

Polyvalent Verbs

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Abstract

Polyvalent verbs can be combined with different sets of complements. The variation concerns both number and type of the complements. In most grammar theoretical frameworks, verbs are of crucial importance for the syntactic structure and semantic interpretation of clauses. They determine via subcategorization frames how many complements of which type are realized. Polyvalence is therefore an unexpected phenomenon. A discussion of several approaches in generative grammar results in the claim that subcategorization is not very useful for the explanation of polyvalence. In the second chapter, a model for the conceptual-semantic interpretation of verbs and clauses is developed that takes polyvalence into account: the conceptual-semantic interpretation of clauses with polyvalent verbs is determined by the verb and complements together. Thematic interpretation is viewed as an inferential process that is embedded within the general conceptual-semantic interpretation processes, not their prerequisite.

Keywords:

polyvalence, valence, argument structure, subcategorization

Zusammenfassung

Polyvalente Verben können mit unterschiedlichen Konstituentenmengen kombiniert sein, wobei deren Zahl und Art variieren. In den meisten Grammatikschulen sind Verben zentral für syntaktische Gestalt und semantische Interpretation von Sätzen. Sie bestimmen über ihre Subkategorisierungsrahmen, wieviele Komplemente welchen Typs im Satz realisiert werden. Daher ist Polyvalenz ein unerwartetes Phänomen. Eine Diskussion verschiedener Ansätze der generativen Grammatik ergibt, daß Subkategorisierung für die Erklärung von Polyvalenz ungeeignet ist. Im zweiten Kapitel wird ein Modell für die konzeptuell-semantische Interpretation von Verben und Sätzen entwickelt, das dem Rechnung trägt: In Sätzen mit polyvalenten Verben bedingen die Komplemente des Verbs zusammen mit dem Verb die konzeptuell-semantische Interpretation. Die thematische Interpretation wird als inferentieller Prozeß angesehen, der keinen Spezialfall allgemeiner konzeptuell-semantischer Interpretationsprozesse darstellt, sondern vielmehr in diese eingebunden ist.

Schlagwörter:

Polyvalenz, Valenz, Argumentstruktur, Subkategorisierung

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Introduction

The topic of this dissertation is the phenomenon of *polyvalent verbs* in German. Sometimes also the term (*variable*) *polyadicity of verbs* is used. I will use the first notion without implying thereby that I place my work into the theoretical framework the notion *polyvalence* stems from. During my research I found that all contemporary models of grammar face relatively serious problems, when dealing with the phenomenon. However, the tradition I am most familiar with is generative grammar, and most of the discussion will be related to theories developed within this framework. In the presentation of the phenomena I will use the terminology that is common in generative grammar.

A polyvalent verb is a verb that can be combined with different sets of constituents – where the notion ‘constituent’ for now does not reflect lexical content of the constituents, but rather exclusively their morphosyntactic features like syntactic category, inflection, case etc. We will later see that it is not unproblematic to abstract from the lexical-semantic content of a constituent.

A good example of a polyvalent verb is the German verb *rollen*. An incomplete sample of valence possibilities is listed below (on the right hand side the respective sets of constituents):²

- | | | | |
|-----|----|---------------------------------------|----------------|
| (1) | a. | Der Ball rollte | NOM |
| | | The ball rolled | |
| | b. | Der Ball rollte unter den Tisch | NOM;DIR-PP |
| | | The ball rolled under the table | |
| | c. | Maria rollte den Ball unter den Tisch | NOM;ACC;DIR-PP |
| | | Maria rolled the ball under the table | |
| | d. | Josef rollte eine Wurst | NOM;ACC |
| | | Josef rolled a sausage | |
| | e. | Kaspar rollte die Wurst rund | NOM;ACC;AP |
| | | Kaspar rolled the sausage round | |

²NOM = nominative, ACC = accusative, DIR-PP = directional prepositional phrase, AP = adjectival phrase. The classification of constituents follows standard methods.

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I assume that these principles are conceptual-semantic in nature. The overall ratio is that a verb-complement combination is licensed, *if it has a plausible conceptual-semantic interpretation*, i.e. if it does not yield ‘non-sense’. Thus, an important part of the theory to be developed here concerns the *semantics of case forms and constructions*, a topic that was rarely discussed in generative grammar until the occurrence of *construction grammar* (see Goldberg (1995) for an overview). In construction grammar case forms and construction types (like ‘transitive construction’, ‘resultative construction’, ‘dative construction’ etc.) are treated on a par with lexemes. The compositional semantics can apply in the usual way, though with different kinds of entities.

The reason why this thesis is not based on construction grammar lies in another empirical phenomenon that can be observed with polyvalent verbs. It has to do with what Dowty (1986, 1989, 1991) called *individual theta roles*. Dowty claims that the notions of universal theta roles that are mostly used in theories of thematic interpretation (like ‘agent’, ‘patient’, ‘theme’ ‘goal’ etc.) only make sense, if we consider them as ‘abstractions’ over the concrete thematic roles provided by individual lexical items, e.g., the verb *rollen* in our example has one ‘individual’ role to assign, that of the entity that rolls, call it R.

A theory of thematic interpretation has to show in the end, how the *individual* roles are assigned. Universal roles are ‘intermediate’ categories without independent foundation. It now turns out that the assignment of individual roles of polyvalent verbs can still vary, when they are combined with the same construction type. Consider the following examples of resultative constructions with *rollen* – the right column indicates the ‘linking’ of the role R is indicated:

- | | | | |
|-----|----|---|-----------|
| (4) | a. | Die Kugel rollte die Kegel um
The shot rolled the pins down | R=SUBJECT |
| | b. | Josef rollte die Kugel um
Josef rolled the shot away | R=OBJECT |
| | c. | Er rollte die Kegel mit der Kugel um
He rolled the pins with the shot down | R=OBLIQUE |

rules, *or* from an idiosyncratic lexical entry. Whether a verb is classified as polyvalent or not, depends on its *flexibility* with respect to complementation. A verb that can only occur in a transitive clause, should be treated as idiosyncratic. A verb that can occur in transitive and several other patterns of complementation is polyvalent. Some verbs are more flexible than others. So polyvalence could be considered as a gradient property. However, I will propose that the variable flexibility of polyvalent verbs results from the general complementation rules to be explored.

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- d. Josef rollte den Teig aus R= \emptyset
Josef rolled the dough out

If the only entities we deal with were constructions and verbs, we would expect that the linking pattern for R did not vary that much. Examples like these convinced me that the relation between syntactic complements and semantic arguments is much more indirect than traditional theories assume. Even in construction grammar this dimension of the problem is not reflected.

I view thematic interpretation as an *inferential process* that takes into account the clause as a whole, and is thus *embedded* in the more general processes of conceptual-semantic interpretation. Earlier generative accounts of thematic interpretation assume thematic interpretation to be ‘prior’ to these processes, and they often connect the issue of thematic role assignment very closely with syntactic processes. In Chomsky’s influential “Lectures on Government and Binding” (Chomsky 1981) the *Theta Criterion* – which stated that each verbal complement has to be assigned a thematic role by the verb and that each thematic role of the verb has to be assigned – is introduced as a constraint on the *syntactic well-formedness* of a clause, not just as a semantic constraint. In principle, this view is still held by most generative grammarians. It entails a specific view on the relation between the ‘syntactic arity’ and the ‘semantic arity’ of a verb that, as I see it, faces big problems when applied to phenomena of polyvalence.

For all these reasons I tried to develop a different proposal on *thematic interpretation as a general inferential process of conceptual-semantic interpretation*. This proposal is the topic of the second chapter.

The first chapter discusses two types of theories of subcategorization and thematic interpretation – the two most widely used theoretical strategies in contemporary generative grammar. Of main interest will be how they deal, or might be able to deal, with polyvalence and which kinds of problems occur. This discussion will also present a more detailed introduction to the phenomena at issue.

Chapter 1

Polyvalence, Subcategorization and Thematic Interpretation. A Critical Overview

Dowty (1989) sorted the currently debated theories of the relation between the semantic and syntactic arguments of predicates (first of all verbs) into two types. The first type Dowty called *ordered argument theories*. Theories of this type assume a homomorphism between the sets of semantic and syntactic arguments of a predicate, or at least a well-defined mapping algorithm between them. Without it, there could not be any mode of semantic interpretation. The best elaborated theory of this type is Categorical Grammar, combined with Montague Semantics. But also Head Driven Phrase Structure Grammar (HPSG) is of this sort, and Lexical Functional Grammar (LFG). Likewise, all theories developed in the realm of generative syntax inspired by the work of Chomsky are of this sort.

The second type of theories can do well without such mapping algorithms. Dowty called them '*Neo-Davidsonian*' *theories of thematic relations*. The main proponent of this type is Parsons (1980, a.o.).

The central problem for the analysis of polyvalence in ordered-argument theories is, how to keep the mapping algorithm between syntactic and semantic arguments flexible enough to capture polyvalence, and restrictive enough to capture the restrictions that occur with other verbs.

Neo-Davidsonian theories may not have problems to explain the semantics of polyvalence phenomena. But they depend on a sufficiently well elaborated and restricted set of universal thematic relations that take the place of the mapping algorithm here. This is problematic for several reasons, first of all because the conception of universal thematic roles is very questionable. We will come to this class of theories in section 1.2. I want to start with ordered-

argument theories, which are also more traditional.

1.1 Ordered-Argument Theories of Thematic Relations

Dowty (1989, 73f) gives the following by and large self-explanatory description of how he understands the term ‘ordered-argument theory’:

[...] An ordered-argument system treats a verb as an unsaturated predicate wanting a particular fixed number of arguments to form a formula. Semantically, a verb denotes an n -place relation, and when the denotations of the proper number of arguments are combined with the relation in an appropriate way, then a truth value is denoted, a proposition is expressed, or a situation is described (depending on which semantic theory you use); if too few argument denotations are made available, then no truth value (or proposition or situation) can result.

In this system, it is important that the syntactic and semantic rules be constructed to combine the argument-denotations with the verb denotation in a fixed arrangement determined by the syntactic arrangement (i.e. by the grammatical relations the arguments bear in the sentence in question), though that semantic arrangement is, in a sense, ultimately arbitrary. Arbitrary, because the choice of relations to be denoted by verbs is likewise open in this theory. The inverse of a two-place relation can carry information equivalent to that of the original relation (think about, e.g., *like* versus *please*), and similarly each of the permutations of an n -place relation can carry the same information. It doesn't matter which permutation we chose for a verb's denotation, as long as the compositional semantic rules match each syntactic argument of each verb with its appropriate semantic “slot” in the interpretation of that verb. (Since we want compositional rules to apply systematically to all verbs, our choice of permutation for one verb will of course fix the choice of permutation for all other verbs of equal or smaller adicity.)

In talking about an ordered-argument theory, I do not distinguish between syntactic analyses which combine a verb with all of its arguments “all at once” (as in the syntax of most formal logics) or one at a time (as in categorial grammars and many versions of Montague Grammar), thus treating the denotations of verbs

as function-valued functions (so-called “furried” functions), both are ordered-argument theories. [...]

Three claims made by ordered-argument theories are especially important for the following discussion:

1. Verbs are unsaturated predicates of a specific fixed arity.
2. Syntactic and semantic rules combine argument and verbs in a *fixed* arrangement.
3. This arrangement is chosen arbitrarily.

The analysis of polyvalence phenomena poses problems for these three claims:

- ad 1. Polyvalent verbs can vary drastically in their syntactic arity.
- ad 2. Polyvalent verbs can vary in the way they combine with their arguments.
- ad 3. For many complement types (i.e. NPs with a specific case, complement clauses of a specific type) we can observe a systematicity in their mode of semantic interpretation that is independent of the verb.

The subsequent sections will give examples for each of these problems, and discuss their theoretical consequences and implications.

In this discussion, I will mainly use the example of Two-Level-Semantics, as developed by Manfred Bierwisch and his colleagues during the 1980s.¹ This theory has an interesting restriction that other ordered argument theories lack, namely, it is not allowed to proliferate lexical entries arbitrarily. If we assumed for each clause in (1) in the introduction that a different verb *rollen* is used and that all these verbs only quasi accidentally have the same phonetic form, then there would not be any problem. Polyvalence would perhaps not even exist for such a theory.

But a theory like this could hardly predict, let alone explain the semantic relations between these sentences. In all the events described by the sentences in (1) in the introduction there is some rolling going on. This can only follow from the verb used. But if the verbs in these sentences have a uniform semantic contribution to the meaning of the clause they occur in, then we have some semantic evidence that we might be dealing with the same verb here, not with six different ones. Two-Level Semantics, in principle, tries to take this evidence serious.² But before we turn to the details, I need to give a brief introduction to a central concept of ordered-argument theories.

¹Bierwisch (1983), Bierwisch (1986), Bierwisch & Lang (1987).

²At least under one interpretation. Cf. the discussion below.

1.1.1 Subcategorization

The problem that ordered-argument theories have with polyvalence is connected with the notion *subcategorization*: Since Chomsky's influential 'Aspects of the Theory of Syntax' (Chomsky 1965), where this notion was invented, lexical items are usually held to be the core of syntactic expressions, such that it lies in their responsibility, whether a phrase is grammatically well-formed. The fundamental observation that led to this claim was that very often lexical items have co-occurrence requirements. E.g., a determiner always requires a noun phrase complement to constitute a determiner phrase:

$$\text{DP} \rightarrow \text{D NP}$$

This is a phrase structure rule in the fashion of structuralist syntax. Phrase Structure rules have been part of syntactic descriptions in generative syntax up to the early 1970s. They have recently been revived by Generalized Phrase Structure Grammar (GPSG, Gazdar, Klein, Pullum & Sag 1985) and Head Driven Phrase Structure Grammar (HPSG, Pollard & Sag 1994).

Subcategorization was introduced to distinguish between category specific and lexeme specific phrase structure rules. The DP rule given above is a category specific rule because it holds likewise for all determiners. Lexeme specific rules *subdivide* a syntactic category into subcategories. To give one example, elements belonging to the syntactic category VERB are known to differ in the number of complements they require. Some take one, some two, some even more complements. Another important factor is the morphological marking of the complements. German prepositions usually take one complement, but they are subcategorized into a group that requires accusative case on the complement, another group that requires dative, a third group that allows for both, and a group that requires genitive.

Subcategorization rules in the first formulation of the theory (Chomsky 1965) only made sense in combination with a set of phrase structure rules that created the environments in question. If a verb had a subcategorization frame ' $_ Y Z$ ', the phrase structure rule component of the grammar had to have a rule ' $\text{VP} \rightarrow \text{V } Y Z$ ' to generate the environment the verb could be inserted in. Though descriptively satisfactory, this was too powerful a mechanism, and there was the redundancy of writing down each rule twice.

More specifically, there was no constraint on possible phrase structures. The situation in natural language syntax seems to be different. Phrases normally are headed, and from the character of the head many morpho-syntactic properties of the phrase follow. In former phrase structure grammar, a noun phrase structure could look like this: ' $\text{NP} \rightarrow \text{A P}$ '. Such structures never have been found. A noun phrase is called a noun phrase, simply because there is a

noun in it, and this noun is the central element of the phrase that determines its morphological and syntactic properties. Noun phrases are thus assumed to be ‘headed’ by nouns, verb phrases by verbs etc.

In generative syntax work of the early seventies the phrase structure rules component was simplified by a constraint that required that phrases are headed and that they are projections of their lexical head. Phrases are assumed to be projections of a certain level, i.e. the maximal level. E.g., VP is the maximal projection of V. In the first versions of these reformulations, there was no upper boundary for the number of levels, V projects to V', V' projects to V'', V'' projects to V''', and so forth (cf. Chomsky 1970). Chomsky (1986) reduced this number to two levels above the V⁰ level, so phrases of an arbitrary syntactic category X are now uniformly projected as follows:

$$XP \rightarrow YP^* X'; X' \rightarrow X^0 ZP^*,$$

where YP* and ZP* stand for 0 or more occurrences of maximal projections.

The task of the subcategorization rules now is determining which kinds of phrases are required in the positions of YP* and ZP*. The transitive verb *to love* requires a subject and an object, and hence the subcategorization rule for this verb could look like this:

$$\textit{love}: VP \rightarrow NP \text{ — } NP$$

It has become usual to say that “the verb ‘to love’ *subcategorizes* a direct object”. This is a somewhat different usage of the term ‘subcategorize’. The correct formulation would be ‘requires qua subcategorization frame’.

Polyvalent verbs can be seen as having multiple subcategorization frames – or no subcategorization frame at all, because listing all the frames it can occur in would equal listing all possibilities there are as such. The fewest verbs have such freedom, but many come quite close to it, and the list for a verb like *rollen* in our introductory example is terribly long.

Before I turn to this in more detail, I want to discuss subject selection, which is a special subcategorization property of verbs. This kind of subcategorization does not depend on the individual lexeme in German (as well as many other languages): whenever a verb is finite, there has to appear a subject in the clause, whenever the verb is non-finite, there must not be a nominative marked subject. But this, as I said, is a property of the whole syntactic category V. Nonetheless, we have an instance of subcategorization here. The syntactic category V is subcategorized into morphologically different forms – finite vs. infinite –, which differ in whether they require or

prohibit the presence of a complement in the nominative.³

As subject selection is correlated with the morphological feature [+finite], which in European languages often is expressed by an auxiliary and not by the matrix verb itself, it has become usual in generative grammar to distinguish the syntactic category V from its inflectional features that are now treated as a syntactic category of their own, called INFL, with its own maximal projection, IP. A finite INFL selects a subject. Likewise, INFL always selects a VP, independent of its finiteness. So the subject is no longer part of the subcategorization frame of V. But note that this is only so because of a *methodological decision*: we are treating a verb and its morphological features as two separate syntactic entities.⁴

This move has, as I alluded, something artificial: INFL cannot seriously be called independent of V; there is no INFL without V, but there might be V without INFL. The following is perhaps an example in case:

- (1) [Bohnen essen] macht Spass
 [beans eating] makes fun
 ‘eating beans is fun’

Though the bracketed VP functions as the subject of the clause, and thus should be nominal, the V-head of VP is still able to assign accusative which would be impossible, if the verb was of category N. There is no evidence, though, that V is accompanied by an INFL here.

Be this as it may, selection of the subject and other constituents have to be kept separate. Subjects are subcategorized by finite verbs, other complements are subcategorized by individual lexical items.

The subcategorization frame for a transitive verb like ‘to love’ now is: ‘love: — NP’. The occurrence of the subject is regulated by INFL.

Up to now, polyvalent verbs only pose the problem of having lots of different subcategorization frames with the same verb. A more serious problem arises with another standard assumption about verbs: it is mostly assumed that the subcategorization frame of a verb depends on its meaning. A standard assumption is that the number of semantic arguments – the semantic

³An exception are impersonal passive constructions that do not even allow an expletive subject, although they contain a finite verb:

- (i) daß (*es) getanzt wurde
 that (*it) danced was

⁴The obvious advantage of this decision is that the morphological difference between periphrastic and synthetic forms is irrelevant for syntactic representations. This is useful because they do not differ in their syntactic properties, e.g., third person forms like ‘went’ and ‘have gone’ both represent a finite verb.

arity – of a verb corresponds with the number of its syntactic arguments – the syntactic arity. One meaning of a verb is assumed to correspond with one subcategorization frame. The only variation that might occur, should result from omission of constituents. We saw that this is not everything that polyvalence is about.

As far as I can see, this problem is inherited from earlier linguistic traditions. When for example Frege (1891*a*) proposed that a verb can be treated as a function, he did not wonder whether this holds both for syntax and semantics or not. It was silently assumed that there is no need to distinguish a semantic notion of arity from a syntactic one. This assumption is formulated in its clearest form in *Categorial Grammar*, and its semantic correlate, *Montague Semantics*. But it was always part of several stages of the Chomskian version of generative grammar. It is essential both for LFG and HPSG.⁵

Nearly all grammar theories assume that whenever a verb requires the presence of a complement with a certain morphological marking, the same verb is also responsible for the semantic, or better: *thematic* interpretation of the complement.⁶

This background assumption can be made explicit in the following way (ignoring the possibility of several syntactic arguments being composed into one semantic argument, see footnote 5):

- I. A lexical entry of a verb ‘p’ consists a.o. of a semantic representation including a set of semantic arguments A, and a subcategorization frame represented by a set of constituents C, including information about the morphological marking of each $c \in C$.

⁵Though all of these theories allow the arities to differ in some restricted cases, as long as the mapping between syntax and semantics is ‘complete’, so to speak, and predictable. Examples in case are ECM-verbs that allow the subject of an embedded infinitive to be case-marked by the matrix verb. For example, the verb ‘to believe’ is semantically a 2-place relation in ‘Mary believes John to win a prize’. The two semantic arguments are ‘Mary’ and ‘John wins a prize’. Syntactically, though, we have three complements of the verb ‘to believe’: the subject ‘Mary’, the direct object ‘John’, and the infinitival complement ‘to win a prize’. A lexeme- or/and construction specific mapping algorithm tells how three syntactic arguments are conflated into the two semantic arguments of the verb. Such an algorithm is then assumed to hold for these constructions in general. The divergencies that can be found with polyvalent verbs are much more ‘irregular’. For example, there might be different linking patterns with one verb within the same construction, depending on the lexemes used as complements.

⁶The notions ‘thematic interpretation’ and ‘thematic role’ will play a crucial role throughout this thesis. To give an example, the verb ‘to love’ stands for a relation between a lover and a loved and the thematic interpretation is that the subcategorized direct object has the role of the loved, and the subject that of the lover.

- II. The cardinalities of A and C are equal: $|A| = |C|$
- III. The reason for II. is that A and C are related by a) an interpretation function I by means of which each element of C is paired with just one element of A, and b) a linking function L , by means of which each element of A is paired with exactly one element of C. Both I and L are thus one-to-one functions. Furthermore, I and L are the inverse functions of each other, because for any $c_i \in C$ and for any $a_i \in A$ the following holds: $I\langle c_i, a_i \rangle \iff L\langle a_i, c_i \rangle$.

For the discussion, let us take the example of the German two-place noun *Schwester* (sister). Nobody ever proposed that the two semantic arguments of this predicate have to be realized in a sentence, and that the way these arguments have to be realized is determined by an extra subcategorization frame in the lexical entry of the noun. It is easy to see that any such attempt could not be defended. Let us take a look at the following sentences. In (2-a,c-g) shall hold that Maria is Peter's sister:

- (2)
- a. Maria ist Peters Schwester
M. is P.'s sister
 - b. Peter hat eine Schwester
P. has a sister
 - c. Peter hat Maria als Schwester
P. has M. as sister
 - d. Hans sah Peters/*Marias Schwester
H. saw P.'s/*M.'s sister
 - e. *Marias Schwester von Peter
M.'s sister of P.
 - f. Hans brachte Peter zu einer Schwester
H. brought P. to a sister
 - g. Hans hat drei Schwestern. Maria besuchte eine der
H. has three sisters. M. visited one of the
Schwestern
sisters
 - h. Ein paar finstere Gestalten entführten dem Peter die
A couple of shady customers kidnapped the P.-DAT the
Schwester
sister
 - i. Hans übernachtete mit Peter bei einer Schwester
H. stayed overnight with Peter at a sister ('s place)

Let us assume for the semantics of *Schwester* a two-place relation between a female person f and another person x : f is the sister of x iff a) f is female and b) f and x have the same parents. How are f and x linked in (2)? In (2-a), x is the genitive attribute of the predicative nominal, hence part of the phrase built by the semantic predicate ‘sister’. f is realized outside of the phrase as matrix subject.

In (2-b), both x and f are realized ‘outside’. But in all the other cases the noun ‘sister’ is not used predicatively but rather as referent of its own argument f . So f cannot be realized syntactically any more (it is already, one might say). Are there any constraints to observe on the morpho-syntactic properties of x ?

As we can see, x can be realized as nominative, accusative, dative, PP. It can also even be a simple discourse referent, mentioned in the discourse preceding the actual sentence (2-g). This is the clearest indication that there is only a semantic constraint on the use of the predicate ‘sister’: it is useless to speak of a ‘sister’, without telling, whose sister she is. To get an interpretation, we need the actual value of x , but this is not guaranteed by a mapping algorithm, it is a genuine semantic condition. We see that from the fact that this condition can be fulfilled by non-syntactic interpretative inferences alone.

Theorists rarely propose subcategorization rules for nouns, but in the case of verbs they are the standard. What are the arguments in favour of this different treatment? First of all, the argument is empirical in nature. Consider that a verb like *gedenken* (‘to commemorate’) in German requires a genitive object. Genitive objects are very rare in German, so this is quite idiosyncratic. Using the verb without the object is rather odd:

- (3) ?Maria gedachte
M. commemorated

This may have the same semantic reasons as in the case of ‘Schwester’ above. Telling that someone commemorates without telling whom she commemorates is not very informative, one might say. But whenever the argument is realized, it has to be realized in the genitive case.

This is different from the noun case. However, this is only a single datum, there are many more of this kind, but the question remains, whether this is sufficient evidence for the claim that verbs *in general* must have subcategorization frames.

It is not surprising that many verbs like ‘gedenken’ exist, if one considers the enormous amount of idioms in languages (my ‘Oxford Advanced Learner’s Dictionary’ is proud of presenting “12.720 idioms and phrasal verbs”). If

we leave out the semantics and just look at the surface form, idioms differ from verbs with subcategorization frames only in one respect: they not only determine the morpho-syntactic properties of the complements – as verbs with subcategorization frames do –, they also determine the lexical items the verb has to be accompanied by, e.g., as in:

- (4) Maria macht sich aus dem Staub
 “Maria makes herself out of the dust” = M. leaves

Noone ever claimed that all linguistic expressions are idioms. But everybody agrees that idioms exist. Likewise, we can agree that verbs with subcategorization frames exist, without claiming that all verbs necessarily have subcategorization frames. I will call verbs with subcategorization frames *semi-idioms*. Like idioms, semi-idioms can be seen as clusters of a verb and one or more constituents. As in idioms, the morphological marking of the verb’s complements is fixed. Unlike idioms, in semi-idioms the lexical items that can be introduced in the place of the complements are not fixed, though choice of complement is never really arbitrary. We thus have a tripartite classification of verb-complement relations, distinguished by the degree of fixation of the properties of the verb’s complements:

	<i>Type</i>	<i>complement morphology</i>	<i>complement lexeme</i>
1.	idioms	fixed	fixed
2.	semi-idioms	fixed	free
3.	‘free’ verbs	free	free

Theories of subcategorization are basically theories of semi-idioms. The possibility of the existence of ‘free’ verbs and its theoretical consequences are not discussed in these theories. All verbs are treated as semi-idioms. Naturally, those verbs that impose the most problems for the concept of subcategorization are polyvalent verbs, which should belong to type 3 in the above classification.

German prepositions as one example for the co-existence of semi-idiomatic and ‘free’ lexemes

Most German prepositions assign either accusative or dative. Many of them can assign both cases. Accusative case is used when the PP expresses a direction, and dative case is used for the expression of positions, cf.:

- (5) a. Das Buch fiel auf den Tisch
 the book fell on the-ACC table

- b. Das Buch lag auf dem Tisch
the book lay on the-DAT table

This holds for a couple of German locative prepositions, e.g., *an*, *in*, *auf*, *vor*, *hinten*, *über* ('at', 'in', 'on', 'in front of', 'behind', 'above'). Thus, there is a meta-lexical generalization that holds for German prepositions:

- (6) P+DATIVE: position
P+ACCUSATIVE: direction

However, there are other prepositions in German that take only one case. The prepositions *zu*, *bei*, *mit*, *aus* ('to', 'at', 'with', 'off/out') take dative, while *durch*, *für* and *um* (through', 'for', 'around') take accusative. Here the above generalisation no longer holds, *zu*, e.g., is a directional preposition that takes the (otherwise positional) dative case.

On the one hand we have a set of prepositions that obey a general (or default) rule, and on the other hand we have a set of more or less idiosyncratic (or 'semi-idiomatic') prepositions. The prepositions all require an NP complement. This is a category specific rule. But the individual lexemes differ in whether they determine the case of their complement. If they do, then the semantics of the P+NP combination is also determined individually. But if they do not, then both case and semantics are subject to the category specific generalisation expressed in (6).

It is interesting and important for the introduced distinction between semi-idiomatic and 'free' lexemes, that we do not find a set of prepositions that show the opposite pattern of (6). The conception of subcategorization does not exclude per se the possibility of a preposition that is used with both the positional and the directional interpretation and takes the dative for the direction and the accusative for the position. This theoretical/typological overgeneration can be seen as a hint that we need a more restrictive model than the conception of subcategorization can provide.

My proposal is the following:

- (7) a. If the morphological marking of a head's lexical complement is fixed, then this may be determined by the head. The head-complement relation is semi-idiomatic or idiomatic.
b. If the morphological marking of a head's complement is not fixed, then the choice of morphological marking is based on rules that hold for the whole lexical category the head belongs to. The head-complement relation is 'free'.

What is prohibited by this model, is that a verb (or any lexical head) has its own ‘private case system’, so to speak. Case systems cannot be defined globally, but have to be defined at least category wise anyway: the accusative used by prepositions has different semantic and syntactic properties than those used for verb complements; the genitive used for NP complements is a structural case, while the genitive used for verbal complements is an oblique or inherent case etc. But case systems should not be definable lexeme wise.

Let me now turn into a more detailed discussion of the concept of subcategorization and the properties of theories based on it. To show the kinds of problems that occur I want to discuss one subcategorization based theory, the approach founded by Manfred Bierwisch in various papers beginning with Bierwisch (1983), popular under the name ‘Two-level semantics’ (henceforth TLS). The problems that arise in this approach also arise in other variants of strongly lexicalist theories of grammar, like LFG and HPSG. A short introduction into the technology, as far as we need it for the discussion, will be given first, and the possible ways of dealing with polyvalence are discussed.

1.1.2 Lexicalist Theories of Grammar: The case of Two-level Semantics

Bierwisch (1983) treats lexical items as triples $\langle P, MS, SEM \rangle$. P is the phonetic and SEM the semantic representation. MS lists the morpho-syntactic properties of the lexeme: its syntactic category, inflectional characteristics, and, most important for our discussion, the subcategorization frame.

SEM is an underspecified semantic representation. The underspecification makes it possible that the same lexeme can be interpreted differently in differing contexts without assuming different lexical entries. Bierwisch’s example is the following (Bierwisch 1983, 76):

- (8) Faulkner ist schwer zu verstehen
 Faulkner is hard to understand

Bierwisch shows that this sentence has at least three readings:

- (9) i Faulkner’s actions are hard to understand
 ii Faulkner’s books are hard to understand
 iii Faulkner’s articulation is hard to understand

Bierwisch lists three questions that come up when looking at these examples (Bierwisch 1983, 76):

- I.1 How does the name *Faulkner* receive the three different interpretations?
- I.2 How does the verb *verstehen* receive its three different interpretations?
- I.3 How is the connection between the variants of *Faulkner* and *verstehen* established?

Bierwisch calls the phenomenon touched by I.1 *conceptual shift*: *Faulkner* stands for different properties of the person in question. We also have different interpretations of the verb *verstehen*. This phenomenon is called *conceptual specification* by Bierwisch. The difference between shift and specification is that shift is a relation between two senses, while specification is basically precisification of the concept invoked here by the verb. Its meaning or reference is not changed, it rather gets ‘completed’ by the interpretative process.⁷

⁷Here is the respective passage from Bierwisch (1983, 76f):

[...] Drei Probleme sollen an diesem Beispiel erläutert werden.

- (I.1) Wie kommt der Eigenname „Faulkner“ zu den verschiedenen in [(9)] angegebenen Interpretationen?
- (I.2) Wie kommt „verstehen“ zu den verschiedenen Interpretationen, die in [(9)] zwar nicht durch verschiedene Paraphrasen wiedergegeben sind, die aber begrifflich deutlich unterschieden werden können.
- (I.3) Wie kommt der Zusammenhang zwischen den Varianten von „Faulkner“ und „verstehen“ zustande?

Das Problem (I.1) will ich provisorisch das der konzeptuellen Verschiebung nennen und damit andeuten, daß zwischen den verschiedenen Varianten in verschiedene begriffliche Bereiche verschobene Interpretationen eines sprachlichen Ausdrucks auftreten. Zwei triviale Antworten auf dieses Problem sollen im vorhinein ausgeschlossen werden.

Erstens: Die verschiedenen Interpretationen von „Faulkner“ in [(8)] sind nicht reguläre oder akzidentelle Ellipsen, d.h. [(8)] hat nicht verschiedene zugrunde liegende syntaktische Strukturen, die etwa den Sätzen [(9)] entsprechen. Der Grund: eine solche Erklärung würde erstens eine völlig unbestimmte und zudem ganz unmotiviert Mehrdeutigkeit (und zwar syntaktischer Art) für [(8)] postulieren müssen, und zweitens die Syntaxtheorie durch ganz und gar unmotiviert Tilgungsregeln aufweichen.

Zweitens: „Faulkner“ ist nicht semantisch ambig dergestalt, daß seine Lexikoneintragung alles das als alternativ semantische Repräsentationen enthält, was in der Ellipse-Version die semantische Repräsentation der ‚zugrunde liegenden‘ Strukturen wäre. Der Grund sollte hinreichend deutlich sein: Eigennamen (und nicht nur die) würden unbestimmt mehrdeutig, was nicht nur die Theorie des Lexikons amorph machen würde, sondern auch offensichtlich den Fakten widerspricht.

The semantic ‘sphere’ is subdivided by Bierwisch into two subcomponents: the Semantic Form SF and the conceptual structure CS. This makes an implementation of conceptual shift and specification possible. SF is an abstract or underspecified semantic representation both for the lexical meaning and for the lexically determined meaning parts of a clause. SF typically contains those semantic aspects of a lexeme that are linguistically relevant, first of all its arity. Many aspects, especially those that can be subject to conceptual shift and specification, are underspecified at SF and need to be (contextually) specified at the level of CS. The conceptual interpretation of a lexeme or a clause can be seen as a contextually specified/enriched version of the SF representation. Conceptual shift and specification are CS phenomena. From the assumption that grammatically relevant semantic information is encoded in SF follows the proposal that conceptual shift and specification do *not* affect subcategorization properties of a verb. This is the crucial prediction that will turn out to be problematic in the subsequent discussion.

Eine auf den ersten Blick weniger triviale Antwort wäre die Annahme, daß „Faulkner“ einen unscharfen Begriff repräsentiert, dessen Kern die Person ist und dessen Peripherie verschiedene Aktivitäten, Attribute etc. der Person umfaßt. Soweit diese Überlegung in der Substanz plausibel ist, läßt sie sich jedoch nicht in den Rahmen der unscharfen Begriffe bringen, für den etwa der Vagheitsspielraum bei Farbwörtern oder bei Dimensionsadjektiven wie „klein“, „dick“ etc. einschlägige Beispiele sind. Die Unterscheidungen zwischen [(9-i)] und [(9-iii)] sind nicht unscharf, sondern durchaus genau bestimmbar.

Das Problem (I.2) will ich, ebenfalls provisorisch, das der konzeptuellen Differenzierung nennen. Gemeint ist damit, daß die verschiedenen Varianten von „verstehen“ in [(9)] nur unterschiedlich differenziert sind, aber – in einem hinreichend einleuchtenden Sinn – unter den gleichen ‚Oberbegriff‘ fallen. Die Erklärung durch syntaktische und semantische Mehrdeutigkeit (im Sinne von „akustisch verstehen“, „intellektuell verstehen“, „moralisch verstehen“ etwa) soll hier ebenfalls im vorhinein ausgeschlossen werden, aus den gleichen Gründen. Die Deutung als unscharfer Begriff liegt hier etwas näher, trifft aber das eigentliche Problem ebenfalls nicht: die verschiedenen Bezüge, die für die Varianten von „verstehen“ relevant sind, lassen sich (anders als unterschiedliche Nuancen von rot oder orange) beliebig scharf unterscheiden und gehen nicht allmählich ineinander über.

Das Problem (I.3) schließlich, das provisorisch das der Selektion heißen soll, ist eindeutig ein Nachfolgeproblem zu (I.1) und/oder (I.2). Da ich bereits angenommen habe, daß Verschiebung und Differenzierung nicht zur semantischen Repräsentation gehören, kann auch das Selektionsproblem nicht durch semantische (oder gar syntaktische) Selektionsbeschränkungen erfaßt werden. Es muß vielmehr auf der konzeptuellen Ebene als Folge der Interpretation von *sem* in bezug auf den jeweils unterschiedlichen Kontext *ct* erklärt werden. [...]

According to TLS a lexical entry has three parts. Let us take an illustrative example (from Bierwisch 1986, 13), the entry for the verb *rollen*, ‘to roll’:

(10) /roll/; V,[_ (PP₂)] ; ⟨ x_1x_2 ⟩ [(DO x_1) [ROLL x_1x_2]]

The first part of the lexical entry is a phonetic string. After the first semi-colon comes the subcategorization frame that tells which syntactic categories have to appear with the verb. In this case it is a PP. ‘PP₂’ is in round brackets which means that it need not necessarily be realized, thus a clause of the form ‘x rolls’ is also licensed by this entry. The subject is not mentioned in the subcategorization frame because its appearance is governed by the verb’s finiteness feature, as discussed above.

The third entry – after the second semi-colon – is the SF template that consists of two parts, indicated by different kinds of brackets. The square brackets encapsulate a predicate logic formula representing the meaning of *rollen*, and the angled brackets mark the theta-grid or argument structure of the verb: the theta-grid is always a subset of the variables in the semantic formula. The order of the variables in the theta grid mirrors the hierarchical order of the arguments in the clause. The connection between variables in the semantic representation and syntactic complements of the verb is guaranteed by indices at the variables.

The bracketed DO-prime in (10) indicates optionality of *volitional* action: A rolling can be performed accidentally, as, e.g., by a stone, but also volitionally, as, e.g., by a person:

- (11) a. John rolled down the hill
b. The stone rolled down the hill

This representation appears problematic to me. It makes sense to allow optionality in *subcategorization* frames – but, I think, only *because* the meaning of the lexical item remains constant. E.g., the object of ‘to eat’ can be omitted, but the interpretation is kept that something is eaten in such a case (cf. ‘I am eating’). The bracket notation is here an abbreviation for two alternative syntactic structures.

If parts of the semantic representation are left out, we have a different meaning: [DO x_1 [Roll x_1x_2]] is different from [Roll x_1x_2]. But remember that we also can have different *conceptual* interpretations, as achieved by conceptual shift or specification. So we now have the problem to decide *for the same lexical item*, whether we are dealing with a semantic or a conceptual meaning variation. And we are left quite alone with the problem to find criteria for our decision between these two possibilities in a concrete case.

Why, e.g., should we not treat the volitional rolling of persons as a conceptual specification? In fact, I think this is the better choice. If we want to keep the distinction between two semantic levels, then it is better to keep SF constant and put all variation into CS.

In two-level semantic literature one can find two different strategies for the differentiation of the two levels:

(12) Two strategies of level differentiation

Strategy A: <i>Underspecified word meaning and its contextual specification</i>
<i>Level 1:</i> literal meaning
<i>Level 2:</i> meaning of a word, when it is used
Strategy B: <i>Grammaticalization as a heuristics for the two levels</i>
<i>Level 1:</i> grammatically relevant aspects of word meaning
<i>Level 2:</i> further aspects of word meaning

The first strategy is often illustrated with nouns, as, e.g., with *Faulkner* in (8). A division like this has also been argued for by Searle (1983). He claims that though the clauses in (13) describe totally different events, it is no accident that the same verb is used, and that we are well-advised to assume that the verb ‘to open’ has one genuine meaning – otherwise we might perhaps be forced to propose infinitely many lexical entries for ‘to open’, one for each use (Searle 1983, 145):

- (13)
- a. Tom opened the door
 - b. Sally opened her eyes
 - c. The carpenters opened the wall
 - d. Sam opened his book to page 37
 - e. The surgeon opened the wound

So the first strategy has an independent justification. This is not the case for the second one. We are only given a heuristics: If a certain semantic aspect of a verb is grammatically relevant, then it is part of its SF. This strategy is often used to determine the SF representation of verbs.⁸ However, it is quite conceivable to do the same within a ‘one-level-semantics’. We do not have to separate grammatically relevant meaning aspects on different levels in order to show how grammatical properties follow from them.⁹

⁸It can be found practised in several papers by Dieter Wunderlich and his colleagues.

⁹This argument has also been put forward by Taylor (1994).

The difference between meaning of a word as such and its meaning in a specific use can be related to the difference between word meaning and sentence meaning. Though the contribution of the verb ‘open’ to each of the sentences in (13) might be the same, these sentences differ in *how they ‘conceptualize’ it*. As also Bierwisch (1983) put it: It makes not much sense to view the different interpretations of *open* in (13) and likewise *verstehen* in (8) as parts of the lexical meanings of these words, even in a broad sense. It is better to see them as an *effect* of the word’s *use*, and thus as a property of the clause.

From the SF-CS division, as drawn by TLS, follows an important proposal about subcategorization that will be the main topic of the discussion in the subsequent parts of this section:

- (14) **Two-level semantic conjecture on the relation between the CS and the subcategorization frame of a verb**
Properties of CS, especially conceptual shift or specification, should not affect the subcategorization properties of a verb.

In TLS, conceptual aspects of a lexical item are not represented in its lexical entry. The lexical entry can only restrict the range of variation in conceptual interpretation. It does not replace it.

I want to discuss six phenomena of German that should or have to be treated as cases of conceptual shift or specification, and *do* affect subcategorization properties. All of these are polyvalence phenomena.

1.1.3 Problem 1: Conceptual shift may affect a verb’s valence

The first phenomenon looks like a case of conceptual shift of a verb. The verb *schlagen* (‘to beat/hit/strike’) can either be used to refer to the physical action of beating/hitting, or to the sound evoked by this action. As a verb that describes the physical action, *schlagen* can behave like a transitive verb:

- (15) a. Maria schlägt den Hund
 M. hits the dog
 b. Maria schlägt einen Nagel in die Wand
 M. hits a nail into the wall

When the object is omitted, we get an interpretation of an arbitrary implicit argument for the object:

- (16) Peter schlägt
P. beats

This sentence is interpreted generically: Peter has the habit to beat people.
The situational

- (17) Peter hat zugeschlagen
P. has out-lashed

is only acceptable in a context, where speaker and hearer know, what or who is beaten by Peter, and how.

Sound-emission *schlagen*, on the other hand, is fine as an intransitive verb, and there is no comparable interpretive effect of implicit arguments:

- (18) a. Die Uhr schlägt
The clock strikes
b. Die Tür schlug
The door slammed
c. Ich hörte die Tür schlagen
I heard the door slam
d. Ich hörte die Trommeln schlagen
I heard the drums beat

These sentences are all well-formed, even when uttered ‘out of the blue’, and without arbitrary or habitual/generic interpretations. Sound-emission *schlagen* behaves like a typical intransitive verb. Like many intransitive verbs, sound emission *schlagen* allows for cognate objects:¹⁰

- (19) a. Die Uhr schlug zwölf
The clock struck twelve
b. Maria tanzte Walzer
M. danced waltz
c. Die Trommeln schlagen einen Marsch
The drums beat a march
d. Maria singt eine Arie
M. sings an aria
e. Holger weint dicke Tränen
H. cries thick tears
f. Es regnet Bindfäden
It rains strings
≈ ‘It’s pouring’

¹⁰Cognate objects are semantically not really arguments of the verb. Rather, they only seem to describe the event more precisely.

Schlagen parallels Bierwisch's *Faulkner* example quite well. We have one and the same entity, i.e. a *schlagen* event, but it can be viewed under different perspectives, e.g., sound-emission or physical action. For both interpretations of *schlagen* it is true that there is some 'schlagen' going on. There is no basis for claiming that we have two different verbs in the sense of TLS à la Bierwisch (1983), under this interpretation. But the subcategorization facts are also clear: sound-emission *schlagen* behaves like an intransitive verb, physical-action *schlagen* like a transitive one.¹¹

I can see no other way to solve the problem than giving up the idea that subcategorization properties are unrelated to specifics of the conceptual interpretation of the verb – at least in this case.

1.1.4 Problem 2: Conceptual Specification may affect a verb's valence

The second example can be seen as an instance of conceptual specification. We are dealing with the verb *glauben* ('to believe').

Let us assume for the semantics of *glauben* that it describes a two-place relation between, say, a *believer* (a conscious living being) and a *belief* (arguably a proposition). We mostly have more details about the nature and/or origin of the believed proposition – this is very often even necessary to get a meaningful interpretation –, but this additional information would have to be considered as conceptual specification. As it turns out, such details affect the range of possible realizations of the *belief*-argument. There are several possibilities:

- (20) a. Maria glaubt, daß Gerda froh sein wird
 M. believes that G. happy be will
- b. Maria glaubt, Gerda wird froh sein
 M. believes G. will happy be
- c. Maria glaubt, schwanger zu sein
 M. believes pregnant to be

¹¹The notion 'transitive' is used in a broad sense here: requiring two complements, but the second complement need not be an accusative object. E.g., these are also transitive constructions:

- (i) a. Maria hat gegen die Tür geschlagen
 M. has against the door hit (e.g., with her hand)
- b. Maria ist gegen die Tür geschlagen
 M. is against the door hit (her body)

- d. Maria glaubte seine Erklärungen
M. believed his explanations-ACC
- e. Maria glaubte seinen Erklärungen
M. believed his explanations-DAT
- f. Maria glaubte an Peter
M. believed in P.

Our interest lies in (20–a) and (20–b). A V2-complement clause as in (20–b) seems to be odd, if the belief argument expressed by the complement clause is subject to *presuppositions* or certain *conversational implicatures*. It is neither possible, when the matrix verb is negated, nor when it is accompanied by a dative object. The corresponding sentences with a *daß*-introduced subordinate clause are perfect:

- (21) a. *Maria glaubt nicht, Gerda wird froh sein
M. thinks not, G. will happy be
- b. *Maria glaubt Peter, Gerda wird froh sein
M. believes Peter-DAT G. will happy be
- c. Maria glaubt nicht, daß Gerda froh sein wird
M. thinks not that G. happy be will
- d. Maria glaubt Peter, daß Gerda froh sein wird
M. believes P. that G. happy be will

The presupposition attached to (21–b) is that Peter told Maria before that Gerda will be happy. The interpretation of the sentence is thus: “Maria believes what Peter told her, namely, that Gerda will be happy”. That we are dealing with something that looks like a presupposition in (21–a), too, is not as easy to argue for. Nonetheless, it is clear that the effect is induced by the negation, and I suspect that it is the pragmatics of the negation that is important here. The debate about these effects has a long history and is connected with the question of the very nature of presuppositions. I do not want to review the whole debate. The central observation is the following: When Frege (1891*b*) introduced the notion ‘presupposition’ he assumed that in a sentence like

- (22) The king of France is bald

in order to determine whether this sentence is true or false it must be the case that there actually exists a king of France. If this was not the case, the sentence could not be assigned a truth value. Thus, ‘the king of France exists’ is a presupposition of ‘the king of France is bald’. One tool to test,

whether a proposition is a presupposition, is its behavior under negation. Presuppositions hold likewise for a proposition and its negation. Frege claims that this is the case here:

(23) The king of France is not bald

According to Frege, sentence (23) also has the presupposition that there is a king of France. Russell (1905) considered this view to be simply false. For him sentence (22) has a truth value, even if there is no present king of France, i.e. it is false. And sentence (23) has two readings, one under which it is true, and another one under which it is false. The two readings are: ‘there is a king of France and he is bald’ (false) and ‘the king of France is not bald, because there is no king of France’ (true). This second reading should be impossible, if the existence of the king was presupposed, because the apparent presupposition is within the scope of the sentence negation.

This is essentially what the debate is about. It is still continuing. The development of linguistic pragmatics in the 1970s added many additional facts about presuppositions, several different solutions were proposed. A very interesting pragmatic account is Grice (1981). I again do not want to go into the details of this account here, but its essentials are that the utterance of a negated clause must have some conversational importance, the utterance of “ $\neg p$ ” is comparable to a previous utterance of “ p ”. Uttering “ $\neg p$ ” out of the blue would be pragmatically strange, because there are many things that do not hold in the world. There must be something about p within the present context such that uttering $\neg p$ introduces new and relevant information. This effect can be illustrated very clearly with *wh*-clauses:

(24) What did Mary believe?

This question has two readings: a) a ‘weak’ reading that just implicates that Mary believed something, but it could be anything; b) a ‘strong’ reading that could be understood as ‘Which of the things she had been told before did Mary believe?’. However, if we negate the question, only the strong reading is possible:

(25) What did Mary not believe?

When we ignore echo questions, the only possible reading is ‘Which of the things she had been told before did Mary not believe?’. Corresponding to the weak reading would be an answer like “Mary did not believe that god is a horse” or something else out of the terribly large set of propositions for which hold that Mary did not believe them. It is very unlikely that someone asks for this set of propositions. It is not informative to know anything that

someone does not believe. There must be something specific in the current discourse about which it is helpful to know whether someone believes it or not. The same facts hold for the German translation ‘Was hat Maria (nicht) geglaubt?’. Although Russell might be right in that even the negated clause is ambiguous from a *logical* point of view, it is clear that the *pragmatics* of utterances sorts out the weak reading for the reason of being uninformative or ‘absurd’.

So we can conclude that the sentence negation has the property of triggering existential presuppositions. I assume that this property is responsible for the change in the subcategorization properties of *glauben*.

Sentence (21-a) has in common with (21-b) that the proposition represented by the complement clause carries the implication that it has previously been introduced into the discourse. The only difference is that the person who has introduced it is not explicitly mentioned in (21-a).

Under the assumption that *V2-complement clauses can only be used to introduce new information* the data come out quite naturally without recourse to the subcategorization frame of *glauben*. Thus, we have a candidate for a lexeme independent rule governing the realization possibilities of complement clauses as V2-clauses. We do not need to mention it in the subcategorization frame of *glauben*. Reductions of this kind are the main strategy in making subcategorization frames obsolete.¹²

¹²It would be nice, if the facts were always that clear. Unfortunately, V2-complement clauses are very frequent in reported speech. Even a verb like *bedauern* (‘regret’) which is a typical presuppositional verb that never allows for V2-complement clauses in written German, can appear with them in ordinary speech: “Ich bedaure, ich kann nicht kommen” (‘I regret, I cannot come’). It is also hard to decide in reported speech, whether we have a sequence of a main clause and a subordinate clause, separated by a comma, or a sequence of two main clauses, separated by a colon: ‘Sie sagt(,/:) er kann nicht kommen’ (She says(,/:) he cannot come). Many apparent counterexamples against the proposed treatment of V2-complement clauses in fact result from such intervening stylistic factors. E.g., the verb *wissen* (‘to know’) is also clearly presuppositional, and thus does not allow for V2-complement clauses:

- (i) *Sie weiß, er ist krank
She knows he is sick

But the same sentence appears to be better, if construed in the past tense:

- (ii) ?Sie wußte, er war krank
She knew he was sick’

One line of reasoning to explain (ii) would be the claim that we are dealing with ‘reported thought’ here. (ii) does in fact sound very narrative.

The ‘un-familiarity condition’ also holds in the following nice little dialog containing *bedauern* (‘regret’) (many thanks to Hans-Martin Gärtner (p.c.) for this example):

I am again assuming that serious TLS theorists would not propose that there are two different verbs *glauben*, one of which is presuppositional and the other is not. A serious TLS theorist thus would have to admit that conceptual specification changes the subcategorization properties of the verb.

A second subcategorization problem connected with the discussed data is the occurrence of the dative object in (20-b). Again we have to say that it is possible that one can believe something that she has been told by someone else. But as this is not necessary for a believe relation to hold we are again forced to treat this as conceptual variation in the interpretation of the verb. We might say, in TLS terms, that this is another instance of conceptual specification. But then we once more have to state that a subcategorization property (i.e. the occurrence of the dative object) is licensed by an interpretative effect beyond the level of semantic form.

It would also be ad hoc to propose that the dative object has to be selected by the verb in this case. The phenomenon of so-called ‘free dative objects’ is well-known in German, and requires an independent treatment anyway. It could possibly cover this case.

Another way of putting the problem would be the inclusion of selectional restrictions in lexical entries and letting them be crucial for the realization as V2 clause. But the *belief* argument of *believe* can be presuppositional or not, so this should be left open or underspecified at the SF level, and only be specified at CS. But this would repeat my point: CS decisions are crucial for what was usually assumed to be subcategorization.

The overall ratio of my argumentation on the last few pages is that there is not only a systematicity in how verbs combine with constituents, but that very often *there is also a systematicity in how constituents with certain morpho-syntactic properties are used*. This second systematicity can be exploited to explain the behavior of polyvalent verbs. *Polyvalent verbs*, from this point of view, *can be seen as verbs that have no subcategorization frames*.

The TLS approach does not exclude that SF templates of verbs are combined with SF-templates of other constituents (in fact, Bierwisch (1988) has proposed this for prepositional phrases). This leaves open the possibility that constituents in general occur with their own SF-templates. If this happens

-
- (iii) A: Mein Kanarienvogel ist tot (‘My canary is dead’)
 B: *Ich bedaure sehr, er ist tot (‘I regret very much, it is dead’)
 B’: Ich bedaure sehr, daß er tot ist (‘I regret very much that it is dead’)

The oddity of answer B can again be explained with the assumption that V2 subordinate clauses have to introduce new material into the discourse. Whether this assumption can be justified, would have to be shown by a detailed empirical study that lies beyond the scope of what I intend to do here. I only want to point at the possibility of a lexeme independent rule here and try to give some empirical arguments in its favor.

to be reasonable, and I will argue here that it does in the case of polyvalent verbs, then the need for verbal subcategorization frames is no longer given for the verbs in question, because the complements can ‘decide’ themselves, so to speak, whether they are licensed in a given environment, or not, and the polyvalent behavior of the verbs in question is predicted. This also makes clear, I hope, that I am not attacking the framework of TLS as such (or any other framework), but only the unrestricted use of subcategorization frames that this framework shares with many others. Subcategorization is not at all essential for these frameworks and most of what I am postulating here might be fairly compatible with most frameworks.

1.1.5 Problem 3: Pragmatically licensed implicit arguments

The third phenomenon that I want to discuss here is the problem of implicit arguments. As is well-known, some verbs allow (some of) their complements to be left out in a sentence. The verb ‘to eat’ is the classical example. Though it is semantically a two-place relation between an eater and a food argument, the food argument can be omitted. ‘Mary is eating’ is a well-formed English sentence (likewise ‘Maria ißt’ in German). Not all transitive verbs allow for this. E.g., the verb ‘to swallow’ is transitive, too, but it is quite odd to say ‘I am swallowing’ (or ‘ich verschlucke’ in German), though this verb describes a relation that is closely related to ‘eat’. For this reason the standard assumption about implicit arguments is that they are licensed lexeme-specifically. The licensing condition is part of the verb’s subcategorization frame. This holds not only for TLS, but for most current grammar theories.

Whether an argument can be omitted in a sentence is indicated by round brackets in the subcategorization frame. The lexical entries for the two verbs in question might look, in the SF format, as follows:

- (26) a. eat: V,[(NP2)] ; $\langle \underline{x}_1 x_2 \rangle$ [DO x_1 [EAT $x_1 x_2$]]
 b. swallow: V,[NP2] ; $\langle \underline{x}_1 x_2 \rangle$ [DO x_1 [SWALLOW $x_1 x_2$]]

That an argument can be omitted syntactically does not imply that it is also missing from the semantic representation. In the case of ‘to eat’, we see in the argument structure or theta-grid, written in angled brackets, that the two arguments are always there, whether they are realized syntactically or not.

The phenomenon of implicit arguments requires a complication in the models of subcategorization. As already noted, it has become usual practice to distinguish subject subcategorization from subcategorization of other con-

stituents, because they illustrate two different ways of dividing the syntactic category VERB into subcategories. While objects and other constituents are assumed to be selected by individual lexemes, subjects are assumed to be selected by specific morphological realizations of verbs. With the phenomenon of implicit arguments another difference comes into play. Subjects cannot be optional. Whenever a subject is omitted, though required, or realized, though forbidden, the sentence is ill-formed. This raises the doubt whether the two phenomena are of the same type. To be more explicit, *it is an open question whether the sentence*

(27) I am swallowing

is both grammatically and semantically odd or only semantically. There is no violation of the Subject Selection Constraint imposed by the finite verb. The word order is also correct. The verbs are correctly inflected, so is the pronoun. If this is all syntax is about, then the sentence is well-formed.

The question is: what counts as a morpho-syntactic constraint? We would be well-guided, if we considered morpho-syntactic constraints to be ‘hard constraints’: whenever a supposed syntactic constraint can be violated optionally, we may use this as an indication that it in fact is no morpho-syntactic constraint. The computational theories of syntax that currently are prominent in the field would certainly do better with such a strict conception.

Lexeme specific subcategorization would then have to be seen differently. In the opening of this chapter I suggested that subcategorizing verbs can be treated on a par with idioms, this might be an alternative to explore. Idioms like ‘to kick the bucket’ are treated as one morpho-syntactic unit. The object ‘the bucket’ is not subcategorized by ‘to kick’. The whole unit constitutes one single lexical entry. The same view might be possible for ‘to swallow + ACCUSATIVE’. Thus, ‘swallow’ would be an instance of a ‘semi-idiom’, as introduced on pages 18ff.

Under this perspective, then, optionality of an argument is a hint that there is no subcategorization going on, but rather something different that should be given a different name. This appears just to be an exercise in terminological clarification. But once we accept that optionality of rules is not a property of morpho-syntax, we are forced to find a non-morpho-syntactic explanation of implicit arguments. I will give a brief sketch of such an attempt in section 2.5.1. In the present section I will discuss the analyses given by ordered-argument theories, and discuss some problems they face.

The crucial task that has to be done by the theories under discussion, among them as only one example TLS, is to guarantee the equivalence of the semantic and syntactic arity of verbs allowing for implicit arguments. This

equivalence is one fundamental assumption of these theories that is more or less constitutive for their mode of construing the relation between syntax and semantics.¹³

Since the first proposal by Katz & Postal (1964) the treatment of the problem has basically remained the same. Katz and Postal elaborated on the idea of a syntactic deep structure that both feeds semantic interpretation and serves as the starting point for the derivation of a syntactic surface structure. Because it has a semantic interpretation paraphrasable as ‘something’, the implicit object has to be present at deep structure. A syntactic transformation rule called “something deletion” then yields the surface structure output by performing what the name suggests – deletion of ‘something’.

Dowty (1978, 1989) and Dowty, Wall & Peters (1981) elaborated something equivalent for categorial grammar and Montague semantics. Here a syntactically invisible operator **O** was introduced that reduces an n -place predicate to an $n-1$ -place predicate. The application of **O** is restricted to cases where the reduced argument can be existentially quantified over. This way, the appropriate semantics and syntax are guaranteed.

Both solutions look quite ad hoc. They are ways of dealing with the problem technically. Both add a special device to the devices already present in the approach. The same holds for TLS: What is ‘something deletion’ in Katz & Postal (1964) and the operator **O** in Montague semantics, are the round brackets in the subcategorization frame of the verb, as illustrated in (26-a). An additional semantic rule called ‘unspecified argument rule’ guarantees that arguments that are omitted syntactically are existentially quantified over in the semantic representation (cf. Bierwisch 1987, 97f).

None of these implementations addresses the question *why* it is the case that the technical device in question can be applied with ‘eat’, but not with ‘swallow’. The application domains for the rules thus have to be stipulated as lexical idiosyncrasies of the verbs. Being a possibility in principle, this way of dealing with the problem can be interpreted as the admittance that the phenomenon is not really understood – implicating further, perhaps, that there *is* nothing to understand.

¹³Conceptual theories usually deal with a higher number of arguments in conceptual representations – this is the case in TLS, as well as in Jackendoff’s model. For example, according to Jackendoff (1990*b*), the ‘lexical conceptual structure’ of ‘to drink’ includes the drinker’s mouth as an argument. The verbs ‘to buy’ and ‘to sell’ include a ‘money argument’ in their concepts that likewise need not be realized syntactically. However, these models have a mode of indicating which of the arguments have to be realized syntactically. In TLS, this is the function of the theta grid. And the relation between theta grid and syntactic complements normally is a one-to-one relation, with the exception of the special case of implicit arguments, and, of course, subjects.

However, as Fillmore (1986) pointed out, there is another class of verbs allowing for object omission, but under totally different conditions. With this second class of verbs the object can only be omitted, if it has previously been mentioned in the discourse. Its semantics is not an arbitrary indefinite interpretation as for the omitted object of ‘to eat’, but rather equivalent to an anaphor. Fillmore calls these omitted objects *definite null complements* (DNC), those of verbs of the ‘eat’-class *indefinite null complements* (INC). He describes these two types of null complements as follows:

[...] With *definite null complements* the missing element must be retrieved from something *given* in the context; with *indefinite null complements* the referent’s identity is unknown or a matter of indifference. One test for the INC/DNC distinction has to do with determining whether it would sound odd for a speaker to admit ignorance of the identity of the referent of the missing phrase. It’s not odd to say things like, “He was eating; I wonder what he was eating”; but it is odd to say things like “They found out; I wonder what they found out” The missing object of the surface-intransitive verb EAT is indefinite; the missing object of the surface-intransitive verb FIND OUT is definite. The point is that one does not wonder about what one already knows. [...]

Fillmore shows that even with closely related verbs, there are differences in whether they allow for DNCs or not. He gives the example of the verb ‘to insist’. A possible reply to ‘Why did you marry her?’ could be (28–a), but not (28–b) or (28–c) (cf. Fillmore 1986, 98):

- (28) a. Because Mother insisted
 b. *Because mother required
 c. *Because mother demanded

DNCs pose a special problem for subcategorization based theories. It lies in the fact that DNCs are licensed by the discourse. Subcategorization frames are syntactic well-formedness conditions for sentences. These well-formedness conditions are placed in an encapsulated and purely linguistic ‘zone’ – call it a mental module or faculty. The licensing factor for DNCs, on the other hand, clearly lies outside of this module. We need access to discourse referents, and representations of the previous discourse in order to tell whether the DNC is correctly chosen or not. However, the way out would be treating DNCs like pronouns. Whatever the model has to say about them, would have to be carried over to DNCs. Nonetheless, two separate rules of complement omission have to be stipulated, distinguished by two different semantic rules,

one rule as ad hoc as the other. But note that under this treatment the subcategorization frame for DNCs strictly speaking does no longer decide about the well-formedness of the construction. From a syntactic point of view, for those verbs which allow for DNCs (which would be lexeme-individually specified) all sentences with DNCs are well-formed.

Another problem of DNCs, also illustrated by Fillmore (1986), has to do with polysemy and might be more closely related to the issues under debate in TLS. Fillmore notes that certain verbs only allow for DNCs under certain interpretations or meanings. His examples are the verbs ‘to win’ and ‘to lose’. The direct object of ‘to win’ can either stand for a competition or for a reward:

- (29) a. He won the election / the race / the game
 b. He won the first prize / the gold medal / the blue ribbon

Only in the competition case DNCs are possible, i.e.,

- (30) He won

implies that he took part in a competition. The same holds for the verb ‘to lose’. Fillmore gives many additional examples. He takes the differing subcategorization properties (i.e. allowing for a DNC or not) as evidence for two different verb senses: we are dealing with two different verbal lexemes that, strictly speaking, only *accidentally* have the same phonetic form. I doubt whether this can or should be taken over for these cases in TLS.

What is more, there is another possibility with ‘to win’ that Fillmore might have overlooked – at least with the German corrolar ‘gewinnen’ the case is clear. When someone takes part in a lottery we can say

- (31) Sie hat gewonnen (in einer Lotterie)
 She has won (in a lottery)

This sentence does not imply that she won the first prize, but rather that she won *something*. So here we have a case with an INC. Following Fillmore’s ratio, we now have three different verbs ‘to win’ with three different senses, i.e. winning in a competition (29-a), winning in a lottery (31), and winning some prize (29-b).¹⁴ The question is, whether the third case, winning some prize, is really semantically or conceptually distinguishable from the first

¹⁴Carlson (1984) gave another example for interpreting implicit arguments. He argues that at least under one reading the sentence

i. Mary was left alone

is interpreted as ‘Mary was left alone by everybody’. Here the implicit argument is *universally* quantified.

two cases. One can only win, if one takes part in some social event which is especially created for winning, e.g. competitions and lotteries. The latter are only special cases of the former – from a semantic point of view. So they are good candidates for conceptual specification, but not for different verbs in TLS. Else we face the danger of creating different lexical entries for only different *uses* of the same verb. We again have an instance of conceptual specification of a verb that affects its subcategorization properties.

It is the main advantage of the TLS view, that it addresses the problem of explaining why, e.g., in all our three cases the verb ‘to win’ is used.

It might be important to make my position clear at this point: I do not want to claim that the two-level approach as such is wrong. The main thesis that words have basic meanings and a range of different possible conceptualizations and uses is, I am sure, correct. I only try to show that these conceptualizations affect what are assumed to be subcategorization properties. It is the concept of lexeme-specific subcategorization that I am attacking, at least for many cases, and only insofar as the TLS approach, or any other approach, relies on it, I am also attacking these.

1.1.6 Problem 4: Causatives and Resultatives – Lexical or Conceptual Variation?

If we accept the fundamental TLS claim about uniform lexical meanings and conceptual variations on their basis, we get the general problem of deciding when we are dealing with a single lexeme and when with different ones. In the case of verbs one important heuristic tool we are given by TLS are differing subcategorization patterns. These patterns, as I already showed, can sometimes be very unreliable candidates for this task. Thus, we had better look for another empirical criterion. The other plausible candidate is a semantic criterion, already introduced in my discussion of Bierwisch’s (1983) original proposal on page 20f and in the discussion of Searle’s (1983) comments on the issue on page 24f. This criterion can be phrased as follows:

«Consider the different sentences with the polyvalent German verb *rollen* illustrated in the opening of this chapter, repeated here for convenience:

- (32) a. Der Ball rollte
The ball rolled
b. Der Ball rollte unter den Tisch
The ball rolled under the table

- c. Maria rollte den Ball unter den Tisch
Maria rolled the ball under the table
- d. Josef rollte eine Wurst
Josef rolled a sausage
- e. Kaspar rollte die Wurst rund
Kaspar rolled the sausage round
- f. Mir rollte der Wagen weg
me-DAT rolled the trolley away
'I had the trolley roll away on me'

These sentences all describe events, and the described events all have something in common, namely: there is some rolling going on in them. The only word in these sentences that can cause this interpretation is the verb *rollen*. Hence, the verb has one constant semantic contribution to all the sentences. We shall use this semantic commonality of the sentences as an indication that one and the same verb with one and the same meaning is used.>

This interpretational strategy has an important consequence: causative and resultative variants of one verb are no longer treated as different lexemes, as is the case in standard lexicalist theories. They must be treated as conceptual variations now.

Standard lexicalist treatments stipulate extra operations of template manipulation in the lexicon to derive causatives and resultatives. Normally this is done by the assumption of a (possibly abstract) causative morpheme that can be combined with nouns, adjectives and verbs quite freely, and carries with it the appropriate semantics. The lexicon thus does not only consist of items, but also of combination rules. This makes sense for true morphological causativizations, where we really have two different lexemes. However, Wunderlich (1992, 1997) tries to extend his semantic treatment of morphological causativization to cases of 'non-morphological causativization' like (32-c), and resultative constructions.

Causative alternating verbs are treated as single, but polysemous words, the meanings of which are systematically related. Wunderlich (1992, 25), dealing quite extensively with the problem within the TLS framework, gives the following SF representations for the verbs *schmelzen* ('to melt') and *rollen*:¹⁵

¹⁵In Wunderlich (1997) the following slightly different notation for 'schmelzen' is given. The analysis, however, remains the same:

schmelzen: $\{\lambda p \lambda x \text{CAUSE}(x, p)\}(\lambda y \text{BECOME}(\text{LIQUID}(y)))(s)$

Wunderlich (1997) is a modified and abridged version of Wunderlich (1992). Especially the

- (33) a. *schmelzen*: { CAUSE(x,} BECOME(LIQUID(y)) {} } (s)
 b. *rollen*: { CAUSE(x,} ROLL(y) {} } (s)

These formulae are meant to derive the possible transitive or causative alternations with the two verbs, cf.:

- (34) a. Das Eis schmilzt ('The ice melts')
 b. Sie schmilzt das Eis ('She melts the ice')
 c. Der Ball rollt ('The ball rolls')
 d. Sie rollt den Ball ('She rolls the ball')

The braces around the CAUSE prime in (33-a) indicate optionality. But we are dealing with semantic optionality here. Thus, realizing the verb intransitively means realizing it non-causatively. But this is a variation in the semantic form, not a conceptual variation. The problem is that we now have variation at both CS and SF, without clear criteria how to distinguish SF and CS. To view a causative alternation of a verb as a conceptual variant is perfectly compatible with TLS. This would keep the central idea untouched: a solid lexical meaning paired with several conceptual variations.

But Wunderlich wants to express with his SF representations that *schmelzen* and *rollen* can be causativized, and so he does it this way.

Not all verbs can be causativized. So it would not help to posit a general device like: 'All intransitive verbs can be used transitively by changing their meaning to that of a causative verb'. But this may have conceptual reasons. An intransitive verb like 'to roll' can be causativized, because a rolling motion can be caused by an external force. This is not possible for some animate motion verbs like 'to crawl'. Under certain circumstances, though, such constructions are possible, as in 'The officer marched the soldiers' or 'I'm walking the dog', but in these cases there is a reasonable external force responsible for the performance of the motions of soldiers and dog, respectively.

So there is hope that the possibility of causativization might be predictable by the conceptual implications of a predicate. And we might well rely on the assumption of a simple general causativization rule. We thus might arrive at a similar problem as in the previous chapter: ordered-argument theories have to stipulate a subcategorization frame, and in this case even a special semantics in the lexical entry of the verb, and thereby de facto *create a new lexical item*, but whether this causativization frame is licensed or not follows from conceptual properties that are 'invisible' at SF.

analysis of resultative constructions given in Wunderlich (1992) does not fully show up in Wunderlich (1997). Because this analysis is quite important for the present discussion, I will refer to Wunderlich (1992) here. The other claims that I cite from this paper can also be found in Wunderlich (1997).

A rule of the general form discussed above for causatives has been proposed by Wunderlich for resultative constructions, like:

- (35) a. Sie aß den Teller leer ('She ate the plate empty')
 b. Sie zog das Kleid glatt ('She pulled the dress smooth')
 c. Sie schlug die Tür zu ('She slammed the door shut')

Wunderlich formulates the rule in the following way (Wunderlich 1992, 45):

[...] For every verb stem (of a certain class) with the phonological matrix /verb/ and the SF $\underline{\text{verb}}(\underline{\text{s}})$ there is a verb stem with the same phonological matrix /verb/ and the SF template:

$\underline{\text{verb}}(\underline{\text{s}})$ & CAUSE-1 (s, BECOME(P(u)))

where P ranges over static predicates [...]

Though Wunderlich makes some refinements of this claim later on, the basic idea remains the same and I will use it in my discussion.¹⁶ Wunderlich gives the following informal representations of what he postulates how causatives and resultatives are construed with a given verb (Wunderlich 1992, 45, 'adj' stands for 'adjective', 'pt' for 'particle'):

- (36) a. causative CAUSE(u, $\underline{\text{verb}}$)
 b. resultative CAUSE($\underline{\text{verb}}$, BECOME(adj/pt(u)))

When construing an SF template for the causativization of a verb, we have to determine, how exactly the semantics of the verb gets extended. Wunderlich makes a specific claim. A transitive construction with the verb *rollen* should either mean 'x causes y to roll' (causative) or 'the rolling of x causes some property P of y' (resultative).

Note that these are already *two* different causativization templates. In principle, whenever we find the verb *rollen* used transitively, we have to *decide* whether the 'cause to roll'-variant is relevant here, or the 'cause by rolling'-variant. We cannot simply state that the resultative construction needs an additional adjective or particle, because of examples like the following from our list above (cf. (32-d)):

- (37) Josef rollte eine Wurst
 Josef rolled a sausage

¹⁶'CAUSE-1' denotes a specific logical type of causative relations in Wunderlich's approach, the details of which can be ignored here.

Here we have a ‘cause by rolling’-event: Josef rolls some stuff until it has the form of a sausage (it need not be a sausage, it just may have the form). The example

- (38) Kaspar hat die Kegel umgerollt (e.g., mit einer Kugel)
 Kaspar has the skittles down-rolled (e.g., with a ball)

can only be explained by assuming *recursivity*. First we apply the causative template and yield ‘Kaspar rolls *something*’, then we apply the resultative template and yield ‘Kaspar’s rolling *something* caused the skittles to fall down’. If this is possible, why can we not causativize the causative construction again? Or resultativize the resultative construction? Wunderlich’s rules are of the form ‘ $V \rightarrow V_{CAUS}$ ’. But V_{CAUS} is itself of category V and thus should be insertable in the V slot again. The rule should be *recursive*. The same should hold in principle of resultatives, though this looks more complicated because of the additional result predicate that often accompanies the verb there.

It should be possible to say something like

- (39) Hans rollte Maria
 Hans rolled Maria

with the interpretation that Hans made Maria roll something:

- (40) $\exists x(\text{CAUSE}(\text{Hans}, \text{CAUSE}(\text{Maria}, \text{ROLL}(x))))$

But this is impossible. Likewise, we cannot express double resultatives:

- (41) ?Hans rollte den Ball kaputt müde

with the interpretation that Hans got tired from rolling the ball broken:

- (42) $\text{CAUSE}(\text{CAUSE}(\text{CAUSE}(\text{Hans}, \text{ROLL}(\text{ball})), \text{BROKEN}(\text{ball})), \text{TIRE}(\text{Hans}))$

Thus, the apparent recursivity in the case of (38) remains curious. In fact, we can only apply the causative and the resultative template once. As long as we consider the theory as a *morphological* theory, this is no surprise, because most verbal affixes can only be attached to a verbal stem, not to a verb that is already pre- or suffixed. The crucial problem is the assumption of ‘invisible’ causative morphology in the case of causative versions of verbs like *schmelzen* and *rollen*.

If we treated causativization as an instance of conceptual specification, we would not expect any recursivity. To speak in TLS terms, conceptual

specification then is a translation from the level SF to the level CS. This translation operation applies to SF objects and translates them into CS objects. Because it can only apply to SF objects, it cannot be applied to the result of a previous application of itself. Hence, recursivity is excluded.

On the other hand, we now would have to explain, how causativization and resultatization can be applied one after the other in (38). I will give a detailed answer to the whole problem in chapter 2. To give a short answer here: it is not clear that we are really dealing with only two rules here. And it is also unclear whether we need such specific rules at all, if we view resultatization and causativization as SF-CS translations. We can allow for a lot more variation in how such structures get interpreted. The whole translation mechanism has to be considered as having much more freedom than the SF rules proposed by Wunderlich allow. In the solution that I will propose in the sections 2.3.7 and 2.4, the variation is captured by a set of optional interpretative rules, yielding a set of possible interpretations. The actual interpretation is the ‘optimal’ one with respect to criteria like possibility and plausibility a.o.

I want to give one empirical datum to underpin this proposal. German has a few verbs that can be considered as morphological causativizations of simple intransitives. The intransitives are *sitzen*, *stehen* and *liegen* (‘to sit’, ‘to stand’ and ‘to lie’). The respective causatives are *setzen*, *stellen* and *legen*. Following Wunderlich, the causatives would have to have the meanings ‘cause to sit/stand/lie’. This is correct for the following examples:

- (43) a. Maria setzt das Kind auf den Stuhl
 M. sit-CAUSE the child on the chair
 b. Maria stellt die Vase auf den Tisch
 M. stand-CAUSE the vase on the table
 c. Maria legt das Kind ins Bett
 M. lie-CAUSE the child into the bed

Wunderlich would propose that it is impossible to find examples with these verbs that are interpreted as ‘cause by sit-/stand-/lying’. But there are examples like this. When we have things or people standing around in front of an entrance, such that one cannot pass through, we can say:

- (44) a. Die Kisten stellen den Eingang zu
 The boxes stand-CAUSE the entrance closed
 b. Die Leute stehen den Eingang zu
 The people stand the entrance closed

The verbs in these sentences clearly have a ‘cause by standing’ interpretation. It is interesting that we have to use different verbs for animate and inanimate subjects. The versions with the other verb, respectively, are odd, or have a different interpretation:

- (45) a. ??Die Kisten stehen den Eingang zu
 The boxes stand the entrance closed
 b. Die Leute stellen den Eingang zu
 The people stand-CAUSE the entrance closed
 ‘The people cause the entrance to be closed by putting something there’ or ‘the people intentionally place themselves in front of the entrance to make it closed’

When we have an inanimate subject, we have to use the causative verb even to express ‘cause by V-ing’. The following examples illustrate this general pattern:

- (46) a. Die Bücher legen/*liegen den Tisch zu
 The books lie-CAUSE/*lie the table full
 b. Der Staub setzt/*sitzt den Filter zu
 The dust sit-CAUSE/*sits the filter full

These examples are hard to explain anyway, but they show that the assumption of one fixed SF template for the causative verbs is too rigid. A conceptual treatment does not rely on such rigidity, and hence may have less problems with these data, but I do not have a conceptual explanation at hand right now.¹⁷

¹⁷A possible solution might be expressible in terms of markedness. The idea is that the ‘marked’ form (i.e. the ‘causativized’ verb) goes along with the ‘marked interpretation’ (i.e. the causative interpretation) and the unmarked form (i.e. the ‘simple’ verb) with the unmarked interpretation (i.e. non-causative). This explains the data with inanimate subjects. The problem with animate subjects occurs, because there are two different ways of causation by animates, intentional and non-intentional causation. Under the assumption that non-intentional causation is the simpler concept, we again predict that the marked form, the morphologically causative verb, goes along with intentional causation, as exemplified by (45–b). Perhaps in order to make an overt distinction between intentional and non-intentional causation, the simple verb form is chosen for non-intentional causation, as in (44–b). The distinction between causative and non-causative use of the simple verb form might be neglectable, because usually the causative interpretation goes along with a transitivity of the otherwise intransitive verb, thus this distinction can be read from the surface irrespective of the verb form.

1.1.7 Problem 5: The linking of individual roles varies

According to Dowty (1986, 1989, 1991) the talk about universal thematic roles like AGENT, PATIENT, GOAL etc. only makes sense if we treat them as abstractions over the concrete thematic roles assigned by verbs. E.g., the verb ‘to sing’ has a singer and a sound-argument. These are the *individual roles* assigned by this verb. Universal roles are sets of individual roles with certain characteristics: the role SINGER belongs to the universal role AGENT, because it describes the sentient and volitional performer of an action.

So the *real* thematic roles we are dealing with are the individual roles. Whether universal roles are necessary, depends on how helpful they are in explaining linguistic facts. Their existence is not taken for granted, as is the existence of individual roles (cf. also Ladusaw & Dowty (1988) for an argument in point).

The concept of subcategorization thus requires that individual roles are always assigned in the same way. This is not the case with many polyvalent verbs. Consider the following examples with the verb *rollen*. One role that this verb at least assigns is that of a rolling entity, call it R. We see that in the four examples the assignment of R varies:

- | | | | |
|------|----|---|-----------|
| (47) | a. | Die Kugel rollte die Kegel um
The shot rolled the pins down | R=SUBJECT |
| | b. | Josef rollte die Kugel um
Josef rolled the shot away | R=OBJECT |
| | c. | Er rollte die Kegel mit der Kugel um
He rolled the pins with the shot down | R=OBLIQUE |
| | d. | Josef rollte die Kegel um
Josef rolled the pins down | R=∅ |

Nonetheless, these are all resultative structures. If we assume that resultatives and causatives are derived in a fixed manner from simple verbs, as suggested by Wunderlich (1992, 1997), then the role R would have to be realized with the same case uniformly in these sentences.

Let us have a look at the semantically two-place verb *schlagen* (‘to beat/hit/strike’ etc.). Let us assume that it has at least two roles to assign: a moving entity M, and a still standing entity or target S: M moves towards and finally hits against S in the act of *schlagen*. The following four sentences all have the same sets of verbal complements: subject, object and directional PP. But the two roles are assigned differently in each case:

- | | | |
|------|----|--|
| (48) | a. | Sie hat den Nagel in die Wand geschlagen
she has the nail into the wall hit |
|------|----|--|

- b. Sie hat ein Loch in die Wand geschlagen
she has a hole into the wall hit
- c. Sie hat den Hammer in die Wand geschlagen
she has the hammer into the wall hit
- d. Der Hammer hat den Nagel in die Wand geschlagen
the hammer has the nail into the wall hit
- e. Der Hammer hat ein Loch in die Wand geschlagen
the hammer has a hole into the wall hit

The role M is realized as the object in (48–c) and as the subject in (48–d,e). It is not realized in (48–a,b). The role S is the object in (48–a) and the PP in (48–b–e). How do we arrive at the correct role assignments here? We certainly cannot assume that the assignments are fixed qua lexical entry. Too much variation is possible. It is obvious that conceptual knowledge about the used nouns plays a certain role: holes cannot move and cannot be hit either, so they cannot play a role in a *schlagen*-event, except as a result, of course, as in our example.

On the other hand, if we use universal role names for the roles in these sentences, then we arrive for the subject at AGENT in (48–a–c) and INSTRUMENT in (48–d,e), THEME for the object, and GOAL for the PP in all five examples. There is a mismatch between universal and individual roles here that raises doubts about the concept of universal thematic roles.

We see that polyvalent verbs not only occur in sentences with differing constituent sets, but also in sentences with equal constituent sets, but differing linking patterns. It is hard to see how to deal with these variations in any template based account.

Whenever we assume a certain template, we have to fix the correlation between syntactic constituents and semantic arguments in one or the other way. Thus we have to *decide* for a certain linking pattern. This is the heart of ordered argument theories. It is this unavoidable force for a certain linking decision that causes the problems. The data in (48) and (47) display the core phenomena that will be dealt with in chapter 2.

I want to mention two further phenomena that call into question the assumption of a one-to-one correspondence between syntactic and semantic arguments. The first has to do with *schlagen* as emission of sound verb, as introduced in section 1.1.3:

With *Glocke* ('bell') as subject, this verb can be used intransitively, likewise with *Tür* ('door'), but not with *Besen* ('broom'):

- (49) a. Die Glocke schlug
the bell tolled

- b. Die Tür schlug
the door slammed
- c. *Der Besen schlug
the broom beat/hit/...

Let us again assume for the conceptual structure of *schlagen* that it entails at least a relation between a moving entity M and a still standing entity S. If M moves towards S with a sufficiently high speed, and finally contacts it, then the moment of contact is what *schlagen* describes. One natural question is then, how the two arguments M and S are ‘linked’ to syntactic complements here. One explanation for (49–c) could be that we get no interpretation for S, if we identify the broom with M. If the broom is S, the interpretation seems to be even less possible. In (49–b) the door can be identified with M, and we very easily get a denotation for S, e.g., the door frame or the wall surrounding the door. But in (49–a) things are different: the two arguments of the *schlagen* concept are *built into* the bell: M is the bell’s clapper, and S is the bell’s side. If this is the correct interpretation, then two semantic arguments are *conflated* into one syntactic argument. This should never be allowed in a traditional conception of arity, because we then never could predict, which syntactic arity a predicate has to have. Sometimes it can be one argument, sometimes it have to be two arguments, it depends on the lexeme we choose for the subject.

The opposite case – where one semantic argument is split into two syntactic arguments – can also be found:

- (50) Jana Novotna war mit Helena Sukova das beste Doppel der
J.N. was with H.S. the best doubles of the
Welt
world

The one-place predicate *Doppel* requires an argument consisting of two individuals. The subject ‘Jana Novotna’ alone is only one. But if we combine her with the individual in the *mit*-phrase, we get a two-membered individual. This is what obviously happens here. In order to achieve a correct result we first have to *rearrange* and *recompose* the arguments, prior to the actual process of assigning thematic roles. Argument linking in this case under no circumstances can be seen as a one-to-one correspondence between the syntactic complements and (a subset of) the semantic argument places of the verb; it must be mediated by a conceptual-semantic reanalysis.

These data will be at issue again in section 2.5.2 and 2.5.3.

1.1.8 Problem 6: Oblique Marking specific for a Conceptual Domain

Very often verbs ‘take’ a certain preposition to mark one of their complements obliquely. The standard assumption is that the choice of preposition is arbitrary, and hence has to be listed in the subcategorization frame of each verb. For example, the verb *sprechen* (‘to speak’) takes the preposition *über* (‘about’) to mark the complement that expresses the ‘content’ of a talk.

Ordered-argument theories predict that similar verbs can use different prepositions to express an equivalent argument. However, the preposition *über* can be found quite often as marker of a complement that expresses the ‘content’ or ‘topic’ of a conversation, or of some information storage (process), or other processes that involve a ‘topic’. The same seems to be true of the English preposition ‘about’:

- (51)
- a. Sie redeten/diskutierten/stritten über Pragmatik
they chatted/discussed/argued about pragmatics
 - b. Ich las/schrieb etwas über Pragmatik
I read/wrote something about pragmatics
 - c. Sie ärgerte/freute sich über das Buch
‘She was happy/angry about the book
 - d. Er lachte/schimpfte über das Buch
he laughed/complained about the book
 - e. Das Buch/ Der Artikel/ Die Schrift ist über Pragmatik
the book/ the article/ the text is about pragmatics

The generalization may be: “The oblique marker of the topic argument of predicates that involve a topic is the preposition *über* or ‘about’, respectively”.¹⁸

The problem for TLS is that predicates cannot be grouped, as far as I can see, at SF. Let us call a domain like ‘the set of predicates that involve a topic’ the *conceptual domain* of topic-related predicates. Because the choice of the preposition can only be determined by SF, not CS, TLS would have

¹⁸We can also observe a certain productivity. The verb *arbeiten* (‘to work’), for instance, can be specified to denote all kinds of activities, among them, of course, scientific work. Under this conceptual specification, it is possible to say:

- (i) Chomsky arbeitet über Pragmatik
C. works about pragmatics

But it would be an erroneous over-generalization to state that *arbeiten* subcategorizes an *über*-PP. Under most other conceptual specifications, such a complement is impossible.

to formulate the empirical generalization at SF, too. But the generalization clearly is about a conceptual domain. The preposition has the function in question only in this domain. But distinctions between such domains have before been treated as CS properties. E.g., we can say:

- (52) Der neue Chomsky ist über Pragmatik
The new Chomsky is about pragmatics

with the interpretation that the new book by Chomsky is about pragmatics. But, as we saw in the beginning of this section, the use of the name ‘Chomsky’ here is an instance of *conceptual shift*. It could also be used as referent for the person (e.g., ‘Chomsky works in Massachusetts’), or a theoretical framework (e.g., ‘I’ve been teaching Chomsky to my students for years’). But only under the ‘book’ interpretation is it possible to use a prepositional phrase with the preposition ‘über’ or ‘about’ in the topic sense. In TLS, we have the choice either to miss this generalization, to place the apparent conceptual shift into the level of SF for certain cases by an ad hoc stipulation, or to admit that subcategorization can be affected by conceptual properties.

The first two alternatives would weaken the power of the theory or make its basic notions unclear. The third alternative, on the other hand, once more shows that subcategorization is the wrong theoretical conception to account for the phenomena at hand.

1.1.9 Summary

In the introductory parts of this chapter I listed the following three important features of ordered-argument theories, as defined by Dowty (1989):

1. Verbs are unsaturated predicates of a specific fixed arity.
2. Syntactic and semantic rules combine arguments and verbs in a *fixed* arrangement.
3. This arrangement is chosen arbitrarily.

I further claimed that the analysis of polyvalence phenomena poses the following problems for these three claims:

- ad 1. Polyvalent verbs can vary drastically in their syntactic arity.
- ad 2. Polyvalent verbs can vary in the way they combine with their arguments.
- ad 3. For many complement types (i.e. NPs with a specific case, complement clauses of a specific type) we can observe a systematicity in their mode of semantic interpretation that is independent of the verb.

The examples discussed in the sections above illustrate various of these problems. Section 1.1.3 shows that the syntactic arity of the same verb can vary with different conceptual interpretations. Section 1.1.4 shows that the options for the morphological marking of a complement of the same verb can vary with different conceptual interpretations. Section 1.1.5 shows that the licensing conditions for the syntactic omission of an argument can be pragmatically based. Thus, a system that solely relies on syntactic and lexical-semantic conditions (i.e. an ordered-argument theory) cannot predict well-formedness in these cases. Section 1.1.7 shows that once we take a close look at what Dowty called the *individual* thematic roles of a verb, we find that the way how the same syntactic argument is interpreted semantically and how its semantic representation is combined with the verb's semantic representation, can vary. Section 1.1.6 showed that even the extension of a verb into a causative verb can proceed in more than just one or two ways. This again makes it very difficult to stipulate a lexical entry or a general lexical causativization rule. Section 1.1.8 gives some examples of meta-lexical semantic conditions for morphological complement marking. One other example was also discussed in section 1.1.4.

The discussion of the use of the concept of subcategorization in this section focused on the example of Two-Level Semantics. But TLS is only one example out of a whole range of theoretical frameworks that are equivalent in their mode of construing verb-complement dependencies. Nearly all concepts common in generative grammar fall into this class, most prominently among them Lexical Functional Grammar (Bresnan 1982*b*), Head Driven Phrase Structure Grammar (Pollard & Sag 1994) and Jackendoff's *Semantic Structures* (Jackendoff 1990*b*). Other concepts with the same properties, but perhaps less elaborated, are those of Rappaport and Levin (1988, Levin & Rappaport Hovav 1991, 1995, Levin & Rapoport 1988, Levin 1993), Hale & Keyser (1991, 1993), Grimshaw (1990) and Tenny (1994). But not much has changed in the way how subcategorization is designed since 1965 (when Chomsky's '*Aspects*' appeared). I want to emphasize that TLS is a richer framework than those just mentioned in that it at least *addresses* the problem of distinguishing the 'literal' meaning of a lexical item from its contextually enriched meaning when it is used. All the other frameworks I mentioned here do not even provide the tools to *express* this difference.

The aim to explain polyvalence by subcategorization frames leads to additional 'machinery' in all discussed frameworks. The easiest way to handle them is perhaps proliferation of lexical entries. But this is also the 'ugliest' way, because a syntactic variation is not paired with a semantic variation. We would have different lexemes that differ only in their subcategorization

frames.

Four conceptual problems have been mentioned in this section that occur in all subcategorization based frameworks:

- i. Lexeme specific und category specific subcategorization are treated as different instances of the same rule type, rather than different rule types.
- ii. It is impossible, for this reason, to *explain* why category specific subcategorization rules can never be violated, but lexeme specific rules can.
- iii. The often quite extreme empirical differences between semi-idiomatic and polyvalent verbs are not reflected in ordered-argument theories.
- iv. The (non-)occurrence of many complement types can be predicted to a certain extent. Subcategorization based theories tend to view the requiring category as the only source of restrictions concerning the occurrence of complement types. Complement types have no independent status – in spite of the empirical evidence.

While it is clear that category specific subcategorization rules are not determined or influenced by semantic, conceptual or contextual factors, the facts are far less obvious in the case of the lexeme specific rules assumed for verbs. I gave several examples that showed that the (so-called) subcategorization behavior changes with different conceptualizations of the same verb.

On the other hand, not all verbs pose such problems. Many verbs determine both the morpho-syntactic properties of their complements and their semantic interpretation exactly in the way described by ordered-argument theories. I proposed the following three-fold classification of head-complement relations:

	<i>Type</i>	<i>complement morphology</i>	<i>complement lexeme</i>
1.	idiomatic	fixed	fixed
2.	semi-idiomatic	fixed	free
3.	free	free	free

The following explanation of the difference between ‘semi-idiomatic’ and ‘free’ was given:

- (53) 1. If the morphological marking of a head’s complement is *fixed*, then this may be determined by the head. The head-complement relation is semi-idiomatic or idiomatic.

2. If the morphological marking of a head's complement is *not fixed*, then the choice of morphological marking is based on rules that hold for the whole lexical category the head belongs to. The head-complement relation is 'free'.

Treating 'free' verb-complement relations as an instance of polysemy could potentially result in producing lexical entries for each concrete use of a verb. Strictly speaking (as Searle (1983) put it), the interpretations of 'to cut' in 'to cut a bread' and 'to cut a branch from a tree' are not equal. But if we assumed two different lexical entries for the verb here, we would have to do so whenever we use the verb 'to cut' with a different direct object. At least, we would have no criteria, when to assume two entries and when not.

I tried to show that in the crucial cases of polyvalence the distinction between conceptual structure and semantic form, as it is drawn in TLS, faces the same criticism. Different uses of the same verb may result in different 'subcategorization frames'; and it is common practice in TLS, as well as most other ordered argument theories, to pair a different subcategorization frame with a different semantic representation of the same lexeme (with the exception of implicit arguments and, depending on the approach, certain 'regular' alternation phenomena). But taking this as evidence for different lexemes with differing semantic forms could potentially result in mixing up the literal meaning of a verb and its interpretation in a specific environment.

In practice, we might often get into situations where it is hard to decide, whether a complement type is subcategorized or occurs for independent reasons. But I already gave two main criteria that could help in making this decision. If the following questions can be answered with "yes", then we should consider the verb in question as polyvalent:

- a. Is there a semantic/thematic systematicity in the use of the complement type in question? Are there other verbs/predicates, where the same complement type is used for the same or a very similar (individual) thematic role?
- b. Is the verb in question 'flexible'? I.e., can the linking of the same individual thematic role of the same verb vary between different complement types?

Is the classification as 'semi-idiomatic' or 'free' according to the definitions above a classification of verbs or of verb-complement relations? The empirical difference between these options lies in the following problem: if a verb as such is considered as semi-idiomatic, then it 'links' *all* its arguments via subcategorization frame, but if only one specific relation is considered as semi-idiomatic, then a verb might fix the linking of one argument and still

leave the other free. The latter view is more liberal than the former and I think, it is closer to the truth. One hint might lie in the fact that idioms can be accompanied by other elements. Consider the following German example with the idiom *über den Jordan gehen*, which means ‘to die’:

- (54) Ein Patient ist über den Jordan gegangen
 A patient is over the Jordan gone
 ‘A patient died’

It is possible to accompany this idiom with a dative object. The so-called ‘free dative’, having roughly a benefactive or malefactive interpretation, seems to be addable, whenever it makes sense:

- (55) Dem Chirurgen ist ein Patient über den Jordan gegangen
 the surgeon-DAT is a patient over the Jordan gone
 ≈ ‘the surgeon had a patient die on him’

The fact that there is an idiom regulating its verb-complement relations idiosyncratically does not block the addition of a non-subcategorized complement. So I suspect that the same should be possible with semi-idioms. But I admit that it is quite hard to find examples of 3-place verbs that subcategorize one ‘internal’ argument and let the other vary. One example might be the German verb *stechen* (‘stitch’). Under the assumption that the direction argument of this verb has to be realized as directional PP, the locatum can be realized as accusative or in a *mit*-(‘with’)PP:

- (56) a. Peter hat eine Nadel in das Kissen gestochen
 P. has a needle into the pillow stitched
 b. Peter hat mit einer Nadel in das Kissen gestochen
 P. has with a needle into the pillow stitched

The central direction of my argument is that the concept of subcategorization is useless for the various instances of polyvalence that I discussed. Whether a verb can be combined with a certain constituent or not, may depend on the verb, but not only on the verb. Rather, the conceptualizations of the verb *and* its complements in the given contextual environment have to be taken into account. Thus, this kind of ‘subcategorization’ cannot be viewed as a morpho-syntactic property of the verb. If the latter were the case, subcategorization would be a context- and even semantics-independent property. An alternative explanation is therefore required. This alternative should take a more holistic perspective on the clause with the verb as only one among several relevant factors. Before starting this enterprise, I want to discuss an alternative theoretical account that is not necessarily based on subcategori-

zation. It is the so-called ‘Neo-Davidsonian’ theory of thematic relations, as developed by Terence Parsons and others. It will be the topic of the next section.

1.2 The Neo-Davidsonian Theory of Thematic Relations

This section focuses on a specific semantic account that assumes that the reference of a clause, at least of an action sentence, is an *event*. Events are assumed to be individuals like the referents of ‘teacher’ or ‘child’. This allows for a parallel treatment of event nouns like ‘fight’ and nouns denoting things or persons. The event variable as reference of the clause was originally proposed by Reichenbach (1947). His conception was revised and also ‘revitalized’ by Davidson (1967*b*). Parsons (1980, 1985, 1990) revised Davidson’s conception again and applied this revision to issues of thematic interpretation (especially in Parsons 1995).

Although the latter approach is the most relevant for the discussion in this chapter, I want to spend some time discussing the conceptions of events used by all three authors. The main reason for this is that the alternative account that I will develop in chapter 2 is formulated in Discourse representation theory (DRT), and DRT makes crucial use of events. However, the discussion will show that the original Reichenbachian conception of events is the best choice, at least for the solution of the problems at hand. The three conceptions have rarely been compared in detail, but most current work that makes use of events refers either to Parsons or to Davidson. This has some problematic consequences that I want to point at.

1.2.1 From the Reichenbachian via the Davidsonian to Neo-Davidsonian logical forms

The Neo-Davidsonian theory of thematic relations is a modification of Davidson’s (1967*b*) way of representing the logical form of action sentences. Davidson introduced into the logical form of action sentences a referential variable for the event described or denoted by the sentence. This helped him to divide the arguments and adverbs of a sentence in its logical form. (57–a) has the Davidsonian logical form (57–b):

- (57) a. Jones buttered his bread in the bathroom
 b. $\exists x[\textit{butter}(\textit{jones}, \textit{bread}, x) \& \textit{in}(\textit{bathroom}, x)]$

From this logical form can directly be derived that (57–a) necessarily entails

(58) Jones buttered his bread

Davidson saw this as the major advantage of his representation. With Kenny (1963) he claimed that one fundamental task of theories of logical form should be providing the ground for deductions of this kind. For the given example a traditional representation would look like this:

(59) *butter(jones, bread, in-bathroom)*

The addition of the event variable allows for the desired separation of arguments of the verb and adverbs of the clause within the logical form.¹⁹ Davidson borrowed the idea of the event variable from Reichenbach (1947). But Reichenbach used it in a different way and also, I suspect, in a different sense. The variable also appears as *referential argument* of the whole clause there, but not inside the formula, but rather as its argument:

(60) [*butter(jones, bread, in-bathroom)*]^{*}(*x*)

The clause is a predicate, or better: “description” of an event or fact. In Reichenbach’s system (59) and (60) are logically equivalent. The two formulae are two ways of representing the same thing. Reichenbach speaks of *thing-splitting* (as illustrated in (59)) and *event- or fact-splitting*²⁰ (as illustrated in (60)). The logical equivalence, though, holds between the whole terms only, not between parts of them.

Davidson considers the treatment exemplified in (60) as “radically defective”. His argument is that it is impossible to construe the inference from

(61) I flew my spaceship to the Morning Star

to

(62) I flew my spaceship to the Evening Star

¹⁹This question arises only within the debate about ‘logical form’. In ordered argument theories, adverbs have a status that is totally different from arguments. In a Montague style notation, arguments like nouns are of type $\langle e \rangle$ and adverbs of type $\langle t, t \rangle$. One empirical problem that comes up here is that of ‘detecting’ the categorial status of syntactic elements that can be of both types, like prepositional phrases and complement clauses – this has to be stipulated case wise, e.g., by subcategorization frames. The really problematic cases are again polyvalent verbs, of course: the only way of dealing with them is stipulating lexical entries for each different pattern of complementation – a solution that cannot be motivated independently and looks very ad hoc.

²⁰Reichenbach uses the terms ‘event’ and ‘fact’ synonymously.

without deriving the totally vacuous statement that all events are identical. Davidson reconstructs the formula in (60) as an *oblique or referentially opaque context*. Oblique contexts are known to prohibit substitution of extensionally equivalent, but intensionally different terms.²¹

I will not give the details of the proof here, assuming that Davidson's deductions are correct. But I have three objections to make concerning the validity of the argument and Davidson's interpretation of (60).

The first is a fundamental criticism of the argumentation. Barwise & Perry (1983) call Davidson's reasoning here – a “historically important piece of reasoning” – “*the slingshot*”. Their criticism is that in order to accept it, one has to make two critical assumptions: “[...] first, that *logically equivalent sentences have the same reference* and second, that *the reference of a sentence does not change if a component singular term is replaced by another with the same reference*. [...]” (Barwise & Perry 1983, 24, emphasis as given there).

They argue that we have good reason to accept neither of these critical assumptions for the semantics of natural languages.

The first assumption states that, e.g., ‘Joe is eating’ and ‘Joe is eating and Sarah is sleeping or Sarah isn't sleeping’ have the same reference. Barwise and Perry do not accept this. They introduce *situations* as reference of sentences. The difference that turns out for the two examples here is that the first sentence is about Joe, while the second is about Joe and Sarah. Thus, we have situations either with only Joe or with both Joe and Sarah. If this is a reasonable way of thinking about natural language, then we are well-advised not to apply the concept of logical equivalence to the logical forms of natural language expressions.²²

²¹A well-known example from Quine (1960) is the following:

i. Nine is greater than four

ii. The number of planets in our solar system is greater than four

‘Nine’ and ‘the number of planets in our solar system’ are extensionally equivalent and can be substituted for each other here without changing the truth value. A modal operator like ‘necessarily’ creates an intensional context. Now the substitution does no longer preserve the meaning of the clause:

iii. Necessarily, nine is greater than four

iv. Necessarily, the number of planets in our solar system is greater than four

²²In Reichenbach's system, the referents of sentences are facts or events, conceived as entities which are as real as tables and stones. Davidson's argumentation relies on a Fregean treatment of sentences, where the reference of a sentence is the true or the false, respectively. Because of this treatment, all true sentences have the same reference, and all false sentences, too, and thus can be substituted for each other. This is a prerequisite for the ‘slingshot’ argumentation to work. Reichenbach is not explicit about this, but if I understand his use of the event variable correctly, he, like Barwise and Perry, rejects the Fregean proposal. Likewise, he would reject Davidson's argument as irrelevant.

Barwise and Perry argue similarly against the second critical assumption. This second assumption is about the problem of substituting, e.g., ‘Morning Star’ and ‘Evening Star’ for each other. Rejecting this assumption means that we expect that natural language sentences regularly constitute oblique contexts, and only a special kind of sentences, perhaps those expressing eternal truths, have the feature that one can substitute referentially equivalent terms.

I share Barwise and Perry’s critical attitude towards the way how in classical semantics features of formal logic and formal languages have been transposed to natural language semantics, and want to add two further critical comments on Davidson’s way of reasoning.

First, in Reichenbach’s system we are not forced to derive the deduction on the basis of (60). As (59) is per definition logically equivalent to (60), we can also choose (59) as basis for the deduction in question. This formula has the advantage that there is no element in it that could be suspected as creating an oblique context in the traditional sense. It is easy to see that by starting with this formula no fallacy arises. The deduction proceeds as follows. We have:

- (63) a. *flew(amundsen,spaceship,morning star)*
 b. *morning star = evening star*

From (63–b) follows that we can substitute in (63–a) and get

- (64) *flew(amundsen,spaceship,evening star)*

Because of the logical equivalence of thing- and event-splitting we finally arrive at

- (65) [*flew(amundsen,spaceship,evening star)*]^{*}(*x*)

which is the wanted result. So Davidson’s claim that it is impossible to derive this deduction in Reichenbach’s account is false. Though he might be right, from his point of view, that fact-splitting creates an oblique context.

My second objection is about Davidson’s interpretation of the asterisk in formula (60). His interpretation is “consists in the fact that”, as illustrated in his supposed Reichenbachian representation of (62) (Davidson 1967*b*, 117):

- (66) ($\exists x$)(*x* consists in the fact that I flew my spaceship to the Morning Star)

This interpretation is not justified by Reichenbach. The use of the notion ‘fact’ in (66) presupposes that Davidson attributes to the asterisk the predi-

cation ‘x is true’. Here is what Reichenbach himself said (Reichenbach 1947, 268):

[...] Between the corresponding propositions we then have a tautological equivalence (as to the accent [...]):

$$f(x_1) \hat{=} g(v_1)$$

where ‘ v_1 ’ denotes the event, and g the event property.

This equivalence may be used to define an event and its property in terms of a thing and its property. It is more convenient to express this idea in the metalanguage, as a relation between terms. We then say that an event-argument and its predicate can be defined as a function of a thing and its predicate. Thus, if ‘ $f(x_1)$ ’ means ‘George VI is crowned’, ‘ g ’ is the predicate ‘coronation of George VI’, which is a function of both the predicate ‘is crowned’ and the argument ‘George VI’. We shall use an asterisk for the indication of the transition to event-splitting and write the function ‘ g ’ in the form ‘ $[f(x_1)]^*$ ’. Then the expression ‘ $g(v_1)$ ’ can be replaced by ‘ $[f(x_1)]^*(v_1)$ ’. The argument ‘ v_1 ’ used here is the name of the event which has the property $[f(x_1)]^*$ and which is determined if both the predicate ‘is crowned’ and the argument ‘George VI’ are given. Usually v_1 is denoted not by a proper name, but by a description using the function ‘ $[f(x_1)]^*$ ’; therefore the event-argument sign ‘ v_1 ’ can be written in the form

$$(\nu)[f(x_1)]^*(\nu)$$

The event is here indicated by a bound variable ‘ ν ’. This mode of expression, prevalent in conversational language, leads to the use of such predicates as ‘takes place’ and ‘occurs’, which merely express existence. Thus we say ‘The coronation of George VI took place’. In symbolic language the last sentence is represented by a bound variable and an existential operator, in the form

$$\exists \nu [f(x_1)]^*(\nu)$$

[...]

This quotation makes one thing obvious: whether an event ν exists, i.e. is a fact, or not, is not expressed by the asterisk, but rather by the existential quantifier or the rotated iota operator.²³ And this is the same in both Davidson’s and Reichenbach’s model.

²³The rotated iota operator is introduced as the operator for definite descriptions. It can be read as “the x for which holds ...”.

The asterisk can best be understood as a ‘type-shifter’. It turns a fully saturated n -place predicate into an unsaturated one-place predicate of events.

Reichenbach’s interpretation of a term like Davidson’s ‘in(x ,bathroom)’ would sound like this: “the fact x is in the bathroom”. This is simply nonsense, facts have no places, they are not these kinds of objects. Rather, the place ‘in the bathroom’ is part of the *description* of the fact. It is the place where the buttering took place, but the described event is a buttering in the bathroom, not the intersection of the events that took place in the bathroom and were butterings. It is possible to relate adverbs to the event they hold of in this system, but this looks different from Davidson’s version. As it is nearly self-explanatory, I will again simply cite the respective passage from Reichenbach (1947, 270f):

[...] If the thing-function ‘ f ’ has several arguments, fact-functions can be constructed in different ways, according as we include all arguments or only a part of them in the fact-function. Thus the sentence ‘Amundsen flew to the North Pole in May 1926’, symbolized in thing-splitting by

$$f(x_1, y_1, t_1)$$

can be transformed into event-splitting in various ways. One is to use the fact-function ‘Amundsen’s flight to the North Pole in May 1926’, symbolized by ‘ $[f(x_1, y_1, t_1)]^*$ ’; we then write

$$(\exists v)[f(x_1, y_1, t_1)]^*(v)$$

In words this reads: ‘a flight by Amundsen to the North Pole in May 1926 took place’. Another form obtains when we use the fact-function ‘ $[f(x_1, y_1)]^*$ ’, and write:

$$(\exists v)[f(x_1, y_1)]^*(v, t_1)$$

[footnote: The function ‘ $f(x_1, y_1)$ ’ can be regarded as defined in the form ‘ $(\exists t)f(x_1, y_1, t)$ ’.] This can be read as ‘a flight by Amundsen to the North Pole took place in May 1926’. [...]

In Reichenbach’s system the adverbial can be a co-argument of the event variable, but not a predicate of it. The relation between adverb and event variable is created by the respective fact-function. If we take the formulae more serious than their linguistic translations (which appear to me a bit unfortunate), we might interpret the last fact-function in the above quotation

– together with the remark in the footnote – as ‘ t_1 fills in the time slot in the description of v ’.

It is also easy to see how Davidson’s problem can be accounted for here. Davidson wants to make explicit the deduction from ‘Amundsen flew to the North Pole in May 1926’ to ‘Amundsen flew to the North Pole’. One way to derive this is to simply assume that all events have a time of occurrence. If this time is not explicitly given, it is existentially quantified over – the footnote in the quotation from Reichenbach given above can be interpreted this way. The same strategy should be applicable to the directional adverb. The sentence ‘Amundsen flew’ entails that he flew *some time somewhere*.

So we only need to add two additional assumptions about the ontology of events and flying-events to formulate the deduction that Davidson praised to be the advantage of his system over Reichenbach’s. These assumptions are a) events have a time, and b) flying-events have a direction. As these assumptions are rather trivial, I do not suspect that anything dangerous follows from them. We then can say that the sentence ‘Amundsen flew to the North Pole in May 1926’ entails ‘Amundsen flew to the North Pole some time’ – which also is the interpretation of ‘Amundsen flew to the North Pole’.²⁴

On the other hand, many things remain unclear in Reichenbach’s system with respect to the arity of predicates. Reichenbach’s analyses are more or less construed after the facts. It is impossible to formulate something like “predicate x *requires* . . .”. The domains of the arguments are also determined post facto. We get no idea how in sentences with multiple adverbs these adverbs come to occupy the correct positions. Whether a verb is a 3-, 4- or n -place function depends on the sentence it appears in. Likewise, whether position 3 in the ordered argument quadruple of a four-place verb in this sense is of domain time, place, manner or whatever, also depends solely on the actual sentence and our method of translating it into the logical language.

This does not seem to be a grammar that makes predictions about the behavior of words. The main invention of Davidson’s paper was to introduce a way to distinguish between the arguments of a predicate and its modifiers in the syntax of logical forms. Such a division needs to be introduced into Reichenbach’s system, it is not already there. Nonetheless, this is possible, e.g., by restructuring the argument sets of predicates: Instead of assuming that the argument set of a predicate is a single n -tuple of arguments and modifiers, we can also say that the arguments of predicates are two sets: one

²⁴This is a solution that has not been accepted by Kenny (1963). He remarks that there could be infinitely many ‘invisible’ modifiers of the form ‘some x ’ to add. Davidson is more careful about this. In fact, the number of addable modifiers is not infinite. We will see later that Davidson’s deduction is also possible with Reichenbach’s treatment of modification, without the additional assumptions given here.

set of arguments and one set of modifiers. We need a heuristics to determine from the surface structure of a sentence which elements are the adverbs – but Davidson does so, too, and whatever Davidson uses, can be applied here, too. This heuristics is enough to derive the two sets correctly, when we translate a natural language sentence into our logical language. So a sentence like

(67) Amundsen flew to the North pole in May 1926

could be represented as

(68) $flew\langle\langle a \rangle, (n, m)\rangle$

where a stands for ‘Amundsen’, n for ‘North Pole’ and m for ‘May 1926’. I distinguished the two sets by different bracket types, indicating that they are different types of sets. The angled brackets signal that we are dealing with an ordered tuple, while the round brackets signal that the modifiers are not ordered. This yields equivalence to Davidson’s treatment where the order of the modifier conjuncts is also free, while the order of the arguments of the verb is fixed. Questions about the way how the formulae have to be interpreted, how the arguments get their interpretations and how the modifiers are related appropriately to the rest of the sentence, still have to be answered in *both* approaches. The modified Neo-Reichenbachian version of the logical form of action sentences now has the following general form:

(69) The Neo-Reichenbachian logical form
 thing-splitting: $predicate\langle A, M \rangle$
 event-splitting: $[predicate\langle A, M \rangle]^*(v)$
 (where A is an ordered tuple of arguments of a fixed number, determined by the lexeme that functions as predicate, and M is an unordered tuple of modifiers that can have any number (including 0), and v is the event variable)

To make the formulae in (69) interpretable we need an algorithm to strip off arguments and modifiers and rearrange them; we could, e.g., assume that the following biconditional holds:

(70) $p\langle\langle x, y \rangle, (m_1, m_2, \dots, m_n)\rangle \Leftrightarrow p\langle x, y \rangle \ \& \ m_1(p\langle x, y \rangle) \ \& \ m_2(p\langle x, y \rangle) \ \& \ \dots \ \& \ m_n(p\langle x, y \rangle)$

Elaborating how an expression $m_i(p\langle x, y \rangle)$ is to be interpreted is equivalent to elaborating the appropriate semantics for $m_i(e)$ in Davidson’s approach. The same holds for $p\langle x, y \rangle$ and $p\langle e, x, y \rangle$, respectively (e shall represent Davidson’s event variable).

The main reason for the exercise in the last paragraphs is that the event variable as introduced by Davidson is by now widely accepted in linguistic analyses. Nonetheless, there are some fallacies in this analysis that result from the way how Davidson modified Reichenbach's version of it, and from his background assumptions. I see basically two fallacies which are connected. First, Reichenbach's treatment is located within a philosophical approach that treats linguistic expressions as *descriptions*. So in $p(x)$ the linguistic predicate p functions as description of the thing, fact or event x . p might be complex in itself, but this is only a matter of the predicate's interior, having nothing to do with the one thing described.

In Davidson's view the interior of p matters insofar, as modifiers are represented in separate conjuncts of the formula, such that a predicate might have the form $p(x) \ \& \ q(x)$. This representation treats the reference of x as the intersection of the set of things with property p and the set of things with property q . As we will see, there are kinds of modifiers that cannot be analysed in this extensional way, but should be as easy to handle as other modifiers in the Neo-Reichenbachian view. For illustration, here the extensional analysis of 'brown cow':

$$(71) \quad \lambda x[\textit{cow}(x) \ \& \ \textit{brown}(x)]$$

The set of brown cows is considered to be the intersection of the set of cows and the set of brown things. Not all adjectives can be treated like this, as is well-known. One class of examples are scalar adjectives like 'good' in 'good piano-player'. The set of good piano-players is not the intersection of piano-players and good people but rather it is the set of those piano-players who are good at piano-playing. By formulating an underspecified, context-dependent semantics of such adjectives, Bierwisch (1987, 112ff) tried to show a way out of this problem, and thereby, as he claimed, keeping the extensional treatment of adjectives. Very simplified, the result looks like this:

$$(72) \quad \lambda x[\textit{piano-player}(x) \ \& \ \textit{good-at-piano-playing}(x)]$$

But there are many other examples where an extensional treatment unavoidably yields contradictions, e.g., the famous 'alleged communist' or 'the former president of the US'. A representation along the given lines would yield the following logical forms:

$$(73) \quad \begin{array}{l} \text{a.} \quad \lambda x[\textit{communist}(x) \ \& \ \textit{alleged-communist}(x)] \\ \text{b.} \quad \lambda x[\textit{president}(x) \ \& \ \textit{former-president}(x)] \end{array}$$

Both of these formulae lead to logical contradictions, if we take into account the entailments of the involved predicates. An alleged communist is someone

who might be a communist, but who also might *not* be a communist. So at least in some possible worlds formula (73–a) would entail the contradiction ‘*communist(x) & ¬communist(x)*’. The case of the ‘former president’ is similar, though not that obvious, because we are dealing with a temporal modifier here. The interpretation of a predicate like ‘*president(x)*’ mostly is ‘*actual president*’. And if not the semantics, so at least the pragmatics of the expression ‘former’ entails ‘*¬actual*’. Thus, formula (73–b) entails the contradiction ‘*actual-president(x) & ¬ actual-president(x)*’.

The way out of this problem is generalizing ‘to the hardest case’ and treating adjectives not extensionally, but intensionally: the semantic value of an adjective is not an extension, but an intension. There is no such thing as a set of brown things as the reference of the adjective ‘brown’ – which is the basis of the extensional analysis.²⁵ Instead, the extension of an adjective-noun compositum is derived from the pre-composed expression. Composition ‘applies’ prior to extension, so to speak, not afterwards.²⁶ The hypothetical ‘Neo-Reichenbachian’ theory construed earlier follows the intensional strategy in all cases of modifiers. So there are no extra problems arising for it here.

Reichenbach was already aware of these problems, but he made his decisions pro or contra the extensional treatment casewise. E.g., the sentence ‘The Royal Hall is a red building’ is analysed by him as ‘Royal hall is a building’ and ‘Royal Hall is red’. Obviously he was not aware of the problems that even an adjective like ‘red’ sometimes can evoke²⁷. For sentences like ‘John is a slow driver’ Reichenbach states that “. . . we cannot divide the sentence into two sentences ‘John is slow and John is a driver’. What is said is not that John is slow in general but only that John is slow in his driving; thus the word ‘slow’ [. . .] operates as a modifier of drive. [. . .] ” (Reichenbach 1947, 301)²⁸

²⁵By the way: Bierwisch’s proposal seems already to have given up this background assumption. From a strictly logical point of view, the first conjunct in (72) is redundant. If someone is a good piano player, then she necessarily is a piano player. The relation between the two conjuncts is no longer only an intersection relation, but a subset relation. So it might not be unfair to say that Bierwisch unintentionally already adopted the intensional analysis, and that his keeping of the extensional analysis is only apparent.

²⁶For further discussion of the issue and the details of this intensional solution, see, e.g., Kamp & Partee (1995).

²⁷For discussion cf. Blutner (1997).

²⁸One might wonder why this should not carry over to ‘red’. If something is a red building, this is not supposed to mean that it is red ‘in general’, to use Reichenbach’s words. E.g., a white building might have a red roof and still be a white, not a red building. There is no fundamental difference in this respect between ‘red’ and ‘slow’, as far as I can see.

Adverbs are higher functions, properties of properties, and thus Reichenbach elaborates the following formulae for ‘move’ (m) and ‘move slowly’ (msl):

$$(74) \quad \begin{array}{l} \text{a. } m(x_1) =_{Df} (\exists f)f(x_1).\mu(f) \\ \text{b. } msl(x_1) =_{Df} (\exists f)f(x_1).\mu(f).\sigma(f) \end{array}$$

where μ is a set of properties that hold when something is moving and σ is the set of properties that hold when something is slow. This is an intersective analysis, but it is not an intersection of things, but an intersection of properties that thus creates a new property. A genuine intensional treatment of the problem.

Cases like ‘alleged communist’ can perhaps be treated differently. There is no need to treat all modifiers intersectively. How modifiers apply has to be fixed by meaning postulates for each lexical item. (On the other hand, the intersective intensional analysis might not be as far from truth as the intersective extensional one: “some property p holds of x , and p is an alleged property and p is the communist property”.)

An analysis of adverbial modification looks like this in Reichenbach’s approach (cf. Reichenbach 1947, 305) – the example to analyse is ‘Annette dances beautifully’:²⁹

$$(75) \quad (\exists f)f(x_1).\delta(f).\beta(f)$$

δ represents the dancing properties and β ‘beautiful’. This looks a little more complicated than the Neo-Reichenbachian proposal I gave in (69). Nonetheless, the difference is merely notational, I suspect. Again, it is easy to see how the deduction from ‘Annette dances beautifully’ to ‘Annette dances’ can proceed. Formula (75) says that Annette performs something that is *both* a dancing *and* beautiful. So Davidson’s claim that it is impossible to derive this deduction in Reichenbach’s framework is simply wrong. One criticism, following Parsons (1990), might be that this way we also should be able to derive for *alleged-communist*(x)’ that x is a communist. But this is not the case, because this deduction would yield the contradiction that the property in question is both being a communist and not being a communist. The deduction is not valid. Under an intensional analysis the validity of the deduction is dependent on the *content* of the modifiers, not only on their syntax, and this is exactly what we want for these cases. This is the major advantage of intensional treatments over extensional ones.

²⁹This formula is still quite coarse-grained. Reichenbach (1947, 306ff) developed it further to capture also the more subtle implications of modifiers. But intensionality is kept throughout. We do not need to go into the details here.

Cases similar to ‘alleged’ and ‘former’ can be construed with adverbs. Good candidates might be modal adverbs like *probably*, *possibly*, *presumably*. In fact, proponents of the extensional view never denied that these adverbs require a different treatment. Their hope seems to be that the division between extensional and non-extensional adverbs mirrors that between sentence and verb modifiers. It is hard to see how this carries over to ‘alleged communists’ and ‘former presidents’. So their approach lacks a mechanism when to apply which treatment. They might perhaps stipulate lexical entries, but this cannot help, because the extensional treatment requires a uniform syntax³⁰ for adnominal modifiers. And this is an intersective structure. This structure on the other hand, pre-determines how the semantics is supposed to work. An intensional analysis has more space for syntactic variation in the logical structures. This is the reason, why they work better in these cases.

Parsons, the inventor of the Neo-Davidsonian theory we will discuss in the next paragraphs, overlooked the possibility of an intensional intersective treatment à la Reichenbach, when he gave his reasons for adopting Davidson’s view. He claims that the only possibility to represent multiple modifiers intensionally is as operators with a form like $m_1(m_2(x))$. This wrongly predicts that there are always scope effects between the modifiers (cf. Parsons 1990, 54ff). The formula in (75) makes no such predictions in spite of its representing an intensional treatment.

Before continuing I want to summarise the preceding discussion. We saw that we are not forced to adopt Davidson’s modification of Reichenbach’s theory of the logical form of action sentences. We could do quite well with a slightly modified version of Reichenbach’s model to get all the properties Davidson praised as advantages of his approach. Furthermore, Reichenbach’s logical form has the advantage of being able to deal with intensional modifiers. The principal decision that has to be made is whether one wants to adopt an extensional treatment of modification, perhaps à la Davidson, or an intensional treatment, perhaps à la Reichenbach. I think, I gave good reasons why an intensional treatment should be preferred. The subsequent discussion of the Neo-Davidsonian theory (henceforth NDT) is based on Davidson’s extensional account, however.

To illustrate the differences and equivalences, consider the following logical forms for a clause with a transitive verb, subject, object and one modifier:

$$(76) \quad \frac{\text{Logical Form à la Davidson}}{\exists e[\text{verb}(x, y, e) \ \& \ \text{mod}(e)]}$$

³⁰‘Syntax’ does not refer to natural language syntax, but to the syntax of logical forms here.

(77) Logical Form à la Reichenbach

$$\exists f[\textit{verb}(f) \ \& \ f(x, y) \ \& \ \textit{mod}(f)]$$

The Reichenbachian formula does well without an event variable. One might also say that the event variable is an extensional interpretation of Reichenbach's function variable f .

1.2.2 Thematic Roles in the Neo-Davidsonian Logical Form

The Neo-Davidsonian approach was first advocated by Parsons (1980), further explored by Carlson (1984), later revised by Parsons (1990) and Parsons (1995). Several versions of it were also discussed by Dowty (1989). The difference between Davidson's view and NDT is that in the latter the arguments also occur each in a separate conjunct of the formula. The argument conjuncts are two-place relations between the event and the argument. These relations are called thematic relations. Thematic relations are the 'roles' a verb assigns to its arguments. E.g., the subject of the verb 'to sing' receives the role 'singer' from the verb. Thematic roles are often clustered together into classes like 'agent', 'patient', 'theme', 'goal' and 'instrument'. Though these labels are not very well-defined, there appears to be a rough consensus about what they mean – at least the advocates of thematic roles believe so. In NDT sentence (78–a) has the logical form (78–b):

- (78) a. Brutus stabbed Caesar with a knife
 b. $\exists e[\textit{stab}(e) \ \& \ \textit{AGENT}(\textit{Brutus}, e) \ \& \ \textit{PATIENT}(\textit{Caesar}, e) \ \& \ \textit{INSTRUMENT}(\textit{knife}, e)]$

A very nice and perhaps the most appealing feature of this representation is that verbs now uniformly are treated as one-place predicates of events. This makes it possible to treat them on a par with nouns, as denotations, labels or 'names' for specific entities. The arity of a predicate is of no syntactic consequences, neither for the morphosyntax of a verb, nor for the logical form of a sentence. Rather, complementation requirements are treated as entailments, e.g., for the verb 'to kiss' as follows:

$$\Box(e)[\textit{kiss}(e) \rightarrow \exists x \exists y[\textit{kisser}(x, e) \ \& \ \textit{kissed}(y, e)]]$$

A similar case for a noun might be the example of 'leg': for all x that are legs necessarily holds that x is a leg of some larger entity y . Such entailments are important for the interpretation of sentences with the respective words, but they are not seen as part of the specific linguistic knowledge of the words in NDT.

Parsons puts it like this: “Every stabbing requires an Agent, an Instrument, and a Location, though not necessarily a Theme. And so on. Specifying these generalizations is an enterprise in metaphysics, not in linguistics, for the topic is not logical forms, it is metaphysical generalizations.” (Parsons 1995, 659). He further gives a philosophical argument for his point of view (*ibid.*):

[...] Why take this route rather than building the meaning of *ate something* into *ate*? Because we need to make sense of claims in which necessity itself is at issue. The simplest illustration is a claim like this:

Necessarily, whenever x eats, x eats something.

This makes a substantive point. The point is lost if the logical form associated with the sentence contains an existentially quantified direct object place in the antecedent clause. For then the substantive principle has the force of

Necessarily, whenever x eats something, x eats something.

This just doesn't say the same. If the former claim is true, then the latter one is necessarily equivalent to it, but that does not indicate that they mean the same. [...]

This is reminiscent of the problem of distinguishing between linguistic and non-linguistic lexical knowledge in Two-Level-semantics, as discussed in the first section of this chapter. I will return to this important issue after having discussed the concept of universal thematic roles which is crucial in NDT, and also problematic in combination with polyvalence phenomena and Parsons' view on entailments.

Thematic roles are two-place predicates in NDT that relate “an event (or state) and a thing. No event stands in one of these relations to more than one thing; thus, each event possesses at most one Agent, at most one Experiencer, and so on” (Parsons 1990, 74). It is important to note that this uniqueness requirement is necessary. Without it, Parsons says, the theory tends to fall into falsehood. He gives the example of a ditransitive verb like ‘to give’: if we labeled both objects of this verb as ‘theme’, we could not prevent an interpretation of, e.g., ‘Peter gave Mary the book’ where Mary was given to the book.

But note further that this forces us to be careful about our way of classifying thematic role types. They should not be designed in such a way that

two roles of a verb fall into the same class. One such candidate might be the verb ‘to feed’ that Parsons discusses (Parsons 1995, 641f):

[...] For example, that a sentence entails that someone is an Agent does not necessarily make that person an Agent of the event specified by the verb of the sentence. One cannot argue as follows:

In *Mary fed her baby* the baby has to eat; therefore, it is an Agent of the feeding.

The question of Agenthood is not whether one may infer that the baby is an Agent of *something*, but whether one may infer that the baby is an Agent of *the feeding*. And this cannot be inferred. [...]

Obviously, the thematic role labels are not just ontological labels. But the crucial problem is the notion ‘event’ here. Parsons’ use of it is different from Davidson’s. For Davidson the feeding and the eating are one and the same event. And the possibility to speak of one event as both a feeding and an eating was a major motivation for his whole enterprise. If events are real things in the world, they must be attributable with different predicates without changing themselves – other real things like people or chairs have a lot of different properties, but they are what they are.

Not allowing for an event to be given different ‘names’ would equal postulating that the expressions ‘Peter’ and ‘the man over there’ can *necessarily* never refer to the same person.³¹

Parsons has to claim that an event could not be a feeding and an eating at the same time, because then he would get two agents and a possible interpretation where the baby feeds Mary. For this reason he has to reject Davidson’s Reichenbachian event notion.

Parsons’ event variable is thus not a referential argument in the usual sense and one may doubt whether it is a referential argument at all. An even more conclusive example Parsons gives is that of a buying event that can also be considered as a selling event, depending on the perspective one takes in the description of the event. Parsons states that in his framework the buying and the selling are two different events (Parsons 1995, 643).

It is totally unclear to me how this event notion fits into the classical semantic distinction of sense and reference. As it stands, Parsons seems to

³¹Dowty (1989) claims that the major advantage of NDT lies in its treatment of event nominalizations: event nouns can be treated just like other nouns. The above discussion, however, calls into question whether this is really the case.

claim that the sense is also the reference here. He seems to deny that this distinction exists for events. But how can one distinguish between a real event of buying and a real event of selling without taking into account the meanings of these two verbs? If we need the words to distinguish the two events, then the event itself is a linguistic entity and not a 'real' entity out there in the world, so to speak. Furthermore, as Parsons seems to deny that there are real events (as he implicitly identifies reference with sense), how can he even speak of linguistic events? How can he justify them? As it stands, Parsons' event notion is totally obscure.³²

Remember that Parsons is forced to adapt this strange event notion only because he makes use of *universal* thematic role labels. If he used individual labels, things were different. E.g., one could claim that the verb 'to feed' has two roles, a feeder and an eater, and the verb 'to eat' has an eater role and a food role. Parsons' problem of mixing up the roles of the verbs would not occur here, and we even could keep the Davidsonian event notion.³³

But Parsons cannot accept this solution without giving up other important properties of his approach. Individual roles, as illustrated above, are *entailments* of the predicates and not part of the logical form. On the other hand, Parsons is mixing the categories anyway. Cf. the following quote (Parsons 1995, 659):

[...] We then explain certain necessary consequences of sentences in terms of the combinations of those sentences with certain well-known general necessary truths. An example of such a general truth is

Necessarily, in every eating something is eaten,

symbolically:

$$\Box(e)[\text{Eating}(e) \rightarrow (\exists y)[\text{Theme}(e,y)]]$$

This principle then lets us infer the logical form of *Something was eaten* from *Someone ate*. [...]

³²Parsons admits that philosophers might have problems with his event notion. He claims to answer the question from the linguistic point of view: 'events are what we can identify as events with linguistic methods', so to speak. Whether this is acceptable, also depends on the chosen methods. Parsons' main linguistic tool are universal thematic roles. As these turn out to be nearly as obscure as Parsons' event notion, Parsons' system remains very unattractive.

³³The same kind of solution to the problem has been proposed by Lombard (1985).

When Parsons paraphrases the entailment ‘y is eaten’ with ‘Theme(e,y)’, he mixes the real entailment and the thematic role concept. Metaphysics, which is often referred to by Parsons, should be blind about thematic roles. There is only the concrete relation of being the thing that gets eaten in the event. Else Parsons would claim that Agent and Theme are real relations, rather than abstractions over concrete relations such as, e.g., ‘eaten(e,y)’. He never touches on the problem, how to get from the abstract or universal roles to concrete or individual roles. But if this is not done, nothing can be said about the meaning of the expression, and so we do not even have a semantic theory.

To give a simple example that yields quite absurd consequences in Parsons’ system, look at the following resultative (from Wunderlich (1992), discussed in section 1.1):

- (79) Sie aß den Teller leer
She ate the plate empty

From Parsons’ heuristics we get that the plate is theme here, because the ‘eating-empty’ was ‘of the plate’ (see below). On the other hand, we know that in every eating event there is a theme which is the thing eaten. But in (79) it is not the plate that is consumed, but something else, located on the plate. So, if the eating-empty event also was an eating event, we would have two themes. For this reason, we have to state that no eating-empty event can be an eating event:

- (80) $\Box(e)[\textit{eating-empty}(e) \rightarrow \neg\textit{eating}(e)]$

This is an absurd result. Under one interpretation, it is supposed to mean, that in every event where someone eats something empty, there is no eating going on. The entailments that hold for eating events also are no longer derivable. Thus, we *cannot* derive ‘Something was eaten’ from ‘Someone ate the plate empty’ – though this is not just true, but even necessarily true.

Universal roles such as ‘Theme’ are part of the logical form in NDT, but they appear there not because they are part of a ‘metaphysical’ entailment of the verb, but because *they appear in the sentence*, in the form of case markings and/or prepositions. Parsons gives a clear heuristics about how to detect thematic relations. For him, it is more than a heuristics, it is a definition (Parsons 1995, 638f):

[...] Suppose we accept the fact that thematic relations relate events and/or states to things. Ignore states for the moment. Then, most thematic relations can be defined as follows:

Agent	e is by x
Experiencer	x experiences e
Theme	e is of x
Source	e is from x
Goal	e is to x
Instrument	e is with x [or 'e is by means of x']
Benefactive	e is for x

We have to assume that the desired *analyses* may not exist, and we may only have the accurate *definitions* given above. [...]

The definitions are empirically based. If, e.g., the sentence 'the VERB-ing is of x' is an acceptable sentence of English, then x is in the Theme relation to the described event. The following passages may help to clarify how the use of the prepositions has to be understood:

[...] After all, our test relies on understanding prepositions, and prepositions are known to be ambiguous. But this is no more intractable than other ambiguities that we live with all the time. The ambiguity of prepositions is on a par with that of other common words, such as *go*. In practice, it is no more difficult to distinguish the senses of prepositions than it is to distinguish the senses of verbs, and it is no more difficult to tell which senses of the prepositions are intended in the definitions above. [...] (Parsons 1995, 640)

[...] When I give the definitions of thematic relations, I use ambiguous prepositions, I assume that my readers are conversant with the prepositions' various senses, and I only need to identify which sense I intend. I can communicate this by various means, such as the use of illustrative examples. I then rely on the reader to know when an example uses the preposition in the same sense. [...] (Parsons 1995, 641)

The problem is obvious. Parsons reduces one fuzzy concept, universal thematic roles, to another, prepositions, and, what is more, he appellates on the careful reader to find out what he means, without really defining what he means. He suggests that this problem is not special for thematic relations, but occurs always in language. The difference is: We *know* that there are words, like prepositions and verbs, but we do *not* know whether there are universal thematic roles. We know, on the other hand, that there are individual thematic roles. So, what Parsons does, is substituting the fairly clear and

independently justified concept of individual thematic roles with the fairly fuzzy and not independently justified concept of universal roles. So his excuse is not valid. This theory suffers from a serious methodological defect. Furthermore, it is not clear that Parsons' definition of 'Theme' covers something else than direct objects. If this suspicion turns out to be justified, then we could simply rely on grammatical relations, and, of course, prepositions, without any mention of universal thematic roles. But this would just make even more obvious what I complained about before: the theory does not tell us much about how we come to know what a sentence means. In order to do so, Parsons has to address the connection between universal and individual thematic relations. This will become very clear, when we turn to polyvalent verbs.

1.2.3 Polyvalence and individual thematic roles in the Neo-Davidsonian Theory of Thematic Roles

Consider the following sentences, most of which already have been discussed in section 1.1.7:

- (81) a. Sie schlug den Nagel in die Wand
 She hit the nail into the wall
 b. Sie schlug ein Loch in die Wand
 She hit a hole into the wall
 c. Sie schlug den Hammer in die Wand
 She hit the hammer into the wall
 d. Der Stein schlug ein Loch in die Wand
 The stone hit a hole into the wall
 e. Sie schlug den Hund auf den Kopf
 She hit the dog on its head

Parsons distinguishes between the 'goal' of a dative construction and the goal of motion (Parsons 1995, 641, footnote 11). So let us assume that there is such a specific goal role, 'Goal-of-motion'. Then, all the directional prepositional phrases in these examples should qualify as 'Goal-of-motion'. Likewise, all the direct objects pass the test for 'Theme', and the subjects pass the test for 'Agent' (81-a-c) or 'Instrument' (81-d,e). Let us further assume, as we did in the previous discussion of these examples, that the verb *schlagen* has two individual roles, namely a moving entity M that moves towards and finally hits against a still standing entity S in the act of *schlagen*. M is a typical 'Theme', and S a typical 'Goal-of-motion'. So we would expect for the five sentences in (81), that uniformly the object has role M and the noun within

the PP has role S.

The facts, of course, are different: M is explicitly mentioned only in (81-c), as object, and in (81-d), as subject. In all the other cases it is implicit. S is realized as object in (81-a) and (81-e), and as PP in (81-b), (81-c) and (81-d). So here we have one counterexample against NDT that illustrates my complaint that it in fact is vague about the relation between universal roles – which I suspect to be nothing more than grammatical relations in Parsons’ approach – and individual roles.

Problems like these are notorious in ordered argument theories, too. To discuss the other example used in section 1.1.7, let us have a look at *rollen* again:

- (82) a. Die Kugel rollte die Kegel um
The shot rolled the pins down
b. Maria rollte die Kugel weg
M. rolled the shot away
c. Josef rolte den Teig aus
J. rolled the dough out
d. Fritz rollte die Hosen mit einer Karre weg
F. rolled the trousers with a trolley away

Assume that *rollen* has one individual role, that of a rolling entity R. R is a good candidate for a ‘Theme’, so we can assume that Parsons would classify it as ‘Theme’. In the sentences above, again the direct objects all pass Parsons’ test for themes, but R is the object only in (82-b). In (82-a) it is the subject, in (82-c) it is left out, and in (82-d) it is realized in a *mit* (‘with’)-PP, thus passing the instrument test. To conclude: Parsons’ approach tells us *something* about thematic interpretation, i.e. that the trolley is instrument in (82-d), and that the subjects are agents (except perhaps in (82-a)), but this is not all we need to know to do thematic interpretation.

These examples make clear that thematic interpretation consists of *two* tasks (which are distinct, but often influence each other):

- a) thematic interpretation of the constituents of a clause
- b) determining the ‘role-bearers’ of verb and other predicates of the clause

The above discussion suggests that NDT gives us a rough heuristics about task a), but has nothing to say about task b).

With respect to task b), there has been some discussion in NDT that I mentioned earlier in this chapter. It concerns the treatment of implicit arguments in cases of detransitivization. It has been claimed that NDT has

an advantage over ordered argument theories in this case. Let me first repeat the relevant proposal in ordered argument theories: whenever an argument is omitted, these theories need an extra mechanism. Cf. the pair

- (83) a. John ate a sandwich
b. John ate

If we want to treat the verb ‘to eat’ the same way in both sentences in ordered argument theories we have to propose that it has the same number of arguments in both. But this is not the case here, at least not on the surface. The way out of this problem that has been shown by Dowty (1978, 1979), Dowty et al. (1981) and Bresnan (1982*a*), is assuming a lexical operation on the verb ‘to eat’ that reduces the number of arguments a verb takes. An example is the operator **O** defined as follows (cf. Dowty 1989, 88):

- (84) a. syntax: If δ is an n -place predicate, then $\mathbf{O}(\delta)$ is an $n-1$ place predicate.
b. semantics: If δ denotes an n -place relation d , then $\mathbf{O}(\delta)$ denotes that $n-1$ place relation R such that for any $n-1$ place sequence of individuals $\langle x_i, \dots, x_{n-1} \rangle \in R$ iff there is some individual y such that $\langle x_1, \dots, x_{n-1}, y \rangle \in d$.

O is to be interpreted as a quantifier that “existentially quantifies” one argument position of a predicate. The problem with this device is that it could be applied anywhere and any time. The class of verbs and circumstances, however, under which implicit arguments are possible, is restricted and the nature of these restrictions still remains in the dark under this treatment.

In NDT, as pointed out first by Carlson (1984), the interpretation of the existentially quantified implicit object follows from the entailments of the verb. It follows from the meaning of the verb ‘to eat’ that in every eating event there is some entity or stuff that is eaten:

$$\forall e[eating(e) \rightarrow \exists xAgent(x, e) \ \& \ \exists yPatient(y, e)]$$

Carlson claims that this treatment of detransitivization is one major advantage of NDT over ordered argument theories. He further gives examples of different kinds of detransitivizations where ordered argument theories would have to assume different types of operators to get the syntax and semantics correctly (Carlson 1984, 264):

- (85) a. The mule kicked something
b. The mule kicked

The verb ‘kick’ has no entailments about further arguments besides the ‘kicker’. So there is no existential quantification and the two sentences are correctly predicted not to be paraphrases.

Existential quantification often occurs in passives:

- (86) a. Someone touched the vase
b. The vase was touched

But also in passives there are cases where the existential quantification is not recommended, because of specific entailments of the verb, cf.:

- (87) a. Martha was left alone
b. Someone left Martha alone

Under one interpretation, (87–a) is not paraphrased by (87–b). In this reading, Martha is not just left alone by someone, but there is in fact nobody, who bothers her. The quantification in this case is not existential, but rather universal.

These might be arguments in favor of an NDT treatment of thematic relations, but not necessarily in favor of the specific NDT versions Carlson and Parsons have in mind. The theory would work even better without universal thematic roles, but this would cause serious problems with the way thematic interpretation has to be conceived. Nonetheless, I suspect that it would not *cause* these problems, but rather just make them *obvious*. The problems are already there: when we rely on individual thematic roles, the generalizations about how to translate syntactic constituents into semantic arguments get lost, and should perhaps be stipulated casewise. But this would result in formulating just another ordered argument theory – which would face all the problems discussed in section 1.1.

Let me make one final remark on the claim of Parsons’ that a theory of logical form should make necessary truths of the following kind expressible:

- (88) Whenever x eats, x eats *something*

I suspect that the problem formulated here results again from mixing up syntactic and semantic arity. (88) is just ‘loose talk’ for the following:

- (89) Even if *eat* is used with the syntactic arity 1, *eat*’ nevertheless always has to be interpreted as a semantic predicate with arity 2.

Thus, we are shifting into a ‘meta-language’. Consider the following:

- (90) Whenever Peter says that Mary is eating, he says that she is eating something

This is not contradictory, because in the premise of this conditional the verb ‘say’ is used for ‘speaking’, and in the conclusion for ‘expressing’. Things get different, when we use the verb ‘express’:

- (91) ?Whenever Peter expresses that Mary is eating, he expresses that she is eating something

This seems a bit strange to me. Either it is contradictory, or it is tautological – depending on whether we assume that ‘Mary is eating’ and ‘Mary is eating something’ mean the same or not. So there is an effect, and thus we have to take care to predict this effect in our semantics. If I understand Parsons correctly, then his position is that no such effect should occur here, as is the case in (88). If the above observation is correct, then Parsons must be wrong again.

1.2.4 Summary

The Neo-Davidsonian theory has fundamental problems that make it very unattractive:

- The event notion used by Parsons is obscure. He would do better with Reichenbach’s original version, at least from a philosophical point of view.
- The syntax of Davidsonian logical forms combined with Davidson’s rigid extensional semantics makes it impossible to account for higher order predicates like many modifiers. Reichenbach’s original proposal should be preferred.
- NDT has no theory about the relation between universal and individual thematic roles.
- The heuristic ‘definition’ of universal thematic roles given by Parsons is too fuzzy. Because of this and the previous feature, NDT turns out not to yield semantic interpretations of sentences.
- It would not help to replace universal thematic roles by individual roles, because then we would have to stipulate which argument is realized with which morphosyntactic properties, and the result would be another version of ordered argument theories.

1.3 Outline

The most important result of section 1.1 is that we have to distinguish between what I called ‘semi-idiomatic’ and ‘free’ verbs. While subcategorization based theories, and ordered argument theories in general, perform well on semi-idioms, they can hardly explain the polyvalent behavior of ‘free’ verbs. An alternative is therefore in order, but it should not be based on universal thematic roles, as demonstrated in section 1.2.

A different treatment is therefore necessary and I will develop such a treatment in the next chapter. It will have the following four major features:

1. In the discussion of Two Level Semantics in section 1.1 I showed that the ‘conceptual level’ is sometimes important to explain polyvalent behavior. It therefore does not make sense to me to distinguish two semantic levels. Likewise, as the relevant conceptual factors can be of very different kinds, usage of conceptual primes like CAUSE, BECOME, BE etc. will not be very helpful, and I will avoid it.
2. An important background assumption is that complement types, i.e., NPs with specific cases, PPs with specific prepositions (and cases), and complement clauses of specific kinds, have their own independent semantic contributions that come into play especially in combination with polyvalent or ‘free’ verbs. So the central ‘machinery’ that the approach has to provide is one that regulates how verb meaning and complement meaning are combined to yield the meaning of the clause. Once we got rid of subcategorization frames and universal thematic roles, this issue is totally open.
3. The perspective on clause meaning is *holistic* in nature. We thus do not expect that relations within the syntactic representation of the clause are mapped homomorphically into relations within the semantic representation. We expect, however, that there could be global conditions and restrictions for the conceptual-semantic interpretation of clauses.
4. We also expect that a sentence might have several alternative conceptual-semantic interpretations. The theory to be developed has to provide this and it has to explain why and how one interpretation is chosen.

Chapter 2

Thematic Interpretation Without Subcategorization: Linking By Inference

As I concluded in the first chapter, thematic interpretation consists of *two* independent, but interrelated tasks:

- Find the role bearers of the predicates in the clause
- Find out the ‘roles’ played by each non-predicative constituent of the clause

Semi-idiomatic verbs regulate these tasks qua subcategorization frames in their lexical entries. Polyvalent or ‘free’ verbs have no subcategorization frames, and so it is totally open, how thematic interpretation works with this class of verbs.

In this chapter, I will elaborate an alternative model for thematic interpretation with polyvalent verbs. I will take into account the following background assumptions:

- The verb does not totally determine what the sentence describes, or better: it does not necessarily do so. It is a *partial* description of the event described by the sentence, and only in trivial cases the event is described by the verb in toto. This holds especially for the thematic interpretation of verbal complements: case and other morphosyntactic features of complements play an independent role in determining thematic roles. Specific case+verb configurations, like, e.g., the transitive construction, are also important.

- For polyvalent verbs, it is not fixed, how they contribute to the meaning of the clause. We usually have several options. A main task of the model to be developed is to provide this freedom without allowing anything.
- The thematic interpretation of a constituent may result from its own morphological and semantic properties, from several attributes given by the predicates in the clause, as well as from plausibility inference (e.g., if we know in order for y to have property P , it must be in state S , and if our interpretation of the clause tells that y has property P , then y is assumed to be in state S).
- We should not expect that the role bearers of a predicate can always be found among the clausal constituents. An argument can be omitted, or even only partially omitted – leaving full determination open for thematic inference based on lexical and contextual information, as well as world knowledge.

In this chapter, I will do the following:

1. I will develop a theory of ‘flexible’ argument linking that makes crucial use of the following theoretical and conceptual ‘resources’:
 - (a) Individual thematic roles as defined by Dowty (1989)
 - (b) The assumption that complement types and constructions have semantic entailments, as proposed in Construction Grammar (Fillmore, Kay & O’Connor 1988, Goldberg 1995)
 - (c) Contextual information and world knowledge – the implementation is based on DRT as developed by Kamp & Reyle (1993). This framework provides a straightforward integration of contextual information and world knowledge with ‘new’ information from a given clause
2. The empirical discussion will focus on German transitive constructions with and without a co-predicate and the two German polyvalent verbs *rollen* (‘to roll’) and *schlagen* (‘to beat/hit/strike’)

The model to be developed concerns the *conceptual-semantic interpretations* of sentences. It will not say anything new about events and truth conditions. However, the conceptual-semantic interpretation can be used for the formulation of a Reichenbach-style truth condition. Let us assume that the concept

C_i represents the conceptual-semantic interpretation of a sentence S_i , then the truth condition for S_i is:¹

$$S_i \text{ is true} \longleftrightarrow \exists x.C_i^*(x)$$

x is an event or fact in Reichenbach's sense. A sentence S_i might have more than one possible conceptual interpretation. One source for this is the nature of polyvalent verbs: it is mostly the subcategorization frame that determines the way, how in a verb+constituent complex thematic roles are assigned. Verbs without such a frame lack linking rules. Contextual factors as well as ambiguities induced by lexical items can lead to situations where we have a bundle of options. As a result, in computing the possible thematic interpretations of S_i we often do not arrive at a single concept C_i , but at a set of equally 'well-formed' conceptual-semantic interpretations $\{C_{i_1}, \dots, C_{i_n}\}$. Which of these options is chosen, results from a second step of evaluation of these 'candidates' with respect to plausibility, simplicity and maybe more criteria. A discussion of the following pair of examples shall exemplify this consideration:

- (1) a. The ball is rolling
b. The books are rolling

Assume that *roll* has one individual thematic role to assign, that of the rolling entity, R. In (1-a), R is linked to the subject, *the ball*, while in (1-b) this cannot be the correct linking, because books cannot roll. The interpretation we arrive at for (1-b) is that the books are located on a rolling entity, e.g., a cart. So we have two options for the conceptual-semantic interpretation that, for now, I represent with sets of predicate logic expressions:

- (2) a. $\{roll(ball)\}$
b. $\{on(books, cart), roll(cart)\}$

The mechanism to be developed must be able to derive both kinds of interpretations for intransitive clauses with *roll*. Thus, the structure in (2-b) should also be an option for (1-a), and the structure in (2-a) should also be an (albeit implausible) option for (1-b):

- (3) a. (i) $\{roll(ball)\}$
(ii) $\{on(ball, cart), roll(cart)\}$
b. (i) $\{roll(books)\}$

¹Within model-theoretic semantics, a version of which I will adopt here, this should be formulated as: " S_i is true if and only if there is a model x such that x is a model for C_i ":
 $S_i \text{ is true} \longleftrightarrow \exists x.x \models C_i$

- (ii) $\{on(books, cart), roll(cart)\}$

An evaluation mechanism has to filter out the actual interpretations (3-a.i) and (3-b.ii). The criteria for this are *simplicity* for (3-a) ((3-a.ii) is a two-membered set and (3-a.i) a one-membered set, this prefers the latter over the former) and *plausibility* for (3-b) (books are unlikely to roll because of their shape, this prefers (3-b.ii)).²

We now need a format for the representation of conceptual interpretations of linguistic expressions and their relation to the context. One format that has many of the features needed here is *Discourse Representation Theory* (DRT) as introduced by Kamp & Reyle (1993):

1. DRT is a theory about the relation of the semantic information given by a clause to its immediate context. For some cases of polyvalence it is essential to make use of contextual knowledge in thematic interpretation. Consider, e.g., the case of (1-b) as discussed above. Presumably, this clause is only acceptable within a suitable context, not in an out-of-the-blue context.
2. DRT provides a mechanism of the stepwise translation of syntactic structures into *Discourse Representation Structures (DRSs)*, the *DRS construction rules*. There is no general restriction against the formulation of construction-grammar-like DRS construction rules, e.g., for transitive constructions, that can do some of the work for the interpretation of clauses with polyvalent verbs.
3. DRT makes use of the conception of ‘event’ in a way that is very close to the Reichenbachian intuition in that it treats whole clauses as predicates of events, on a par with event nominalizations.
4. Kamp & Roßdeutscher (1994*a, b*) deal with the task of integrating lexical knowledge into DRSs. Though I do not agree with some details of their proposal, the overall treatment and formalization is something that we can build on.
5. An important conceptual issue is that DRS lays much emphasis on *interpretation*. DRSs are more than just a representation of truth conditions. DRSs also show, how new information is integrated into a given discourse. As we saw in the discussion of (1-b), information given in the

²This is reminiscent of an optimality theoretic model. The criteria must be ranked hierarchically: The more complex model only ‘wins’ if it is more plausible: plausibility \gg simplicity.

preceding discourse of a clause can be important for the assignment of thematic roles. In this sense, the linking of thematic roles is an interpretive task. The elaborated structure of DRSs and the mechanisms of discourse interpretation will be helpful in its formalization.

6. The format of DRSs allows to distinguish between three different parts of lexical-semantic information: i) the introduction of individuals representing the thematic roles of the verb by *discourse referents*; ii) the predicative part of a verb constituting the event, and iii) certain prerequisites and selectional restrictions for the individuals can be integrated as ordinary DRS conditions.

The next section will introduce the core concepts of DRT and discuss the DRT implementation of thematic interpretation outlined in Kamp & Roßdeutscher (1994b).

2.1 Verbs, Thematic Roles and DRT

A *Discourse Representation Structure* “... consists of two components:

- (i) a set of discourse referents, called the *universe* of the DRS, which will always be displayed at the top of the diagram; and
- (ii) a set of DRS-conditions, typically displayed below the universe” (Kamp & Reyle 1993, 63)

Thus, sentence (4) has the DRS (5) (example taken from Kamp & Reyle 1993, 60ff):

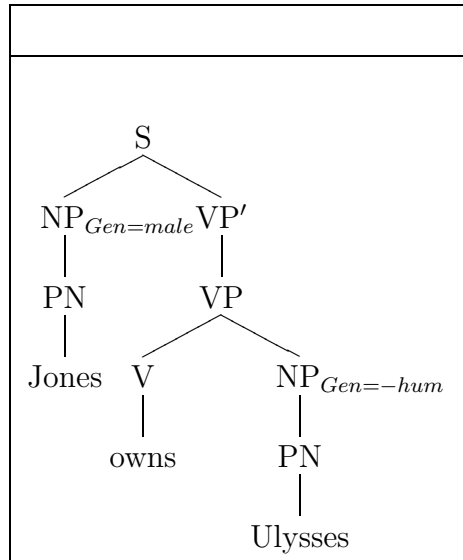
(4) Jones owns Ulysses

(5)

x y
Jones(x) Ulysses(y) x owns y

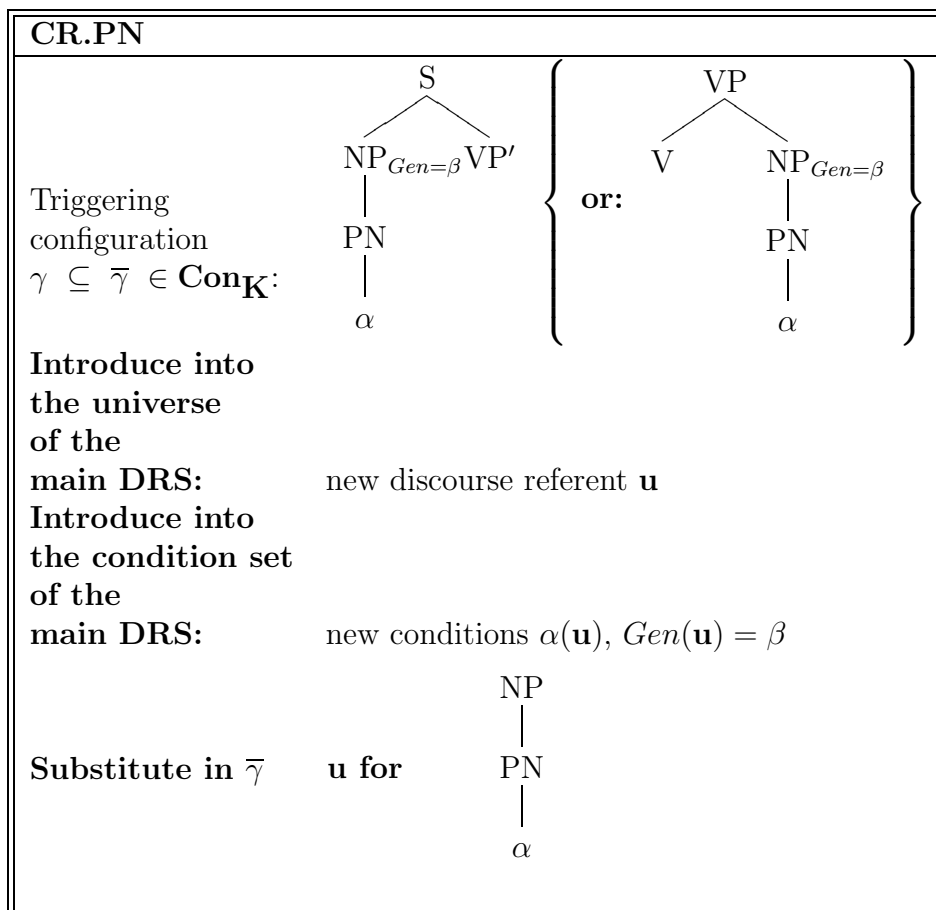
The *initial DRS*, however, is an empty discourse with the syntactic structure of the sentence added:

(6)



The nodes labelled 'PN' are already more than syntactic labels. They denote the NP *type* 'proper noun'. Other NP types are 'pronoun' (PRO), 'definite description' (DD) and 'indefinite description' (ID). Each of these NP types has its own *DRS construction rule*. The construction rule for proper nouns is given in (7) (Kamp & Reyle 1993, 121):

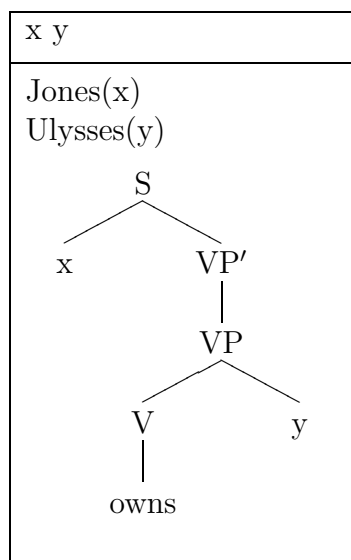
(7)



The application of this rule introduces discourse referents and conditions and yields a reduction of the syntactic tree.³ (7) is transformed into (8):

³ $\mathbf{Con}_{\mathbf{K}}$ is the set of conditions in the DRS \mathbf{K} ; γ is the configuration that triggers the application of the rule; $\bar{\gamma}$ is the treated condition that contains γ as subtree.

(8)



The next thing to do is transforming the verb and its VP into their DRS correlates. Kamp and Reyle formulate this together with the construction rules that translate temporal and aspectual features. I will ignore those and only quote the passages dealing with the verb here:

(i) Introduction of a new discourse referent for the described eventuality

[...]

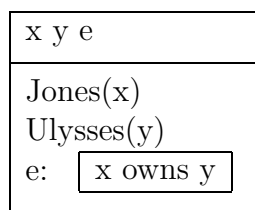
(v) Introduction of a DRS-condition e : $\boxed{\gamma}$ which specifies the “type” of the described eventuality.

(Kamp & Reyle 1993, 514f)

It should also be added that the triggering configuration for this construction rule – an S that contains the VP and discourse referents in place of the nominal constituents, just as in (8) – is erased, as soon as this ‘construction rule’ is applied.

The result is a DRS that no longer contains a syntactic tree, the translation is completed:

(9)



This treatment is rather superficial with respect to the problem of thematic role assignment. Kamp & Roßdeutscher (1994*b*) study in more detail how the lexical information of a verb enters a DRS. We will turn to this proposal in section 2.1.1. Syntactic trees inside of DRSs are *reducible conditions*: “A *reducible* condition is one containing at least one triggering configuration for some construction rule.” (Kamp & Reyle 1993, 87). A reducible condition can be seen as syntactic information that is not yet translated into the DRS. A translation is completed, if there are no more reducible conditions, which in other words means that ‘all syntactic information is interpreted’. The general form of the *DRS Construction Algorithm* is (10) (Kamp & Reyle 1993, 87):

(10)

DRS-Construction Algorithm	
Input:	a discourse $D = S_1, \dots, S_i, S_{i+1}, \dots, S_n$ the empty DRS K_0
Keep repeating for $i = 1, \dots, n$:	
(i)	add the syntactic analysis $[S_i]$ of (the next) sentence S_i to the conditions of K_{i-1} ; call this DRS K_i^* . Go to (ii)
(ii)	Input: a set of reducible conditions of K_i^* Keep on applying construction principles to each reducible condition of K_i^* until a DRS K_i is obtained that only contains irreducible conditions. Go to (i).

2.1.1 DRSs and the Lexicon

An account of the integration of lexical information into DRSs, including thematic role assignment, was offered by Kamp & Roßdeutscher (1994*b*). They develop their own proposal for the format of lexical entries, but their background assumptions are uncontroversial. A simple lexical entry of a verb consists of a syntactic and a semantic part. The German verb *heilen* (‘to heal’), as used in (11), has the lexical entry (12) (cf. Kamp & Roßdeutscher 1994*b*, 108,110):⁴

- (11) Der Fuß heilte (*vom Knochenkrebs)
The foot healed (of bone cancer)

⁴Kamp and Roßdeutscher assume that all instances of HEILEN involve two “Theme” roles, which represent the body part that healed (Theme₁) and the ailment or disease it healed of (Theme₂).

- (12) *heilen* $\{\langle \theta_1, \text{Nom} \rangle\}$
 e: HEILEN($y_{\text{th}1}$, $z_{\text{th}2}$) Theme₁ Theme₂

The first line in (12) contains syntactic information, and the second semantic information: “The syntactic component is to be read in the following way: The verb in question, *heilen*, occurs on the left. It is followed by the different argument phrases which are syntactically realized by the verb and which correspond to arguments of the corresponding concept. In the present instance there is one such argument. Syntactically it is realized with nominative case, indicated here by the case index [Nom]. The denotatum of this phrase plays the thematic role of Theme₁; this role is mentioned directly underneath, in the tier reserved for the semantic component.” (Kamp & Roßdeutscher 1994*b*, 110)

Kamp and Roßdeutscher observe several phenomena that complicate lexical entries. One such complication arises with optional arguments, like the object of *essen* (‘to eat’):

- (13) a. Fritz aß einen Kuchen
 F. ate a cake
 b. Fritz aß trotzdem
 F. ate nevertheless

Round brackets around a theta role in the first line of the lexical entry indicate this optionality. This is usual practice (Kamp & Roßdeutscher 1994*b*, 111):⁵

- (14) *essen* $\{\langle \theta_1, \text{Nom} \rangle, (\langle \theta_2, \text{Acc} \rangle)\}$
 e: ESSEN(x_{ag} , y_{th}) Agent Theme

Another important factor are *selectional restrictions* for arguments of the verb. As already noted, intransitive uses of ‘heilen’ require a body part as subject. The ‘second theme’ has to be an ailment or disease. This contrasts with the German verb ‘gesundeln’ that requires an organism as subject and does not allow for a body part:⁶

- (15) a. Der Fuß heilte (*vom Knochenkrebs)
 the foot healed of bone cancer
 b. *Der Patient heilte (vom Knochenkrebs)
 the patient healed of bone cancer

⁵In the original lexical entry the highest theta role is written “ $d\langle \theta_1, \text{Nom} \rangle$ ”, where the ‘d’ indicates that this role is the ‘designated argument’ that is to become subject, is suppressed in passivization etc. I am omitting this ‘d’ for ease of reading here.

⁶The asterisk marks semantic unacceptability here.

- (16) a. *Der Fuß genas (vom Knochenkrebs)
 the patient healed of bone cancer
 b. Der Patient genas (vom Knochenkrebs)
 the foot healed of bone cancer

Kamp and Roßdeutscher assume that ‘genesen’ and ‘heilen’ are not different in their meaning. Both use the template HEILEN in the semantic part of their lexical entry. The difference lies only in the *selectional restrictions* they impose on their arguments. Such restrictions are necessary independently, e.g., to exclude (17):

- (17) *Der Kleiderschrank heilte
 the wardrobe healed

The respective selectional restrictions are encoded in the semantic part of the lexicon:

- (18) e: HEILEN(y_{th1}, z_{th2}) Theme₁ Theme₂
 SEL RESTR SEL RESTR
 organism ailment
 or body part or disease

But the exclusions of body parts for *gesund* and organisms for *heilen* are represented not as restrictions on the concept, i.e. not as semantic restrictions, but as idiosyncrasies that belong to the syntactic component of the respective lexical entry (cf. Kamp & Roßdeutscher 1994b, 112f):⁷

- (19) *heilen* $\{\langle \theta_1, Nom \rangle\}$
 *organism(i)
 e: HEILEN(y_{th1}, z_{th2}) Theme₁ Theme₂
 SEL RESTR SEL RESTR
 organism ailment
 or body part or disease
- (20) *gesund* $\{\langle \theta_1, Nom \rangle\}$
 *body part(i)
 e: HEILEN(y_{th1}, z_{th2}) Theme₁ Theme₂
 SEL RESTR SEL RESTR
 organism ailment
 or body part or disease

⁷The (i) signals that the restriction is idiosyncratic in nature.

This treatment implies that ‘gesunden’ and ‘heilen’ mean the same, and that their different selectional properties are more or less arbitrary and have nothing to do with the meaning of these words. Such a position need not necessarily be taken. It is as well possible to consider the different selectional restrictions as parts of the semantic component.

The motivation for entries as in (19) and (20) is conceptual: HEILEN is assumed to be an abstract, essentially non-linguistic, semantic concept. Words are related to such concepts. I am sceptical whether it is really necessary and helpful to assume that a theory of word meaning depends on a theory of non-linguistic meaning. But this is a minor issue here. Kamp and Roßdeutscher make a difference between conceptually motivated selectional restrictions, like those that exclude wardrobes as possible subjects of intransitive *heilen* and *gesund*, and idiosyncratic or ‘syntactic’ selectional restrictions, like those that exclude body parts as possible subjects of *gesund* and organisms as possible subjects of intransitive *heilen*. As long as a theory of non-linguistic concepts is not developed, we are not forced to assume two different types of selectional restrictions. I will assume only one type of selectional restrictions which is encoded in the *semantic* part of lexical entries. Remember that polyvalent verbs under the treatment developed here do not have a subcategorization frame and thus have no syntactic information at all in their lexical entry (apart from morphosyntactic information that concerns the syntactic category ‘V’ in general; i.e., no *lexeme specific* information is added).

But before turning to polyvalent verbs let us see how Kamp and Roßdeutscher translate lexical information into a DRS. According to Kamp & Reyle (1993) a DRS like (21) would not contain any reducible conditions:⁸

(21) *Der Fuß heilte* (*‘the foot healed’*)

n e x
e < n der Fuß(x) e: x heilen

In Kamp & Roßdeutscher (1994b), the condition “x heilen” can and thus has to be reduced by replacing it with the conceptual-semantic part of the lexical

⁸The discourse referent n (from ‘now’) stands for the utterance time, the condition ‘e < n’ (to be read as ‘the event e took place before utterance time’) represents the DRS translation of the past tense feature.

entry of ‘heilen’. This lexical entry is represented in a *schematic DRS* as in (22) (Kamp & Roßdeutscher 1994b, 121f):

(22)

e y z
e : HEILEN(y , z)
y = Theme ₁ (e)
z = Theme ₂ (e)

The discourse referents are typed in bold face to indicate that they have the status of *schematic discourse referents*. The thematic roles are represented as functions from eventualities to the entities involved in these eventualities. While the use of the term ‘Theme’ indicates that the conception of universal thematic roles is used, the subscripts of these labels indicate that they can only be understood in relation to the given verb, and thus are closer to individual thematic roles in this respect. Apart from this, it is not clear to me that the two conditions containing the thematic roles are really necessary. Why should the information about the thematic roles of the discourse referents not already follow from the condition ‘HEILEN(**y**,**z**)’?

The schematic DRS (22) replaces the occurrence of the verb in (21). The schematic discourse referents, however, are only introduced, if they are not identified with a discourse referent in the old DRS. Thus, **e** is identified with *e*, and **y** is identified with *x*, while **z** has to be added as schematic discourse referent (Kamp & Roßdeutscher 1994b, 122):⁹

⁹Kamp and Roßdeutscher claim that schematic discourse referents do not have the status of ordinary discourse referents. This shall be manifested by the fact that schematic discourse referents are not available as antecedents for pronominal anaphora (Kamp & Roßdeutscher 1994b, 123):

- (i) Der Fuß heilte schließlich. Es hatte den Patienten aber monatelang geplagt.
‘Finally the foot healed. It had troubled the patient for month’

Kamp and Roßdeutscher propose that the pronoun ‘es’ cannot refer to the ailment which had been affecting the foot. I am not convinced that the generalization is correct. Consider the following example:

- (ii) John hat wieder geheiratet. Sie ist sehr nett.
‘John has married again. She is very nice’

Here, it seems to me totally clear that *Sie* refers to the schematic discourse referent of John’s new wife which was introduced by the verb *heiraten*. It might be the case that most schematic discourse referents are not available as antecedents, but excluding this option in general is an overgeneralization. This is, however a minor problem for our discussion, because I will not be concerned with anaphora resolution.

(23)

n e x z
e < n
der Fuß(x)
e: HEILEN(x,z)
x = Theme ₁ (e)
z = Theme ₂ (e)

What has to be shown next, is how we come to identify, e.g., the discourse referent x with the schematic discourse referent y , rather than with z . This is explained by Kamp and Roßdeutscher with reference to the process of sentence parsing. Let us consider the following example (Kamp & Roßdeutscher 1994b, 149ff):

- (24) Der Arzt heilte Peter von der Grippe
The doctor cured Peter of the flu

Kamp and Roßdeutscher assume that the parser computes the *ArgSet* of a sentence as one component of its output, “in the form of a set of pairs, each consisting of (i) the NP or PP in question, and (ii) its *generalized case information* (for an NP this is its case, for a PP it is its preposition + the case of the NP governed by it).” The *ArgSet* of (24) is the following three element list:

- (25) {⟨der Arzt, Nom⟩, ⟨Peter, Acc⟩, ⟨von der Grippe, von + Dat⟩}

The lexical entry for transitive ‘heilen’¹⁰ has two variants (the PP in (24) is optional) (Kamp & Roßdeutscher 1994b, 151, only the syntactic component of the lexical entry is mentioned here):

- (26) a. *heilen* {⟨ θ_1 , Nom⟩, ⟨ θ_2 , Acc⟩, ⟨ θ_3 , von + Dat⟩}
Agent Theme₁ Theme₂
b. *heilen* {⟨ θ_1 , Nom⟩, ⟨ θ_2 , Acc⟩ }
Agent Theme₁ Theme₂

Each of these entries has a set *ObArg* of ‘semantically obligatory arguments’ and a set *GrArg* of ‘grammatically realized arguments’. *GrArg* is a subset of *ObArg*, because it contains only those members of *ObArg* that are grammatically realized:

¹⁰Note that Kamp and Roßdeutscher chose a strategy where polyvalent behaviour is encoded by a set of lexical entries for the same verb *heilen*.

- (27) ad (26-a):
 ObArg = $\{\langle Agent, Nom \rangle, \langle Theme_1, Acc \rangle, \langle Theme_2, von + Dat \rangle\}$
 GrArg = $\{\langle Agent, Nom \rangle, \langle Theme_1, Acc \rangle, \langle Theme_2, von + Dat \rangle\}$
- (28) ad (26-b):
 ObArg = $\{\langle Agent, Nom \rangle, \langle Theme_1, Acc \rangle, \langle Theme_2, NIL \rangle\}$
 GrArg = $\{\langle Agent, Nom \rangle, \langle Theme_1, Acc \rangle\}$

Kamp and Roßdeutscher say the following about the procedure of finding the right lexical entry:

[...] To verify that its parse is lexically possible the parser must choose an entry for the verb and establish that the [sentence's, RV] ArgSet it has computed matches this entry's GrArg. It is clear that such a match exists for the ArgSet [(25)] and the GrArg of the entry represented under [(27)]. [...] (Kamp & Roßdeutscher 1994*b*, 151)

The parser then uses this lexical entry to establish the assignment of thematic roles.

Such a procedure is possible for verbs that have subcategorization frames – ‘semi-idioms’, as I called them. In order to account for polyvalent verbs we need another strategy.

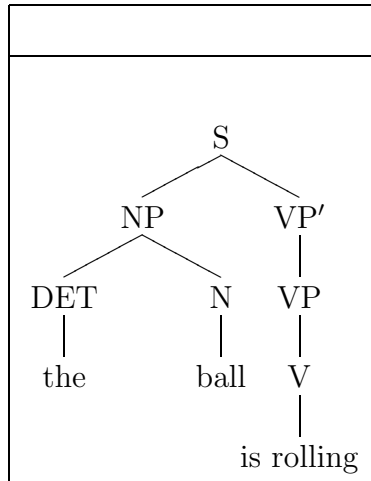
2.2 Polyvalent Verbs in DRSs – First Steps

What happens, when we try to construct a DRS for a clause with a polyvalent verb? Let us start with a simple example:

- (29) The ball is rolling

The initial DRS we start with contains only the syntactic representation of the clause to be translated:

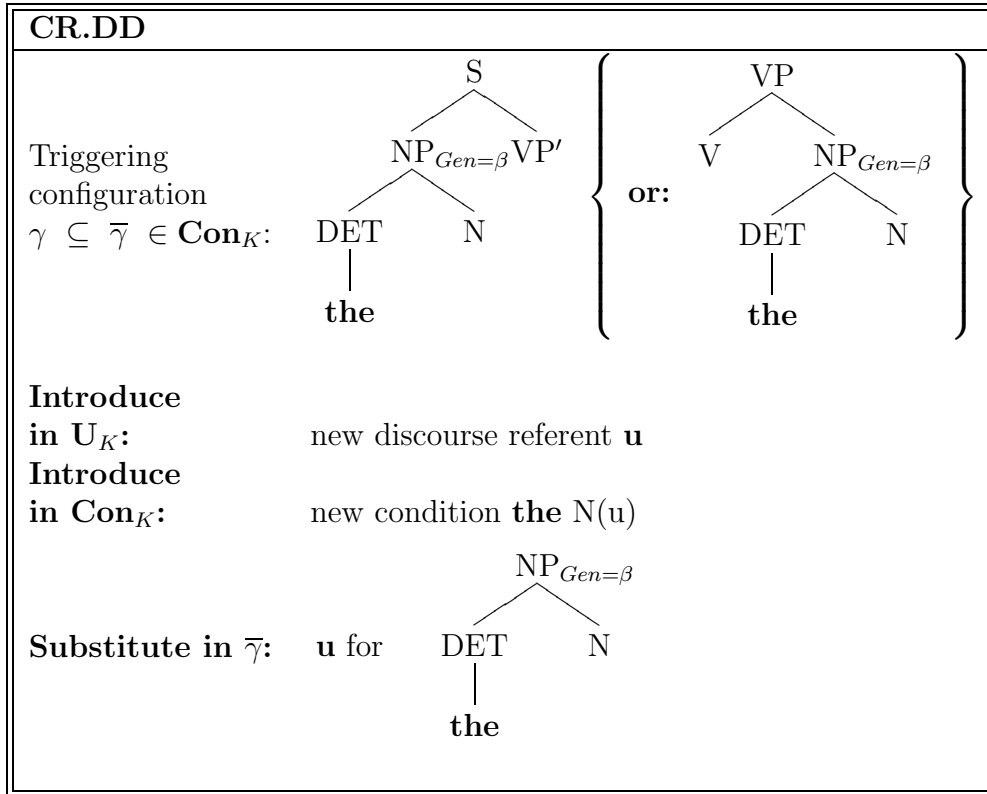
(30)



The temporal and aspectual features of the verb shall be ignored here and subsequently. The first step in our translation concerns the definite noun phrase which is translated by the DRS construction rule for definite descriptions, CR.DD. It has the following form (Kamp & Reyle 1993, 254):¹¹

¹¹Remember that the variables γ and $\bar{\gamma}$ stand for the substructure γ of the processed structure $\bar{\gamma}$, where γ is the ‘triggering configuration’ for the application of the DRS construction rule.

(31)



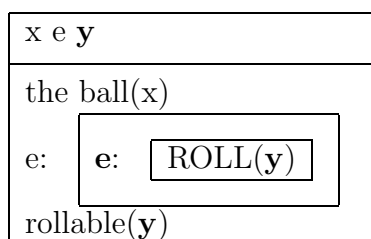
This rule reduces the NP part of the structure in (30). It thereby introduces a discourse referent, say, x , and a condition of the form ‘the ball(x)’.¹² It also replaces the triggering configuration with the discourse referent. The DRS we arrive at looks like this:

¹²Kamp and Reyle note that this account for definite noun phrases is not really satisfactory. A proper account, they say, should have to provide additional processing principles corresponding to the different types of use of definite descriptions, which reduce conditions like ‘the N(x)’ further.

construction rule.

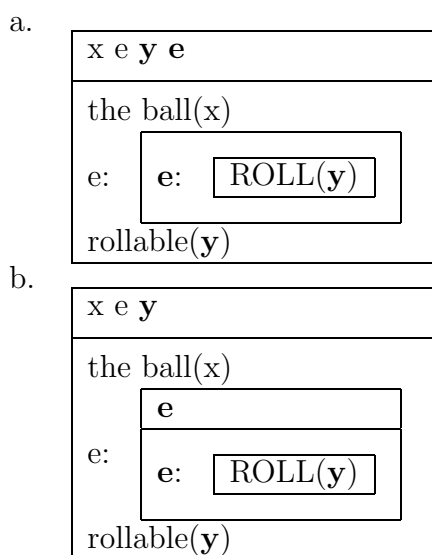
The next step according to the construction rule described in section 2.1.1 is the integration of the schematic DRS of *roll* into the DRS that we already derived. This yields the elimination of the remaining piece of the syntactic tree. It thereby introduces a discourse referent for the event, *e*, and the schematic discourse referent **e**. While *e* is introduced by the clause itself (the S node, to be precise), **e** is introduced by the verb *roll*.

(35)



Kamp & Reyle (1993) and Kamp & Roßdeutscher (1994*b*) do not give detailed proposals about the status of event variables and when they are introduced. The treatment that I prefer here is the one proposed by Reichenbach (1947), as discussed in detail in section 1.2. Thus, the variable *e* stands for an event or fact in Reichenbach’s sense. In (35), it is not determined, in which universe the schematic event variable of the verb is to be introduced. It could be either the universe of the main DRS (36–a) or the universe of *e* (36–b):

(36)



(36–a) would treat schematic event variables like schematic variables of individuals. Kamp & Roßdeutscher’s (1994*b*) treatment of verbs expressing so-called ‘causal complexes’ treats schematic event variables as in (36–b).

However, the reasons for this choice are not given. For the present purposes, a treatment as in (36–b) is also the better choice. Remember that we assume here that the verb does not totally determine the meaning of the clause, but that, nonetheless, the meaning of the verb is *part* of the meaning of the clause, i.e. \mathbf{e} is a part of e . Inserting \mathbf{e} in the universe of the main DRS would imply that an event \mathbf{e} existed independently of e , which is not what we want – a part of some x cannot exist independently of x . (36–b) does not have this implication. However, a fully satisfactory account of the semantic relation between \mathbf{e} and e must be based on an ontology of events which is a project much too ambitious to be given here.¹⁴ For the present discussion, I will assume that such an event semantics can be given and that it formulates the relation of \mathbf{e} and e as a part-to-whole relation.

Another issue that needs clarification is the positioning of the selectional restriction ‘rollable(\mathbf{y})’ outside of the DRS boxes of \mathbf{e} and e . The motivation for this is that we want the content of the DRS box of e to say what the event referred to by the clause is about. A clause containing the verb *roll* is about the rolling of some \mathbf{y} . The rollability of \mathbf{y} is a necessary condition of its rolling that is presupposed, rather than being asserted by the clause. Inserting selectional restrictions into the main DRS is one way of expressing this difference. It requires that selectional restrictions can be differentiated from the ‘real’ predicates in the schematic DRS of a lexical entry, which is the case in the discussed method of formulating lexical entries. A more detailed discussion of the treatment of presupposed material will follow below.

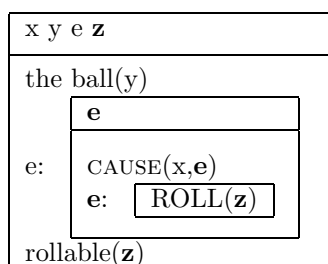
The schematic event variable \mathbf{e} need not necessarily be only a part of e . In simple cases, the content of \mathbf{e} can be identical with that of e . In this situation can e and \mathbf{e} be unified and \mathbf{e} can totally disappear.¹⁵

Likewise, it does not automatically follow that the schematic discourse referent \mathbf{y} is identified with the discourse referent x in (36). This would only

¹⁴It could perhaps be based on Bach (1986) and similar work.

¹⁵The variables e and \mathbf{e} may not be unified, whenever the verb does not introduce all predicates given in a clause. For example, causative uses of *rollen* could be represented with the same lexical entry for *rollen* as above, but now e and \mathbf{e} differ:

- (i) Mary rolled the ball



follow if the verb’s lexical entry contained a subcategorization frame that enforced that. We assume that this is not the case for *roll*.

That we can unify discourse referents, but do not have to, is not untypical for DRT. This also occurs, for example, in anaphora resolution, where the referent of an anaphoric expression has to be identified with a previously introduced discourse referent, but it is not determined, how this referent is chosen.¹⁶

Let us make the following assumptions about the integration of the schematic DRS: a verbal schematic DRS **e** is introduced inside the DRS of *e*, which represents the interpretation of the clause. The two event variables can be unified, but do not have to. The other schematic discourse referents may be identified with discourse referents within the clause, but again they do not have to. We introduce the conditions given by the schematic DRS inside the DRS of **e** (or *e*, in case of unification). Let us assume that *e* and **e** are unified in (36). This yields at least two possibilities that differ in whether *x* and **y** are also unified:

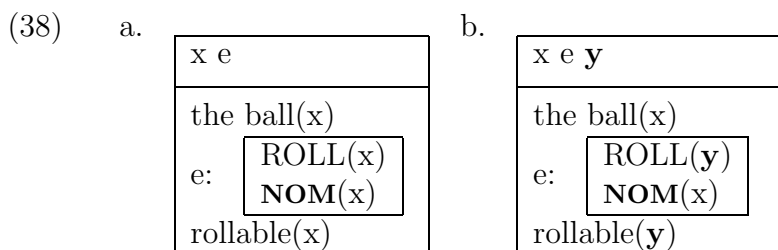
(37)	a.	<table style="border-collapse: collapse; width: 100%;"> <tr><td style="border-bottom: 1px solid black; padding: 2px;">x e</td></tr> <tr><td style="padding: 2px;">the ball(x)</td></tr> <tr><td style="padding: 2px;">e: ROLL(x)</td></tr> <tr><td style="padding: 2px;">rollable(x)</td></tr> </table>	x e	the ball(x)	e: ROLL(x)	rollable(x)	b.	<table style="border-collapse: collapse; width: 100%;"> <tr><td style="border-bottom: 1px solid black; padding: 2px;">x e y</td></tr> <tr><td style="padding: 2px;">the ball(x)</td></tr> <tr><td style="padding: 2px;">e: ROLL(y)</td></tr> <tr><td style="padding: 2px;">rollable(y)</td></tr> </table>	x e y	the ball(x)	e: ROLL(y)	rollable(y)
x e												
the ball(x)												
e: ROLL(x)												
rollable(x)												
x e y												
the ball(x)												
e: ROLL(y)												
rollable(y)												

There is something strange in the DRS (37–b) that makes it very unlikely to represent a possible interpretation, namely: we do not know more about the discourse referent *x* than that it is a ball. If we were to paraphrase (37–b) we would come up with a statement like “Something is rolling and the ball is around there”. The problem about (37–b) is that nothing in this structure points to this oddity.

I have not addressed yet an important fact about subcategorization that might be relevant here: Subcategorization frames use *case information* to encode thematic relations. Under the perspective of subcategorization, it is reasonable to assume that case information does not enter a DRS, because it would only be a reduplication of thematic information. But polyvalent verbs do not have subcategorization frames, and so it is an open question, how case information is ‘reduced’. Let us assume that in these cases the case information enters the DRS on a par with the schematic DRS and that it is contained inside the DRS box of *e*. The structures in (37) have to be modified

¹⁶An optimality theoretic solution of this problem is proposed in Hendricks & de Hoop (1999).

in the following way:



Conditions of the form $\langle \mathbf{CASE} \rangle(x)$ are reducible conditions. But they cannot be reduced in the usual way as triggers for DRS construction. Intuitively speaking, what we want is a condition that regulates the elimination of $\mathbf{NOM}(x)$ in (38). This condition is met in (38–a), but not in (38–b).

A comparison of the two structures makes the difference quite obvious that might allow the elimination of $\mathbf{NOM}(x)$: The box of the event e contains a condition that says something about x in (38–a), but not in (38–b). So one formulation of the desired rule could be that $\langle \mathbf{CASE} \rangle(u)$ can be eliminated from an event box, if it contains another condition that has u as its argument. The problem with this kind of strategy is that any predicate logic formula ϕ can be paraphrased in the form $\phi(x)$.¹⁷ This formula might be semantically empty, but the proposed rule is only a syntactic one, so this does not count.¹⁸

The criterion for the reduction of conditions of the form $\langle \mathbf{CASE} \rangle(x)$ thus has to be a semantic one. The first thing that might come to one’s mind, are perhaps thematic roles. We could include thematic role predicates in the box of the event e , like, e.g., ‘ $\mathbf{THEME}(x)$ ’ in (38–a). We then could classify a set of predicates representing the universal thematic roles and state the following rule: “A predicate of the form $\langle \mathbf{CASE} \rangle(x)$ can be eliminated from a DRS box of an event e iff this box contains a condition of the form $f(x)$, such that f is an element of the set of universal thematic roles.” However, I already showed in chapter 1.2 that universal thematic role labels are conceptually problematic and for this reason undesirable. It might perhaps work better with individual role labels, but this still excludes certain thematic interpretations. It can happen that a constituent receives a thematic interpretation that is only partly determined by the verb. In principle, thematic interpretations can be ‘derived’ in the course of interpretation.

For these reasons I will not rely on thematic role labels, but exploit a claim that was also made in the first chapter, namely, that complement types are

¹⁷Thanks to Wolfgang Sternefeld for pointing this out to me.

¹⁸One could think of a filtering mechanism that excludes such semantically empty predications from the set of relevant conditions. But this would seriously complicate the definition of the logical inventory. We had better avoid this strategy.

not semantically neutral. The different types of complement clauses, case-marked DPs and PPs all occur under certain semantic circumstances and the complement type may influence the thematic interpretation of a verbal complement. For structural cases like nominative and accusative, this semantic contribution might be rather weak. My proposal for nominative, that will be explored and more deeply motivated in the next sections, is that nominative (and likewise accusative case) in German assumes *total involvedness*. Thus, the elimination rule that I want to state is the following:

(39)

Nominative Elimination				
Triggering configuration: A DRS box of an event e , containing the condition $\mathbf{NOM}(u)$:				
e:	<table border="1" style="border-collapse: collapse; margin: auto;"> <tr><td style="padding: 2px 10px;">...</td></tr> <tr><td style="padding: 2px 10px;">$\mathbf{NOM}(u)$</td></tr> <tr><td style="padding: 2px 10px;">...</td></tr> </table>	...	$\mathbf{NOM}(u)$...
...				
$\mathbf{NOM}(u)$				
...				
eliminate $\mathbf{NOM}(u)$, iff $e \longrightarrow \text{totally_involved}(u)$				

If the claim that complement types have semantic import is correct, then rules like this have to be stated for all case forms, subordinate clause types and prepositional complements.¹⁹

In order to eliminate $\mathbf{NOM}(x)$ from the DRS in (38-a) we now have to prove $\text{totally_involved}(x)$. How can we do that? Suppose the DRS contains the following meaning postulate:

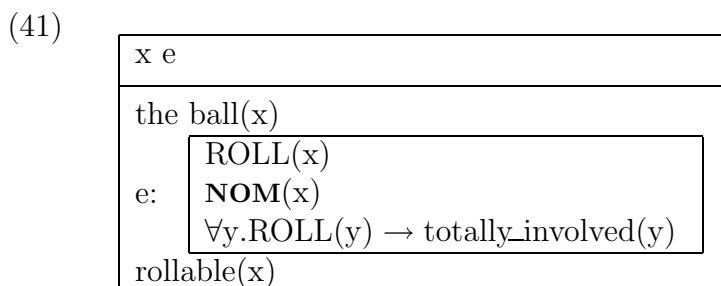
$$(40) \quad \forall x. \text{ROLL}(x) \rightarrow \text{totally_involved}(x)$$

Then we could infer from the premise in (40) and the condition ‘ $\text{ROLL}(x)$ ’ given in (38-a) that $\text{totally_involved}(x)$ holds, by modus ponens.

The last problem to be solved is how to make a postulate like (40) enter the DRS. I am assuming that such postulates are part of general world knowledge, and I furthermore assume that world knowledge is included in any DRS. Linguistic communication never takes place in a literally empty context. The least thing that we have is our knowledge about the world and our knowledge about lexical items and how to use them to refer to what we

¹⁹For PPs this appears to be rather natural, because this would only mean that we have a semantic lexical entry for lexical prepositions.

know about the world. I will only represent those world knowledge postulates that are relevant for the inferences I am looking for. I further assume that world knowledge postulates need not be inserted in the outermost box of a DRS. They can be placed anywhere. The revised structure of (38-a) looks like this:²⁰

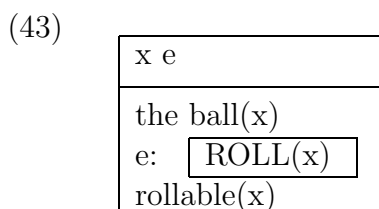


We now have two conditions inside the box of e from which we can infer, by modus ponens, that ‘totally_involved(x)’ holds:

(42)

$$\frac{\forall y. \text{ROLL}(y) \rightarrow \text{totally_involved}(y) \quad \text{ROLL}(x)}{\therefore \text{totally_involved}(x)}$$

This inference allows to add ‘totally_involved(x)’ to the DRS box of e in (41). ‘Nominative elimination’ can take place and (42) is transformed into (43) (leaving out again the postulate from world knowledge):



This DRS has no more reducible conditions and thus serves as one possible interpretation of the clause under examination. And we arrived there with the help of certain inferences, but without the use of subcategorization frames.

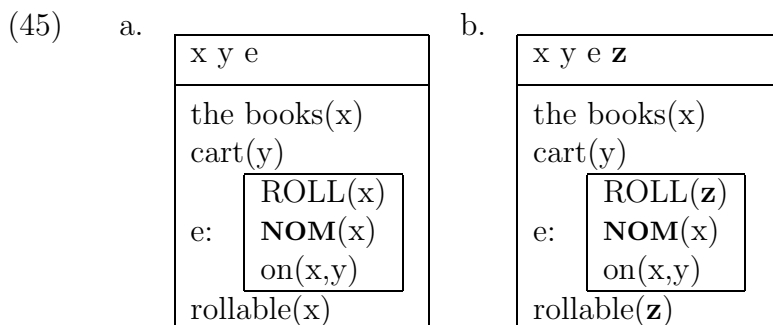
It might be impossible to reduce the DRS in (38-b) in the same way. This would leave the condition **NOM(x)** in the DRS, and this in turn can be seen as an incompleting DRS construction. I assume that such a DRS does not count as a possible interpretation. Under other circumstances a structure like (38-b) can be more successful. One example in case is the following:

²⁰Kamp & Reyle (1993) propose an own DRS-style representation of universal entailments. However, they also show that it is equivalent to standard formulae of predicate logic. I am using the latter for ease of representation.

(44) The books are rolling

This example might appear a bit strange, but it might be uttered by a person who put some books on a cart that suddenly starts to roll away. Let us assume this possibility, only for the sake of the example.

Let us assume that the basic processes of DRS translation have already applied and we derived two DRSs parallel to (38), but now with the addition of the contextual knowledge that the books are on a cart:



For our purposes, contextual knowledge can be treated like world knowledge. This means that terms of contextual knowledge can be introduced anywhere as DRS conditions.²¹ The structure (45-a) can be reduced in the same way as before. Because the books are rolling, they are totally involved and this satisfies the reduction condition for ‘NOM(x)’. After this reduction the translation is completed. But the DRS contains the conditions ‘rollable(x)’ and ‘the books(x)’. This is contradictory, strictly speaking. Books usually do not have the shape to be able to roll. So here we have a well-formed DRS that is unlikely to represent the correct interpretation for independent reasons.

Structure (45-b) can do better under these circumstances. As an alternative to the subject of the clause, ‘the books’, the discourse referent representing the cart could be unified with the schematic discourse referent **z**. This yields the following DRS:

²¹Discourse referents that stem from the preceding discourse are necessary for the interpretation of pronominal drop phenomena. German has optional topic-drop, especially in answers, as in the following dialogue:

- (i) A: Was hat Maria_i gestern gemacht?
 B: \emptyset_i Hat ein Buch gelesen
 (A: What did Maria do yesterday?
 B: Read a book)

B’s answer can only be interpreted correctly in the context of A’s question.

(46)

x y e			
the books(x) cart(y)			
e: <table border="1"> <tr> <td>ROLL(y)</td> </tr> <tr> <td>NOM(x)</td> </tr> <tr> <td>on(x,y)</td> </tr> </table>	ROLL(y)	NOM(x)	on(x,y)
ROLL(y)			
NOM(x)			
on(x,y)			
rollable(y)			

A cart is a rollable entity, so in this respect, (46) performs better than (45–a). But the problem with (38-b) was that the condition ‘**NOM(x)**’ was irreducible. We have to show that this does not happen with (46). It does not, and the reason is that it is now possible to infer ‘**totally_involved(x)**’, though in a quite indirect way. Assume that the following two propositions are part of world knowledge:

- $\forall x,y.(on(x,y) \wedge roll(y)) \rightarrow move(x)$
 (“For all x and y, if x is on y and y is rolling, then x is moving”)
- $\forall x.move(x) \rightarrow totally_involved(x)$
 (“for all x and y, if x is moving, then x is totally involved”)

We can add these conditions to the DRS box of the event e in (46):

(47)

x y e					
the books(x) cart(y)					
e: <table border="1"> <tr> <td>ROLL(y)</td> </tr> <tr> <td>NOM(x)</td> </tr> <tr> <td>on(x,y)</td> </tr> <tr> <td>$\forall x,y.(on(x,y) \wedge roll(y)) \rightarrow move(x)$</td> </tr> <tr> <td>$\forall x.move(x) \rightarrow totally_involved(x)$</td> </tr> </table>	ROLL(y)	NOM(x)	on(x,y)	$\forall x,y.(on(x,y) \wedge roll(y)) \rightarrow move(x)$	$\forall x.move(x) \rightarrow totally_involved(x)$
ROLL(y)					
NOM(x)					
on(x,y)					
$\forall x,y.(on(x,y) \wedge roll(y)) \rightarrow move(x)$					
$\forall x.move(x) \rightarrow totally_involved(x)$					
rollable(y)					

Now it is possible to infer ‘**totally_involved(x)**’. We know that x is on y and that y is rolling. From this follows that x is moving, according to the first of the two world knowledge postulates. From the second postulates follows that x is totally involved, because it is moving. ‘**NOM(x)**’ can be erased. So we arrive at:

(48)

x y e	
the books(x) cart(y)	
e:	
<table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td style="padding: 5px;"> ROLL(y) on(x,y) move(x) totally_involved(x) $\forall x,y.(on(x,y) \wedge roll(y)) \rightarrow move(x)$ $\forall x.move(x) \rightarrow totally_involved(x)$ </td> </tr> </table>	ROLL(y) on(x,y) move(x) totally_involved(x) $\forall x,y.(on(x,y) \wedge roll(y)) \rightarrow move(x)$ $\forall x.move(x) \rightarrow totally_involved(x)$
ROLL(y) on(x,y) move(x) totally_involved(x) $\forall x,y.(on(x,y) \wedge roll(y)) \rightarrow move(x)$ $\forall x.move(x) \rightarrow totally_involved(x)$	
rollable(y)	

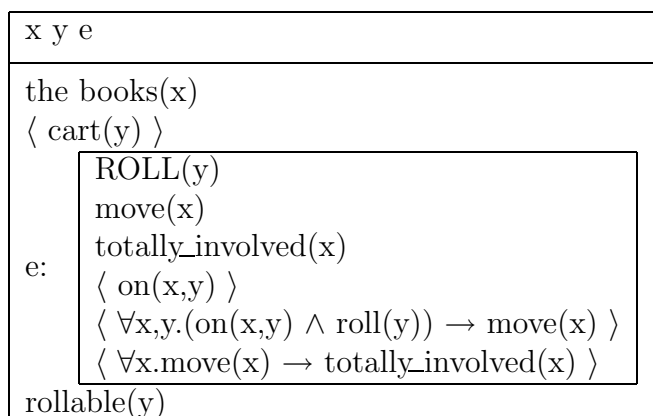
One problem has not been discussed yet. It concerns the application conditions for the rule of nominative reduction. Up to now, it is possible, in principle, that a world or contextual knowledge condition could satisfy the condition of total involvedness for a constituent alone. Thus, the condition ‘on(x,y)’ might already be sufficient to eliminate the condition ‘NOM(x)’, because if x is on y, the whole of x is on y, so this might already count as total involvedness. We surely do not want this, because in this case we might have a third interpretive option, where the books are on the cart, but not the cart is rolling, but something else, perhaps a ball. It is clear that this is an impossible interpretation for the clause ‘the books are rolling’. However, the condition ‘NOM(x)’ could still be reduced, and the DRS would be well-formed.

In order to avoid this, I want to distinguish between the *regular conditions* of a DRS, and those conditions that are introduced only via contextual or world knowledge.

(49) **Regular DRS conditions** are DRS conditions that are introduced by DRS construction rules or (at least partly) inferred from them.

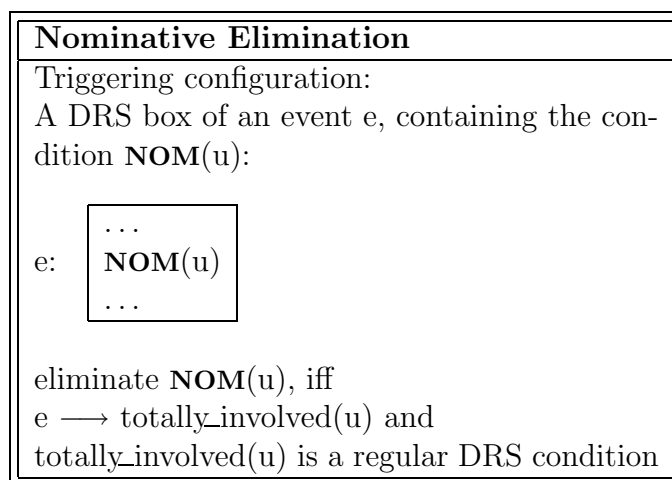
Inferences that introduce regular DRS conditions could be assisted by world and contextual knowledge conditions, and this is their main purpose, but conditions that are introduced *directly* from world or contextual knowledge or inferred *only* from such conditions, do not count as regular DRS conditions. In order to distinguish the two types of DRS conditions, I will put non-regular conditions in angled brackets. The structure in (48) then looks like this:

(50)



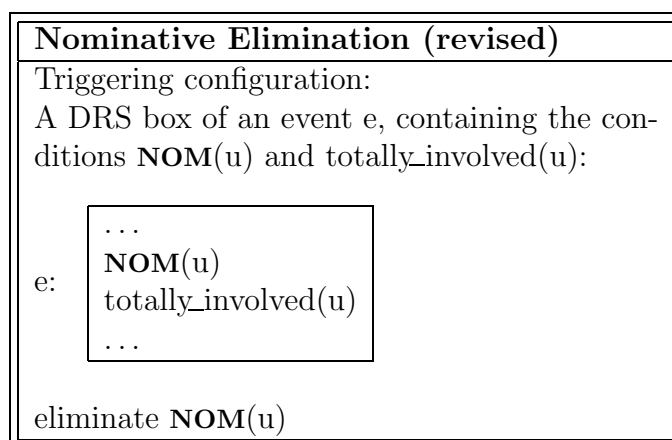
The conditions ‘move(x)’ and ‘totally_involved(x)’ are regular conditions, because they are inferred from a regular condition, ‘ROLL(y)’. They also have non-regular conditions in their inference path, but not only, and this is what counts. This consideration requires a reformulation of the nominative elimination rule:

(51)



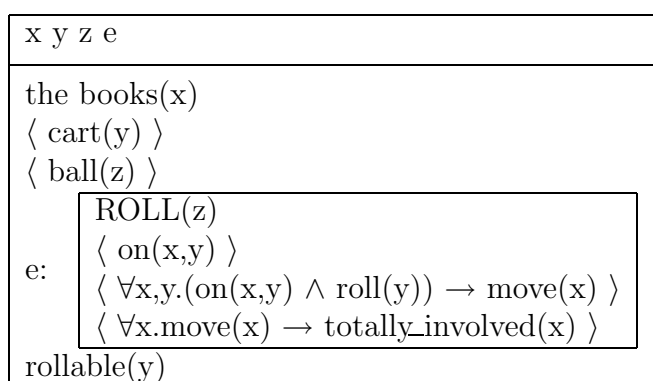
With the convention of the angled bracket notation for non-regular conditions in mind, and given a DRS that contains all regular DRS conditions that can be derived, the formulation of this rule can be simplified:

(52)



Let us briefly consider an interpretation that was mentioned above, and has to be excluded in general. The following DRS represents an impossible interpretation for ‘the books are rolling’:

(53)



The problem with this DRS was that we might not be able to exclude that the condition ‘ $\text{on}(x,y)$ ’ entails ‘ $\text{totally_involved}(x)$ ’, and thus get a well-formed DRS insofar as it contains no irreducible conditions. We solved this problem by distinguishing regular and non-regular DRS conditions. But there might also be a deeper reason for excluding interpretations of this kind. What the DRS in (53) says is that a ball is rolling and that the books are on a cart. The natural intuition about this DRS is that it cannot be the interpretation for ‘the books are rolling’, because it does not tell us what the books and the rolling are having to do with each other. It in fact says that they have nothing to do with each other, and this seems counterintuitive. If this is a general fact about sentences, then there might exist a general restriction for possible interpretations, something like a ‘connectedness’ requirement. The DRS serving as semantic representation for a clause has to contain conditions

that connect the expressions occurring in the clause. Such a restriction might become even more important for clauses with more than one predicative expression, like resultative constructions:

(54) Martha wiped the slate clean

An interpretation where the two predicates in (54–a) introduce individuals that are not connected would be something like “Martha wiped (something else) and the slate was or became clean – where the latter has no causal or other connection to the former”. This appears to be an impossible interpretation. The only interpretation of this sentence is a ‘connected’ one, paraphrasable as “Martha made the slate clean by wiping it”. Even with two one-place predicates the resultative has a ‘connected’ interpretation, as in:

(55) The audience laughed the actor off the stage

The interpretation of (55) is not “The audience laughed and the actor went off the stage”, but rather “The audience made the actor leave the stage by laughing”. The typical interpretation of resultatives is that the action of the entity denoted by the subject is a cause for the action (or whatever) of the entity denoted by the direct object. So even here we have a connection between the two predicates and between the two individuals – connections, however, that are obviously established by the *construction*, not by one of the predicates.²²

Similar observations can be made with any other type of constructions. It seems to be an indisputable finding that interpretations of sentences are ‘connected’ structures in the sense discussed here.²³ So I will assume this as an acceptability criterion for interpretations of sentences, but will not postulate it as an independent rule, but rather let it follow from the mechanisms of DRS construction and interpretation.²⁴ Our problem here is already partly solved in the formulation of the reducibility conditions for case information. By referring to a *regular DRS condition* triggering deletion of ‘NOM(u)’ in (52), the need for a connection between the discourse referent ‘u’ and the predicative expressions of the clause, first of all the verb – these are represented by the ‘regular’ DRS conditions –, is established.

²²I will discuss the details of the formulation of DRS construction rules for constructions in the next section. Here I only state the need for such rules, and assume that they can be formulated.

²³Of course, the conjuncts of coordinated sentences have to be treated as single sentences of their own w.r.t. connectedness.

²⁴We will later return in some detail to this problem. It is much more complicated than it might seem.

Let me focus a bit on some theoretical consequences. The main feature of the proposed analysis that distinguishes it from traditional accounts of thematic interpretation is the just illustrated possibility to, so to speak, ‘create’ thematic roles during the interpretation process. The traditional view only deals with the thematic roles provided by verbs and other predicates within the clause. For this reason they lack plasticity and can hardly account for data like (44), repeated here, in an insightful way:

(56) The books are rolling

More traditional approaches would treat this sentence on a par with

(57) The cart is rolling

In both cases, the subject is supposed to be the complement assigned the role *THEME*, the sole role the verb ‘roll’ assigns under traditional assumptions. This level of analysis neither tells us what is actually going on with the books in (56), nor does it tell us what the rolling entity is in the described event.²⁵

²⁵Problems that at first glance might appear similar to the contrast between (56) and (57) have been discussed as instances of polysemy by Pustejovsky (1991*a*, 1995). His standard example is

(i) Mary began a novel

This can mean that Mary began either the reading or the writing of a novel. In Pustejovsky’s view, this polysemy is located on the complement noun *novel* in (i). Roughly speaking, this theory claims that *novel* is polysemous and has at least the meanings ‘novel’, ‘reading a novel’ and ‘writing a novel’. If we applied this kind of reasoning to our problem with the rolling books we would have to claim that *books* is polysemous between the meanings ‘books’ and ‘cart with books on it’. Such a polysemy might be construable ‘on the fly’ during discourse. The problem seems to me that while in (i) we really talk about reading/writing a novel I doubt that we talk about the cart in (56). Consider some even clearer examples illustrating the same problem:

(ii) a. Mary flew to Paris
b. John drove to Denver

In (ii-a) what is communicated is that Mary moved to Paris, by flying, but it is unimportant whether she took a plane or a helicopter, likewise, what is said in (ii-b) is that *John* moved to Denver, not his car or the train he took. There is nonetheless the problem that Mary cannot fly by herself, neither can John drive by himself, but this is only a problem for a theory that requires that the subject denotes the flying or driving entity. On the other hand, most theories of thematic interpretation are based on individual thematic roles (because the standard assumption is that universal roles are sets of individual roles). Once again the only solution at hand for such approaches seems to be positing two different lexical entries for, ‘fly’ as in (ii-a) and as in ‘The plane flew to Paris’ – which is yet another kind of polysemy solution, again clearly quite ad hoc. Note that it would

Once we switch to individual roles, however, the problem surfaces: ‘roll’ is not a verb of transportation, and books cannot roll. The solution requires inferential mechanisms and a processual view on thematic interpretation.

It is important that we used general world knowledge and contextual information to infer the role of the individual introduced by ‘the books’ (we made use of the proposition: “if books are on a cart and the cart is moving, then the books are moving, too”). Use of world knowledge and contextual information is one important feature that differentiates this system from earlier theories of thematic interpretation.

In the subsequent sections, I will turn to some applications which will lead to further refinements of the approach. The discussion will focus on transitive constructions.

2.3 Transitive Constructions

A fairly big amount of polyvalence and argument structure alternation phenomena involve transitive constructions.²⁶ The causative alternation is the alternation between a non-causative intransitive construction and a causative transitive construction; the locative alternation is an alternation between two different transitive constructions; the partitive alternation is an alternation between a transitive construction and a ‘nominative + partitive’ construction; resultative constructions are transitive constructions, passive constructions are derived from transitive constructions etc.

The standard case of a transitive construction in German is a two-place verb with a nominative subject and an accusative object, as in:

- (58) Hans küßt Maria
‘H. kisses M.’

Let us assume that the verb *küssen* has two individual thematic roles, ‘KISSER’ and ‘KISSED’. All transitive clauses with *küssen* have the subject linked to KISSER and the object to KISSED. The traditional subcategoriza-

not be enough to simply posit an underspecified individual role for the subject. The interpretation of (ii-a) has to contain information about the flying entity, even with ‘Mary’ as subject (the sentence would be false, if Mary went to Paris by train), it only need not be encoded in the subject position. So the role of the flying entity is not underspecified. Note also that the flying entity can be added in an adjunct phrase, as in:

- (iii) Mary flew to Paris with a Zeppelin.

²⁶I use the term ‘transitive construction’ for constructions with an accusative or direct object.

tion model for verbs states this as a lexeme-specific linking rule. This is also an option in the model proposed here. But transitive constructions are also possible with verbs that have more variation in the realization of their arguments, and my strategy for these verbs is to assume that their behaviour results from more general principles of complement-argument correspondence. These principles for transitive constructions have to be explored here.

The general idea is that these principles are semantic. One semantic implication of structural cases is the holism effect that we already made use of. It will be discussed more broadly in the next section. The notion of ‘perspective’ has been associated with the structural cases in earlier work by Charles Fillmore. I will discuss it and show that it can be quite useful for our purposes. Another implication that is very often associated with transitive constructions is causative interpretation. It will also be discussed below.

2.3.1 Transitivity and Thematic Hierarchies

A generalization that has been proposed by Baker (1988) and which was used by Grimshaw (1990) and others, is the assumption that thematic roles are hierarchically ordered and that the hierarchy of roles has to match the hierarchy of cases – a correspondence principle between semantic/conceptual relations and case relations. There are two versions of thematic hierarchies under discussion. Baker’s *Uniformity of Theta Assignment Hypothesis* (UTAH, Baker 1988) uses the weaker one. It claims that the linking behavior of verbs is constant. Whenever we use a certain verb, we link its arguments in the same way. This is a postulation of a *lexeme specific thematic hierarchy*.

Grimshaw (1990) argues for a universal thematic hierarchy. She uses a limited and rather small set of universal thematic roles. All thematic roles of all verbs are taken from the rather small set of universal thematic roles. The weaker version of the UTAH, henceforth ‘weak UTAH’, does not have such a conceptual burden. It can rely solely on individual thematic roles. A hierarchy of these roles nonetheless has to be part of the lexical entry of the verb. Grimshaw’s list of universal roles with their ranking is the following (Grimshaw 1990, 8):

(Agent (Experiencer (Goal/Source/Location (Theme))))

Most characteristic is the prominence of Agent and Experiencer over the other roles. That Theme is the lowest role, and especially lower than the Goal/Source/Location role, follows more from Grimshaw’s linking theory, I suspect, than from conceptual reasoning: Linking starts, according to Grimshaw, with the lowest role and the ‘lowest’ case, which is assumed to be

the direct object. As Theme is a role that is typically linked to direct objects, the thematic hierarchy *has* to be designed this way. Direct objects usually are the constituents that are syntactically closest to the verb. However, what it means to be conceptually low or high or close, is far from clear, and we do not get explications of this from the proponents of thematic hierarchies. The assumption of a universal thematic hierarchy is a working hypothesis that has not much independent justification.²⁷

It seems to be a commonplace especially in Cognitive Grammar (Langacker (1987) and subsequent literature inspired by him) that the concepts represented by words have a strong correlation to the concepts of perception. But this, again, is only a working hypothesis and we can be sure that it is not everything that needs to be said about concepts. The ‘perceptualist reductionism’, as I may call it here, in its simplest form says nothing about the intentional side of language. How, for example, can the difference between ‘hear’ and ‘listen’ be accounted for with solely perceptual categories?

Furthermore, the lexicon of a natural language is also a product of the communication processes within the speech community. How can we be sure that these social factors are less important than individual-psychological and mental aspects? In fact, we can *not* be sure, and this is, why I am sceptic about solely perceptual justifications for universal thematic roles.

An empirical counter-argument against perceptualist reductionism and universal role hierarchies might be the difference between the verbs ‘buy’ and ‘sell’. The event described by “ x bought y from z ” could be identical to the event described by “ z sold y to x ”. But this in turn would mean that the participants x , y , and z do the same things in both events. If universal roles were the only possible thematic roles, and if their ranking was crucial for the linking between roles and grammatical functions, it should be impossible to have different linking patterns for ‘buy’ and ‘sell’, because they have the same set of thematic roles.

The latter, however, could be denied.²⁸ Let us start with the individual role labels. We can assume that both verbs have roles for a ‘BUYER’, a ‘SELLER’ and a ‘GOOD’. But if we follow Parsons (1995) and assume that the buyer is the agent of the buying and the seller the agent of the selling, and if we further prefer to keep universal thematic roles, we have to assume that both buyer and seller are agents. This is already in conflict with Parsons’ approach, because he claims that a single verb can only have one agent – Parsons’ solution was the invention of a different notion of ‘event’, as discussed in section 1.2.2.

²⁷Perhaps with the exception of the dominant status of the Agent role.

²⁸As Parsons (1995) does, cf. section 1.2.

Consider an alternative strong UTAH theory that allows for more than one agent. How would it prevent linking the wrong agents? How would it ensure that one agent is interpreted as BUYER and the other as the SELLER, if it is only the universal theta role label that is ‘visible’ to the linking mechanism? The problem seems impossible to solve.

Weak UTAH theories have no problem here, because they can define hierarchies lexeme specifically. It is no contradiction under the weak UTAH that with ‘buy’ BUYER is ‘higher’ than SELLER, while with ‘sell’ it is the other way around.

The position of Parsons (1995) at first sight seems to be somewhat in between of all that. Though he uses the universal labels agent, patient, theme, goal etc., it is the verb that defines what the agent is. So in fact we cannot speak of agents as such, but only of agent-of-‘buying’, agent-of-‘selling’, agent-of-‘eating’ and so on. The universal labels are used to indicate linking properties: agent-of-V is linked to subject, theme/patient-of-V is linked to direct object etc. As the determination of agent-hood varies from verb to verb, this conception can be seen as a notational variant of weak UTAH. The results should be equivalent. Parsons only encodes verb-specific linking patterns with universal thematic role labels, but there is nothing universal in this approach.²⁹

Another problem that should be kept in mind is that semantics is, among other things, about relations *between* linguistic expressions, and we would prefer a theory that provides us with a basis for the following deduction:

$$\forall x, y, z [buy(x, y, z) \longleftrightarrow sell(z, y, x)]$$

An extremely weak UTAH theory would lead to a very atomic lexicon that provided no basis for this. What is needed seems to be something that is in between of the two positions. The theory proposed here uses only individual roles, and replaces universal role labels with cases and other complement types and their semantic implications. The linking of a role to a certain case form can then be seen as resulting from a match of the semantic implications of the role and the semantic implications of the case form. The following sections will present some motivation and evidence for semantic implications of the structural cases and how they will be implemented in the proposed DRT model.

2.3.2 Transitivity and Perspective

Charles Fillmore’s paper “The Case for Case Reopened” (Fillmore 1977) is a revision of his theory of cases, or better: ‘deep cases’, proposed in Fillmore

²⁹Cf. the more detailed discussion in section 1.2.

(1968). The notion of a deep case system only makes sense under the assumption of a ‘deep’ or ‘underlying’ level of syntactic structure, deep structure, which was also assumed to be the interface level for semantic interpretation. Fillmore’s ‘deep case system’ can be seen as an early version of a thematic roles system. To take an example, consider the following active/passive sentence pair:

- (59) a. Mary saw John
 b. John was seen by Mary

These two sentences have two different surface subjects (i.e. ‘Mary’ in (59–a), and ‘John’ in (59–b), while they both have ‘Mary’ as the ‘agent’. In the generative syntax of the late 1960s the deep structure of a clause represents an early stage in its derivation that holds prior to the application of the passive transformation. At this stage the two clauses in (59) are identical, likewise the ‘deep objects’. The notions ‘deep subject’ and ‘deep object’ are, however, problematic for other reasons (though they are probably indispensable, see for discussion Anderson 1971, Lasnik 1988, and Steinbach & Vogel 1994), but we need not go into this here.

According to Fillmore (1977) deep cases are not ordered by a hierarchy of thematic roles, but by what he calls a *perspective*. Fillmore claims that meanings of lexical items are relativized to *scenes*. What a scene exactly is, is not that clear, the notion might be understood as equivalent to ‘event’ or ‘situation’ in other semantic systems.³⁰ One example for a scene given by Fillmore is the ‘COMMERCIAL EVENT’. It is the event, situation or scene that is referred to when we use verbs like ‘buy’, ‘sell’, ‘cost’ etc. Fillmore sometimes also speaks of a scene as the *background* for a clause.

The assumption that *buy* and *sell* refer to the same scene helps to draw the connection between the two verbs. The semantic difference, however, lies not in the scene they refer to, but rather in the *perspective* they offer on that scene or event. In Fillmore’s words (Fillmore 1977, 72ff):

[...] In the usage that I suggest, any verb identifying any particular aspect of the commercial event will constrain us to bring one or more of the entities in the event INTO PERSPECTIVE, the manifestation of this choice for English being the selection of grammatical functions corresponding to the notions of underlying subject and direct object. For example, if I wish to take the perspective of the seller and the goods, I will use the verb *sell*. Should I wish to take the perspective of the buyer and the money,

³⁰In subsequent work, Fillmore replaced the term ‘scene’ with the term ‘frame’.

I will use the verb *spend*. [...]

[...] the speaker is required to construct a sentence in which one of the two or three entities that have been put into perspective becomes the subject: and, maybe, one becomes the direct object. The new question for the theory of cases is this: What do we need to know about the various participant roles in a situation in order to know which of these roles or which combinations of them can be put into perspective, and then, for those which have been put into perspective, which is to become the subject and which is to become the direct object?

The connection with the notion of scenes can be stated this way. The study of semantics is the study of the cognitive scenes that are created or activated by utterances. Whenever a speaker uses ANY of the verbs related to the commercial event, for example, the entire scene of the commercial event is brought into play – is “activated” – but the particular word chosen imposes on this scene a particular perspective. [...]

[...] Any particular verb or other predicating word assumes, in each use, a given perspective. [...]

[...] whenever we understand a linguistic expression of whatever sort, we have simultaneously a background scene and a perspective on that scene. Thus, in our examples about buying and selling, the choice of any particular expression from the repertory of expressions that activate the commercial event scene brings to mind the whole scene – the whole commercial event situation – but presents in the foreground – in perspective – only a particular aspect or section of that scene. [...]

It is Fillmore’s merit that he introduced the conception of perspectivity into the case theoretic discussion. But though the paper is about twenty years old by the time of this writing, ‘perspective’ has been used very rarely in linguistic explanations. This holds especially of the discourse I am dealing with here, the discussion about thematic roles, subcategorization and linking within generative syntax (the situation might be different in theories and research of lexical fields).

In the ‘mainstream’ of generative syntax, the view formulated in Chomsky’s (1981) influential “Lectures on Government and Binding” is still dominant. There the conception of thematic roles and linking is the traditional one with the usual universal thematic roles. The difference between the verbs ‘buy’ and ‘sell’ in approaches of this kind is expressed by different subcate-

gorization frames for the two verbs, but the thematic roles are the same; and thematic roles are all this conception of grammar uses for thematic interpretation. Not only those linguists who worked within the Chomskian mainstream took over this view, but also many others who work within alternatives to the Chomskian program, most prominently among them perhaps LFG and HPSG.³¹

One problem certainly is that Fillmore introduced ‘perspective’ quite informally: it might not be easy to integrate it into what I developed here thus far. The reason why I nevertheless will try to do so is that I am convinced that Fillmore’s argument is basically correct and brings us one step forward.

2.3.3 How Perspective can be Integrated into DRSs

The interpretation of the term ‘perspective’ that I will assume here is the following: when we describe an event linguistically we do not just tell what kind of event it was and who participated, but we also put structure into our description, we put some participants into the foreground, others into the background. Lexical items can sometimes only be distinguished by the perspectives they offer. The perspective might not be truth conditionally relevant, but it is essential for the way we encode content linguistically.

Fillmore’s original proposal is that the perspective divides the participants in a scene into two subsets: those that are in perspective, and the others. Furthermore, the participants in perspective are also ranked. If x and y are brought into perspective by a verb, then the perspective goes *either* from x to y or vice versa. This means that the higher one is subject and the lower one direct object. There cannot be more than two participants in perspective.

This conception of perspective can be integrated into the DRT based theory of thematic interpretation I am advocating. As perspective orders the discourse referents of a DRS, we shall view it as a strict partial order on the concept’s set of discourse referents. The perspective of a concept then is a subset of the discourse referents. In a transitive clause with nominative and accusative we just have an ordered pair. But consider a sentence with an ECM-construction like the German ‘Accusativus cum Infinitivo’ (AcI) construction:

³¹It is interesting that Jackendoff (1990*b*), in addition to verb specific linking rules introduced a so-called ‘action tier’ that is especially designed to deal with transitive constructions and express their meta-lexical regularities. This ‘action tier’ can be seen as a kind of hidden implementation of ‘perspective’. The same holds for the ‘aspectual tier’ of Tenny (1989, 1994) used also by Grimshaw (1990).

- (60) Maria sah die Kinder Bilder malen
 M.-NOM saw the children-ACC pictures-ACC paint
 ‘Maria saw the children paint pictures’

In this case the perspective contains three discourse referents. Sentences with only a subject and no direct object have only one element included in their perspective. We need a way to indicate the perspective in the DRS. A direct way to do that is the introduction of a special DRS condition, expressing the perspective as a property of the event introduced by the respective clause, as in the following example:

- (61) John brought the child to school

e x y z	
John(x) child(y) school(z)	
e:	BRING(x,y,z) <u>per</u> : x > y

The introduction of perspective is an enrichment of the structure of conceptual representations that I assume.

2.3.4 The Relation Between the Perspectives of Verbs and Clauses

The focus of the discussion was thus far the introduction of a perspective via the structural cases. However, we also discussed perspective as a property of single lexical items as in the ‘buy/sell’ case analyzed by Fillmore. But we have not addressed yet the question how these kinds of perspective are related, especially: what happens to the perspective of the verb, when its schematic DRS is integrated into the clause?

I will indicate the perspective of schematic DRSs with underlining. Let us take a look at the schematic DRS of the verb *bring* again:

- (62)
- | | |
|---------|------------------------------------|
| e x y z | |
| e: | BRING(x,y,z)
<u>per</u> : x > y |

To get used to the problem that needs to be solved, consider the following pair of an active and a passive clause:

- (63) a. Eve bought the book from Harry
b. The book was bought from Harry by Eve

If we assume that the perspective of a schematic DRS enters the DRS of the clause in the same way as its other conditions, we get the following two DRS representations for the two clauses (leaving out further details about the case information for now) – the assumption that *buy* has the perspective agent \succ -theme follows the argumentation in Fillmore (1977):

- (64) ad (63–a): ad (63–b):

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">e x y z</td></tr> <tr><td style="padding: 2px;">Eve(x)</td></tr> <tr><td style="padding: 2px;">book(y)</td></tr> <tr><td style="padding: 2px;">Harry(z)</td></tr> <tr><td style="padding: 2px;">e :</td></tr> <tr><td style="padding: 2px;">BUY(x,y,z)</td></tr> <tr><td style="padding: 2px;">per: x \succ y</td></tr> <tr><td style="padding: 2px;"><u>per</u>: x \succ y</td></tr> </table>	e x y z	Eve(x)	book(y)	Harry(z)	e :	BUY(x,y,z)	per: x \succ y	<u>per</u> : x \succ y	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">e x y z</td></tr> <tr><td style="padding: 2px;">Eve(x)</td></tr> <tr><td style="padding: 2px;">book(y)</td></tr> <tr><td style="padding: 2px;">Harry(z)</td></tr> <tr><td style="padding: 2px;">e :</td></tr> <tr><td style="padding: 2px;">BUY(x,y,z)</td></tr> <tr><td style="padding: 2px;">per: y</td></tr> <tr><td style="padding: 2px;"><u>per</u>: x \succ y</td></tr> </table>	e x y z	Eve(x)	book(y)	Harry(z)	e :	BUY(x,y,z)	per: y	<u>per</u> : x \succ y
e x y z																	
Eve(x)																	
book(y)																	
Harry(z)																	
e :																	
BUY(x,y,z)																	
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<u>per</u> : x \succ y																	
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Harry(z)																	
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BUY(x,y,z)																	
per: y																	
<u>per</u> : x \succ y																	

Though the same verb is used, the perspectives of active and passive clauses with this verb are different. Assuming that **per** and per had to match exactly would exclude passive and many other modes of morpho-syntactic realization of the verb and its arguments. So this restriction would be too strong.

On the other hand, this does not mean that the relation between the two perspectives is unconstrained. There is one theoretically possible option that does not seem to be realized in the natural languages throughout the world. This is the possibility of a reversal of the verb’s perspective. Thus, if a verb contains a perspective ‘per: x \succ y’, there does not seem to be a language in the world that has a mode of morphosyntactic realization of verbs such that the perspective of a clause with the respective verb would be ‘per: y \succ x’.

We might formulate this as a well-formedness constraint on DRSs:

- (65) **Restriction on the Perspectives of DRSs**

A DRS of an event that contains perspectives with contradictory rankings of discourse referents is ill-formed.

Though the concepts of ‘buy’ and ‘sell’ differ in per, they can be identical in **per**, e.g., when we use passive voice:

- (66) a. The book was bought from Harry by Eve
 b. The book was sold to Eve by Harry

- (67) ad (66–a): ad (66–b):

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">e x y z</td></tr> <tr><td style="padding: 2px;">Eve(x)</td></tr> <tr><td style="padding: 2px;">book(y)</td></tr> <tr><td style="padding: 2px;">Harry(z)</td></tr> <tr> <td style="padding: 2px;">e :</td> <td style="border: 1px solid black; padding: 2px;"> BUY(x,y,z) <u>per:</u> y <u>per:</u> x \succ y </td> </tr> </table>	e x y z	Eve(x)	book(y)	Harry(z)	e :	BUY(x,y,z) <u>per:</u> y <u>per:</u> x \succ y	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">e x y z</td></tr> <tr><td style="padding: 2px;">Eve(x)</td></tr> <tr><td style="padding: 2px;">book(y)</td></tr> <tr><td style="padding: 2px;">Harry(z)</td></tr> <tr> <td style="padding: 2px;">e :</td> <td style="border: 1px solid black; padding: 2px;"> SELL(z,y,x) <u>per:</u> y <u>per:</u> z \succ y </td> </tr> </table>	e x y z	Eve(x)	book(y)	Harry(z)	e :	SELL(z,y,x) <u>per:</u> y <u>per:</u> z \succ y
e x y z													
Eve(x)													
book(y)													
Harry(z)													
e :	BUY(x,y,z) <u>per:</u> y <u>per:</u> x \succ y												
e x y z													
Eve(x)													
book(y)													
Harry(z)													
e :	SELL(z,y,x) <u>per:</u> y <u>per:</u> z \succ y												

This follows also from Fillmore’s account of perspective, as long as verb perspective and sentence perspective are not considered as perspectives ‘of a different type’, and thus uncomparable. But note that this also depends on a neutral analysis of the passive *by*-phrase. As soon as this phrase gets a special status, which it does in some theories of passive, this status might be reflected in the DRS and might thereby create a perspectival difference between the two clauses. I will not discuss this problem here, however, as passive is not the kind of diathesis that belongs to the phenomena grouped under the term ‘polyvalence’.

We will now turn to some empirical issues and discuss transitive constructions with the polyvalent German verbs *rollen* (‘roll’) and *schlagen* (‘beat’). We will see very soon that we need a more elaborated semantic account of accusative and nominative case. The effects of these cases are not always reducible to perspective.

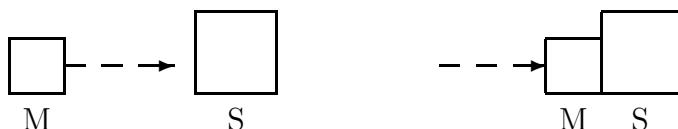
2.3.5 ‘Pure’ Transitive Constructions³²

Schlagen might be easier than *rollen*, because it is semantically a two-place verb, and transitive constructions are also two-place. So one might guess that in the simplest use of *schlagen* there is a homomorphic correspondence between semantic and syntactic arity. This is an illusion, as we will see. But let me start with a formulation of the concept of *schlagen*. I assume that the concept German speakers have in mind when they use the word *schlagen* is a scene where a.o. one entity (I call it ‘M’ for ‘moving’) moves towards another entity (I call it ‘S’ for ‘still standing’) with a certain speed, and with

³²By ‘pure’ transitive constructions I mean German clauses of the form: NP-NOM+Verb+NP-ACC, without further constituents.

a final contact that actually is the event of *schlagen*, usually accompanied by a characteristic sound. We have a scenario consisting of two parts, that together form the concept of *schlagen*:

(68) **stage 1: before contact** **stage 2: contact**



A simplified version of the concept of *schlagen* might look like this (leaving out perspective for the moment):

(69)

e	e'	x	y
$e' > e$			
e' :	move_towards(x,y)		
e :	SCHLAG(x,y)		
	movable(x)		
	solid(y)		

The condition ' $e' > e$ ' says that e' precedes e . This might be an incomplete and informal notation, but it contains all we need here. The perspective has not been added yet. Whether there is one or not, is also an empirical issue. One method to find out whether *schlagen* contains a perspective or not is to look out for transitive clauses with the two roles realized as subject and accusative object. There are none such, as we see in (70):

- (70) a. *Der Stein schlug das Fenster
 'the stone-NOM beat the window-ACC'
 b. *Der Stock schlug die Wand / das Kind / den Esel
 'the stick-NOM beat the wall / the child / the donkey-ACC'
 c. *Das Fenster schlug den Stein
 'the window-NOM beat the stone-ACC'
 d. *Die Wand / das Kind / der Esel schlug den Stock
 'the wall / child / donkey-NOM beat the stick-ACC'

The examples in (70-c+d) look worse than the first ones, though they are all unacceptable under literal interpretations. It seems totally impossible to realize S as subject and M as accusative object. This might be a hint that the schematic DRS in (69) contains the perspective ' $x \succ y$ '.

I will assume that this is the case. The sentences in (70-a+b) are acceptable under a sort of ‘fairy-tale’ interpretation, if the stone and the stick are assumed to be animate conscious beings. Transitive sentences with *schlagen* are fine, when they have an animate subject:

- (71) Das Kind schlug den Hund
 ‘The child-NOM beat the dog-ACC’

But here the child cannot be identified with the moving entity M. Rather, M has to be the child’s hand or some instrument. So this is not the case we are looking for yet. As noted above, we may have some empirical reason to assume that *schlagen* has a perspective from the individual with role M to the individual with role S. But this does not seem to be enough to justify a transitive construction. Else the sentences in (70) would be fine.

What is wrong with these sentences? The use of a transitive construction with a polyvalent verb seems to imply more than just a certain perspective. How can this ‘more’ be described?

First of all, let me emphasize that we are not looking for the semantics of transitive constructions as such. As developed in the first chapter of this thesis, I only expect such generalizations to work with verbs that are not of a semi-idiomatic character. The systematicity is assumed to hold with verbs that vary in the way their arguments are realized – the underlying assumption being that in these cases the variations follow more general regularities. Verbs that only occur in transitive constructions may conform to these regularities. But they could as likely be semi-idioms.³³

That cases and/or constructions have their own characterizable semantic properties, is not at all a new proposal. There has been much debate about this, and I will discuss some proposals about transitive constructions and especially accusative case that focus on different aspects that all might be relevant here. The property of transitive constructions that is responsible for the oddity of the examples in (71) is that subjects and direct objects have ‘holistic readings’. This will be the issue of the next section.

³³I assume something like a blocking mechanism. We have a system of general interpretation rules that usually apply, but are blocked by a verb with a lexical entry that specifies the interpretation and argument linking. This is parallel to verb inflection rules. Most English verbs are inflected regularly, the participle and the past tense forms are built by adding *-ed* to the stem, as in *walk*, *walk-ed*, *walk-ed*. This rule need not be specified for all verbs. It is assumed to be a general rule holding of all verbs. Only the exceptions to this rule have to be fixed in individual lexical entries, as for *go*, *went*, *gone*.

2.3.6 The Holism Effect

The effect to be discussed here can be traced back at least to Anderson (1971). This paper is a reaction to Fillmore's (1968) 'The Case For Case'. The debate was about the following contrasts with locative alternation verbs:

- (72) a. John smeared paint on the wall
 b. John smeared the wall with paint
- (73) a. Bees are swarming in the garden
 b. The garden swarms with bees

Anderson's observation was that the two sentences in (72) and (73) differ not just in their surface structure, but also in their meanings. The latter in a systematic way: the entities represented by the direct object in (72-b) and by the subject in (73-b) are considered as *totally affected* by the action, while this is not the case, when the same arguments are realized as prepositional phrases, as in the respective a.-sentences.

In the event referred to by (72-a) only part of the wall gets smeared, while the preferred reading for (72-b) is that the wall gets smeared as a whole. Likewise, in (73-a) part of the garden swarms with bees, while it is the whole garden in the event referred to by (73-b).

Anderson refers to these two readings as 'holistic' and 'partitive'. His claim is that the holistic reading corresponds with the syntactic position of subject and direct object, while the partitive reading corresponds with the realization as prepositional phrase.

There is, however, one objection to make that shows that this empirical generalization is not quite correct. The crucial example is (72-b). According to the generalization, the paint gets a holistic reading in (72-a), and a partitive one in (72-b). The use of an indefinite mass term makes it hard to decide this here, so I replace 'paint' with 'the paint':

- (74) a. John smeared the paint on the wall
 b. John smeared the wall with the paint

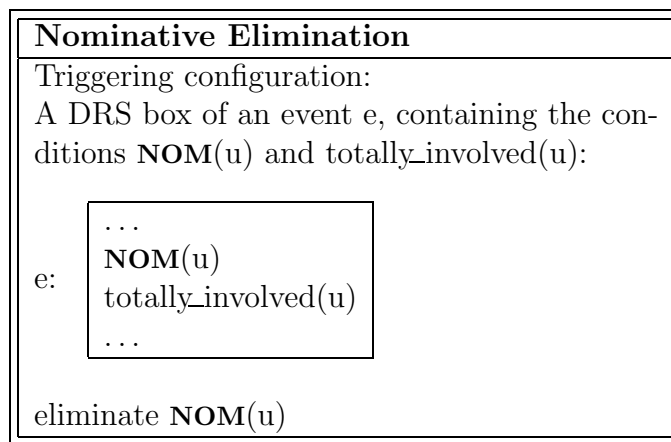
It is clear that the whole paint gets on the wall in (74-a), but is (74-b) really different in this respect? It is not. The whole paint could get on the wall in (74-b), too. So we have two additional insights:

- i. The holistic reading is not exclusive for the structural cases
- ii. The partitive reading does not have to occur with all prepositions

I conclude that partitive readings are invoked by specific prepositions like 'in', 'on', 'at' etc., thus, these readings are genuine *lexical* properties. Holistic

readings can be seen as a kind of default: unless an indicator of partitivity (i.e. a specific preposition) is used, an individual is considered to be involved as a whole. This is on the one hand independent of the use of specific case forms. On the other hand, it follows from this that individuals introduced by nominative and accusative complements are involved as a whole. And this can be part of our DRS translation rules for the structural cases. I have already introduced this rule in the introductory parts of this chapter, the rule for nominative elimination was given in (52), repeated here:

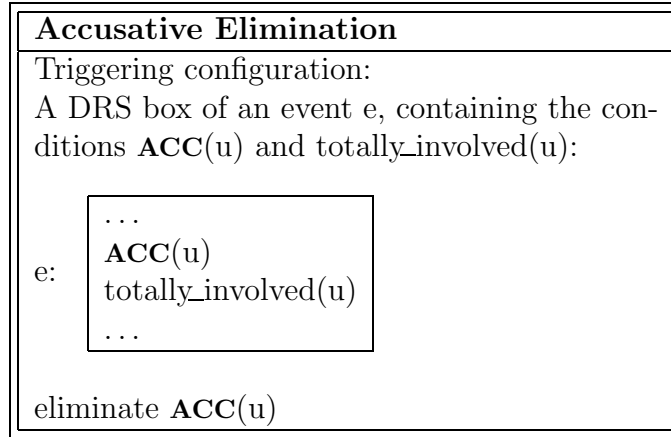
(75)



Remember that the basic idea was that case information enters the DRS, but has to be eliminated to yield a well-formed DRS. One condition for this elimination to apply is total involvedness. I.e., a DRS is only well-formed if the discourse referent referred to by a nominative marked constituent has what Anderson (1971) called a ‘holistic reading’. This must be entailed by the other conditions of the DRS.

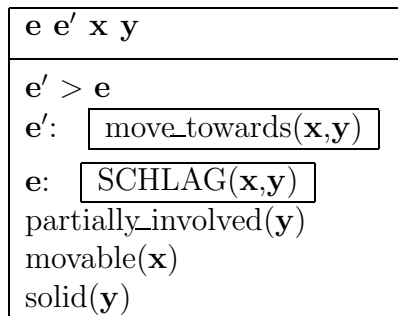
The parallel situation holds for accusative case or direct objects, respectively:

(76)



How can this help to solve the problems we have with (70)? As a starting point, let us assume that the individual role of *schlagen* that I called S does not entail total involvement, but only partial involvement. We may add the condition ‘ $\text{partially_involved}(\mathbf{y})$ ’ to the schematic DRS of *schlagen* in (69):

(77)



As a conceptual justification for this assumption might serve the fact that the kind of involvement for the touched entity in a *schlagen* event is similar to relations expressed by the partial prepositions ‘on’ and ‘at’. When three-dimensional objects contact, it is only one side, e.g., their front sides that contact, but then necessarily other sides, e.g., their back sides, do not contact. The movement of M, however, holds of M as a whole, so while S is only partially involved, M is totally involved. So (77) can again be modified:

(78)

e	e'	x	y
$e' > e$			
e' :	move_towards(x, y)		
e :	SCHLAG(x, y)		
	partially_involved(y)		
	totally_involved(x)		
	movable(x)		
	solid(y)		

Total involvedness is crucial for nominative and accusative elimination, as defined in (75) and (76). If the schematic discourse referent of the role M, x in (78), is unified with the discourse referent introduced by the subject or the direct object of the clause, then nominative or accusative elimination can occur and we might yield a well-formed DRS. The same is not possible for the role S and its schematic discourse referent y , because this role does not entail total involvedness. The prediction that follows from this is that transitive constructions with *schlagen* are odd, if subject and direct object directly realise the individual roles M and S. This explains the oddity of the examples in (70).³⁴

We see that a lexically specified perspective alone does not license a transitive construction. Total involvedness is needed in addition. Total involvedness is more crucial than perspective. Remember that the only restriction induced by a lexically specified perspective is that the perspective of the DRS of the clause may not contradict the perspectival hierarchy given by the schematic

³⁴Terms like ‘totally_involved’ are explications of conceptual knowledge about actions referred to by the verb *schlagen*. This might look like an ad hoc method, but lexical knowledge is often arbitrary. The guidance that we have is the quest for consistency, and our commonsense intuition about what a verb means. On the other hand, commonsense reasoning and knowledge about the world might be a better method than the invention of conceptual categories like universal thematic roles and conceptual primes. World knowledge is accessible and transparent, it is shared by the speech community. But the conceptual categories ‘invented’ by linguists are quite opaque. We do not know for sure that they exist, and in doing linguistic analyses we would not only have to account for the data, but also prove thereby the existence of the conceptual categories and, even more, find out their exact definitions. I cannot see how one can do all of this and at the same time avoid circularity in defining conceptual categories. Ladusaw & Dowty (1988) show for a different empirical area – the control properties of infinitival purpose clauses, infinitival relative clauses and infinitival embedded questions – how an explanation formulated in terms of universal thematic roles can be replaced by an account based on commonsense reasoning. They also show that the latter account is empirically superior to the thematic role account.

DRS of the verb. Thus, it is possible that the lexical perspective is completely ignored in a clause. The restriction on total involvedness has to be obeyed.

There are, however, well-formed transitive constructions with *schlagen* that at first sight seem to realise both M and S as structural cases, contradicting what we just said. It is crucial for such examples, whether subject and object are animate or not. Consider the following examples, especially (79–a):

- (79) a. Maria schlug den Hund
 ‘M.-NOM hit the dog-ACC’
 b. *Maria schlug die Wand
 ‘M.-NOM hit the wall-ACC’
 c. *Der Stock schlug den Hund
 ‘the stick-NOM hit the dog-ACC’
 d. *Der Stock schlug die Wand
 ‘the stick-NOM hit the wall-ACC’

The examples in (79) vary in the animacy of subject and object. Only (79–a), the example with two animate NPs, is well-formed. At first sight, one might assume that Maria has role M and the dog role S in the event described by (79–a). But if we had to be precise, we would speak of body parts. It is presumably Maria’s hand, or even some instrument, that has role M, and it is not the whole dog, but only a body part of it, that receives the hit – this reflects the partial involvedness of role S.

An intentionally acting being is not required in subject position in general, but only in the transitive construction, cf. the well-formedness of the following example, where the object of (79) is replaced by a PP:

- (80) Marias Hand schlug gegen den Kopf des Hundes
 Maria’s hand hit against the head the dog-GEN
 ‘Marias hand hit against the head of the dog’

The total involvedness of M licenses its linking to the subject position. (79–a) with the subject of (80) is again odd:

- (81) *Marias Hand schlug den Hund
 Maria’s hand hit the dog
 ‘Marias hand hit the dog’

This clause would be acceptable under a kind of fairy-tale reading, where the hand is conceived as an animate intentional being. This intentional being is the *intentional performer* or *causer* of the action. This interpretation seems

necessary, but only for the sake of the object, not the subject itself.

The first thing we can say is the following: The interpretive difference between (79-a) and the other sentences on the side of the subject is that the individual introduced by the subject does not receive any role of the *schlagen*-scheme. Rather, this individual *performs* or *causes* the action. The individual carrying role M is presumably Maria's hand or some instrument, both of which are not included in the DRS of the clause yet.

Let us now have a look at the direct object. The difference between (79-a) and (79-b) seems to be more subtle. But it obviously seems to play a role whether the individual carrying role S is able to *experience* the whack, and recognize that it was performed by someone. Such a whack can be interpreted as an interaction that is more than just the physical action: it is a kind of social interaction, an act of punishment. A punished individual, however, is punished as a whole, and it does not matter that the whack only was against one part of his/her body. So in this situation the individual with role S can be considered as totally involved in the sense described above.

Evidence for this kind of reasoning can be seen in the following minimal pair:

- (82) a. Das Kind schlug den Hund auf den Kopf
 the child hit the dog-ACC on the head
 The child hit the dog on its head
 b. Das Kind schlug dem Hund auf den Kopf
 the child hit the dog-DAT on the head
 The child hit the dog on its head

The only difference between the two clauses is the case of the object. In (82-a) the object has accusative, and in (82-b) dative. There is a subtle interpretive difference: while (82-a) implies that the child intentionally hit the dog, (82-b) can be true of a situation, where the child hit the dog by accident. (82-a) describes an action that is *directed* against the dog, an act of punishment, for example. This act of punishment is directed against the dog as a whole. Thus, the dog is totally involved, not by the *schlagen* action as such, but because the child intends to punish it by performing this action. Let us assume a world knowledge condition that formulates this, in the following way: "if *z* (intentionally) performs SCHLAG(*x,y*) and *z* and *y* are both animate, then *z* performs a violent act, in short an act of punishment, against *y*":

- (83) $\forall x,y,z. \text{PERFORM}(z, \text{SCHLAG}(x,y)) \wedge \text{animate}(z) \wedge \text{animate}(y) \longrightarrow \text{PUNISH}(z,y)$

The predicate ‘PERFORM’ stands for intentional and volitional causation. I use ‘PUNISH’ as a cover term for any intentionally aggressive act against a living being. The following world knowledge condition is needed in addition to derive total involvedness of the punished individual:

$$(84) \quad \forall x,y.PUNISH(x,y) \longrightarrow \text{totally_involved}(y)$$

Let us now try to derive the DRS for (79-a), repeated here:

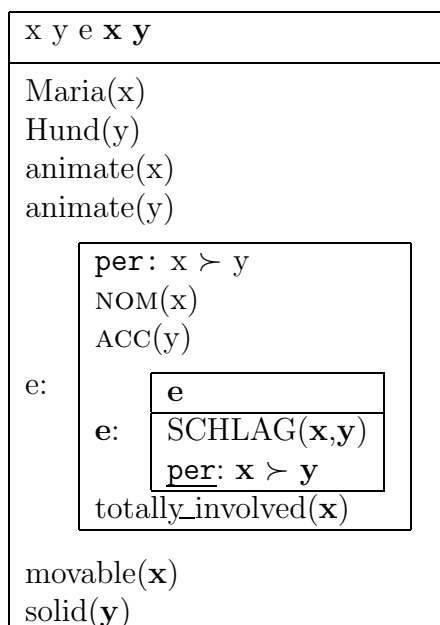
$$(85) \quad \begin{array}{l} \text{Maria schlug den Hund} \\ \text{‘M.-NOM beat the dog-ACC’} \end{array}$$

We use the following schematic DRS for *schlagen* (reduced version of (78)):

$$(86) \quad \begin{array}{|l|} \hline \mathbf{e \ x \ y} \\ \hline \mathbf{e:} \quad \begin{array}{|l|} \hline \mathbf{per: \ x \succ \ y} \\ \mathbf{SCHLAG(x,y)} \\ \hline \end{array} \\ \text{movable(x)} \\ \text{solid(y)} \\ \hline \end{array}$$

The DRS translation of (85) is straightforward, given the rules we have established thus far: subject and object introduce their referents and case conditions, we add some entailments about animacy that can be inferred and which are needed. The perspective is also straightforward. The verb introduces its schematic DRS into the conditions set of the event variable of the clause:

(87)



As pointed out above, we need to interpret Maria as the intentional performer of the action in order to get an interpretation of total involvedness for the accusative object ‘den Hund’ and reduce ‘ACC(y)’. This condition cannot stem from the verb itself, rather, it must stem from the transitive construction. Let us assume the performer interpretation as an interpretative option, thus, the following DRS translation rule for transitive clauses is *optional*.³⁵

³⁵I assume that the NP nodes have already been reduced by the respective DRS construction rules proposed by Kamp & Reyle (1993) – with the exception of case information.

(88)

Performer Interpretation of subjects of transitive clauses	
Triggering configuration $\gamma \subseteq \bar{\gamma} \in \mathbf{Con}_K$:	<pre> S / \ / \ NP_NOM VP / \ u V NP_ACC alpha v </pre>
Introduce into the universe of the main DRS:	new discourse referent e
Introduce into the universe of e:	schematic discourse referent e for the verb α
Introduce into the conditions set of e:	NOM(u), ACC(v) per: $u \succ v$ schematic DRS e of the verb α PERFORM(u,e)
Substitute in $\bar{\gamma}$:	e for [V α] u for [NP u] v for [NP v]

This rule should be embedded in the general DRS construction rules for the several noun types and the verb. The only crucial addition is the optional introduction of the condition ‘PERFORM(u,e)’. Suppose that we did apply this construction rule and added the condition, and also the two world knowledge postulates discussed above. We then yield the following DRS:

(89)

$x \ y \ e \ x \ y$											
Maria(x) Hund(y) animate(x) animate(y)											
e:	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td colspan="2" style="text-align: center; padding: 2px;">e</td> </tr> <tr> <td colspan="2" style="padding: 2px;"> $\text{per: } x \succ y$ NOM(x) ACC(y) PERFORM(x, e) </td> </tr> <tr> <td style="padding: 2px; vertical-align: middle;">e:</td> <td style="border: 1px solid black; padding: 2px;"> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td colspan="2" style="text-align: center; padding: 2px;">SCHLAG(x, y)</td> </tr> <tr> <td colspan="2" style="padding: 2px;"> $\text{per: } x \succ y$ totally_involved(x) </td> </tr> </table> </td> </tr> </table>	e		$\text{per: } x \succ y$ NOM(x) ACC(y) PERFORM(x, e)		e:	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td colspan="2" style="text-align: center; padding: 2px;">SCHLAG(x, y)</td> </tr> <tr> <td colspan="2" style="padding: 2px;"> $\text{per: } x \succ y$ totally_involved(x) </td> </tr> </table>	SCHLAG(x, y)		$\text{per: } x \succ y$ totally_involved(x)	
e											
$\text{per: } x \succ y$ NOM(x) ACC(y) PERFORM(x, e)											
e:	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td colspan="2" style="text-align: center; padding: 2px;">SCHLAG(x, y)</td> </tr> <tr> <td colspan="2" style="padding: 2px;"> $\text{per: } x \succ y$ totally_involved(x) </td> </tr> </table>	SCHLAG(x, y)		$\text{per: } x \succ y$ totally_involved(x)							
SCHLAG(x, y)											
$\text{per: } x \succ y$ totally_involved(x)											
movable(x) solid(y) $\langle \forall x, y, z. \text{PERFORM}(x, \text{SCHLAG}(x, y)) \wedge \text{animate}(z) \wedge$ $\text{animate}(y) \longrightarrow \text{PUNISH}(z, y) \rangle$ $\langle \forall x, y. \text{PUNISH}(x, y) \longrightarrow \text{totally_involved}(y) \rangle$											

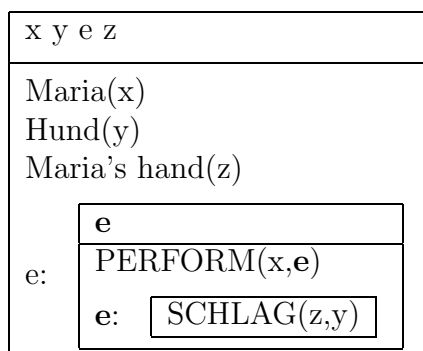
Performing an action entails total involvedness, so ‘NOM(x)’ can be erased. Further world knowledge reasoning lets us interpret Maria’s hand as a plausible ‘instrument’ of the hitting, and the dog as its target, and we make the appropriate variable unifications:

(90)

x y e z					
Maria(x) Hund(y) animate(x) animate(y) Maria's hand(z)					
<table border="1" style="border-collapse: collapse; margin-left: 20px;"> <tr> <td style="padding: 5px;">e</td> </tr> <tr> <td style="padding: 5px;"> per: x \succ y ACC(y) PERFORM(x,e) </td> </tr> <tr> <td style="padding: 5px;"> <table border="1" style="border-collapse: collapse; margin-left: 20px;"> <tr> <td style="padding: 5px;">SCHLAG(z,y)</td> </tr> <tr> <td style="padding: 5px;"> e: per: z \succ y totally_involved(z) </td> </tr> </table> </td> </tr> </table>	e	per: x \succ y ACC(y) PERFORM(x,e)	<table border="1" style="border-collapse: collapse; margin-left: 20px;"> <tr> <td style="padding: 5px;">SCHLAG(z,y)</td> </tr> <tr> <td style="padding: 5px;"> e: per: z \succ y totally_involved(z) </td> </tr> </table>	SCHLAG(z,y)	e: per: z \succ y totally_involved(z)
e					
per: x \succ y ACC(y) PERFORM(x,e)					
<table border="1" style="border-collapse: collapse; margin-left: 20px;"> <tr> <td style="padding: 5px;">SCHLAG(z,y)</td> </tr> <tr> <td style="padding: 5px;"> e: per: z \succ y totally_involved(z) </td> </tr> </table>	SCHLAG(z,y)	e: per: z \succ y totally_involved(z)			
SCHLAG(z,y)					
e: per: z \succ y totally_involved(z)					
e:					
movable(z) solid(y) $\langle \forall x,y,z. \text{PERFORM}(x, \text{SCHLAG}(x,y)) \wedge \text{animate}(z) \wedge \text{animate}(y) \longrightarrow \text{PUNISH}(z,y) \rangle$ $\langle \forall x,y. \text{PUNISH}(x,y) \longrightarrow \text{totally_involved}(y) \rangle$					

The event box now entails that x is performing a SCHLAG action that has y as its target. As both x and y are animate the conditions of the first world knowledge postulate at the bottom of the DRS box are fulfilled and we thus can conclude that x is punishing y, which in turn entails that y is totally involved, as given in the second world knowledge postulate. This now allows us to erase 'ACC(y)' from the DRS and we thus end up with only non-reducible conditions. Leaving out the conditions representing selectional restrictions and world knowledge, we arrive at the following DRS that represents the interpretation we wanted to derive:

(91)



We see that the intended interpretation can be derived by the given mechanism. There might be other interpretations that are also derivable. This is no danger, as long as the above interpretation can be shown to be the most plausible or optimal one, given an independently formulated evaluation method that is not the topic of our discussion here. The crucial additional assumption that was necessary to derive (91) was the introduction of a construction specific DRS construction rule. (88) is a DRS implementation of a construction grammar type interpretation rule. A causative interpretation is a kind of default interpretation for transitive clauses, whenever we have no lexical information of the verb available to assign thematic roles. This observation has been made by many researchers from very different frameworks. I will make use of the according generalizations, which will be elaborated in more detail in the next section.

2.3.7 Transitivity and Causativization

One type of data that interest us in this section are transitive alternations with a special class of intransitive verbs, often called ‘ergative’ or ‘unaccusative’ verbs (cf. e.g. Levin & Rappaport Hovav 1995). The following verbs can be used intransitively and transitively, where the subject of the intransitive clause becomes the object of the transitive clause:

- (92) a. The window broke
 The bell rang
 The ice melted
- b. John broke the window
 Mary rang the bell
 Petula melted the ice

In these alternations, the transitive versions *always* receive a *causative* interpretation. This is a very robust generalization that holds of all verbs of

this kind in English, and in German, too. This might justify a general construction specific rule specifying that transitive variants of intransitive verbs receive a causative interpretation. On the other hand, not all transitive constructions are causative constructions, so we would also be well-advised to make our rule not too general. The relevant situation where this interpretation shows up most regularly is, it seems, a situation where we have to *infer* a thematic interpretation for the subject, because there is no thematic role left over for it by the predicates of the clause.

Assume that all verbs in (92) have only one individual thematic role: the breaking, ringing or melting entity. If this role is already linked to the direct object, we have no role left for the subject, and must infer its thematic interpretation. The use of a general rule like the assumed ‘causativization rule’ can be restricted to situations like these: *If* we have a transitive construction with a one-place action verb the single role of which is linked to direct object, *then* the subject is interpreted as the causer of the action. In the last section, I introduced the rule (88) for the ‘performer interpretation’ of the subject. The application of this rule is optional.

The optionality of the insertion of ‘PERFORM(u,e)’ might already serve our purpose. The causative interpretation can apply, but it need not necessarily do so. However, it’s application can only be avoided if there is an alternative way to get a thematic interpretation for the subject. This alternative might block the application of (88). There are two scenarios we can think of:

- i. the verb has a subcategorization frame and fixes the thematic role of the subject in its lexical entry
- ii. the verb has enough thematic roles left over for the subject, and one of them is fine

Given that one of these situations holds and we nonetheless introduced ‘PERFORM(u,e)’, there are again two possibilities:

- i. ‘PERFORM(u,e)’ contradicts the thematic role information already given for the subject, we get an ill-formed DRS, but this does not matter, because the insertion of the condition is not obligatory, there is a well-formed alternative DRS without this condition
- ii. the DRS is well-formed even with this additional condition, although it would also be well-formed without it.

In the latter case ‘PERFORM(u,e)’ would either be redundant, because it is already entailed by the subject theta role, which means that the two DRSs

are notational variants – everything else being equal –, or it would be true additional information. Only in the second situation has the DRS with the additional condition a chance of representing the optimal interpretation of the clause. But nonetheless, this DRS is still more complex than the DRS without the condition, and thus would only be preferred over the simpler one under specific (contextual) circumstances. This seems to be an acceptable result. The details of the evaluation of alternative interpretations have to be worked out, but we can be sure that contradiction, complexity and redundancy are core criteria for preferring one DRS over another.

As it stands, (92) seems to imply that any intransitive verb can be causativized. However, the rule is less productive, and there are differences between languages, as the following comparison between English and German shows:

- (93) a. John walked the dog
 b. The officer marched the soldiers
 c. Anne jumped the horse
 d. *The clown laughed the audience
 e. *Yoko crawled John
- (94) a. *John lief den Hund
 b. *Der Offizier marschierte die Soldaten
 c. *Anne sprang das Pferd
 d. *Der Clown lachte das Publikum
 e. *Yoko kroch John

One explanation could be that English speakers consider an action already as caused by a person x , if it was only ordered qua authority by x , while German speakers think about causation more physically. The causer has to be the ‘real’ force of the action, not just the one who ordered it. One way to represent this difference could be that for the German verbs ‘lachen’, ‘kriechen’, ‘marschieren’ and similar verbs that describe ‘self-enforced actions’ – i.e. actions the performer of which is also necessarily their force – it is impossible to integrate them into a causative construction as causee, for example:

$$\forall x, y[(x = \text{KRIECHEN}(y)) \longrightarrow \neg \exists z(\text{CAUSE}(z, x))]$$

This assumes a narrow, physical conception of CAUSE. The English CAUSE however, as used in the transitive clauses above, seems to be a broader one that includes being ordered by an authority. Such differences should be allowed. There is no need to assume that the meanings of linguistic elements are universal, not even the meanings of cases or constructions. An alternative version could assume a universal physical conception for CAUSE and broaden the English rule for the transitive constructions, such that the subject could

be the causer or the ‘orderer’.

It could also be the case that the well-formed examples in (93) are instances of conventionalization. Consider that John can *walk* the dog, but he cannot *run* the dog, likewise the officer can *march* the soldiers, but he cannot *crawl* them. If this were the case, then English and German could be seen as not very different in this respect, and the ‘exceptions’ in (93) would be treated as idiomatic expressions that fall out of the scope of the theory anyway.

(93) captures the cases we have been dealing with up to now. It is a good starting point. The phenomenon of causativization nonetheless has a broader range and the rule might need some additions to include a broader range of data. One such addition might be required for inanimate subjects. A performer was conceived as a volitional and sentient performer, but neither volition nor sentience are necessary to be a causer of something, cf.:

- (95) Der Wind rollte den Ball weg
the wind rolled the ball away

Wind can cause a rolling, though neither volitionally, nor with sentience. So another condition that could optionally be added to the DRS of a transitive construction might be something like ‘CAUSE(u,e)’, where CAUSE is understood in a very neutral sense.

The next step of generalization is not to limit the application of the rule to sentences with only one predicate. Resultative constructions also receive a causative interpretation. But they contain involve *two* predicates, a verb and a resultative co-predicate, mostly a prepositional phrase or an adjective. This co-predicate usually predicates over the direct object. So it does not change the situation for the subject. Thus, in a sentence like

- (96) Maria rollte den Ball weg
‘M.-NOM rolled the ball away’

we again get a causative interpretation. But here it is important to observe that in addition to the causative relation between subject and verb, there is a causative relation between verb and co-predicate. There are many complications to consider in constructions with co-predicates, I will examine them in the next section in detail.

The accusative object also requires closer inspection. It is easy to find examples, where the object needs a thematic role by some inferential mechanism, either because of the absence of thematic information, or because we have to choose between several possibilities. The latter is especially frequent in the case of *schlagen*. We already saw that transitive constructions with

schlagen are well-formed with two animate subjects, as in:

(97) Das Kind schlug den Hund

However, the only thematic role of *schlagen* that can be linked to the dog, is the role of the still-standing entity, S, not the role of the moving entity, M. Why is this so, and how can we account for it? Likewise, the verb *rollen* varies in the assignment of its only thematic role, the rolling entity R, in transitive constructions. This can be seen in the following examples:

- (98) a. Maria rollte den Ball
M.-NOM rolled the ball-ACC
b. Maria rollte einen Braten
M.-NOM collared a roast-ACC
c. Der Ball rollte eine acht
The ball-NOM rolled an eight-ACC

All of this requires explanation and elaboration. Let us first have a look at (97). Why can this clause not have the interpretation that the dog was beaten or hit against some *x* by the child? Why, on the other hand, is the interpretation possible that the child beats the dog with some *x*? What makes the crucial difference between these two readings?

One obvious difference between the two readings is that under the valid interpretation ('dog'=S) we get an interpretation for the missing individual M, or, at least, we have a rather small range of possibilities: M is either the child's hand, or some instrument that the child holds in her hand. In the other case, where the dog is interpreted as M, we have no such hints, S could be nearly anything. Without a narrower description of the situational context, this individual is totally unspecified.

I assume that this lack of narrower specifications for the missing individual is the crucial point here. About the missing S under the M-interpretation for the dog we know nearly nothing, about the missing M under the S-interpretation for the dog we have a default interpretation, and a quite specific description for alternatives. Either it is the child's hand, or an instrument like a stick or something similar. For the 'M=the child's hand' interpretation, it is even unusual to mention the hand explicitly in the clause. The following clause seems slightly strange, because it contains redundant information:

- (99) [?]Das Kind schlug den Hund mit seiner Hand
'The child-NOM beat the dog-ACC with its hand'

Though it need not *necessarily* be the hand that the child beats with, the latter is so likely that explicit mention of the hand seems superfluous. If this is lexical knowledge, it is not of the usual kind, because it does not *determine* a certain value, but only its *probability*. The deduction rule could look like this:

$$(100) \quad \forall xyz [(\text{CAUSE}(x, \text{SCHLAGEN}(y,z)) \wedge \text{animate}(x) \wedge \text{animate}(y)) \\ \longrightarrow \text{hand_of}(y,x)]$$

Note that this should be considered a *default* rule. If we have *no* other information, then *y* is the hand of *x*. The hand is the most likely interpretation, but not the only one possible. Be this as it may. Something like (100) must be part of our conceptual knowledge of *schlagen*.

But maybe this rule itself is already derived from something underlying. The hand is likely to be M, but *because* of another conceptual consideration. This consideration could be about the ways in which someone can be the causer of a beat/whack. Of course, there might be infinitely many ways of causing a whack. But the CAUSE we use in our inference rules here is obviously of a more specific kind, not only in the example discussed here. Consider a clause like ‘Mary rolled the ball’. The interpretation is that Mary caused the rolling of the ball, but this causation is very direct, unmediated.

That the causation scheme used in conceptual interpretation very often is direct causation, not any causation, has been observed by various researchers, cf. for example Wunderlich (1992, 1997).

I will use the predicate ‘d-CAUSE’ for direct causation henceforth. Whenever I made use of CAUSE before, this term has to be considered as identical with d-CAUSE. Especially in the interpretation of transitive constructions, it seems to be not only causation, but rather *d*-causation that is relevant.

There is a difference between causation of a beat/whack in general, and its direct causation. Though a beat can be caused in arbitrarily many ways, its *direct* causation by a person is only possible if that person uses her hand. Either she holds something in her hand that she beats with, or it is the hand itself that performs role M of the concept of *schlagen*. So I will replace rule (100) with the following:

$$(101) \quad \forall xyz [(\text{d-CAUSE}(x, \text{schlagen}(y,z)) \wedge \text{animate}(x) \wedge \text{animate}(y)) \\ \longrightarrow (\text{hand_of}(y,x) \vee \text{in_hand_of}(y,x))]$$

That the hand is the default interpretation, might result from the fact that the hand is always there: when we have a person that is assumed to d-CAUSE the beat, we also have her hand. But we do not necessarily have an instrument. This *explains* the fact illustrated in (100). It might even be

possible that rule (101) is explainable by a further conceptual constraint that describes the role that hands play for primates. But we might as well stop here, because (101) is detailed enough to fulfil its task in the explanation of the discussed phenomenon.

The reasoning that we use to explain how the accusative object in (97) receives the role S and how role M is assigned has already been introduced above. Are there situations, in which the role of the subject is fixed and the role of the object has to be inferred?

The answer is ‘yes’ and some examples in case with *rollen* have already been given in (98). They are repeated here for convenience:

- (102) a. Maria rollte einen Braten
 ‘M. rolled a roast’ = “M. collared a roast”
 b. Der Ball rollte eine acht
 ‘The ball rolled an eight’

Which roles do we assign to the roast and the eight? In the case of the roast we can speak of creation. Before the rolling we only have a piece of meat, afterwards we have a collared roast. At least, this is the interpretation for the German example. I do not know whether this is the case for the given English translation. The role of the eight in (102) is that it is ‘performed’ by the ball. The word *acht* may describe a specific kind of motion path. These interpretations might be combinable under the term ‘creation’. If creation of something means causing its existence and if an action exists only when it is performed, or the kind of motion path introduced by ‘eight’ exists only when it is passed along, then we might say that performing an action or describing an eight in a motion path means ‘creating’ it. If this sounds too mysterious, we could as well write down different rules for different ontological types (i.e. ‘actions’, ‘paths’ and ‘things’).

Again, this creative interpretation is optional. It can be added to the other optional conditions in our DRS construction rule that by now turns into a rule for the transitive construction. Let me sum up what we have:

(103)

DRS construction rule for transitive constructions	
Triggering configuration $\gamma \subseteq \bar{\gamma} \in \mathbf{Con}_K$:	<pre> S / \ NP_NOM VP / \ u V NP_ACC alpha v </pre>
Introduce into the universe of the main DRS:	new discourse referent e
Introduce into the universe of e:	schematic discourse referent e for the verb α
Introduce into the conditions set of e:	NOM(u), ACC(v) per: $u \succ v$ schematic DRS e of the verb α and <u>optionally</u> : PERFORM(u, e) d-CAUSE(u, e) CREATE(e, v)
Substitute in $\bar{\gamma}$:	e for [$_V \alpha$] u for [$_{NP} u$] v for [$_{NP} v$]

The interpretations of the two accusative objects in (102) follow directly from (103). The eight is being ‘created’ by the rolling ball, and the roast is being created by Maria. What is missing in the second case is the rolling entity. It is neither the roast nor Maria. Rather, it is the meat that is to become the roast by virtue of Maria’s ‘rolling’ it. How do we arrive there? Again, this is an instance of general conceptual reasoning. We know that roasts do not come into being by themselves, rather they are created. From the causative interpretation of the subject according to (103) it already follows that Maria causes that the roast ‘comes into being’. Furthermore, it is part of our general knowledge, how roasts come into being. One way is to ‘roll’ meat yielding a

collared roast. So this leads to an acceptable conceptual interpretation.

Other interpretations might be possible with a different rolling entity. Such a concept would be less optimal than the one developed before, because it has at least one more individual. An entity in question could be something that Maria uses in order to create the roast. E.g., something she rolls over the meat. While this does not seem to be very reasonable in the case of a roast, it is natural in the case of, e.g., a pizza dough:

- (104) Maria rollte einen Pizzateig
 M. rolled a pizza dough

The instrument Maria uses is a rolling pin. Again, the rolling is conceived as part of the *creation* of the dough. But the boundary between creation and manipulation is not very clear here. Let us compare this clause with

- (105) Maria rollte einen Pizzateig aus
 M. rolled a pizza dough out

In this second case we assume that the dough already exists, and is only being transformed. The separable prefix *aus* serves as a secondary predicate that gives us a thematic interpretation for the direct object, the addition of the condition ‘CREATE(e,v)’ would yield a contradiction: an event of creation of x presupposes non-existence of x before the event, the particle ‘aus’ expresses a change of state here, which presupposes a different state before the event and thereby existence.³⁶

The creation interpretation for direct objects without a thematic role assigned by the verb is quite frequent. When we have a direct object the thematic interpretation of which is not clear, we have two strategies: First, we can try to relate it to something in the concept of the verb, as in, e.g.:

- (106) Es regnet Bindfäden
 It rains strings-ACC (i.e. ‘It’s pouring’)

Here the noun describes the *shape* of the rain coming down. The other strategy is a default interpretation that I circumscribed as ‘come into being’. No third alternative seems possible. Consider again sentence (102-b). What else could happen to the eight besides that it is the action being performed or path being followed? It could be the creation of an eight, if ‘eight’ is understood as a special kind of a street, but if the eight already existed, what could happen to it by the rolling then, if we exclude everything that might be derivable from the concept of rolling? It seems impossible to figure out anything.

³⁶How secondary predicates combine with verbs will be discussed in the next section.

Everything more specific than the predication of mere creation requires additional information as would be given, e.g., by a secondary predicate. This will be the topic of the next section.

2.4 Transitive Constructions with two Predicates

The addition of a *secondary* or *co*-predicate can have a crucial effect on the acceptability of a clause. In the discussion of pure transitive clauses with *schlagen* we noticed that the following examples are odd:

- (107) a. *Der Stein schlug das Fenster
 ‘the stone-NOM hit the window-ACC’
 b. *Der Stock schlug die Wand
 ‘the stick-NOM hit the wall-ACC’
 c. *Das Kind schlug den Stock
 ‘the child-NOM hit the stick-ACC’
 d. *Maria schlug den Hammer
 ‘M.-NOM hit the stick-ACC’

These examples are fine with an appropriate co-predicate:

- (108) a. Der Stein schlug das Fenster kaputt
 ‘the stone-NOM hit the window-ACC’ broken
 b. Der Stock schlug die Wand kaputt
 ‘the stick-NOM hit the wall-ACC broken’
 c. Das Kind schlug den Stock entzwei
 ‘the child-NOM hit the stick-ACC in two’
 d. Maria schlug den Hammer entzwei
 ‘M.-NOM hit the hammer-ACC in two’

The co-predicates obviously neutralize the problems that occurred with these sentences before. How they do so has to be examined here.

But it first has to be discussed how co-predicates enter the clausal DRS, what their morpho-syntactic status is and how they relate to the matrix verb.

2.4.1 Morpho-syntactic specifics of co-predicates

Constituents that feature as co-predicates of verbs have some interesting morpho-syntactic properties they do not have under a different use. A standard example of a co-predicate is the predicative element that accompanies

copula verbs like *sein* ('be'), *werden* ('become') and *bleiben* ('remain'). Each of the four major lexical categories can be combined with the copula. Consider first nouns. Nouns that are combined with a copula might have inherent case, as in:

- (109) Das Buch ist Peters / dem Peter
 'the book is P.-GEN / DET P.-DAT
 "The book is Peter's"

The noun can also receive case by agreement with the subject:

- (110) a. Der liebe Gott ist ein guter Mann
 'the dear god-NOM is a good man-NOM'
 b. Sie ließ den lieben Gott einen guten Mann sein
 'She-NOM let the dear god-ACC a good man-ACC be'

Both cases are intriguingly interesting, but for different reasons. The possibility of co-predicates with inherent case shows first that there is a semantic difference between inherent and structural cases. The latter are nominative and accusative in German. When we use an accusative marked co-predicate with *sein* the sentence is simply uninterpretable:

- (111) *Der liebe Gott ist einen guten Mann
 the dear god-NOM is a good man-ACC

The co-predicate function obviously divides case forms of noun phrases into two classes. A reasonable explanation is that the co-predicate noun cannot be assigned case. It thus either has to be already case marked (i.e. with inherent case), or it receives case via agreement with the subject. There is *no* other construction in the grammar of German, where a bare noun phrase receives its case via agreement with another noun (one lexicalized exception is the preposition 'als', cf. footnote 37 below).

Adjectives in a sense show the opposite behavior: while they normally agree with their head nouns when used as nominal modifiers, they do not agree when they are used as co-predicates:

- (112) a. das dicke Buch
 the thick-AGR book-NOM/ACC
 b. Das Buch ist dick
 the book is thick-NOM

However, this behavior of adjectives only parallels their adverbial use. The lack of morphological marking might be the reason why we can also use

particles as co-predicates which cannot occur as nominal modifiers because of their lack of inflectional morphology, but otherwise seem to be like adjectives:

- (113) a. Der Fernseher ist an
the TV set is on
b. *der an_e Fernseher
the on-AGR TV set ≈ ‘the on TV’

Particles rarely ever occur as adverbs.³⁷ An interesting fact to note about prepositional phrases is that directional PPs can occur as arguments and co-predicates, but not as modifiers. Though directionals cannot be used with the above mentioned copulas (because these are all static verbs), they can occur in other clear cases of co-predication, such as:

- (114) Maria hat den Hund in den Garten gelassen
M.-NOM has the dog-ACC in the garden-ACC let
‘Maria let the dog into the garden’

To give some examples with verbs as co-predicates:

- (115) a. Dieses Buch ist zu lesen
this book is to read
‘This book has to be read’ or ‘This book can be read’
b. Maria ist spielen gewesen
M.-NOM has play(ing) been
‘Maria was out to play’

The *zu*-infinitive in (115–a) is especially interesting here. It also has an adnominal correspondent. In this case, however, the present participle is used:

³⁷The only example in point might be depictive uses, as in:

- (i) Der Fernseher gefällt mir aus am besten
the TV set pleases me off most
‘I like the TV most, when it’s turned off’

It is not clear, whether this is an adverbial use, but depictives can be distinguished syntactically from co-predicates quite clearly. Bare nouns, for example, cannot occur as depictives:

- (ii) Der liebe Gott-NOM gefällt mir am besten *(als) guter Mann-NOM
the dear god pleases me most *(as) good man

Note that although the preposition ‘als’ is necessary here, it also assigns case via agreement:

- (iii) Ich sehe den lieben Gott als guten Mann
I see the dear god-ACC as good man-ACC

- (116) das zu lesende Buch
 the to read-PART-PRES-AGR book
 “the book that has to be read”

The *zu*-infinitive also has to lack its accusative object (in addition to the always lacking subject) in order to be interpretable as a predicate. In the ordinary uses of these infinitives the conditions on argument omission are the same as for normal clauses (with the exception of the subject, of course). But this might just be a semantic fact, not a morpho-syntactic one. Though it looks like a parallel to passive, one can doubt that this is just a passivized infinitive, because the passive version should look like ‘gelesen zu werden’ (like ‘to be read’), which is odd for a co-predicate, because there is no omitted accusative object within the infinitive. So this infinitive is a very special entity that again occurs only as co-predicate, though, of course, in its participial version also as adnominal modifier.

To sum up, we have some good reasons to assume that CO-PREDICATE constitutes a syntactic function³⁸ of its own in German. The following table lists (only!) the *differences* for the discussed lexical categories between ‘ordinary’ uses, uses as co-predicates, and uses as adverbial modifiers:

<i>Category</i>	<i>Ordinary Use</i>	<i>Co-predicate Use</i>	<i>Adverbial Use</i>
noun phrase (structural case)	structural case by government	structural case by agreement	impossible
adjective	agreement	no agreement	no agreement
particle	cannot occur	can occur	only depictive
prepositional phrase	positional directional	positional directional	positional
zu-infinitival noun modifier	participial	infinitival	impossible

³⁸I use the term ‘syntactic function’ without being very clear about what it is supposed to mean. A syntactic function might be understood as a specific syntactic position with specific properties. A comparable phenomenon might be the topic marker in, e.g., Japanese and Korean, where a nominal constituent, originally marked with structural case (not, e.g., with the dative), has the topic marker instead of the case marker, when it is sentence-initial.

However, an important fact about co-predicates seems to me that there can occur only one co-predicate per sentence, not only with copula verbs, but also in resultative constructions. The following clause is odd:

- (i) *Maria warf die Vase weg kaputt
 M.-NOM threw the vase-ACC away broken’

For a more detailed discussion of the morpho-syntactic specifics of co-predication see Steinbach & Vogel (1994, chapter 3).

I will leave the topic at this informal descriptive stage. For our discussion is important that co-predicates can be identified as such in a syntactic structure. They have specific morpho-syntactic properties. We do not need four or even more different rules for the DRS translation of the diverse lexical categories' co-predicates into the sentential concept, but rather can speak about co-predicates in general.

2.4.2 The Interaction of Co-predicate Meaning and Verb Meaning in Resultative Constructions

A standard case of co-predication is the so-called resultative construction, where we have a subject, a direct object, a verb and a co-predicate, as in:³⁹

(117) The audience laughed the actor off the stage

Both predicates in this example are one-place predicates. However, which predicate chooses which noun phrase as its argument, does not seem to be arbitrary. The audience is the sole argument of LAUGH, and the actor is the sole argument of OFF_THE_STAGE. The reverse assignment is impossible. Furthermore, we also have a causative interpretation: the laughing causes the actor's leaving the stage.

This causative interpretation can neither stem from the meaning of LAUGH, nor from the meaning of OFF_THE_STAGE. It seems that the rule for the DRS translation of transitive constructions (103) can be applied here. Let us have a look at it again:

³⁹The term 'resultative construction' was originally only used for constructions with adjectival co-predicates, as in *John hammered the metal flat*. The adjective *flat* is said to describe the result of the hammering action. But if this is the crucial property of resultatives, then the same can be said for a locative resultative as in (117), because the PP *off the stage* describes the direction of the actor's motion that *results* from the audience's laughing.

(118)

DRS construction rule for transitive constructions	
Triggering configuration $\gamma \subseteq \bar{\gamma} \in \mathbf{Con}_K$:	<pre> S / \ NP_NOM VP / \ u V NP_ACC alpha v </pre>
Introduce into the universe of the main DRS: Introduce into the universe of e:	new discourse referent e schematic discourse referent e for the verb α
Introduce into the conditions set of e:	NOM(u), ACC(v) per: $u \succ v$ schematic DRS e of the verb α and <u>optionally</u> : PERFORM(u,e) d-CAUSE(u,e) CREATE(e,v)
Substitute in $\bar{\gamma}$:	e for [$v \ \alpha$] u for [$NP \ u$] v for [$NP \ v$]

The semantically interesting conditions are the optional ones at the bottom of the rule. There seems no reason, at first sight, to exclude one of the three conditions for the translation of transitive constructions with co-predicates. But some further conditions are missing that deal with the interpretation of co-predicates. Four extensions are necessary:

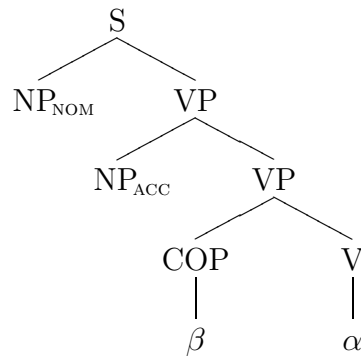
- (119)
- The triggering configuration has to be adjusted for transitive constructions with co-predicates. This is straightforward and not problematic.
 - A rule must be added that requires the introduction of the

schematic DRS of the co-predicate. We need a theory of the schematic DRSs of co-predicates

- A condition has to be added to the event box of the clause that formulates the causative relation between the action described by the verb and the result described by the co-predicate.
- A rule has to be added that guarantees that the direct object serves as the ‘external argument’ or ‘subject’ of the co-predicate. This is not unproblematic.

The triggering configuration can be exemplified with the following structure for German:

(120)



The precise structure depends on the assumptions about the syntax of these constructions, but as this is of less importance here, I am using a simple and more or less surface-oriented representation. ‘COP’ stands for the co-predicate, and ‘ α ’ and ‘ β ’ stand for the lexical expressions used as verb and co-predicate.

As we are now dealing with the schematic DRSs of both the verb and the co-predicate, we have to distinguish them. The following rules have to be added:

- (121) **Introduce into the universe of e :**
 schematic discourse referent e_1 for the verb α
 schematic discourse referent e_2 for the co-predicate β
Introduce into the conditions set of e :
 schematic DRS e_1 of the Verb α
 schematic DRS e_2 of the co-predicate β

A further condition to be added establishes the causative relation between the action expressed by the verb and the result expressed by the co-predicate:

- (122) **Introduce into the conditions set of e:**
 CAUSE(e_1, e_2)

This is the crucial semantic property of resultative constructions. Note, that this does not necessarily entail that there also is a causative relation between subject and direct object, because the linking of especially the verb's arguments can vary.

One might wonder, whether 'CAUSE' can be replaced by the more specific term 'd-CAUSE' introduced earlier. I used d-CAUSE as a relation of direct causation between an individual and a property of an(other) individual. There is a consensus among philosophers, psychologists and linguists that the conception of causation that we have 'in our minds' actually is a relation between two states of affairs. What I introduced as d-CAUSE has to be interpreted as an abbreviation for a relation I want to call D-CAUSE:⁴⁰

- (123) $\forall x, p [d\text{-CAUSE}(x, p) \longleftrightarrow \exists f(D\text{-CAUSE}(f(x), p))]$

The d-CAUSE relation was used as a default for the interpretation of subjects of transitive action sentences that do not have a thematic role assigned by one of the clause's predicates. One such example was:

- (124) Maria rollte den Ball
 M. rolled the ball

What (123) says about this clause is that there has to be a property f that holds of Maria and that this causes the rolling of the ball. What could f be? Presumably, it has to be the action that causes the rolling of the ball. But if this action causes the rolling of the ball, then it somehow must be related to the ball. E.g., Maria could be pushing the ball. So we could perhaps also use the following formula for the relation between d-CAUSE and D-CAUSE:

- (125) $\forall x, g [d\text{-CAUSE}(x, g(y)) \longleftrightarrow \exists f(D\text{-CAUSE}(f(x, y), g(y)))]$

The individual x does something (or is in relation) f to the individual y , and as a result y has property g . This still is an abbreviation, but it is a bit more explicit than the previous versions of causation. However, we have to be

⁴⁰D-CAUSE can be seen as a special case of CAUSE: every D-CAUSE relation is a CAUSE relation, but only the direct CAUSE relations are D-CAUSE relations. There is some evidence from psycholinguistic and general cognition research that the difference between direct and indirect causation is crucial for the early development of cognition. Events of direct causation can be detected at extremely early stages of childhood. It might even be the case that the concept of direct causation is innate. See Verfaillie & Daems (1996) for a broader discussion.

careful. If g is EXIST, i.e. if the result of x 's action is the creation of y , then x *cannot* literally have done something to y , because y did not exist at the time when f was performed. So the proposition in (125) is only one *interpretation* or *explication* of (123). It is reasonable for results like ROLL(y); but (125) does *not* replace (123). (125) can be seen as resulting from a world knowledge rule that could roughly look like this:

$$(126) \quad \forall x,y[d\text{-CAUSE}(x,\text{ROLL}(y)) \longleftrightarrow \exists f(\text{D-CAUSE}(f(x,y),\text{ROLL}(y)))]$$

However, especially for results that express a change of some individual y , it seems very likely that x must have done something to y in order to cause that change of y . Most resultatives express such causations of changes, and hence the following world knowledge rule is very likely to be applicable:

$$(127) \quad \forall x,y,g[d\text{-CAUSE}(x,g(y)) \wedge \text{CHANGE}(g) \longleftrightarrow \\ \exists f(\text{D-CAUSE}(f(x,y),g(y)))]$$

The label *CHANGE* stands for the set of those properties that describe a change of an individual.

The D-CAUSE relation together with (127) describes quite closely the interpretation of resultatives and the relation between matrix verb and co-predicate. We might only need to identify f with the verb and g with the co-predicate. But how do examples fit into this picture where the direct object is only argument of the co-predicate, not of the verb, as in the previously discussed (128):

$$(128) \quad \text{The audience laughed the actor off the stage}$$

Assume that the following is true here:

$$(129) \quad \text{CAUSE}(\text{LAUGH}(\text{audience}),\text{OFF_THE_STAGE}(\text{actor}))$$

There are, in principle, two ways of interpreting LAUGH here: i) the audience laughed about something, and this made the actor leave the stage; ii) the audience laughed about the actor, and this made the actor leave the stage. Clearly, it is the second interpretation that we apply to (128), not the first one. The actor would not have left the stage, if the audience's laughing was not somehow related to him. This can be captured by assuming that LAUGH has a second argument, the 'trigger' of the laughing:⁴¹

⁴¹The condition **trigger**(y) is redundant in this DRS. It is only inserted for the sake of explicitness.

(130)

e x y			
e:	<table border="1"> <tr> <td>LAUGH(x,y)</td> </tr> <tr> <td>trigger(y)</td> </tr> </table>	LAUGH(x,y)	trigger(y)
LAUGH(x,y)			
trigger(y)			

The two interpretations of (129) relate to the following two different DRSs:

(131) a.

e x y z w												
audience(x) actor(y) stage(z)												
e:	<table border="1"> <tr> <td colspan="2">e₁ e₂</td> </tr> <tr> <td colspan="2">CAUSE(e₁,e₂)</td> </tr> <tr> <td>e₁:</td> <td> <table border="1"> <tr> <td>LAUGH(x,w)</td> </tr> <tr> <td>trigger(w)</td> </tr> </table> </td> </tr> <tr> <td>e₂:</td> <td> <table border="1"> <tr> <td>OFF(y,z)</td> </tr> </table> </td> </tr> </table>	e₁ e₂		CAUSE(e₁,e₂)		e₁:	<table border="1"> <tr> <td>LAUGH(x,w)</td> </tr> <tr> <td>trigger(w)</td> </tr> </table>	LAUGH(x,w)	trigger(w)	e₂:	<table border="1"> <tr> <td>OFF(y,z)</td> </tr> </table>	OFF(y,z)
	e₁ e₂											
	CAUSE(e₁,e₂)											
e₁:	<table border="1"> <tr> <td>LAUGH(x,w)</td> </tr> <tr> <td>trigger(w)</td> </tr> </table>	LAUGH(x,w)	trigger(w)									
LAUGH(x,w)												
trigger(w)												
e₂:	<table border="1"> <tr> <td>OFF(y,z)</td> </tr> </table>	OFF(y,z)										
OFF(y,z)												

b.

e x y z												
audience(x) actor(y) stage(z)												
e:	<table border="1"> <tr> <td colspan="2">e₁ e₂</td> </tr> <tr> <td colspan="2">CAUSE(e₁,e₂)</td> </tr> <tr> <td>e₁:</td> <td> <table border="1"> <tr> <td>LAUGH(x,y)</td> </tr> <tr> <td>trigger(y)</td> </tr> </table> </td> </tr> <tr> <td>e₂:</td> <td> <table border="1"> <tr> <td>OFF(y,z)</td> </tr> </table> </td> </tr> </table>	e₁ e₂		CAUSE(e₁,e₂)		e₁:	<table border="1"> <tr> <td>LAUGH(x,y)</td> </tr> <tr> <td>trigger(y)</td> </tr> </table>	LAUGH(x,y)	trigger(y)	e₂:	<table border="1"> <tr> <td>OFF(y,z)</td> </tr> </table>	OFF(y,z)
	e₁ e₂											
	CAUSE(e₁,e₂)											
e₁:	<table border="1"> <tr> <td>LAUGH(x,y)</td> </tr> <tr> <td>trigger(y)</td> </tr> </table>	LAUGH(x,y)	trigger(y)									
LAUGH(x,y)												
trigger(y)												
e₂:	<table border="1"> <tr> <td>OFF(y,z)</td> </tr> </table>	OFF(y,z)										
OFF(y,z)												

As unification is optional in general, both of these structures are admissible. The preference for the structure (131–b) might suggest that there is a presumably pragmatic preference for unification. (131–b) is more informative than (131–a), because (131–b) provides us with a trigger for the laughing, while (131–a) only says that the audience laughed about something.

If this line of reasoning is on the right track, then we might add ‘d-CAUSE(**u,e₂**)’ as another obligatory condition for the DRS translation of resultative constructions. I will keep the issue undecided here.

We have not yet discussed, what the schematic DRS of a co-predicate looks like. It can be quite simple as with one-place adjectives like *flat*:

(132)

e x
e: FLAT(x)

But two-place predicates like prepositional phrases pose the problem of identifying the external argument, consider the schematic DRS of the preposition *off* in (133), as used in clauses like (128):

(133)

e x y
e: OFF(x,y)

If we used this structure for the DRS translation of (128), then we would have (at least) two possible interpretations, one of which is the natural interpretation where the actor gets off the stage, and the other is the ‘nonsensical’ interpretation that the stage gets off the actor. This way of linking roles and grammatical functions is in general impossible for prepositional phrases. It can be avoided by the assumption that the thematic role of the location is linked qua subcategorization frame to the syntactic complement position of the head of the PP. This is a natural and uncontroversial way of dealing with this problem, cf. Bierwisch (1988) for one proposal in this direction. The ‘external argument’ is the real problem, because it is ‘external’, its linking can or at least should not be fixed. The tool that I will use to indicate the external argument is the *perspective*. In the case of the schematic DRSs of co-predicates the perspective contains exactly one argument, the ‘external’ argument.

(134)

e x y
e: <u>per: x</u> OFF(x,y)

To guarantee the correct linking pattern, we need an additional DRS translation rule:⁴²

⁴²It might be possible to formulate a more general rule that holds of all co-predicates. Instead of explicitly mentioning the accusative or direct object, it might make sense to speak of the complement marked with structural case that is the closest c-commander of

(135) **Unify:** The single element of $\underline{\text{per}}(e_2)$ with v .

This completes the discussion of the tasks listed in (119). The following rule sums everything up. What we did, was enriching the translation rule for transitive constructions, such that it covers transitive constructions with a co-predicate:

the co-predicate in the syntactic structure. This would conform to established theories of predication such as by Williams (1980) or Bowers (1993).

(136)

DRS construction rule for transitive constructions with a co-predicate	
Triggering configuration $\gamma \subseteq \bar{\gamma} \in \mathbf{Con}_K$:	
Introduce into the universe of the main DRS: Introduce into the universe of e :	new discourse referent e schematic discourse referents e_1 and e_2
Introduce into the conditions set of e:	NOM(u), ACC(v) per: $u \succ v$ schematic DRS e_1 of α schematic DRS e_2 of β CAUSE(e_1, e_2) and <u>optionally</u> : PERFORM(u, e_1) d-CAUSE(u, e_1) CREATE(e_1, v)
Unify:	The single element of <u>per</u> (e_2) with v.
Substitute in $\bar{\gamma}$:	e_1 for [V α] e_2 for [COP β] u for [NP u] v for [NP v]

Not all constituents that look like co-predicates structurally, act (only) as co-predicates. Consider the following examples:

- (137) a. Maria schlug den Nagel in die Wand
 M. hit the nail into the wall
 b. Maria schlug den Hammer in die Wand
 M. hit the hammer into the wall

Both clauses have a resultative interpretation. The result of the described events is that nail and hammer, respectively, are located in the wall. In (137–b) the wall is also an argument of SCHLAGEN. It serves as the individual with the role of the still-standing entity S. Consider now the causative relations in (137–b). What exactly causes the placement of the hammer in the wall? Is it the fact that the hammer serves as the moving entity M, or is it Maria’s action?

The problem that this points at, is that we would not want to say that the hitting event causes something that it entails. If an event e_1 consists of two subevents e_2 and e_3 , then the two subevents are entailed by e_1 , but we would not want to say that e_1 *causes* e_2 or e_3 . Compare (137–b) with (138):

- (138) Maria schlug den Hammer gegen die Wand
 M. hit the hammer against the wall

The natural interpretation of this clause is that Maria is the ‘d-CAUSER’ of the hitting, that the hammer is the moving entity M of the hitting, and that the wall is the still-standing target S of the hitting. The meaning of HIT itself already entails that M moves *against* S. So here the preposition *against* might not give us additional semantic information. This contrasts with the preposition *in* in (137–b). The hammer not only moves against the wall, but stays in the wall, after the hitting event is over. This *is* additional information that is contributed by the preposition. So for (137–b) we can say that the hitting causes the IN relation, i.e. it makes sense that we apply (136) in the ordinary way. But in (138) the situation is different, because the movement against the wall is already entailed by the meaning of HIT:⁴³

- (139) $\forall x,y.HIT(x,y) \longrightarrow AGAINST(x,y)$

In the case of (138) it does not make sense to apply the translation rule for transitive constructions with co-predicates, although we have the appropriate triggering configuration. I conclude from this that the application of the whole rule (136) itself is optional.

A way of excluding it could be assuming a world knowledge rule like the following:

⁴³AGAINST is here an abbreviation for ‘move against’.

$$(140) \quad \forall \mathbf{e}_1 \mathbf{e}_2 [(\mathbf{e}_1 \longrightarrow \mathbf{e}_2) \longrightarrow \neg \text{CAUSE}(\mathbf{e}_1, \mathbf{e}_2)]$$

The co-occurrence of entailment and causation would then yield an inconsistent, hence ill-formed DRS, that would be ruled out by the system. Because the entailment is usually introduced by the lexical meaning of predicates like ‘SCHLAGEN’, the causative interpretation would always be blocked in such a situation. Two further sources of avoiding the causative interpretation are: i) the DRS with the condition ‘CAUSE($\mathbf{e}_1, \mathbf{e}_2$)’ is larger than the DRS without that condition; ii) the DRS without that condition has less discourse referents, because it interprets the whole event \mathbf{e}_2 as entailed by \mathbf{e}_1 , which means that the set of discourse referents used in \mathbf{e}_2 has to be a subset of the set of discourse referents used in \mathbf{e}_1 .⁴⁴

For instances where (136) does not apply we need a DRS translation rule for co-predicates. Let us keep it simple:

(141)

DRS construction rule for co-predicates	
Triggering configuration $\gamma \subseteq \bar{\gamma} \in \mathbf{Con}_K$:	COP α
Introduce into the universe of e:	schematic discourse referent e
Introduce into the conditions set of e:	schematic DRS e of the co-predicate α
Substitute in $\bar{\gamma}$:	e for $[_{\text{COP}} \alpha]$

As (136) is optional, (141) cannot be obligatory either. On the other hand, the co-predicate has to be translated, so one or the other rule *has* to be applied.⁴⁵ But we have a couple of options and thus a couple of possible interpretations

⁴⁴Another way of seeing the problem might be to assume that ‘CAUSE($\mathbf{e}_1, \mathbf{e}_2$)’ is redundant, if ‘ $\mathbf{e}_1 \longrightarrow \mathbf{e}_2$ ’ holds. The CAUSE relation might be considered to be trivially reflexive, any event causes itself (and anything that it entails): ‘ $\forall e[\text{CAUSE}(e, e)]$ ’. As this is more a philosophical, than a linguistic issue, I will not discuss it any further.

⁴⁵Remember that reducible DRSs are ill-formed, as proposed by Kamp & Reyle (1993). The fact that we have several ways of reducing a DRS, does not make a difference in this respect.

for a clause like (138). But this is expected in the approach proposed here. What has to be guaranteed, is, first, that the desired interpretation is among the set of possible interpretations and, second, in some way the most plausible or optimal one. The latter task is not the central issue here, but the first one is. Let us consider (138), repeated here:

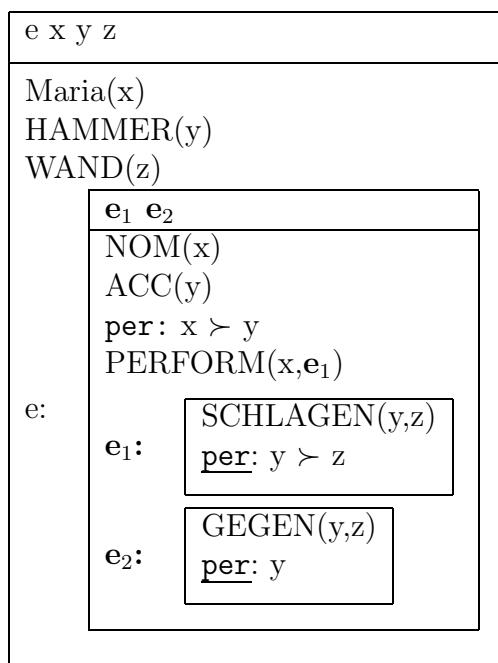
- (142) Maria schlug den Hammer gegen die Wand
 M.-NOM hit the hammer-ACC against the wall

Let us assume that (136) is not applied here, but the DRS translation rule for transitive constructions, and in addition the rule for co-predicates, (141). The latter rule only requires the introduction of the schematic DRS of the co-predicate, the PP *gegen die Wand*. The rule for the DRS translation of transitive constructions obligatorily requires the introduction of the schematic DRS of the verb, the introduction of the case conditions and the NOM>ACC perspective. The optional conditions will be considered later. This yields the following DRS:

- (143)
- | | | | | | | | | | | | | | | | | | |
|----------------------------------|---|-------------------------------|--|--------------------------------|--|------------------|---|---------------|--|------------|--|------------------|---|------------|--|--------|--|
| e x y z u v w | | | | | | | | | | | | | | | | | |
| Maria(x)
HAMMER(y)
WAND(z) | | | | | | | | | | | | | | | | | |
| e: | <table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td colspan="2" style="padding: 5px;">e₁ e₂</td> </tr> <tr> <td colspan="2" style="padding: 5px;"> NOM(x)
 ACC(y)
 per: x > y </td> </tr> <tr> <td style="padding: 5px; vertical-align: middle;">e₁:</td> <td style="padding: 5px;"> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td colspan="2" style="padding: 5px;">SCHLAGEN(u,v)</td> </tr> <tr> <td colspan="2" style="padding: 5px;">per: u > v</td> </tr> </table> </td> </tr> <tr> <td style="padding: 5px; vertical-align: middle;">e₂:</td> <td style="padding: 5px;"> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td colspan="2" style="padding: 5px;">GEGEN(w,z)</td> </tr> <tr> <td colspan="2" style="padding: 5px;">per: w</td> </tr> </table> </td> </tr> </table> | e ₁ e ₂ | | NOM(x)
ACC(y)
per: x > y | | e ₁ : | <table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td colspan="2" style="padding: 5px;">SCHLAGEN(u,v)</td> </tr> <tr> <td colspan="2" style="padding: 5px;">per: u > v</td> </tr> </table> | SCHLAGEN(u,v) | | per: u > v | | e ₂ : | <table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td colspan="2" style="padding: 5px;">GEGEN(w,z)</td> </tr> <tr> <td colspan="2" style="padding: 5px;">per: w</td> </tr> </table> | GEGEN(w,z) | | per: w | |
| e ₁ e ₂ | | | | | | | | | | | | | | | | | |
| NOM(x)
ACC(y)
per: x > y | | | | | | | | | | | | | | | | | |
| e ₁ : | <table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td colspan="2" style="padding: 5px;">SCHLAGEN(u,v)</td> </tr> <tr> <td colspan="2" style="padding: 5px;">per: u > v</td> </tr> </table> | SCHLAGEN(u,v) | | per: u > v | | | | | | | | | | | | | |
| SCHLAGEN(u,v) | | | | | | | | | | | | | | | | | |
| per: u > v | | | | | | | | | | | | | | | | | |
| e ₂ : | <table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td colspan="2" style="padding: 5px;">GEGEN(w,z)</td> </tr> <tr> <td colspan="2" style="padding: 5px;">per: w</td> </tr> </table> | GEGEN(w,z) | | per: w | | | | | | | | | | | | | |
| GEGEN(w,z) | | | | | | | | | | | | | | | | | |
| per: w | | | | | | | | | | | | | | | | | |

An important part of the interpretation we want to arrive at can be derived from this simply by unification. We unify the schematic discourse referents **u** and **w** with **y**, and **v** with **z**. For the thematic interpretation of the subject *Maria* we make use of one of the optional rules of the DRS translation rule for transitive constructions and insert ‘PERFORM(x,e₁)’ into the DRS box of e:

(144)



The above DRS is well-formed, if there are no contradictory perspectives, and if ‘NOM(x)’ and ‘ACC(y)’ can be reduced, i.e. if x and y are ‘totally involved’. y is the first argument of SCHLAGEN, and this entails total involvedness, as discussed earlier. Let us assume that being the first argument of the ‘d-CAUSE’ relation also entails total involvedness – if something causes something else, then it does so as a whole. This means that both ‘NOM(x)’ and ‘ACC(y)’ can be removed. Another question is whether the perspectives of clause and verb conflict. This is also not the case, the clause has the perspective ‘x \succ y’, and the only conflicting perspective would be ‘y \succ x’. Neither the verb nor the co-predicate have this perspective. So the DRS above is well-formed, and can be derived in the given system.

As already said, a couple of other possible interpretations can also be derived. Many of these options might be usable for different examples with the same structural properties. Remember the different linking relations in the following resultative constructions with *schlagen*:

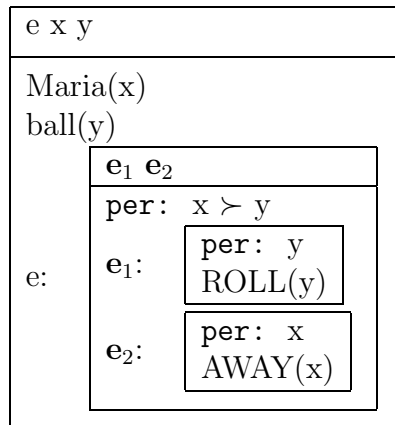
- (145)
- a. Maria schlug den Nagel in die Wand
M. hit the nail into the wall
 - b. Maria schlug den Hammer in die Wand
M. hit the hammer into the wall
 - c. Maria schlug ein Loch in die Wand
M. hit a hole into the wall

- d. Der Hammer schlug den Nagel in die Wand
 The hammer hit the nail into the wall
- e. Der Hammer schlug ein Loch in die Wand
 The hammer hit a hole into the wall

It is obvious that the two individual thematic roles of SCHLAGEN are linked differently in these examples, although we have the same syntactic construction throughout. The individual role of the moving entity of SCHLAGEN is linked to the direct object in (145–b), to the subject in (145–d,e) and left implicit in (145–a,c). The target role of SCHLAGEN is linked to the direct object in (145–a,d), and to the PP in (145–b,c,e). So some variation is required, in order to account for the data. The optionality of unification guarantees that these linking options are ‘derivable’. Some of these options are excluded by world knowledge: a hole can neither move, nor can it serve as a target for hitting. Likewise, only people with extraordinary power would be able to hit a wall against something else.

On the other hand, there might be some ‘derivable’ interpretations of (142) that can never occur, and are not yet excluded. One such example is perhaps represented by the following DRS:

- (146) Maria rollte den Ball fort
 M-NOM rolled the ball-ACC away



The interpretation represented here is a kind of conjunction: ‘The ball is rolling and Maria is going away somehow’. The two subevents are not ‘connected’, i.e. they have nothing to do with each other. It seems that such interpretations are possible in general only in explicit coordination structures. I discussed this kind of problem earlier in this chapter on page 105. There I proposed that connectedness is supposed to follow from the system, and need not be stated as an independent rule. It might, however, be un-

avoidable to posit the connectedness requirement at least as an ‘optimality criterion’ for the evaluation of different possible candidates. A perhaps even harder example has already been discussed several times:

(147) The audience laughed the actor off the stage

Why is the interpretation ‘the audience laughed and the actor left the stage, where laughing and leaving have nothing to do with each other’ impossible? I suspected earlier that the latter interpretation has the weakness of not telling us the ‘trigger’ of the laughing. Another reason could be that this is an interpretation that treats laughing and leaving as two non-connected subevents.

This might point to a principal problem. The DRS construction rules used here introduce the event variable ‘e’ as semantic correspondent of the clause – this comes close to Reichenbach’s (1947) original intention, discussed in section 1.2. We furthermore have the schematic event variables ‘e₁’ and ‘e₂’ of verb and co-predicate. These are sub-events of the event variable representing the whole clause. What is the relation between ‘e’ on the one hand and its sub-events ‘e₁’ and ‘e₂’ on the other hand? Because ‘e₁’ and ‘e₂’ are *sub-events*, the most natural assumption is a part-whole relation. The part-whole relation ruled out here, is one, where the sub-events simply add up to yield ‘e’:

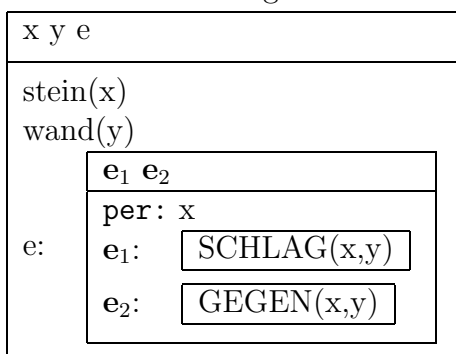
(148) $e = e_1 \wedge e_2$

The solution of the problem lies in the event notion used here. What we want to assume is that events are indivisible. They might have identifiable parts, but these parts are connected with other parts, and these connections between the parts are crucial for the whole event. A simple coordination structure as in (148) does not represent a connection in this sense. (148) only states that e₁ and e₂ are contained in e, but not, how they are related. A conjunction, in this sense, is a *non-relation*. To put it another way, there is no event like e in (148): if e is only the coordination of two other independent events, then e is no event, because it is not atomic; rather, e is a set of events.⁴⁶

⁴⁶There is a parallel problem with nouns like *body* or *family*. Although there are identifiable body-parts, a body is not identical to the set of its parts. Likewise, a family can be considered as a set of people, but also as an institution: when we say that the family is eating, we might express the fact that each member of the family is eating, but when we say that the family decided to buy a new house, we cannot really say that each member of the family made the decision individually. What is important here is that such differences would not stop us from representing all nouns alike in the syntax of DRSs. Whether a noun stands for a set of individuals or represents an indivisible individual is a matter of its

The question is, whether we want to represent this insight in our structures or whether we keep it as a meta constraint. I tend to take the latter direction. Consider the following example:

- (149) Der Stein schlug gegen die Wand
The stone hit against the wall



In principle, there are two ways of conceptualizing the DRS in (149): i) there is a single event of x hitting against y; ii) there are two events, where a. x hits y, and b. x moves against y. According to the first interpretation, e_2 in (149) is redundant, because ‘SCHLAG(x,y)’ entails ‘GEGEN(x,y)’, and thus, $e_1 \rightarrow e_2$. So the DRS in (149) is equivalent to (i.e., has the same models as) the same DRS without e_2 .

The second interpretation is the problematic one. I suspect that, whenever we have more than one predicate in a clause, be it a co-predicate or a modifier or another verb, we get into this kind of conceptual ambiguity that does not seem to have anything to do with the way we interpret clauses. For this reason I tend to restrict the domain of the clause’s event variable e to indivisible events:

- (150) **Events are indivisible**

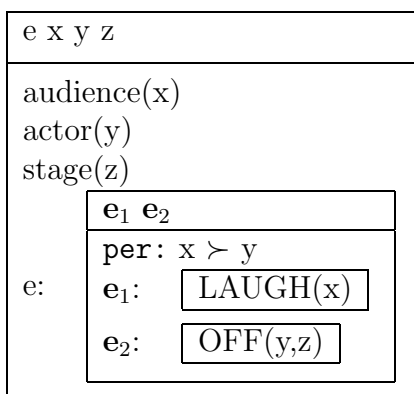
The domain of the event variable e is the set of indivisible events.

The problematic ‘non-connected’ interpretations are now ruled out in general. The two predicates in (149) describe different aspects of the same atomic event, not two different events. If a DRS describes an ‘event’ that cannot be interpreted as atomic, then it cannot have a model, which means that it can never be true. Let us assume that such DRSs are excluded in general.

Consider (147) again. The following DRS is construed analogous to (149), i.e., without the rule translating resultative constructions (i.e. omitting a causal relation between laughing and leaving):

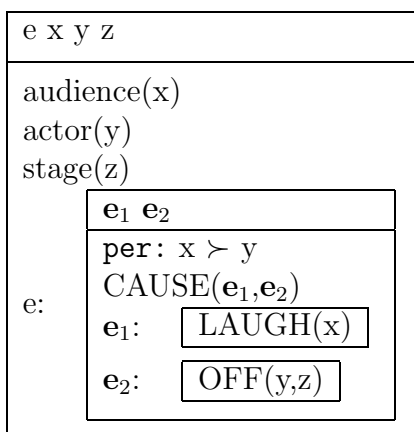
conceptual interpretation. This interpretation is not yet encoded in the DRSs used here.

(151) The audience laughed the actor off the stage



This DRS tells us that the laughing of the audience and the actor's leaving the stage are two aspects of the same atomic event, but we do not know, how these two aspects combine. Without additional information, we have the laughing and the leaving as two different events. The additional information is given by the DRS translation rule for transitive clauses with co-predicates, (136). The condition 'CAUSE(e_1, e_2)' can be added. Now the two sub-events are connected and we interpret e as an indivisible event:

(152)



The application of (136) also solves another problem: without rule (136), it is possible to construe a DRS with the reverse argument linking, yielding an interpretation like 'the actor laughed the audience off the stage'. This is excluded, because (136) also determines that the 'external argument' of the preposition is linked to the direct or accusative object. This also excludes many conceivable DRS translations for the clauses in question.

There are constructions that cannot be interpreted as resultative constructions, without getting absurd results, although they have the structure

of resultatives. Examples in case can be construed with *schlagen* and other verbs of physical attack or punishment:

- (153) a. Maria schlug Hans ins Gesicht
 M.-NOM hit H.-ACC into the face
 b. Maria schlug den Hund auf den Kopf
 M.-NOM hit the dog-ACC on the head
 c. Holger trat Maria-ACC ans Bein
 H.-NOM kicked M.-ACC at the leg
 d. Sonja boxte Petra in den Bauch
 S.-NOM boxed P.-ACC into the stomach

Though I assume that the directional PPs in these examples are not sub-categorized (i.e. required as morpho-syntactic entities) by the verb, they still get their thematic interpretation from the verb, i.e. the noun inside the PP stands for the target of the hitting. And here the interpretation is definitely *not* that the direct object becomes located at the place indicated by the PP. Such an interpretation would be complete nonsense ('Hans moves into his face' etc.). This shows that the classification of (136) as an optional rule is empirically justified.

The details of the interpretation of clauses like (153) without the directional PP has been discussed in connection with the structure (90) on page 129. The analysis of these clauses that we can give now is in some respects more detailed. Maria is the 'PERFORMER' of the hitting action in (153-a), the target of the hitting is not the dog as such, but a body-part of it, expressed by the PP. The dog, however, is still interpreted as being punished by Maria. This is introduced by a world knowledge rule, which was originally given in (83), repeated in (154):

- (154) $\forall x,y,z. \text{PERFORM}(z, \text{SCHLAG}(x,y)) \wedge \text{animate}(z) \wedge \text{animate}(y)$
 $\longrightarrow \text{PUNISH}(z,y)$

This rule requires slight modification to deal with (153). The body-part is now explicitly mentioned:

- (155) $\forall w,x,y,z. \text{PERFORM}(w, \text{SCHLAG}(x,y)) \wedge \text{ANIMATE}(w) \wedge \text{BODY-PART}(y,z) \wedge \text{ANIMATE}(z) \longrightarrow \text{PUNISH}(w,z)$

Being punished entails total involvedness, and so the accusative case is 'justified'. An interesting fact about the data in (154) is that the 'punishment' reading is obligatory, when the object occurs in accusative case, but not, when it occurs in dative case, as in:

- (156) Maria schlug dem Hund auf den Kopf
 M.-NOM hit the dog-DAT on the head

Here, Maria might have hit the dog accidentally. This reading is excluded with accusative case.

I want to close this section with a brief review of the examples I started with. The problem I wanted to discuss was the difference between the following two groups of examples:

- (157) a. *Der Stein schlug das Fenster
 the stone-NOM hit the window-ACC
 b. *Der Stock schlug die Wand
 the stick-NOM hit the wall-ACC
 c. *Das Kind schlug den Stock
 the child-NOM hit the stick-ACC
 d. *Maria schlug den Hammer
 M.-NOM hit the stick-ACC
- (158) a. Der Stein schlug das Fenster kaputt
 the stone-NOM hit the window-ACC broken
 b. Der Stock schlug die Wand kaputt
 the stick-NOM hit the wall-ACC broken
 c. Das Kind schlug den Stock entzwei
 the child-NOM hit the stick-ACC in two
 d. Maria schlug den Hammer entzwei
 M.-NOM hit the hammer-ACC in two

I noted earlier that the crucial ‘defect’ of the clauses in (157) is that the constraint on the conceptual interpretation of accusative objects requires a relation for the individual denoted by this constituent that entails its ‘total involvedness’. I stipulated that the individual role of the target of the hitting is not of this kind, and as there is no other role in sight the clauses in (157) are odd. Things change with the addition of a co-predicate under the resultative interpretation. Entities that are broken or cut in two, are broken as a whole, so it is very reasonable that these predications imply total involvedness, and thus the requirement for the conceptual interpretation of the accusative objects is fulfilled.

Another problem occurs with the examples (157–c,d) and (158–c,d). In these clauses, only one of the two individual roles of SCHLAGEN is realized as a constituent, while the other is left *implicit*. If the accusative object is interpreted as the still-standing target S, then we have a reasonable interpretation for the missing individual (i.e. a hand or some instrument), but if it is

the moving entity M, then S could be nearly everything. But still, however, (158–c,d) are fine with such an interpretation. Problems like these, and the rules governing the possibility of implicit arguments in general will be the topic of the next section.

2.5 Syntactic and Semantic arguments

2.5.1 Implicit Arguments

Implicit arguments are a frequent topic in the debate about argument structure and the linking problem. Very often the fact that some verbs allow implicit arguments while others do not has also been used as an argument in favor of subcategorization rules in the lexical entries of verbs. For example, Jackendoff (1990*b*, 1993) claims that the following difference between the verbs *supply* and *provide* cannot be attributed to their lexical conceptual structure, which he assumes to be equivalent (cf. Jackendoff 1990*b*, 177, 255):

- (159) a. Bill supplied/provided the students with some books
 b. Bill supplied/*provided the students

Another example given by Jackendoff is the pair *empty/rid* (Jackendoff 1990*b*, 177, 255):

- (160) a. Bill emptied/rid the room of insects
 b. Bill emptied/*rid the room

The equivalent German examples are:

- (161) a. Bill versorgte/versah die Studierenden mit einigen Büchern
 b. Bill versorgte/*versah die Studierenden
 (162) a. Bill leerte/befreite das Zimmer von Insekten
 b. Bill leerte/*befreite das Zimmer

An often discussed example is the verb *eat*. It is quite easy to use it without a direct object, while this is not the case with, e.g., *swallow*:

- (163) a. Sally was eating/*swallowing
 b. Sally war am essen/*verschlucken

The standard ‘explanation’ of these differences is to assume, e.g., for *supply* and *provide* that the subcategorization frame of *provide* entails an *obligatory of-PP*, while that of *supply* entails an *optional* one. This is not really an

explanation in the sense that we *understand* the phenomenon. Rather, it is just a mode of *rephrasing* the empirical facts in a model.

I want to suggest that the phenomena can be understood more deeply, if we take a closer look at the examples, and if we examine more seriously the circumstances that allow implicit arguments.

The solution I propose focuses on the notion of *informativity*: Some verbs provide us with a better guess for missing arguments than others, and sometimes these guesses are sufficient to *fulfil the needs of the current discourse*. To explain this more closely consider the following data:

- (164) a. A: “What are you doing?”
 B: “I’m eating”
- b. A: “What are you eating?”
 #B: “I’m eating”

While the use of an implicit argument is fine in B’s first answer, it is not in the second, because it is too *uninformative*. My claim is that the oddity of B’s answer in (164–b) is of the same kind as the oddity of (159-b) with *provide*, (160-b) with *rid* and (163-a) with *swallow*, and the respective German examples. In these cases the verbs do not provide us with enough information about the missing argument, even in an ‘out-of-the-blue’ context.

So the phenomenon has to be traced back to a difference in lexical knowledge. For *eat* and *swallow* this can be paraphrased as follows:

- if *x* swallows *y* then *y* fulfils the physical requirements required for being swallowed
- if *x* eats *y* then *y* fulfils the physical requirements required for being eaten, and *y* is some food for *x*

Nails, for example can be swallowed by human beings, but they are not considered as food for human beings. When inferring possible interpretations of an implicit *y* with *eat*, nails therefore are not taken into account, while they would be in the case of *swallow*. Thus, the set of possible *y*’s for *eat* is much smaller than that for *swallow*. The smaller the set of alternatives, however, the more we actually know about the probable value of a variable. This is where I think that informativity comes into play. The concept of *eat* is more informative about its ‘second’ argument than the concept of *swallow*. This lexical conceptual difference is represented in the selectional restrictions for the verbal arguments in question. The lexical entries in the format proposed by Kamp & Roßdeutscher (1994b) look like this:

such restriction comes with *provide*.

The pattern is quite constant across the data. The overall ratio is:

- (168) **Conjecture on Implicit Arguments**
The more we already know about an individual from the concept it appears in, the easier can it be left implicit.

This may also help to solve the puzzle I introduced in the closing paragraphs of the preceding section. It was about the following example:

- (169) Das Kind schlug den Stock *(entzwei)
 the child-NOM hit the stick-ACC (in two)

If the co-predicate is omitted, the sentence is odd. My standard explanation for such cases was that the accusative object has to be ‘totally involved’. This is not fulfilled if the object is linked to the role of the still standing target S in the concept of *schlagen*. However, here it is very likely that the stick has the role of the moving entity M. This role entails total involvement, so the sentence should be well-formed even without the co-predicate – but it is not.

The reason can again be found in the omitted argument. If the stick is M and we leave out the co-predicate, then S could be nearly any physical entity. But with the addition of the co-predicate *entzwei* things change. Now S can no longer be anything, but must be such solid and big that a stick can break in two, if hit against it. We observe the same effect as above: under certain contextual conditions this information is specific enough.

This line of reasoning proposes that the odd variant of (169) might be acceptable under some circumstances. And indeed, if we know that the child always hits with a stick against the garden doors of the neighbors, a clause like

- (170) Das Kind schlug wieder seinen Stock
 ‘the child beat again its stick’

might not be that bad.⁴⁸ It is, however, quite clear that context does not legitimate the omission of arguments in the same way as lexical knowledge does. Consider the following dialogs:

⁴⁸However, the variant

i. Das Kind schlug wieder mit seinem Stock
 ‘the child beat again with its stick’

is much better, even in-out-of-the-blue contexts. This might be an effect of the ‘deperspectivization’ of the stick. It is much easier to get a habitual interpretation here. Such readings in general are more liberal about the use of implicit arguments.

- (171) a. A: Was hast du mit dem Brot gemacht?
 ‘What did you do with the bread?’
 B: Gegessen.
 ‘Eaten’
- b. A: Was hast du mit dem Brot gemacht?
 ‘What did you do with the bread?’
 #B: Habe Gegessen.
 ‘Have Eaten’

Although neither of the dialogues mentions any of the arguments of *eat* explicitly, B’s answers in these sentences have different interpretations. While in (171–a) the interpretation is: “I have eaten the bread”, that of (171–b) is: “I have eaten (some food)”, which sounds somewhat strange here. So, in (171–b) we have an implicit argument interpretation, while in (171–a), the arguments are all taken from the preceding question. The difference between the two clauses is the presence of a fully inflected auxiliary in (171–b). This turns the answer into a clause. Only topic drop is allowed in German clauses, and as we have no subject present, the subject is interpreted to be dropped, and can be taken from the preceding discourse. With respect to the other arguments of the verb, however, the clause is opaque. If an argument from the preceding discourse has to be an individual in the concept of the current clause, it has to be referred to by pronominal elements.⁴⁹

While the lexical knowledge about *eat* allows for an implicit argument in (171–b), the contextual knowledge has no effect there, contrary to the answer in (171–a), which is not a full clause. This is one phenomenon that has to be kept in mind when comparing the influence of contextual information with that of lexical and world knowledge. The latter operates quite unrestricted within clauses, the former licenses topic drop, but not much more.

⁴⁹Note that in section 2.2 on page 101, I discussed the necessity to introduce individuals from context even for the interpretation of ‘fully specified’ clauses. The example was ‘the books are rolling’, and the problem was that we had to introduce a vehicle into the DRS that serves as the rolling individual (because books cannot roll). That situation is slightly different from the one above. First of all, the verb does not provide us with an alternative rolling individual, or a sufficiently small set of candidates. Second, the vehicle can only be introduced under the *condition* that it stands in some relation to the books (i.e. that the books are lying on the vehicle.), and that this has immediate consequences for the books (i.e. that they are moving). In the above case the only commonality between ‘you’ and ‘the bread’ is that they are mentioned in the same clause. But there is no sufficient conceptual connection that would allow for the same kind of inference as in the case of ‘the books are rolling’.

2.5.2 Is Conflation of Individuals possible?

Let me now briefly address the phenomenon of ‘conceptual shift’ that was important in the first chapter in the discussion of two-level semantics (section 1.1.3). There I mentioned the phenomenon that the verb *schlagen* can be used intransitively when it expresses emission of sound, as in:

- (172) a. Die Uhr schlug
The watch beat (‘rang’)
b. Die Trommeln schlugen
The drums beat
c. Die Glocken schlugen
The bells beat (‘tolled’)

Does this mean that *schlagen* changes its arity under conceptual shift? Consider the following three examples:

- (173) a. Ich hörte die Tür schlagen
I heard the door beat (slam)
b. *Ich hörte den Besen schlagen
I heard the broom beat/hit/slam
c. Ich hörte den Besen gegen die Wand schlagen
I heard the broom against the wall beat (slam/strike)

A broom can be considered as a thing that produces a beating or slamming sound, when it hits against something solid. However, this noun cannot be used intransitively with *schlagen*. The reason becomes quite obvious, when we compare (173–b) and (173–c): in (173–c) we have both a moving entity M (i.e. the broom) and a still-standing target S (i.e. the wall), in (173–b) we only have the former, not the latter. In the case of the door in (173–a) we can infer S from our knowledge about doors: if the door is M then S is either the door frame or the wall surrounding the door. If the door is S, however, we get no idea about M, so this interpretation is predicted to be quite unlikely – which is correct for (173–a).

These observations suggest that even under conceptual shift the standard schematic DRS of SCHLAGEN remains ‘active’. Let us turn now to (172–c). How does the bell fulfil these constraints? A bell can be seen as a kind of ‘machine’ that has the functions described by the concept of SCHLAGEN built into it. The clapper of the bell is M and the bell’s side is S.

If this is the correct interpretation then we have a very interesting situation: the individual introduced by the subject *die Glocke* (‘the bell’) is linked to neither of the two roles of SCHLAGEN. Rather, the two *parts* of

the bell are. The two individual roles of SCHLAGEN are *conflated* into the one individual introduced by the subject of the clause.

The possibility of such a situation calls traditional approaches to thematic interpretation into question. If a verb has two or three individual roles to ‘assign’, it is not necessary to have the same number of verbal complements in the clause to ‘link’ all these roles. *Two (or more) individual roles of the verb might be clustered together within one individual introduced by a verbal complement.*

I know of no theory of thematic interpretation that discusses such a possibility. The complements that function syntactically as arguments of the verb are always mapped as atomic entities into semantic representations and have to be assigned exactly one thematic role by the verb. And, vice versa, the entities that can be assigned thematic roles are those represented by a verbal complement, or implicit arguments (which also are atomic entities).

The problem discussed above can be seen as a kind of metonymic relation: a property predicated of an individual in fact only holds of a part of that individual. The only difference with the above examples is that the property in question is a two-place relation that holds of two parts of an individual. Metonymic relations with monadic predicates are quite common, and well-discussed (e.g., by Pustejovsky 1995). Consider the following example:

- (174) Das Auto rollte
the car rolled

Strictly speaking, it is not the car itself that is rolling, but only a part of it, i.e., its wheels. In this case of metonymic relation, the semantic and syntactic arity of the verb still are equal. But as we saw in the case of (172), this need not necessarily be the case. As soon as we have a semantically multi-place predicate, we get different options for its syntactic arity. The most important consequence of this insight is that *the syntactic arity of a predicate cannot be predicted from its semantic arity.* Thematic interpretation and linking cannot be modeled as an incremental process of ‘stepwise saturation of the verb’s open slots with constituents’. Instead, whether in a clause a verb’s roles are ‘assigned’ is a matter of interpretation and has to be decided case-wise. It *cannot* be decided only by counting the verbal complements. Thematic interpretation has to be seen as an inferential interpretative process on the clause *as a whole*.

The treatment I am proposing is of this kind and can deal with these data. Let us first take a look at the simpler example (174). We start with a DRS that contains the discourse referent introduced by *the car*, and with the conditions introduced by the predicate *rollen*. A car as such cannot roll,

except in an accident, when it ‘rolls’ down a slope, overturning – but as long as we do not have evidence for this interpretation, we consider it as unlikely. So, thus far we do not have a satisfactory conceptual interpretation. However, our (world) knowledge about cars tells us that they all have wheels, and that these can roll, and their rolling causes that the car is moving:

$$(175) \quad \forall x.CAR(x) \longrightarrow \exists y.WHEELS_OF(y,x) \wedge (ROLL(y) \longrightarrow MOVE(x))$$

This is part of our world knowledge and thus can be a condition of our DRS. If we further add the discourse referent of the wheels into that DRS and make the appropriate unifications, we get the result that conforms to the desired interpretation. The car is ‘totally involved’, because it is moving, when its wheels are rolling. So the condition for nominative case reduction is also met.

(176) The car was rolling

e x y		
car(x)		
wheels_of(y,x)		
e: <table border="1" style="display: inline-table; vertical-align: middle; border-collapse: collapse;"> <tr> <td style="padding: 2px;">ROLL(y)</td> </tr> <tr> <td style="padding: 2px;">MOVE(x)</td> </tr> </table>	ROLL(y)	MOVE(x)
ROLL(y)		
MOVE(x)		
⟨ROLL(y) ⟶ MOVE(x)⟩		

Things change only slightly when we turn to (172-c). We have different world knowledge rules, but that is all. The most important rule is that if the clapper of a bell performs a strike against the side of the same bell, then that bell rings:

$$(177) \quad \forall x,y,z.bell(x) \wedge clapper_of(y,x) \wedge side_of(z,x) \longrightarrow CAUSE(SCHLAG(y,z),RING(x))$$

This legitimates the following DRS as a possible interpretation of (172-c), in the same way as above:

(178) Die Glocke schlug
the bell tolled

e x y z			
BELL(x)			
CLAPPER_OF(y,x)			
SIDE_OF(z,x)			
e:	<table border="1"> <tr> <td>SCHLAG(y,z)</td> </tr> <tr> <td>RING(x)</td> </tr> </table>	SCHLAG(y,z)	RING(x)
SCHLAG(y,z)			
RING(x)			

In the final section I will briefly address the opposite problem: Can a single individual be referred to by more than one constituent? The answer will again be ‘yes’, but only under certain assumptions.

2.5.3 Is Splitting of Individuals Possible?

The phenomenon I will address concerns plural or ‘collective’ individuals. Consider as a first example:

- (179) a. Maria und Peter gingen ins Kino
 M. and P. went to cinema
 b. Maria ging mit Peter ins Kino
 M. went with P. to cinema

(179–a) has one verbal complement, and (179–b) has two. But do their DRSs have different numbers of discourse referents? Both sentences have the interpretation that Maria and Peter went to the cinema together, and thus, should be treated as synonymous.⁵⁰ The question, how many individuals have to appear in the DRSs of the two clauses, might be answerable in different ways. But it is very likely that it is answered for both sentences in the same way. If the DRS has only one individual, then (179–b) is a case where one semantic individual is split into two constituents; if the DRS contains two individuals, then (179–a) is another case of ‘conflated individuals’, as discussed in the previous section. I will not decide this question for the concrete case of (179), but will try to search for similar but clearer cases that have to be seen as having only one individual. The clearest cases I could find were with predicates like ‘doubles’, ‘trio’, ‘band’, which all are semantic one-place predicates of plural individuals, in combination with a copula verb. The alternation between a plural subject and a (possibly singular) subject plus a *mit*-PP –

⁵⁰I am leaving aside the issue of different perspectives here. If there is a difference between the two clauses, then with respect to information structure and topicality. In (179–a) we talk about both Maria and Peter, while in (179–b) our primary interest is in Maria. (179–b) is a better answer to the question “What did Maria do?” than (179–a).

Levin (1993) calls it “reciprocal alternation” – can again be observed with these predicates:

- (180)
- a. Jana Novotna und Helena Sukova waren das beste Doppel
 J.N. and H.S. were the best doubles
 der Welt
 of the world
 - b. Jana Novotna war mit Helena Sukova das beste Doppel
 J.N. was with H.S. the best doubles
 der Welt
 of the world
 - c. Peter, Paul und Mary waren das beste Trio der Sechziger
 P., P. and M. were the best trio of the sixties
 Jahre
 years
 - d. Peter und Paul waren mit Mary das beste Trio der
 P. and P. were with M. the best trio of the
 sechziger Jahre
 sixties years
 - e. John, Paul, George und Ringo sind die berühmteste Band
 J., P., G. and R. are the most famous band
 aus Liverpool
 from Liverpool
 - f. John, Paul und George sind mit Ringo die berühmteste
 J., P., and G. are with R. the most famous
 Band aus Liverpool
 band from Liverpool

The predicate ‘trio’, for example, is semantically one-place, but requires that its argument is a collective individual consisting of three members. These data show, to my mind, that the phenomenon that two distinct constituents together introduce one semantic individual really exists.

A slightly more complicated class of predicates with collective individuals are *reciprocal predicates*. These predicates describe properties of a group where, e.g., in a two-membered group each member has the same relation to the other member. Some examples:

- (181)
- a. Maria und Peter sind zusammen
 M. and P. are together

- b. Maria ist mit Peter zusammen
M. is with P. together
- c. Maria und Peter trafen sich heimlich
M. and P. met SELF secretly
(M. and P. met secretly)
- d. Maria traf sich heimlich mit Peter
M. met SELF secretly with P.
- e. Maria und Peter schlugen sich
M. and P. beat SELF
(M. and P. had a fight)
- f. Maria schlug sich mit Peter
M. beat SELF with P.

I will consider reciprocal predicates as semantically one-place again, attributing all the specifics of the reciprocal interpretation to the semantics of the predicate, and how it treats collective individuals. On a deeper level, however, it is impossible that the ‘simple’ predicates the reciprocal predicates are built of are one-place, precisely because of the reciprocity. Reciprocal predicates have the following general structure:

If a reciprocal predicate is based on a two-place relation $f(x, y)$ and is said to hold of a set of individuals A consisting of the individuals a and b , then the reciprocal predicate $f_{rec}(A)$ entails the relations $f(a, b)$ and $f(b, a)$.

Being based on a semantically two-place predicate is the minimum for a reciprocal predicate. If a predicate holds of a plural individual, but is based on a one-place predicate g , then we only get either a distributive interpretation $g(x)$ for each member of the plural individual, or a collective interpretation, where g holds only of the group as a whole. Typical examples for the latter are the above discussed ‘doubles’, ‘trio’ and ‘band’.

Consider example (181–f): *schlagen*, as we know, is a two-place verb, and even if we assumed for the moment that the *schlagen* with the ‘punish’ interpretation used here is a lexeme of its own that requires an agent and a patient, we could not simply link the two thematic roles of the verb to the two introduced individuals (i.e. Maria and Peter). This would yield only ‘SCHLAGEN(m,p)’ or ‘SCHLAGEN(p,m)’, but not both, as required. Thus, in order to get the correct conceptual interpretation we may first have to ‘compose’ the collective individual out of the two constituents, and then ‘apply’ the verb twice, such that both relations are included in the DRS of the clause.

The rules that are necessary can be bound in a quite construction specific manner to the occurrence of the typical morpho-syntax of reciprocal predicates (at least in German), and of course to the involved lexical items. The rule should be formulated as another (perhaps optional) DRS construction rule. The reconstruction of subject and *mit*-PP into one collective individual has to be attributed to the DRS translation of the preposition *mit*. This is also possible.⁵¹

I will not show in detail here, how this interpretation works. But it is clear that in the case of reciprocal predicates again the traditional view on thematic interpretation faces fundamental problems. The whole set of verbal complements has to be ‘rearranged’ conceptually, not only once, but twice! First we produce a collective individual out of two constituents, then we produce two ‘opposite’ concepts/relations out of one. The whole issue of theta role ‘assignment’ is in this case the *result* of these quite complicated processes. It cannot be resolved at the so-called ‘syntax-semantics interface’.

2.6 Summary

The major task of this chapter was the elaboration of a theory of thematic interpretation that covers the linking variability of polyvalent verbs – under the premise that the polyvalent behavior is an effect of the conceptual-semantic specifics of these verbs and of natural language expressions in general, and that polyvalence is *not* (or better mostly not) an indicator of polysemy: for each different ‘valence’ of the same verb we do *not* assume that we are dealing with a different lexeme. Rather, I assume that we are dealing with the same lexeme in all instances of polyvalence – as long as this can be justified semantically. Cases of polyvalence have to be differentiated from cases of true polysemy.

This premise has consequences for the developed theory. Consider the verb *roll* in the following two clauses:

- (182) a. The ball was rolling
 b. Mary was rolling the ball

Traditional approaches consider *roll* to be a manner-of-motion verb in (182–a) and a causation-of-motion verb in (182–b). Under my perspective, it can only be either of the first or of the the second kind in both cases. The minimal assumption is that it is only a manner-of-motion verb, and that

⁵¹The respective rule should not replace the PP by a discourse referent of its own, but rather let it ‘add up’ to another discourse referent.

the ‘additional’ causative interpretation is an effect of the construction the verb appears in. So far, the developed theory can be seen as a version of construction grammar. Goldberg (1995) developed such a construction grammar account of argument structure.

A theoretical consequence of this assumption is that verbs have to be considered as only *partially* determining the meaning of the clause. The thematic interpretation of a verbal complement may not only be determined by the verb, but also by other elements within the clause. The thematic role of a noun might be more complex than the roles provided by the verb.

As the semantics of the verb is assumed to be constant despite its polyvalent behavior, we might find situations, where the actual value of a semantic argument of the verb cannot be found ‘within the clause’, so to speak, but has to be inferred, as a so-called ‘implicit argument’.

I showed that implicit arguments are not the only phenomenon where inference plays a role in thematic interpretation. In addition to verb meaning and ‘construction meaning’, the meaning of the noun in the argument position has to be considered, too. A hammer can be hit into a wall, but a hole can only be created by hitting something else against a wall. Nonetheless, the clause ‘John hit a hole into the wall’ is well-formed. But its linking pattern is different from that of ‘John hit a hammer into the wall’. Verb and construction are equal in both clauses, the only difference is the lexeme occurring in the direct object position. Hence, it must be this lexeme that triggers the alternate linking pattern. This empirical finding has three major consequences for the design of the developed theory:

- The theory has to allow several possible linking patterns for the same construction with the same verb.
- The actual linking pattern is the ‘best’ or ‘optimal’ one, evaluated by an inferential mechanism of comparing the possible options.
- This inferential mechanism takes all available information into account, not only the meaning of the verb (including its selectional restrictions) and the construction, but also the meanings of the complements to be assigned thematic roles, contextual information and world knowledge.

I showed in section 2.5.2 that an individual introduced by a verbal complement sometimes has to be ‘split’ into two conceptual individuals, or that two introduced individuals have to be ‘conflated’ into one individual, in order to determine the correct assignment of thematic roles. This phenomenon raises fundamental questions about the relation between ‘syntactic’ and semantic arguments, syntactic and semantic arity of predicates. It points once

again toward a theory that sees the relation between syntactic and semantic arguments as much more indirect, mediated not simply by a correspondence function, but by an inferential mechanism that establishes this correspondence ‘on the fly’, during the process of semantic interpretation.

I showed in chapter 1 that sometimes quite subtle properties of the involved lexical items can play an important role in explaining phenomena of polyvalence. Discourse Representation Theory, as developed by Kamp & Reyle (1993) provides a format that can deal with these subtleties in principle. I used the format of Discourse Representatoin Structures to develop the theory. But the solution of the given task requires certain extensions of the standard picture of DRT.

The first ‘extension’ that I made was the necessary assumption that world knowledge propositions and contextual information are part of any DRS. I assumed that they can be put anywhere in a DRS. On the other hand, the respective DRS conditions have to be separated from ‘ordinary’ DRS conditions, and so I introduced the notion of *regular DRS conditions* for those conditions that are introduced by the linguistic material, or inferred from the latter. I represented ‘non-regular DRS conditions’ (i.e. world knowlege and contextual information) inside angled brackets:

- (183) p regular DRS condition
 ⟨q⟩ non-regular DRS condition

The reason for this distinction lies in the problem that, although thematic interpretation is an inferential process, it is important that we do not use any propositions in this inferential process, but make use of those propositions introduced by the construction and lexical items of the clause that is currently interpreted.

There might be alternative ways of representing this difference. We might make use of the ‘placement’ options that we have in DRT. Usually, the innermost box stands for the interpretation of the actually processed clause, while the outer boxes represent information given by the preceding discourse. We might restrict the placement of world knowledge and contextual information to the outer boxes, and then replace the notion of ‘regular’ DRS conditions with a restriction that talks about conditions within the same box. But as I am a bit uncertain, how strictly the placement of conditions is governed in DRT, and whether it can be restricted in the intended way, I feel save with the solution that I made use of. I admit that it does not look very elegant.

The central point is that regular conditions can be derived from other regular conditions in connection with non-regular conditions. Thus, the following situation is possible:

$$(184) \quad \begin{array}{ccc} \textit{invalid} & \textit{invalid} & \textit{valid} \\ \frac{p}{\therefore q} & \frac{r}{\therefore q} & \frac{p \quad \langle r \rangle}{\therefore q} \end{array}$$

q is a regular DRS condition inferred from one regular and one non-regular DRS condition. It is impossible to derive a regular DRS condition only from non-regular ones. But I also consider the ‘generation’ of non-regular conditions from regular ones as odd:⁵²

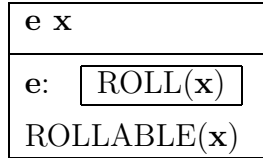
$$(185) \quad \begin{array}{l} \text{a.} \\ \begin{array}{cc} \textit{valid} & \textit{invalid} \\ \frac{\langle r \rightarrow q \rangle \quad \langle r \rangle}{\therefore \langle q \rangle} & \frac{\langle r \rightarrow q \rangle \quad \langle r \rangle}{\therefore q} \end{array} \\ \text{b.} \\ \begin{array}{cc} \textit{invalid} & \textit{valid} \\ \frac{\langle r \rightarrow q \rangle \quad r}{\therefore \langle q \rangle} & \frac{\langle r \rightarrow q \rangle \quad r}{\therefore q} \end{array} \end{array}$$

With respect to the representation of lexical knowledge, I adopt the account of Kamp & Roßdeutscher (1994b), with some modifications. One modification is that I consider selectional restrictions as genuinely semantic, while for Kamp and Roßdeutscher they can be either semantic or syntactic (as a kind of subcategorization restriction). Furthermore, I treat selectional restrictions as *prerequisites* of the interpretation of a clause, not as part of it. Their influence on the interpretation is comparable to that of world knowledge and contextual information. Therefore, they are located in a DRS outer than the DRS of the currently interpreted clause. Take the following simple schematic DRS for *rollen*:

⁵²There is one logical problem that has to be taken care of. It concerns addition of redundant material. Given that ‘p → q’, and p is a non-regular condition, we can derive q, but only as a non-regular DRS condition. But, if ‘p → q’, then necessarily ‘(p ∧ r) → q’. If r is a regular DRS condition, then the above reasoning suggests that now q can be introduced as a regular DRS condition. But this would allow *any* condition to be classified as regular DRS condition, and, thus, make the notion of regular DRS condition unusable. It must be guaranteed that only the *necessary* premises of a deduction count. E.g., in order for the following deduction to justify introduction of r as regular DRS condition, the appearance of q must be crucial (i.e. it must be true that ¬(p→r)):

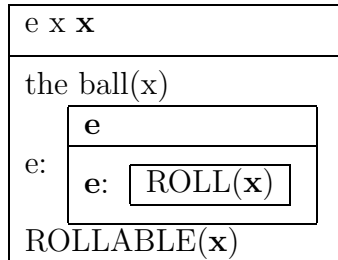
$$(i) \quad \frac{\langle p \rangle \quad q}{\therefore r}$$

(186)



When the schematic DRS is inserted into a clause, the selectional restriction is placed outside of the box of the event variable *e* standing for the interpretation of the clause, as in (187):

(187) Der Ball rollte
the ball rolled

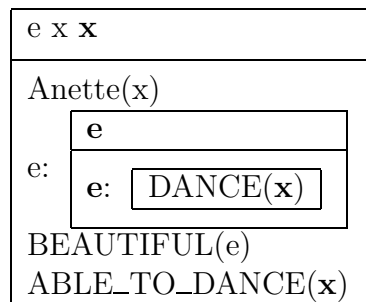


Alternatively, these selectional restrictions might also be treated as non-regular DRSs, and then be inserted freely.⁵³

The use of the event variable that I am making is much closer to Reichenbach (1947) than to Davidson (1967*b*), let alone Parsons (1990). The introduction of schematic discourse referents for events also allows for a Reichenbachian treatment in DRT. The crucial difference would be the use of adverbials. As I see it, (188–a) would correspond to a Davidsonian treatment, and (188–b) to a Reichenbachian:

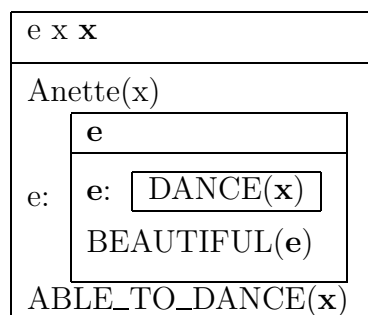
(188) Anette dances beautifully

a.



⁵³The upper boundary is, of course, the DRS that contains in its universe the discourse referents used by the selectional restriction.

b.



After unification of e with e and x with x there is no difference between the two structures, but this unification is not always allowed, as argued in the last sections. As soon as we have two separate independent schematic event variables, we can no longer identify the ‘regular’ event variable e with one of the schematic event variables.

Another important issue with respect to the event notion and the event variable was the requirement that simple events have to be atomic (150):

(189) **Events are indivisible**

The domain of the event variable e is the set of indivisible events.

This is a requirement for the *interpretation* of DRSs, rather than their construction. As far as I can see, it points toward an unsolved problem in the discussion and use of the event notion in semantic representations. (189) is necessary to exclude certain ‘absurd’ interpretations. But these have to be excluded explicitly in any conceptual-semantic theory. (189) has a rather ontological status.

A modification that is also important for the developed theory is the use of *perspective*, as introduced by Fillmore (1977). Fillmore himself already uses perspective as property both of clauses and of lexical items. This is done here in a very similar way. The perspective of a clause are the grammatical functions subject and direct object, with an ordering of subject higher than direct object. The perspective might contain only a subset of the complements, it does not necessarily impose a total ordering. The perspective of verbs and co-predicates works very similar. The restriction for possible interpretations that builds on the perspective was given in (65):

(190) **Restriction on the Perspectives of DRSs**

A DRS of an event that contains perspectives with contradictory rankings of discourse referents is ill-formed.

A contradiction between perspectives occurs in a situation like the following: the schematic DRS of the verb imposes a perspective ‘ $x \succ y$ ’, and the gram-

mational functions of the clause yield the perspective ‘ $y \succ x$ ’. I assume that *schlagen/hit* has a perspective that involves both of its semantic arguments (i.e. the moving entity M and the still-standing target S, where per: $M \succ S$). The (only) reading that is excluded by (190) is one, where M is linked to the direct object, and S to the subject. This is the only plausible reading for (191), but the contradictory perspectives still make (191) odd:

(191) ??The wall hits the stick

With respect to (191), (190) works like a subcategorization rule, but it is much more liberal. To give a simple example, there is no problem with (191) in a passive construction:

(192) The wall was hit by the stick

Because only the subject is part of the clause’s perspective, it imposes no ranking of discourse referents, and so no contradictory rankings can occur.⁵⁴

Because I assume that polyvalent verbs have no subcategorization frames, I have to show how case information disappears from a DRS. I assume that this follows from semantic criteria. The rules for nominative and accusative have been given in (75) and (76), respectively:

⁵⁴A clause like

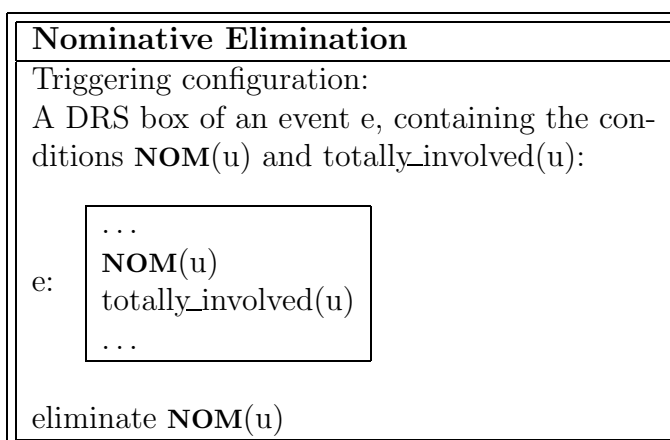
(i) The wall hit with the stick

is still excluded, but by a different restriction that requires total involvedness for the subject. Some German verbs allow goal subjects, if total involvedness is given:

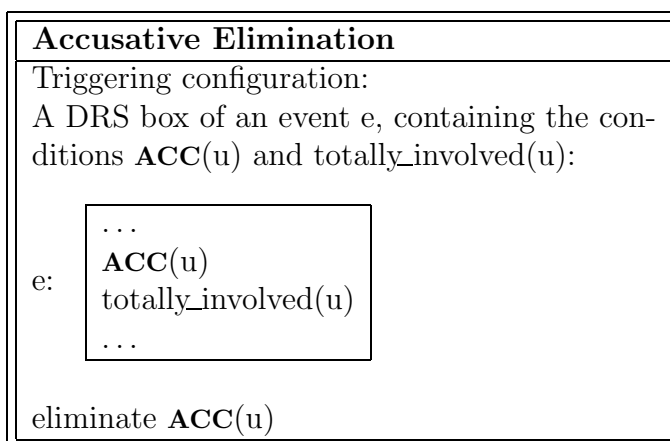
(ii) Der Tisch lag voll Papier
The table lay full of paper

Total involvedness for the subject in (192) would have to be stipulated by a theory of the passive, however.

(193)



(194)



These are the two cases that are central for transitive constructions, on which I focussed in the empirical discussion of this chapter. The construction specific DRS construction rule for transitive constructions was given in (118):

(195)

DRS construction rule for transitive constructions	
Triggering configuration $\gamma \subseteq \bar{\gamma} \in \mathbf{Con}_K$:	<pre> S / \ NP_NOM VP / \ u V NP_ACC alpha v </pre>
Introduce into the universe of the main DRS:	new discourse referent e
Introduce into the universe of e:	schematic discourse referent e for the verb α
Introduce into the conditions set of e:	NOM(u), ACC(v) per: $u \succ v$ schematic DRS e of the verb α and <u>optionally</u> : PERFORM(u, e) d-CAUSE(u, e) CREATE(e, v)
Substitute in $\bar{\gamma}$:	e for [$_V \alpha$] u for [$_{NP} u$] v for [$_{NP} v$]

A crucial point is the optional nature of this rule. It is optional in itself and also contains further optional rules. As a consequence of this, we yield a *set* of possible/derivable semantic interpretations for clauses, not only one. The actual interpretation must be among this ‘candidate set’, but has to be chosen in a second step of evaluation. I will say something more about this second step below.

I also discussed transitive constructions with an additional co-predicate. The DRS construction rule is given in (196). (197) is the DRS construction rule for co-predicates alone (cf. (136) and (141), respectively):

(196)

DRS construction rule for transitive constructions with a co-predicate	
<p>Triggering configuration $\gamma \subseteq \bar{\gamma} \in \mathbf{Con}_K$:</p>	<pre> graph TD S --> NP_NOM[NP_NOM] S --> VP1[VP] NP_NOM --> u[u] VP1 --> NP_ACC[NP_ACC] VP1 --> VP2[VP] NP_ACC --> v[v] VP2 --> COP[COP] VP2 --> V[V] COP --> beta[β] V --> alpha[α] </pre>
<p>Introduce into the universe of the main DRS:</p>	<p>new discourse referent e</p>
<p>Introduce into the universe of e:</p>	<p>schematic discourse referents e_1 and e_2</p>
<p>Introduce into the conditions set of e:</p>	<p>NOM(u),ACC(v) $\text{per: } u \succ v$ schematic DRS e_1 of α schematic DRS e_2 of β CAUSE(e_1, e_2) and <u>optionally</u>: PERFORM(u, e_1) d-CAUSE(u, e_1) CREATE(e_1, v)</p>
<p>Unify:</p>	<p>The single element of $\text{per}(e_2)$ with v.</p>
<p>Substitute in $\bar{\gamma}$:</p>	<p>e_1 for [$V \alpha$] e_2 for [$COP \beta$] u for [$NP u$] v for [$NP v$]</p>

(197)

DRS construction rule for co-predicates	
Triggering configuration $\gamma \subseteq \bar{\gamma} \in \mathbf{Con}_K$:	COP α
Introduce into the universe of e :	schematic discourse referent e
Introduce into the conditions set of e :	schematic DRS e of the co-predicate α
Substitute in $\bar{\gamma}$:	e for $[_{COP} \alpha]$

The developed construction specific DRS construction rules are optional in their application, and contain further options. The result is a set of ‘candidate interpretations’ that compete for the ‘optimal interpretation’. This is another departure from standard DRT, I guess. But on the other hand, optimality theoretic treatments of semantic problems have currently been developed by different researchers, and these are not at all incompatible to DRT.⁵⁵

It seems to me that there are four criteria that are of central importance for the procedure of evaluating the candidate interpretations:

- (198)
- i. **Possibility:** optimal interpretations must be world knowledge consistent.
 - ii. **Plausibility:** optimal interpretations must be context consistent.
 - iii. **Minimal Structure:** optimal interpretations contain as few discourse referents/DRS conditions as possible.
 - iv. **Maximal information:** optimal interpretations contain as few schematic discourse referents as possible – but as many ordinary discourse referents and DRS conditions as possible.

The first two criteria are quite straightforward. Possibility is an absolute criterion. An interpretation is either possible or not. Plausibility on the other hand is gradient. Two candidate interpretations might be equally possible, but one might be *more plausible* than the other. The last two criteria are

⁵⁵See for example Hendricks & de Hoop (1999) and Blutner (1999).

quite interesting. They are strongly reminiscent of the ‘Q-Principle’ and the ‘I-Principle’ of Atlas & Levinson (1981) or Horn (1984) (who calls Atlas and Levinson’s ‘I-Principle’ ‘R-Principle’). A very interesting ‘bi-directional’ optimality theoretic implementation of these two principles has been proposed by Blutner (1999).

Optimality theoretic accounts of semantic issues provide the machinery that is needed here: a framework for semantic interpretation that is based on an evaluation of a set of alternative interpretations for a given string. But the application of OT ‘machinery’ to the problem discussed here is a project of its own.

This completes the summary of the rules and constraints for the conceptual interpretation of natural language sentences and lexemes developed in this chapter. The previous section also discussed the phenomenon of implicit arguments and how it should be addressed in principle, as well as problems connected with ‘mismatches’ in the syntactic and conceptual-semantic arities.

I refer the reader to the concluding remarks for a more general, but brief, discussion of what has been done here.

Conclusion

One important result of this thesis is that once we try to elaborate a theory of thematic interpretation that takes into account the ‘assignment’ of the concrete thematic roles provided by individual lexical items, we cannot avoid viewing thematic role ‘assignment’ as much more indirect than usually assumed. It is often mediated by additional interpretative inferences, and these inferential processes often use ‘non-local’ information: to calculate the role of one complement we have to take into account the semantic properties of other complements. As soon as one is willing to accept this, it is quite easy to see why the phenomenon of polyvalence exists and that it poses a problem for common lexicalist theories of grammar, because polyvalent verbs apparently refuse to do what these theories consider to be their job: rigidly determining the clause’s morpho-syntactic surface and conceptual-semantic, especially thematic interpretation. In order to cope with polyvalence, the role of lexical items in grammar has to be relativised.

If the view on thematic interpretation that I proposed here were carried over to the contemporary mainstream in generative syntax, as formulated by Chomsky (1995), then this approach would lose a quite frequently used tool in explaining word order regularities: the assumption that there are two syntactic positions for a verbal complement, a VP-internal ‘thematic’ or ‘theta position’, and a VP-external case position. As we cannot speak of lexically predetermined thematic roles connected with a fixed syntactic position in the model proposed here – because thematic interpretation is part of the general semantic interpretation processes applying *on* a syntactic structure, not before or within its syntactic derivation –, there is no longer any justification for syntactic ‘theta positions’ – at least in connection with polyvalent verbs.

This consequence seems a welcome progress to me. First, because the mostly used ‘universal’ theta roles have no real independent justification, as discussed in chapter 1.2, and second because the assumption of theta positions leads to mixing-up syntactic and semantic features within one and the same representation, which makes the status of syntactic representations

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somewhat unclear.

The position that inferential processes play a certain role in thematic interpretation is not genuinely new, though. There are some predecessors, one of which is David E. Rumelhart (Rumelhart 1979). His point of view is shared by McClelland & Kawamoto (1986) who summarize it as follows (McClelland & Kawamoto 1986, 316):

[...] A sentence assembles some words in a particular order, and each provides a set of clues that constrains the characteristics of the scenario, each in its own way. The verb, in and of itself, may specify a range of related scenarios and certain constraints on the players. The nouns further restrict the scenario and further constrain the players. But the words themselves are no longer present in the scenario, nor is there necessarily anything in the scenario that corresponds to the literal meaning of the words. Thus in the case of *The doll moved*, the (partially activated) Agent is not a copy of the standard doll pattern, but a pattern appropriate for a doll that can move under its own steam.

The crucial point, here, is that *all* the words work together to provide clues to the case frame representation of the sentence, and *none* of the words uniquely or completely determine the representation that is assigned to any of the constituents of the underlying scenario. [...]

This appears to resemble what is meant by ‘conceptual shift’ and ‘conceptual specification’ in Two-Level-Semantics. Though the approaches of McClelland and Kawamoto as well as Rumelhart still make use of universal thematic roles, and assume that it is the verb that has to provide them, the emphasis is laid on the *interaction* of the constituents in the process of each other’s interpretation. I made one step further here, when I claimed that even the ‘*assignment*’ of thematic roles itself is subject to these interactive interpretative processes.

The model of conceptual-semantic and thematic interpretation developed in chapter 2 is built on well-known and well-established assumptions, but departs from traditional treatments in important details. One major difference is that selectional restrictions play a bigger role than in earlier theories. They are not only restricting the domain of a variable, but they also provide information used in interpretative inferential processes. For thematic interpretation, it is not only important what a verb *expresses*, but also what its prerequisites are, including world knowledge and contextual information. I make use of these prerequisites in the explanation of the varying assignments

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of individual thematic roles, like the role of the moving entity M of *schlagen* in the following examples:

- (199) a. Maria schlug den Hammer gegen die Wand
M. hit the hammer against the wall
b. Maria schlug ein Loch in die Wand
M. hit a hole into the wall

While the individual introduced by the direct object *der Hammer* has role M in (199–a), the direct object cannot receive this role in (199–b). The reason is that holes cannot move, but movability is a *prerequisite* for the role M. Traditional accounts that make use of selectional restrictions and fixed linking rules would predict for such a scenario that the clause is ill-formed. But this is not what we get. We only get a different linking pattern. Providing space for such flexibility was the main reason for the proposal given here. I also argued in chapter 2.5.1 that selectional restrictions and the other prerequisites play an important role in the licensing of implicit arguments.

To account for the observed linking variability of polyvalent verbs, I do not assume, in contrast to the standard view in generative grammar, that their lexical entries include ‘linking devices’ that tell which thematic role has to be linked to which grammatical function or case. The restrictions that I assume are less rigid: roles should be assigned somehow, this increases informativity, and a clause that lies beyond a certain threshold of informativity might be considered ill-formed. Another restriction that looks like a linking device is Fillmore’s (1977) notion of *perspective*. But its implementation given here is much more liberal than a linking device.

Given these assumptions, argument linking can happen in many different ways, and polyvalent behaviour is predicted. Further restrictions that we find with polyvalent verbs follow from more general rules determining the semantic properties of larger clausal units. The interpretation of specific constructions – transitive, causative, resultative etc. –, as well as the semantic implications of case forms and complement clause types, are determined by independent construction specific interpretation rules. I developed such rules for transitive constructions, with and without a co-predicate, for co-predicates, and for the German structural cases. The application of these general rules can be ‘blocked’ or ‘overwritten’ by verbs that do have fixed linking rules. The claim is *not* that, given the evidence that some verbs (the polyvalent verbs) have no subcategorization frames, no verb has a subcategorization frame.

Instead of this, I propose that there is co-existence of default rules and idiosyncratic rules, comparable to the coexistence of regular and irregular

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verb inflection and other similar phenomena. I introduced the term *semi-idiom* for verbs with subcategorization frames. The suggestion is that these verbs have something in common with idiomatic expressions, to a certain degree. The following table shall illustrate the intended idiomaticity scale, exemplified with transitive constructions. The fewer open slots there are in the ‘subcategorization frames’ illustrated in the table in (200), the more idiomatic the respective expression is:

(200) *Idiomaticity Scale for transitive clauses*

DP	V	DP	
the early bird	catches	the worm	proverb
_____	kick	the bucket	idiom
_____	watch	_____	semi-idiom (trans. verb)
_____	_____	_____	transitive construction

An analogy between subcategorization and idiomaticity has also been drawn in Construction Grammar (cf. Fillmore et al. 1988). That constructions as such, as well as cases and types of complement clauses, have their own semantic contributions associated with them is a genuine construction grammarian idea. Goldberg (1995) applies these ideas to argument structure and ‘argument structure constructions’. The system proposed there is nonetheless still deterministic with respect to argument linking. Variable linking patterns for the same verb with the same construction are not accounted for. Goldberg’s model provides no space for world knowledge, contextual information and selectional restrictions to intervene in the process of thematic interpretation. In this aspect, construction grammar is quite traditional. The same holds for the proposal of Dowty (1991).⁵⁶

The empirical discussion was mainly about the German verbs *schlagen* and *rollen*, so the general applicability of the proposal in chapter 2 still has to be explored. Also on the agenda are accounts of the various case forms, prepositional argument types and complement clause types of German, all

⁵⁶Dowty (1991) can be read – against the author’s intentions – as a proposal for the semantics of transitive constructions. Dowty’s claim is that of two roles assigned by a verb, the role with more “Proto-Agent” properties becomes subject and the role with more “Proto-Patient” properties becomes direct object. But the relations subject=Proto-Agent and direct object=Proto-Patient still hold in transitive clauses, where the verb is responsible for the role of only one argument, as in resultatives or causatives with intransitive verbs. Dowty considers only the systematic mapping from role to grammatical function. But the mapping from grammatical functions to role seems to show the same systematicity. On the other hand, the variable linking of the individual roles of polyvalent verbs cannot be accounted for, because Dowty’s system predicts one linking pattern for all occurrences of a verb.

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of which are proposed to make some semantic contributions. The nature of these is an empirical matter yet to be explored in detail.

The proposal that argument linking with polyvalent verbs is based on an evaluation of several interpretative options requires the formulation of a mechanism that performs the task of choosing among the given options. Although I did not work out this mechanism here, I suggested at the end of the last chapter that it could be formulated within optimality theory. The decisive criteria that choose between the candidates are possibility, plausibility, informativity and simplicity.

I want to close with some remarks about language particularity. A basic idea of construction grammar is that construction types are stored in the lexicon, i.e., they have, in analogy to the usual treatment of idioms and proverbs, the status of lexical items. As a consequence of this, the same construction might differ in its semantic entailments from language to language. There is some evidence that this assumption is justified.

The first example in case is from Chinese. According to Li (1993) the following resultative clause has the readings (201–a) and (201–b) (Li 1993, 256):

- (201) Taotao zhui-lei-le Youyou le
T. chase-tired-ASP Y. LE
a. “Taotao chased Youyou and as a result Youyou got tired”
b. “Taotao chased Youyou and as a result Taotao got tired”

Reading (201–b) is impossible for the analogous German resultative clause:

- (202) Taotao jagte Youyou müde
T. chased Y. tired

Only reading (201–a) is possible here. To express reading (201–b) in German, we would have to use a reflexive pronoun as direct object and add the ‘chase’ argument as an oblique argument:⁵⁷

- (203) Taotao jagte sich an/mit Youyou müde
T. chased SELF at/with Y. tired

One and the same syntactic construction, the resultative construction, has different interpretations in German and Chinese. In the system developed in

⁵⁷The two prepositions have slightly different interpretations along lines discussed earlier: *mit* implies total involvedness which here means that Taotao actually caught Youyou; *an* on the other hand is the preposition that is often used to express partiality. Although it also permits the reading where Taotao caught Youyou, the preferred reading seems to be that he did not.

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- b. Me- tOnn nwoma no maa Kofi
I- sold book that gave K.
'I sold the book to Kofi'

While in (206–a) the second verb ‘eat’ stands for a second event following the event introduced by the first verb ‘catch’, in (206–b) the second verb seems to be conceptually ‘integrated’ with the first verb. The two verbs describe two aspects of one single event. Such a construction is not known in modern Germanic and many other European languages. If we posited a DRS construction rule for serial verb constructions, we would certainly not want it to be a universal rule.

The rules proposed in chapter 2 are rules for German. English does not seem to differ much from German in this respect. But, as should have become clear, I do not claim that all transitive constructions in all languages ‘mean’ the same – on the contrary, what the above discussion suggests is that in the domain of syntax-semantics correspondence there is even less universality than in the domain of syntax as such.

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Selbständigkeitserklärung

Hiermit erkläre ich, die vorliegende Arbeit selbständig ohne fremde Hilfe verfaßt zu haben und nur die angegebene Literatur und Hilfsmittel verwendet zu haben.

Ralf Vogel,
6. Februar 1998