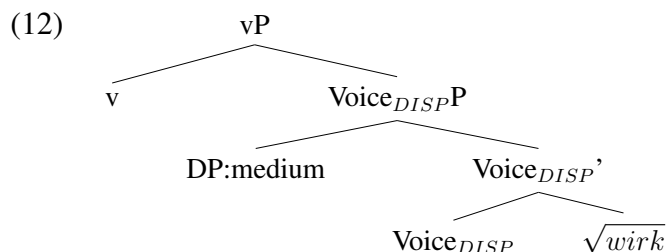
Under the assumption that in "a 'pervasive syntax' approach to morphologically complex forms, like that of Distributed Morphology, the analysis and structures proposed for a form must also be contained within the analysis of any structure derived from that form" (Harley, 2009, p.320), the DN *-ung* nominalization of a MV has an analysis as in (13)

(13)
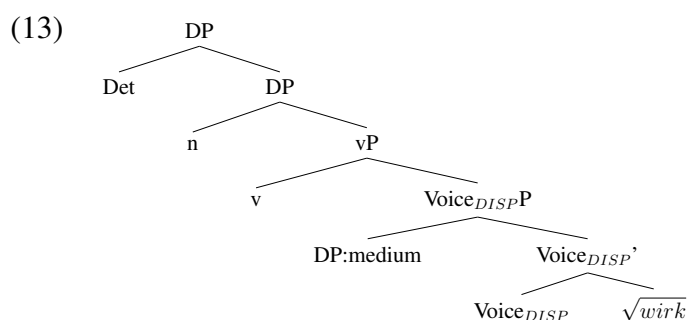
(12) and (13) already get most of the syntactic issues involved in the data in section 1 right. Selection of *haben* as an auxiliary in perfect formation is predicted by the occurence of Voice, which is distinctive for unergative verbs. Most importantly, no impersonal passive and no (reflexive) middles can be formed from MVs because Voice has been determined as dispositional. Finally, no agent/causer introduction with *durch*-PPs in the *-ung* nominalization is possible because the external argument position is already occupied.

2.2 Semantics of medium verbs and their nominalizations

Given the apparent success of (12) in the explanation of the data, it stands to question what the appropriate semantic interpretation for the structures in (12) and (13) is. A first attempt at a compositional semantics for medium verbs employing Kratzerian event identification Kratzer (1996) would be the one given in (14).

(14)
$$
\begin{array}{c}
\text{vP} \\
\lambda e.medium(tablette)(e) \wedge wirk(e)
\end{array}
$$

- v
- $\text{Voice}_{DISP}\text{P}$: $\lambda e.medium(tablette)(e) \wedge wirk(e)$
  - DP : *tablette*
  - Voice_{DISP}' : $\lambda x \lambda e.medium(x)(e) \wedge wirk(e)$
    - Voice_{DISP} : $\lambda x \lambda e.medium(x)(e)$
    - $\sqrt{wirk}$: $\lambda e.wirk(e)$

(14) certainly gets the remaining issue in the data right: there are no resultative constructions and no adjectival use of the participle for medium verbs because their construction does not make a result state available. But there are several reasons why (14) is on the wrong track. First, the *semantic* contribution of v is to introduce an event. But in (14), the event variable must be available for Voice in order to create the external argument position via event identification. Second, (14) is mono-eventive in Marantz (2005)' sense in that no state-denoting XP is available for selection by v but only an atelic event type $\lambda e.wirk(e)$. This would render Roßdeutscher (2010)'s prediction on *-ung* formation wrong, and, because the nominalization would denote an event, also Alexiadou (2001)'s general prediction on the formation of event nominals. In fact, the semantics in (14) can not do justice to the motivation for the identification of the medium theta role as a disposition. In (14) because there is no reference to a disposition. Instead, the semantics for v that I develop in the following sections combines mono-eventive and bi-eventive semantic construction types in a "medium construction type", in that v selects for a (telic) disposition-denoting XP as an atelic event type. This is much in line with Ryle (1949)'s analysis of *to hibernate* and its nominalization *hibernation* as dispositions. Ryle argued that dispositions are "inference-tickets, which license us to predict, retrodict, explain and modify [. . .] actions, reactions and states. ." (Ryle, 1949, p. 124). I propose an analysis of MVs and DNs at the syntax-semantics interface in which events are inferred from the instantiation of dispositional properties.

Note that (15a) - (15c) are english DNs but I focus on German data in the following.

(15) a.   The hibernation of the bear (*by-PP) was interrupted

   b.   The constant ulceration of the wound (*by-PP)

   c.   The constant vibration of the car (*by-PP)

2.3   The semantics of little v in medium constructions

The semantic characterization of the medium theta role that I gave is to be the medium of a disposition. Recall the SCA analysis in (16)

(16) x has the disposition to p if $C \leftrightarrow x$ would p if C were the case.

For the characterization of the predicate *wirken*, the idea in the following is to exploit the biconditional characterization of dispositions to the end that v in a medium construction type infers an atelic event – the pill's taking effect – from the dispositional property of the pill to take effect if ingested. This inference is supported by (16) in that the biconditional characterizes a dispositional property (the left hand side of (16), SCA-L) as a counterfactual event description (the right hand side of (16), SCA-R). If we try to make this distiction more precise by substituting property and event denotations on the left resp. right hand side of the biconditional, a semantic asymmetry arises. The pill's disposition to take effect can be characterized in terms of a counterfactual event of taking effect if ingested (SCA-L). But the event of the pill's taking effect can not be similarly characterized in terms of the pill's dispositional property to take effect if C.

SCA-L $\lambda x \lambda p.wirken(p) \wedge medium(x) \equiv x$ would take effect if C were the case

SCA-R $\lambda x \lambda e.wirken(e) \wedge medium(x) \equiv x$ has the disposition to take effect if C (a dispositional event?).

The reason that SCA-R is strange is that the dispositions expressed by medium verbs are necessarily instantiated by their triggering conditions. That is, a pill does not have the disposition to take effect if C, it takes effect if C. This is different for dispositional properties expressed by adjectives. A vase that is fragile can break when shuttered but a pill takes effect when ingested. That is, not any shuttering of the vase breaks it but any ingestion of the pill activates its disposition to take effect. Consequently, the dispositions expressed by MVs are not "easy possibilities" in the sense that adjectival *fragile* means "can break easily" (Vetter (forthcoming)). Verbal *to take effect* does not mean "can take effect easily" but "does take effect if C" and this is the correct characterization of the event expressed by the medium verb. There are no "dispositional events" but only events which result from the instantiation of a disposition. Thus the correct formulation of the right hand side of the SCA for event denotation of MVs is SCA-R'.

SCA-R' $\lambda x \lambda e.wirken(e)(x) \wedge medium(x) \equiv x$ takes effect if C (an event).

Furthermore, dispositions can only be instantiated once, and once they are instantiated, they result in complex events. I use linear logic implication $\multimap$ and the dynamic box operator $[]$ to model the causal relation between MV dispositions and MV events (see e.g. Steedman (2002) for an overview). $[]$ semantically represents a necessary causal accessibility relation between possible worlds. An example for the usage of $\multimap$ and $[]$ is the modelling of the consequences of actions. If something is shut and you push it, it becomes open: $shut(x) \multimap [push(x)]open(x)$. Applied to dispositions, this means that the ingestion of a pill leads you from a state in which the pill has the dispositional property to take effect if ingested to a state of affairs in which the pill takes effect. Linear

logic implication says that once you apply the rule, the proposition in question is "used up", i.e. the antecedent of the inference rule is removed from the database and only the result state is available. Formally, the inference from dispositions to their instantiations can be represented as in (17), employing a Lewis-style analysis of counterfactuals (Lewis (1973)).
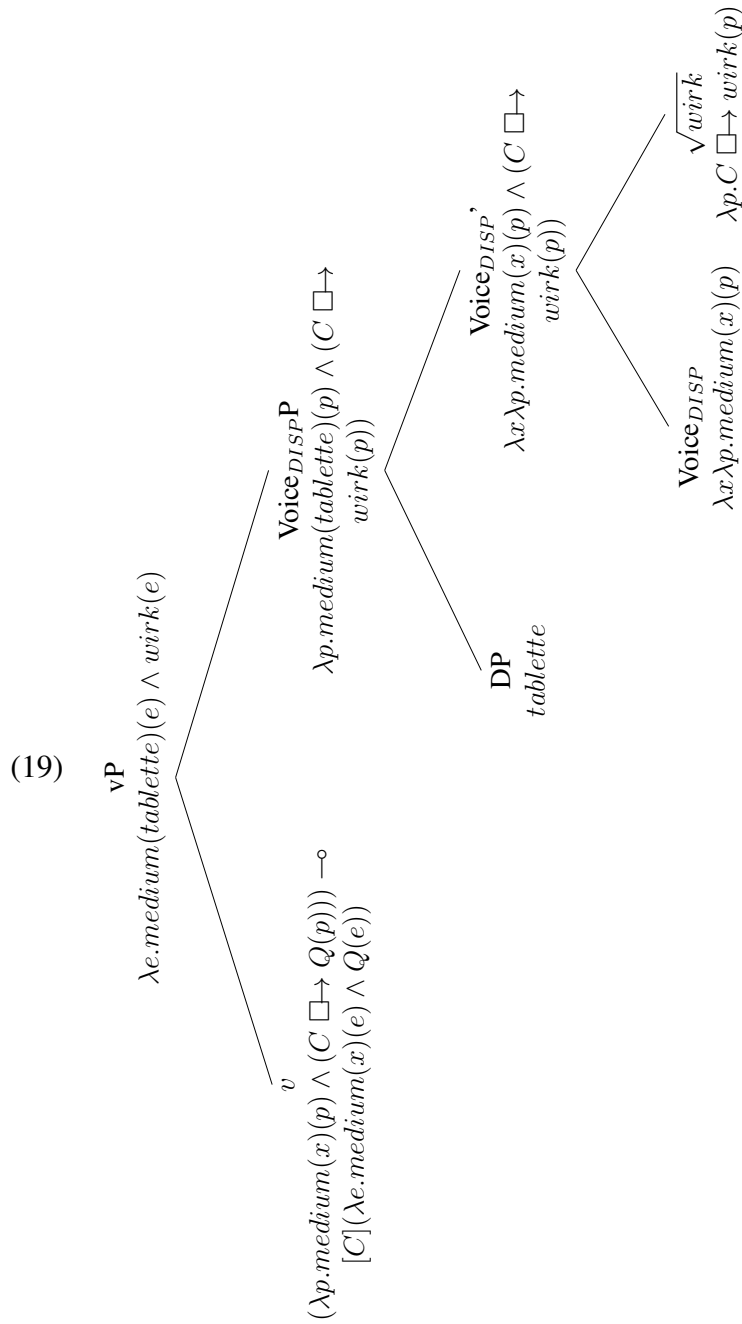
(17) a. $(\lambda p.medium(tablette)(p) \wedge (ingest(tablette) \; \Box\!\!\rightarrow wirk(p))) \multimap [ingest(tablette)]$
          $(\lambda e.medium(tablette)(e) \wedge wirk(e))$.

     b. "If a pill would take effect if it were ingested then, when it is ingested it takes effect."

A general proposal for an instantiation scheme for dispositions that introduces events is given in (18).

(18) a. $(\lambda p.medium(x)(p) \wedge (C \; \Box\!\!\rightarrow Q(p))) \multimap [C](\lambda e.medium(x)(e) \wedge Q(e))$.

     b. "If a medium would p if it were the case that C then, when C it ps."

2.4 Semantic construction for medium verb

I propose that medium verb are ontologically different from their nominalizations in that medium verb denote events (i.e. instantiations of dispositions) whereas their nominalizations denote uninstantiated dispositions. Then, the function of little v in verbal constructions is to identify the disposition predicated of the medium as denoting an event when instantiated, i.e. iff $[C]$ is applied to the dispositional property. This leads to a semantics of v in which v derives a mono-eventive structure in that v instantiates a disposition as an atelic event but v derives also a bi-eventive structure in that v selects a disposition (roughly corresponding to a property/state) denoting XP (i.e. Voice$_{Disp}$P). This is in accordance with the prediction on *-ung* formation made by Roßdeutscher (2010). Voice identifies the medium of the dispositional property instead of the agent of an event but disposition identification is parallel to Kratzerian event identification. There are other options for the semantics of v, e.g. that v does not instantiate the disposition but that this is done by e.g. Tense or modifiers and that consequently the disposition reading of verbs is the basic reading. I won't explore these other options here. I propose that medium verbs have a bi-eventive construction which is selected by v as an atelic event type via disposition instantiation, i.e. they have a medium construction as in (19).
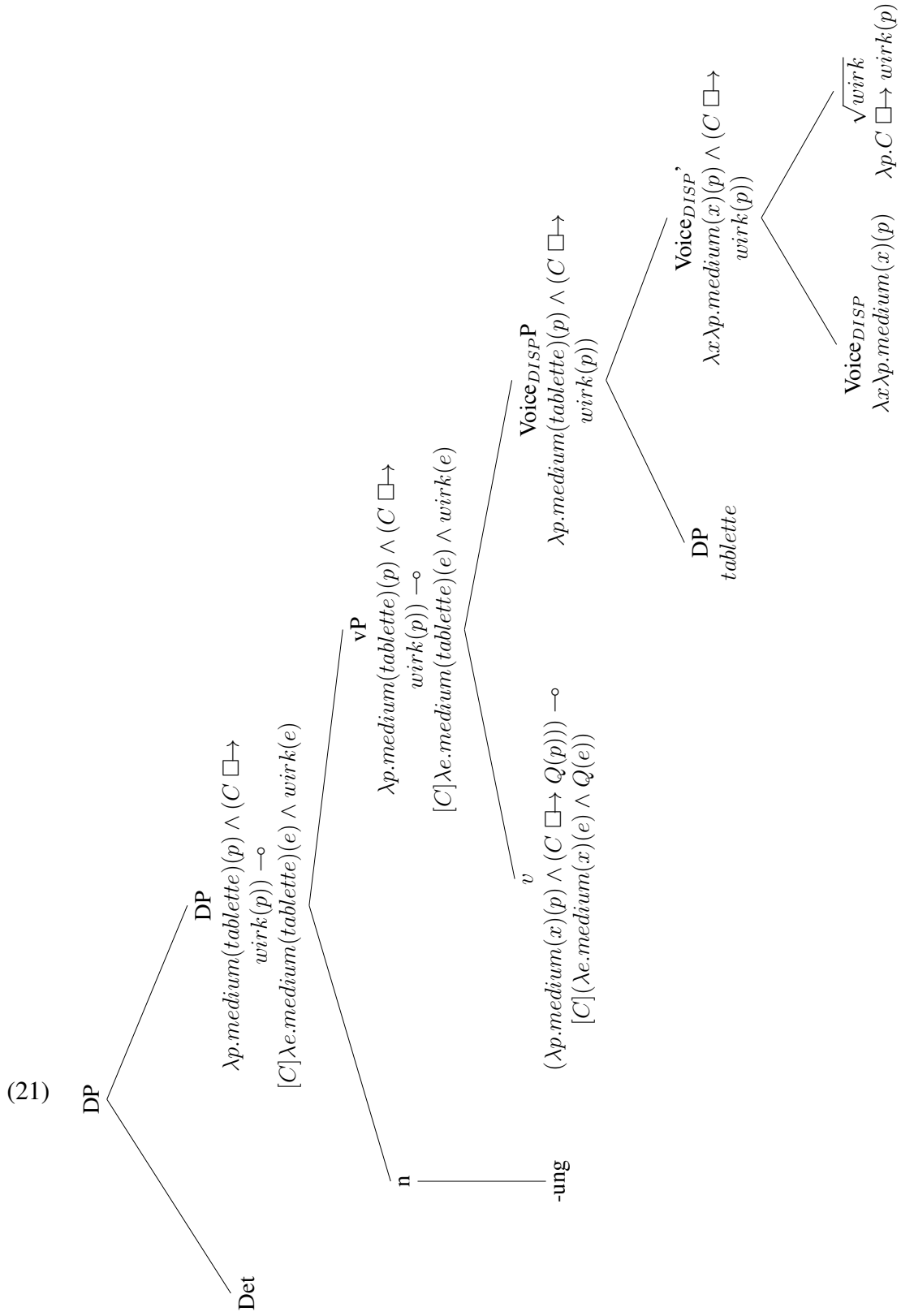
(19)

vP
$\lambda e.medium(tablette)(e) \wedge wirk(e)$

v
$(\lambda p.medium(x)(p) \wedge (C \,\square\!\!\rightarrow Q(p))) \multimap [C](\lambda e.medium(x)(e) \wedge Q(e))$

$\text{Voice}_{DISP}P$
$\lambda p.medium(tablette)(p) \wedge (C \,\square\!\!\rightarrow wirk(p))$

DP
tablette

Voice_{DISP}'
$\lambda x \lambda p.medium(x)(p) \wedge (C \,\square\!\!\rightarrow wirk(p))$

Voice_{DISP}
$\lambda x \lambda p.medium(x)(p)$

$\sqrt{wirk}$
$\lambda p.C \,\square\!\!\rightarrow wirk(p)$

2.5 Semantic construction for Dispositional Nominalizations

As for MVs, two options for the semantics of v in DNs seem possible; either v instantiates the disposition or not. I propose that in DNs, the disposition is not instantiated but the semantics of DNs "waits" for C to be contextually supplied at a level above NP as part of a selection restriction for a complex event. This rehabilitiates the generalization of Alexiadou (2001) as DNs are not eventive because they have a medium construction in which the disposition is not instantiated. Again, there are other options available, e.g.

that v instantiates the event also in DNs. But data as in (20) suggests that in nominalizations, v does not instantiate the dispositions. In (20a)), no event seems to be introduced by *Wirkung* on its own and that is why the localization of an event fails. But once the disposition denoted by *Wirkung* is explicitly instantiated as in (20b)), the event can be localized. However, I consider the diagnosis of event denotation an open research question, see the other article in this volume.

(20) a. ?*Die   Wirkung   der   Tablette fand sofort   statt.*
         the   effect.UNG   the.GEN   pill   took immediately place

     b. *Die   Wirkung   der   Tablette trat   sofort   ein.*
         the   effect.UNG   the.GEN   pill   occured immediately

(21)

DP

- Det
- DP
  $\lambda p.medium(tablette)(p) \wedge (C \,\square\!\!\rightarrow wirk(p)) \multimap [C]\lambda e.medium(tablette)(e) \wedge wirk(e)$
  - vP
    $\lambda p.medium(tablette)(p) \wedge (C \,\square\!\!\rightarrow wirk(p)) \multimap [C]\lambda e.medium(tablette)(e) \wedge wirk(e)$
    - n — -ung
    - v
      $(\lambda p.medium(x)(p) \wedge (C \,\square\!\!\rightarrow Q(p))) \multimap [C](\lambda e.medium(x)(e) \wedge Q(e))$
    - Voice$_{DISP}$P
      $\lambda p.medium(tablette)(p) \wedge (C \,\square\!\!\rightarrow wirk(p))$
      - DP
        tablette
      - Voice$_{DISP}$'
        $\lambda x \lambda p.medium(x)(p) \wedge (C \,\square\!\!\rightarrow wirk(p))$
        - Voice$_{DISP}$
          $\lambda x \lambda p.medium(x)(p)$
        - $\sqrt{wirk}$
          $\lambda p.C \,\square\!\!\rightarrow wirk(p)$

3   Summary

I propose an analysis of a class of strictly intransitive German verbs and their *-ung* nominalizations in which the argument position bears medium theta status in that it conflates a combination of proto-agentive and proto-thematic properties in a dispositional property. I argued that dispositions are coded syntactically and realized semantically in a setting where v selects for a disposition denoting Voice$_{Disp}$P as an atelic event.

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