

**Information Structure  
as a Processing Guide:  
The Left Periphery of German  
Verb-Second Sentences and Its  
Interpretation in Context**

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Potsdam, March 26, 2004

Thomas Weskott

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# Chapter 1

## Introduction

Language can be used to convey information. In uttering a sentence with the propositional content  $p$ , a speaker  $S$  wants a hearer  $H$  to add  $p$  in some way or other to his stock of informational states or beliefs. Accordingly, in understanding  $p$ , the hearer relates the informational content he computed from the utterance to the informational states or beliefs he entertained before  $p$  was uttered. This picture may be overly simple, and moreover may not suite to explain a lot of cases of communicative exchange. Nonetheless, given the right caveats, it will not be plainly false, and may be considered in more detail for the sake of exposition.

Depending on what language  $p$  is encoded into, there will be different degrees of freedom of *how* it can be encoded. For example, if  $p$  is encoded into German, and  $p$  is the proposition that someone called “Peter” hit someone called “Paul”, then there is a range of possibilities how this proposition will surface in German:

- (1.1) (a) Der Peter hat den Paul gehauen.  
(b) Den Paul hat der Peter gehauen.  
(c) Den Paul gehauen hat der Peter.  
(d) Der Paul wurde vom Peter gehauen.  
(e) Vom Peter wurde der Paul gehauen.  
(f) Vom Peter gehauen wurde der Paul.  
(g) Der Peter, der hat den Paul gehauen.

If we conceive of propositions as the objects of our thoughts, and if we further assume that we use language to convey the propositional information that is contained in these attitudes, we may wonder how, for example

I, having the belief that Peter hit Paul and wanting to convey that belief to you, should choose between the alternatives German provides. A natural reaction to this apparent problem will be to say that the sentences in (1.1) do not exactly *mean* the same thing; that they can be used to convey different kinds of meanings. But the reply to this is obvious: wherein, then, *do* their meanings differ? Do they denote different propositions? This would not be a very favourable option to embark on; not only because it begs the question (after all, we started with the assumption that these sentences do encode  $p$ ), but also because it implies that these sentences (and the propositional content they express) will enter different entailment relations. That is, in the worst case, sentence (1.1(a)) will, for example, imply that  $q$  holds, while all the others will imply that  $\sim q$ . But in what respect, if not in meaning, can the sentences be said to differ?

In linguistics, the respect in which these sentences differ has been termed “Information Structure”. The sentences in (1.1) differ with respect to the Information Structure that is assigned to them. But what does *that* mean? A rough and ready answer that will be accepted by most linguists is that the sentences exhibit different distributions of the Information Structural categories of Focus, Background, Topic, Comment etc.

And whereas certain distributions of these categories are said to be “unmarked”, like e.g. German having the Topic at the left periphery of the sentence, and having it precede the Comment, and having the Focus somewhere at the right periphery, and having it adjacent to the verb position, others, like e.g. example (e), will be said to be “marked”, because they do not comply with the properties listed above.<sup>1</sup>

But this will not be a very satisfactory answer to the question we started with either, since what this means again depends on what “Topic” and “Focus” mean, and what “unmarked” means, and so on.

Basically, these are the problems that this thesis will be about. I will try to unfold a notion of Information Structure that may provide first steps towards an answer to the question given above. Of course, in order to do so, I am expected to answer all the questions that followed from it. Some of them, I will try to answer; some of them, I will avoid. For example, I will not have much to say on the type of sentences exemplified by (1.1(c)–(g)). Rather, I will concentrate on the first two cases. And inside these sentences, I will mostly be concerned with the phrases they begin with, the subject “der Peter” in (a) and the direct object “den Paul” in (b). In the literature on

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<sup>1</sup>I will write the technical terms “Topic”, “Focus” etc. with a capital first letter throughout in order to avoid confusion with their casual meanings.

Information Structure, these elements have been called the “Topics” of the respective sentences. The notion of Topic usually is defined by recourse to properties such as “what the sentence is about”, or “the starting point of the sentence”, hence notions that pertain to the *function* of these elements. I will not follow this usage and will rather try to identify the sentence-initial elements by their most salient and obvious property: that they inhabit the sentence-initial position, which is called “Vorfeld” in German. Throughout this thesis, I will use the terms “element in the sentence-initial position”, “element in the Vorfeld position”, and “Topic element” interchangeably. This is not to introduce a new notion of Topic and thereby add to the terminological confusion that the notion is notorious for anyway, but to avoid the definitional pitfalls that the traditional term Topic is prone to when defined functionally. I will also refrain from trying to account for the notion of discourse Topic, which the confusion about Topics partly is due to.

Finally, what I will refrain from giving a proper definition, too, is the notion of markedness. I will propose to replace it by a concept that I think has more theoretical and empirical significance, as well as being more perspicuous. This is the concept of *contextual restriction*, which I will develop systematically in **chapter 2**. In the course from going from the most simple (and least restricting) cases to more complex (and more restricting) ones, a gradual notion of this concept will evolve. This will be used to account for some of the properties that Topics are said to have, and it will be related to the case of German word order variation (the property of the language that makes both (1.1.a and b) syntactically well-formed sentences. At the end of the chapter, I will propose a representation that tries to capture the property of sentence-initial elements to be related to contexts in a certain way.

In **chapter 3**, I will discuss how the context, more specifically: the discourse context which a sentence normally appears in, can be described theoretically, and which conditions that description has to fulfill in order to be compatible with the ideas set forth in chapter 2. At the end of chapter 3, I will propose a refined version of the representation of the relation between Topic and context; this representation is designed to account for the fact that contexts are highly structured objects.

**Chapter 4** will deal with the processing of word order variation in German. I will give an overview over the psycholinguistic literature that has dealt with this problem, and discuss some of the main effects that have been found to influence processing. This will finally lead to a sketch of the empirical hypotheses for the experiments.

The three reading-time experiments that dealt with the processing of subject-initial vs. object-initial sentences in German will be described in detail in **chapter 5**. Each of the experiments combined a manipulation of the context with the manipulation of the word order of a critical sentence in that context. The results will be given a discussion that is basically free from the theoretical assumptions made in the previous chapters.

A discussion that will recur to both the psycholinguistic and the theoretical considerations will conclude the thesis. It will be given in **chapter 6** and will also point to open questions and problems for further research.

## Chapter 2

# Information Structure and Context

In this chapter, I will propose to conceive of Information Structure as a relation between sentence meaning and context. In order to substantiate this proposal in a systematic fashion, I will proceed from the most simple and basic cases to more complex and elaborate ones. In part, this method is inspired by Höhle, 1982, because it also considers the relevant explicandum to be the “normality”, or, as I will term it, “canonicity” of a certain word order in a given sentence, and tries to seek its explication in the relation that that sentence bears to its context. The overall aim is to give a refined and Information Structure-sensitive notion of sentence meaning that can account for different degrees of fit between a sentence and the context it is embedded in.

Although I shall mostly be concerned with sentence-initial elements, I will start this section by looking at the prototypical sentence-final phenomena connected to the Information Structural notion of Focus.

### 2.1 Focus, Background and Context

A sentence containing only a subject and an intransitive verb, be it German or English, like

- (2.1) (a) Peter schläft.  
(b) Peter sleeps.

can be assigned two different Focus-Background structures.<sup>1</sup> In one case, the subject will be the focus, while the verb serves as the background, and vice versa for the other case; cf. (2.2) and (2.3), where  $F$  indicates the focus constituent and  $B$  the background.

(2.2) [Peter]<sub>B</sub> [schläft]<sub>F</sub>.

(2.3) [Peter]<sub>F</sub> [schläft]<sub>B</sub>.

These two Information Structural variants of (1) have different properties at different levels of grammatical representation. Most notably, they have different prosodic patterns assigned to them at the level of phonological form: whereas in (2), the main accent of the utterance will fall on the verb “schläft”, the subject “Peter” will bear the main accent in (3). I will not go into the details of the realization of Focus at the level of phonological form here. Suffice it to say that the Focal constituent in the cases above will get a high tone and the most prominent pitch accent, whereas the tone on the Background constituent will be below one. For convenience, I will indicate the phonological properties of Focus by writing the Focus exponent, i.e. the constituent in the Focus phrase that bears the main accent, in SMALL CAPITALS where necessary to indicate that the Focus exponent will receive a high tone.

At the level of semantic interpretation, the representations of (2) and (3) may also differ: if we assume that the semantics of Focus is to be more or less that of  $\lambda$ -abstraction (as first proposed by Jackendoff (1972), i.e. the focussed constituent gets abstracted over, (2) and (3) will get approximative semantic representations like (2.4) and (2.5), respectively:

(2.4)  $\lambda P [P(\text{Peter})](\text{sleep})$

(2.5)  $\lambda x [\text{sleep}(x)](\text{Peter})$

Evidently, the two representations differ: whereas (2.4) represents the characteristic function denoting the set of Peter’s properties such that, when applied to the property expressed by “schläft”, yields the proposition that it is Peter who sleeps, in (2.5), we apply the focus value “Peter” to the characteristic function denoting the set of sleeping entities, yielding the same proposition. This difference in representation fits nicely with the intuition

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<sup>1</sup>See Winkler (1997), and Zubizarreta (1998), among others, for an overview of the syntactic literature on Focus-Background; and Bosch & van der Sandt (1994), and Kadmon (2000), for the relevant semantic and pragmatic literature. The phenomena related to focus-sensitive operators like *only* and *even* will not be discussed here. See Kadmon (2000) for a detailed discussion of this issue.

that the two variants can be used as answers to different questions: (2) can be used to answer the question “Was macht Peter?” (What does Peter do?), and (3) answers the question “Wer schläft?” (Who sleeps?) . If we spell out this intuition formally, the correspondence between the question and the two answers becomes evident:

(2.6) Was macht Peter?  $\rightsquigarrow \lambda P [P(\text{Peter})]$

(2.7) Wer schläft?  $\rightsquigarrow \lambda x [\text{sleep}(x)]$

The questions represent the functors for which the focus values of the answers supply the argument. This is further witnessed by the fact that the answers to the questions in (6) and (7) may be elliptical, i.e. they may mention only the argument which the function given by the question applies to. Note also that the full answers that assign the focus value to the entity/property not abstracted over in the question are infelicitous (indicated by the hash ‘#’):

(2.8) (a) A: Was macht Peter?

(b) B: [SCHLAFEN]<sub>F</sub>.

(c) B’: [Peter]<sub>B</sub> [SCHLÄFT]<sub>F</sub>.

(d) B’’: #[PETER]<sub>F</sub>.

(e) B’’’: #[PETER]<sub>F</sub> [schläft]<sub>B</sub>

(2.9) (a) A: Wer schläft?

(b) B: [PETER]<sub>F</sub>.

(c) B’: [PETER]<sub>F</sub> [schläft]<sub>B</sub>.

(d) B’’: #[SCHLAFEN]<sub>F</sub>.

(e) B’’’: #[Peter]<sub>B</sub> [SCHLÄFT]<sub>F</sub>.

The appropriateness of the elliptical answer is due to the fact that the background part (the functor) is explicitly represented in *A*’s question, and hence can be taken for granted and does not have to be explicitly encoded by *B* (see Vallduví (2001)). An intuitive explication of the function of Focus-Background structure could attribute the function of “providing the information asked for” to the Focus, while attributing “(optionally) providing the information taken for granted by the question” to the Background. And these intuitive notions seem to have formal counterparts that allow us to make sense of the “appropriateness of the answer with respect to the question” on purely formal grounds: for example, the inappropriateness of the

answers in (d) is evident if we try to compute the question-answer pair as we did above: if we represent the question in (9.a) by  $\lambda x [\text{sleep}(x)]$ , and the answer in (9.d) by  $[\text{sleep}(x)]$ , we do not arrive at a well-formed expression, because the argument is not of the type provided for by the functor:

$$* \lambda x [\text{sleep}(x)]([\text{sleep}(x)])$$

Further, the formal rendering of the questions enables us to model the contexts in which the sentences may be felicitously uttered. If we bind the variables by an existential quantifier, we get the minimal restriction the utterance of the respective answer imposes on the context:

$$(2.10) \exists P[P(\text{Peter})]$$

$$(2.11) \exists x[\text{sleep}(x)]$$

While the sentence “Peter  $[\text{schläft}]_F$ .” can only be uttered felicitously in a context that contains the information that there is a property P applying to Peter, the sentence “[Peter] $_F$  schläft.” constrains the set of contexts to those that contain the information that there is someone who sleeps.

So far, it seems that questions are apt to identify the differences in contextual appropriateness that Information Structural variants of a sentence exhibit. For simple utterances like the ones considered above, a sentence with a certain Focus-Background structure will be a congruent answer to a question only if the question asked for the focal constituent of that sentence.

However, there are—at least—four problems lurking here. The first applies to the problem of context restriction as given in (2.10) and (2.11): if we want to claim that the sentence “Peter  $[\text{schläft}]_F$ .” is less marked than “[Peter] $_F$  schläft.” by recurring to the constraints imposed by (2.10) and (2.11), we should be able to tell which of the two contextual requirements is harder to meet. But this seems impossible without making *ad hoc* assumptions about what is “normally” contained in a context, i.e. whether it is more “normal” to contain information about properties or about individuals. At this point, this question cannot be answered. I doubt it can be answered at all.

The second problem is formal in nature. As noted above with respect to (2.4) and (2.5), it is only the *representations* given that differ, not their denotation. If the respective formulae in (2.4) and (2.5) are computed, i.e. the argument is applied to the functor, the resulting representations, and hence their denotation, will be identical—they both will be of the form “[sleep(Peter)]”. Thus the difference in meaning, as well as the difference in

contextual restriction (which question the sentence is an appropriate answer to) pertains only to the way the meanings get construed, not to the result of the construction. But this raises the question as to why the construction procedures for these semantic representations should be constructed in a different way in the first place, if they will reduce to the same propositional representation anyway. An obvious reaction to this is to point to the fact that the representations chosen here are far from being adequate to represent the differences in meaning that different Focus-Background structural variants of a sentence exhibit. By using more fine grained representations, this problem may be overcome. Such a solution has been proposed e.g. by Steedman (1996, 2000) in order to account for the semantic effects of Information Structural differences triggered by differences in intonational prosody, and by various others to come to grips with the problem of “association with focus” that is posed by Information Structure-sensitive operators like *only*, *even* etc., among them Rooth (1992), and Krifka (1994); see Kadmon (2000) for further details.

Connected to this issue is the problem that, contrary to what has been said so far, there indeed *is* a case where a question-answer sequence like (8.a)–(e), repeated here as (10), can be coherent:

- (2.12) (a) A: Was macht Peter?  
 (b) B: /PETER \SCHLÄFT.

The slash '/' and the backslash '\' indicate a rising and a falling tone, respectively, resulting in the prosodic pattern known as “bridge accent” or “Hutkontur” (s. Büring (1995, 1999); Molnár (1998); and Steube (2000, 2001)). The specific context in which B’s answer may—at least according to my introspective judgment—be felicitous is one where both A and B know that there is at least one entity other than Peter that is salient in the context of the dialogue, and to which the question posed by A may be of relevance. For example, if Peter has a twin, named “Paul”, then A’s question may be answered felicitously by the following utterance, properly containing (10.b):

- (2.13) /PETER \SCHLÄFT, und /PAUL \ARBEITET.

The contextual restriction imposed by sentences like (2.12.b) will be discussed in more detail below in connection with the Information Structural dimension of Topic-Comment. For the moment we conclude that to account for sentences with Bridge contours, we will have to assume a more complex semantic machinery than the one used above, because they not only seem to restrict the possible preceding contexts, but also constrain the form and content of the following sentence.

A further problem with the analysis put forward above is that it fails to distinguish between two possible ways of answering a *wh*-question that are provided by the relative flexibility German word order exhibits. Consider the following, slightly more complex example:

- (2.14) (a) *A: Wen hat der Peter beleidigt?*  
 Whom has the<sub>nom</sub> Peter insulted?  
 ‘Who did Peter insult?’
- (b) *B: [Den PAUL]<sub>F</sub>.*  
 The<sub>acc</sub> Paul.
- (c) *B’: [Den PAUL]<sub>F</sub> hat der Peter beleidigt.*  
 The<sub>acc</sub> Paul has the<sub>nom</sub> Peter insulted.  
 ‘It was Paul that was insulted by Peter.’
- (d) *B’’: Der Peter hat [den PAUL]<sub>F</sub> beleidigt.*  
 The<sub>nom</sub> Peter has the<sub>acc</sub> Paul insulted.  
 ‘Peter insulted Paul.’

The problem here is that both elaborate answers, (c) and (d), are equally felicitous: though (c) violates the canonical word order of German verb-second sentences, this disadvantage is in a way compensated for by the fact that the information asked for is presented first, which is supposedly more hearer-friendly than having the hearer wait until the end of the sentence. Although some informants I asked reported to have a slight preference for (2.14.c) over (d) for the reason mentioned, they were nevertheless not willing to judge one of the sentences as more appropriate in the given question context. This raises the question in which respect these two variants differ, i.e. which possibly different functions they may serve. Since one difference between the two variants is the placement of the focussed constituent, which in turn results in the two differing word orders, we might ask ourselves whether the position of the focus in the syntactic string might play a role, and if so, how that can be accounted for. Focus-Background structure does not tell us anything about that; even if we take into account that normally, focal elements are realized on the right periphery of the sentence (due to the realisation of focus on the most deeply embedded constituent, cf. e.g. Cinque (1993)), it is still unclear why the focussed constituent should be realized on a different, in fact left-peripheral position in (2.14.c).

The problems mentioned so far seem to indicate that, contrary to what is assumed in most of the literature on Information Structure (s. Kadmon (2000), p. 261ff., for an explicit statement), questions are *not* sufficient to

model the role played by context in constraining the Information Structure of a given sentence.

Further, the observations made seem to suggest that we will have to assume a richer notion of Information Structure. This will be the subject of the next section, where a more complex Information Structural representation for sentences will be introduced which may help us to shed more light on cases like (2.12) and (2.14).

## 2.2 Topic, Comment and Context

As was already mentioned in the introduction, I will not try to review the literature on Topics—neither thematically, nor historically.<sup>2</sup> Given the terminological confusion about the term "Topic", I decided not to rely on existing definitions, but rather try to start out by heuristically characterizing German Topics configurationally. To do so, I will first have to make clear my basic assumptions about the syntactic structure of German sentences.

### 2.2.1 Sentence Topics and the Left Periphery of German V2-sentences—Some Basic Syntactic Assumptions

The notion of *canonical word order* of German verb-second sentences was mentioned in section 2.1 already. To clarify what I mean by this, I will start by considering a verb-final sentence of German, since it is verb-final sentences that are said to exhibit the basic order of arguments in German (for this, and much of what follows, see Haider (1993)). Before I start, a disclaimer might be in place: in this section, I will neither go into much detail about current syntactic theorising on word order phenomena, nor about possible interactions between Information Structure on the one hand, and syntax, argument structure, and the lexical semantics of verbs on the other hand. What I will do is attempt to lay a foundation for the notion of canonical word order that is strong enough to bear the notion of markedness built upon it, and that provides me with the syntactic basis for the formulation of the compositional semantics advanced in section 2.2.3.

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<sup>2</sup>For an overview see Lambrecht (1994), and Gómez-González (2001)

To begin with, consider the following example:

- (2.15) (*Der Peter hat erzählt, ...*)  
 (The Peter has told, ...)  
 ‘(Peter told ...)

*dass der Mann dem Jungen das Buch gegeben hat.*  
 that the<sub>nom</sub> man the<sub>dat</sub> boy the<sub>acc</sub> book given has.  
 that the man gave the boy the book.’

The basic order of arguments of e.g. a ditransitive verb like *geben* (‘give’) in embedded sentences is *nominative* < *dative* < *accusative*.<sup>3</sup> Whereas in a sentence like (2.15), all argument positions are in the so-called middle field (“Mittelfeld”), in verb-second sentences, arguments (as e.g. the subject) may move to the Vorfeld; to clarify the topological notions of Vorfeld, Mittelfeld (the so-called “Nachfeld”, the right-peripheral extraposition domain, is ignored here), I put (2.15) above together with the verb-second sentence (2.16) into Table 1 below. (2.17) shows a sentence with a non-argument inhabiting the Vorfeld position.

**Table 2.1:** The topological distinction between Vorfeld and Mittelfeld in German sentences

	Vorfeld	Mittelfeld
(2.15)		dass der Mann dem Jungen gestern das Buch gegeben hat.
(2.16)	Der Mann	hat dem Jungen gestern das Buch gegeben.
(2.17)	Gestern	hat der Mann dem Jungen das Buch gegeben.

In German verb-second sentences, the verb moves to the position at the front of the Mittelfeld; according to the assumptions made here, this is the position under  $C^0$ . If there is no other candidate element for that position,

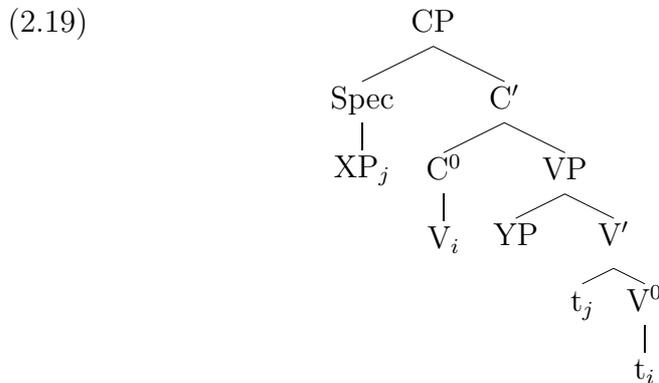
<sup>3</sup>This only holds for fully referential DPs. Pronouns exhibit the order *nom* < *acc* < *dat*, and they do not occupy positions inside VP, but rather in the so-called Wackernagel-position at the front of the Mittelfeld; s. e.g. Lenerz (1992). I will assume that the canonical word order in German is identified by the order of *wh*-indefinites, relative to the argument structure of the verb, cf.: ‘dass wer wen beleidigt hat’ (‘that somebody<sub>nom</sub> somebody<sub>acc</sub> insulted has’), ‘dass wer wem was gegeben hat’ (‘that somebody<sub>nom</sub> somebody<sub>dat</sub> something<sub>acc</sub> given has’), ‘dass wem was gefallen hat’ (that somebody<sub>dat</sub> something<sub>nom</sub> liked has’).

the subject moves above the verb into the specifier of CP, leaving behind a trace in its base position in SpecVP (cf. 2.16). The same holds for non-subjects (cf. 2.17). In German, they can optionally undergo A'-movement to the Vorfeld, like e.g. the direct object in (2.18):

- (2.18) *[Das Buch]<sub>j</sub> hat<sub>i</sub> der Mann dem Jungen t<sub>j</sub> gegeben*  
 The<sub>acc</sub> book has the<sub>nom</sub> man the<sub>dat</sub> boy given  
*t<sub>i</sub>.*

‘The book was given to the man by the boy.’

Although the situation is less uncontroversial for the Vorfeld in verb-second than it is for the Mittelfeld in verb-final constructions, I dare claim that the canonical order in the former case is the one with the subject-DP hosted by SpecCP. Compared to constructions with non-subject argument DPs in the Vorfeld, it is the least marked, and by far the most frequent. Though verb-second constructions with adverbial phrases in the Vorfeld, like (2.17), can be said to be equally “canonical”, the fronting of an adverbial does not necessarily change the relative order of arguments, and hence does not result in a deviation from the canonical order as e.g. the movement of the direct object to the Vorfeld. To illustrate the syntactic assumptions made here, the latter case is represented in (2.19).<sup>4</sup>



With Haider (1993) and *contra* Haftka (1995), I assume that the syntactic structure of German sentences does not provide functional projections

<sup>4</sup>Note that these assumptions apply to the operation of *fronting* only, i.e. only to movement to the specifier of CP, and not to movement to the so-called “Vor-Vorfeld” as constituted by it-clefts, left dislocation, “as for”-constructions etc., which all require the base position of the moved argument to be filled with a resumptive pronoun; s. Scheutz (1997), and Jacobs (2001). For a treatment of fronting in German in an HPSG framework, see Richter & Sailer (2001).

hosting heads where inflectional and tense features can be checked, nor that it, *pace* Rizzi (1997), supplies functional positions that license pragmatic features and hence are targets for “pragmatically motivated” movement. Hence I am forced to claim, herein following Steube & Späth (2002) and Frey (2000), that the only functional projection above VP is CP, and that Information Structure-triggered movement to the Mittelfeld (like e.g. scrambling) has to be conceived of as an adjunction to VP (s. also Haider & Rosengren (1998)). I decided to remain agnostic on the question whether one has to assume a doubled CP for German, as discussed in connection with Topicalisation by Reis (1987), and adopted by Haider & Rosengren for their T(topic)-scrambled elements.

Here, a remark is in place concerning a second Topic position in German recently identified by Frey (2000). It is located at the front of the Mittelfeld, between the finite verb and the position of sentential (i.e. epistemic, modal etc.) adverbials, and is targeted by the same elements that undergo movement to the Vorfeld. Frey has observed certain commonalities and differences between the Vorfeld and Mittelfeld Topic positions. Although I think that the two positions are in close relation to each other, I will not try to argue for that claim, since it is the Vorfeld-Topic that the current investigation is mainly concerned with. Hence, if not indicated otherwise, I will use the term “Topic” to refer to Vorfeld-Topics hosted in the specifier of CP only.

To sum up the claims made so far: the movement operation called “topicalisation”, that is, movement of referential argument DPs to the Vorfeld position, is understood as A'-movement targeting the specifier of CP, leaving behind a trace at the base position of the moved element. The prototypical inhabitant of the target position in German verb-second sentences is the subject. However, German provides the option of also moving non-subject arguments (and even non-referential constituents) into that position. Topicalisation of non-subject arguments yields a noncanonical word order and thus results in a marked construction. What this is supposed to mean will be the subject of the next sections.

### 2.2.2 The Dimensions of Topic-Comment and Their Relation to Context

In this section, I will try to argue for the claim that in order to explain the sense in which certain constructions can be said to be “marked”, we will need both Information Structural dimensions, Focus-Background as well as Topic-Comment. The markedness of a given Information Structural variant of a sentence will be explained in terms of the contextual requirement that

sentence makes. In order to do so, I will proceed along the lines exemplified in section 2.1, that is, from basic and simple to more complex cases. This will hopefully enable us to see in what sense the degree of markedness of a structure corresponds to the restriction it imposes on contexts. Finally, I will formulate a scale of markedness that arranges Information Structural variants according to the degree to which they restrict their context of utterance.

Let us start with the case considered in section 2.1, repeated here as (2.20):

(2.20) Peter schläft.

As we have seen in section 2.1, both constituents of this sentence are possible foci, and we were not able to decide which of the two Focus-Background structures was more basic on purely formal grounds. Although theories of focus assignment tell us that, in the least marked case, the focus wants to be assigned to the most deeply embedded phrase, hence in this case to the verb, we could not translate this into a notion of markedness using the contextual restriction imposed by a sentence as the explanans. Compared to the freedom in ordering that Focus-Background exhibits, the Topic-Comment structure is less ambiguous. Assigning it to sentence (2.20) above, it will result in only one possible labelling, since Topic is a configurational notion: it always has to precede the Comment part of the sentence; in the example below I use *T* to abbreviate Topic, and *C* for Comment.

(2.21) [Peter]<sub>T</sub> [schläft]<sub>C</sub>.

If we look at a more complex case, the way in which Focus-Background and Topic-Comment are related to each other becomes evident:

(2.22) A: Wen hat der Peter beleidigt? ('Whom did Peter insult?')

(2.23) B: [*Der Peter*]<sub>T</sub> [*hat den [den PAUL]*]<sub>F</sub> [*beleidigt*]<sub>C</sub>.  
 The<sub>nom</sub> Peter has the<sub>acc</sub> Paul insulted.  
 'Peter has insulted Paul.'

Here, the narrow focus on the DP "den Paul" triggered by the wh-question is a proper part of the Comment encompassing the whole Mittelfeld. There are also cases where Focus and Comment collapse: one such case is a the so-called *thetic* sentence, or sentence by which a *thetic* judgement is made (s. Eckardt, 1996), i.e. sentences that contain only focussed material:

- (2.24) (a) [Die Sonne scheint]<sub>F=C</sub>. (“The sun is shining.”)  
 (b) [Es regnet]<sub>F=C</sub>. (“It’s raining.”)

Since the aim of this section is to give a more detailed account of the connection between Information Structure and context, I will use the case ofthetic sentences as a starting point.

Sentences like (2.24) above can be uttered “out of the blue”. This is to say that such sentences do not impose any restriction on the context of utterance, apart of course from obeying Gricean maxims; i.e. such a sentence, like any sentence, should only be uttered if the expressed proposition is believed by the speaker to be true at the time of utterance, and if the information it contains can be assumed to be relevant for the hearer (cf. Grice (1975)). More importantly, it is only the content of the sentence that imposes these pragmatic constraints, not the way that this content is encoded in Information Structural terms. This can be attributed to the fact that the sentences in (2.24) cannot really be said to *have* an Information Structure: since they do not exhibit a Background or a Topic part, and since Comment and Focus collapse, the information they contain is presented “holistically”, i.e. in an unstructured manner. Note also that it is quite difficult to conceive of a question that captures the “out of the blue”-ness of the sentences. Although one could utter them as a reply to questions like “What’s up?”, or: “What’s going on?”, such question-answer sequences seem to bring with them more assumptions about the situation in which such sequences can be felicitously uttered. They would constitute a coherent exchange of information if for example somebody enters the room with a sunburn, or with her or his clothes soaking wet. Moreover, they do not seem to be good answers to questions that purportedly model null contexts like “What happened?”. This of course must be attributed to the fact that these sentences denote situations rather than events, and that the former may be perceived more holistically, if not as less structured than the latter.<sup>5</sup>

This assumption is confirmed if we look at another kind of sentence which is also analysed as being able to expressthetic judgements, but which denote events rather than states and seem to exhibit more internal structure than the examples above:

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<sup>5</sup>For example, Eckardt (1996) remarks: “If s/he is making athetic judgement, the speaker has in his mind a state of affairs as a whole, something which cannot be separated any further into a property and an object (“the sun is shining”, “it is snowing”). Thethetic judgement is made by asserting or negating that the corresponding state of affairs holds.”. Note in passing that in making athetic judgement containing a negation, the speaker imposes more restrictions on the context than in making a positive judgement.

(2.25) *Friedrichs ist gestorben.*

Friedrichs is died.

‘Friedrichs (a German TV-newscaster) has died.’

(example from Eckardt (1996), in her discussion of Sasse’s (1987))

Apparently, this sentence can be assigned two different accent patterns:

(2.26) (a) FRIEDrichs ist gestorben.

(b) Friedrichs ist GESTORben.

While, by uttering variant (2.26.a) (possibly out of the blue), the speaker makes athetic judgement—all the information contained in the sentence is focal; there is no Background, let alone Topic. However, this is not the case in sentence (b), the utterance of which will only be felicitous in a context where both speaker and hearer mutually assume the entity named “Friedrichs” to be salient, be that by prior mention, or by his picture appearing on TV etc. Accordingly, (2.26.b) can be uttered in reply to a question like “What about Friedrichs?”, or an assertion like “I haven’t seen Friedrichs on the telly for quite a while.” This indicates that we have to analyse the sentence as expressing a categoric judgement, and that the expression “Friedrichs” in (2.26.b) is the Topic of the sentence. This is in accordance with the common conception of Topics, namely that they have to be *familiar* (i.e. being mentioned in prior discourse or accessible to the participants for other reasons), and that they are expressions *about* whose referents the sentence predicates or makes a judgement; see Reinhart (1981) and (1996), for the definition of sentence Topics in terms of “aboutness”. A detailed account of what it means for a referent to be “familiar”, “taken for granted, or “salient in context” in terms of presupposition will be given in the next section.

To sum up: whereasthetic sentences have a holistic or unstructured Information Structure, and do not seem to impose requirements on the context of utterance that pertain to its Information Structure, the opposite holds for categoric sentences: they cannot be uttered out of the blue, and the reason for this is to be sought in their higher degree of internal structure. Hence, a sentence like (2.26.b) above will be assigned the following Information Structure:

(2.27) [Friedrichs]<sub>T=B</sub> [ist GESTORBEN]<sub>F=C</sub>

where the two dimensions of Topic-Comment and Focus-Background coincide, i.e. they jointly divide the sentence into two parts. As was noted

above, the entity denoted by the Topic has to be part of the common knowledge of  $S$  and  $H$ , and it also has to be in an accessible status. The reason for the condition that the referent of the expression “Friedrichs” has to be salient evidently has to be ascribed to the fact that the sentence has a Topic-Comment structure. Remember that it was the lack of this structure inthetic sentences that seemed to be responsible for their imposing minimal requirement on the context. From the observation that the Topic-Comment structure in (2.27) increases the contextual restriction we have to conclude that it is the Topic that is responsible for this restriction. Note that the identification of the topical constituent in this sentence relies on two kinds of information: firstly, on the fact that Topic and Comment are complementary, and that the Comment and the Focus coincide; and secondly on the configurational information that the Topic has to precede the Comment. Taken together, this uniquely determines the Information Structure represented in (2.27).

Also note that it is indeed the requirement that the topical part of the sentence has to be accessible for both speaker and hearer that increases the requirement on context. It narrows down the set of contexts in which the sentence may be felicitously uttered to those that fulfill the requirement that the referent of the topical constituent be accessible for the participants. A formal characterization of this requirement will be given in the next section. For the moment, we may conclude that if we conceive of the degree of contextual restriction a sentence imposes as being scalar, we may formulate the following hypothesis H1:

$$(H1) \ [_{CP} \dots ]_{F=C} <_R \ [_{CP} [\alpha_{nom}]_{T=B} [_{C'} \beta ]_{F=C}]$$

where

- $[_{CP} \dots ]_{F=C}$  stands for athetic sentence,
- $[_{CP} [\alpha]_{T=B} [_{C'} \beta ]_{F=C}]$  represents a categoric sentence where  $\alpha$  is the Topic and  $\beta$  is the Comment, and Topic and Background as well as Focus and Comment coincide, and
- $<_R$  is a total ordering on the set of Information Structurally labelled sentences, i.e. it is a transitive, irreflexive, asymmetric and connex relation.

To emphasize this point once again: the Information Structural labelled bracketings *together* with the syntactic labelled brackets uniquely determine the properties of the sentence type irrespective of the particular form that

$\alpha$  may take, as long as it is the subject of the sentence, i.e. as long as the whole structure complies with the canonical word order of German defined in the last section.<sup>6</sup> By the same token,  $\beta$  may possibly be complex, i.e. have a ditransitive verb as its head etc.; but as long as it coincides with the Comment, it will not restrict the context *beyond* any restrictions that may be due to properties of specific lexical items contained in  $\beta$ , as e.g. presuppositions triggered by definite NPs, factive verbs and so on.

Furthermore, the representation given for simple categorical sentences respects three of the four dimensions along which instances of Topic-Comment structures vary and around which they form the prototype of the concept of Topic-Comment. This approach to Topic-Comment structures has been proposed in an important paper by Jacobs (2001). Since I found Jacobs' paper extremely helpful in my own attempts to come to grips with a context-related notion of Topic, I will briefly digress to discuss it. This will also provide the opportunity of laying the foundation of a more formal analysis for Topic-Comment structure.

The first dimension Jacobs discusses is *informational separation*; it is defined as follows:

“In (X Y), X is **informationally separated** from Y iff the semantic processing of utterances of (X Y) involves two steps, one for X and one for Y.” (Jacobs (2001), p. 645; the emphasis is his.)

It may seem trivial to state that a bipartition of a sentence by Topic and Comment leads to a separation of the information in the sentence. However, as will be discussed below, the emphasis should be put on the *semantic processing involving two steps*, which is, if spelled out formally, far from being trivial. Furthermore, since *informational separation* is a property that Jacobs ascribes to the *prototype* of Topics, different tokens of Topical elements will vary with respect to the degree to which they fall under that property.

It is obvious that the rendering of categorical sentences given in (H1) will fulfill the property of informational separation, by simply replacing  $X$  by  $\alpha$  and  $Y$  by  $\beta$ .

The second dimension that Topic-Comment structures occupy according to Jacobs is *predication*. The definition is:

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<sup>6</sup>Thus, a non-focal indefinite DP in the Vorfeld will give rise to athetic reading of the sentence; cf. ‘A man entered a RESTAURANT.’ vs. ‘A MAN entered a restaurant.’

“In (X Y), X is the **semantic subject** and Y the **semantic predicate** iff (a) X specifies a variable in the semantic valency of an element in Y, and (b) there is no Z such that (i) Z specifies a semantic variable in the semantic valency of an element in Y and (ii) Z is hierarchically higher in semantic form than X.” (p. 647)

“X specifies variable  $\alpha$ ” is to be understood as “X restricts the assignment of a value to  $\alpha$ ”. Hence, in our example (2.27), repeated here for convenience,

(2.28) (.b') [Friedrichs]<sub>T=B</sub> [ist GESTORBEN]<sub>F=C</sub>

the expression “Friedrichs” can be said to specify the variable left open in the predicate expression “ist gestorben”, which could be rendered as  $\lambda x[\text{died}(x)]$ , and since there is no other constituent around that—in this sense—specifies a variable, the Topic “Friedrichs” is the semantic subject, and the Comment “ist gestorben” is the semantic predicate of the sentence. To check whether Jacobs’ property of *predication* also captures cases of deviant word order, consider the following example (similar to Jacobs’ (11)):

(2.29) [Den Peter]<sub>T=B</sub> [hat der PAUL beleidigt.]<sub>F=C</sub>  
 The<sub>acc</sub> Peter has the<sub>nom</sub> Paul insulted.  
 ‘Peter was insulted by Paul.’

Here, the direct object “den Peter” specifies a variable in the semantic valency of the verb, and there is no expression “higher in the semantic form” than the Vorfeld accusative DP. In particular, the *in situ* subject “der Paul” is not higher in semantic form. This is due to the fact that, motivated by the property of separation, the semantic form of Topic-Comment structure is a conjunction; in Jacobs approach, (2.29) would be rendered approximately like this:

(2.30) [PETER(y) & [PAUL(x) & INSULT(x,y)]]

The hierarchy of the semantic form thus mimicks that of syntactic surface structure, and by defining “X is higher than Y” in terms of “X asymmetrically c-commands Y”, the hierarchies will conform to each other. This idea is essential to most of the formal representations of Topic-Comment structures to be discussed in the next section.

Another important aspect of the dimension of *predication* is that it captures the sense in which Topics are said to have the *aboutness* property that was already mentioned above. Even in cases of deviant word order like the

one presented above, where the (syntactic) subject remained in its base position below the fronted object, the sentence will not be about the syntactic subject, but rather about the fronted object.<sup>7</sup>

The third dimension along which Topics can vary is the dimension of *addressation*, which is defined as follows:

“In (X Y), Y is the *address* for Y iff X marks the point in the speaker-hearer knowledge where the information carried by Y has to be stored at the moment of the utterance of (X Y).”  
(p.650)

As I understand it, this dimension is conceptually dependent on the first two introduced above: *X* can only mark a specific point in speaker-hearer knowledge if it is informationally separable from *Y* (see the case of thetic sentences), and *Y* can only be stored at some specific point in the hearer’s knowledge if it has the form of a predicate. The intuitions behind introducing the dimension of *addressation*, as Jacobs notes, are similar to those behind Heim’s (1982) file metaphor, and, following her file change semantics, Valldeví & Engdahl’s (1996), and Portner & Yabushita’s (1998) formalisation of the latter.

Addressation then comes close to the conception of a “search address” under which (*predicative*) information *about* an entity is stored and accessible, and from which it can be retrieved—processes that are, among other things, indispensable for antecedent search in anaphor resolution, and that represent the crucial underpinnings of the notion of *context update* in dynamic theories of sentence meaning. Jacobs uses addressation as a test for the specificity of Topic phrases; he shows that non-specific elements like indefinites or DPs with negative quantifiers (e.g. “no *X*”) are instances of Topics that are prototypically predicated over, but not supplying an address, and therefore are less typical instances of Topics than e.g. definite DPs. Regrettably, he does not try to integrate the notion of context update into his approach.

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<sup>7</sup>It should be noted that Jacobs himself connects aboutness rather to the dimension of *addressation* than to *predication* (loc.cit, p.655). As the discussion in Reinhart (1981) reveals, nothing hinges on that, since aboutness is itself defined by, among other things, “presumption of knowledge”—a notion which in fact is fairly close to *addressation*, or what has elsewhere been termed *familiarity*. And in turn, the definition of *addressation* itself to a certain extent presupposes something like a *predicative* structure, as we will see below. In computer science, this muddle of definiens and definiendum is approached from a different angle; there, *aboutness* figures prominently in theories of information retrieval and seems to be defined by appeal to topicality, as the following definition suggests: “If a system determines that a document *d* is topically related (i.e. about) query *q*, then the document is returned to the user.” (Song et al. (1999)).

Below I will discuss how a dynamic conception of sentence meaning lends itself to a context-sensitive treatment of Topic-Comment structure in which the dimension of *addressation* will find its natural place.

To sum up: Jacobs' discussion of the dimensions of *informational separation*, *predication* and *addressation* turned out to be fruitful in enumerating criteria that Topic-Comment structures prototypically fulfill.<sup>8</sup>

More importantly, it provided us with the tools necessary for carving out the formal details of the connection between Topic-Comment structure and context. This concludes the digression.

Coming back to the relation of Topic-Comment structure and context, let us look at the following example of a sentence expressing a categoric judgement which, compared to the last one discussed before the digression, has a slightly more complex Information Structure because Comment and Focus overlap, but do not coincide; the Focus does not project to the whole Mittelfeld, but rather encompasses the Focus exponent only:

- (2.31) *Der Peter hat den PAUL beleidigt.*  
 The<sub>nom</sub> Peter has the<sub>acc</sub> Paul insulted.  
 'Peter has insulted PAUL.'

It is not clear whether the difference between a wide and a narrow Focus can be discriminated on phonological grounds in German (s. Féry (1992)). What is clear, though, is that, if we assign the sentence above a Focus-Background structure with the DP "den Paul" as the narrow focus, we get a more complex Information Structure than in the case where Focus and Comment collapse:

- (2.32) [[Der Peter]<sub>T</sub> [hat [den PAUL]<sub>F</sub> beleidigt]<sub>C</sub>.

Since the problem whether such a labelling can be justified on phonological grounds is as yet unsolved, we will only note that the contextual restriction imposed by it is more complex than for the one for wide Focus, where Focus and Comment coincide. In a way, this is trivial, because the Information Structural labelling itself is ambiguous and depends on phonological and/or contextual properties to disambiguate between wide and narrow Focus, and also between narrow and contrastive Focus. Since these questions

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<sup>8</sup>Jacobs' fourth dimension, *frame setting*, is neglected here, because it is devised to account for cases of non-referential Topics like e.g.: [Körperlich]<sub>T</sub> geht es mir gut. ('Physically, I'm well.'). Since I will only treat referential Vorfeld elements here, I shall not enter into the dispute as to whether elements like these really are Topics, and if so, in which sense. See e.g. Maienborn (1998), for discussion.

do not touch upon the status of the Vorfeld DP, I will not go into them here. Suffice it to say that the contextual restriction is stronger than that for a sentence where Focus = Comment.<sup>9</sup>

A similar case is constituted by sentences where the word order is canonical, but the Focus has moved from its unmarked position on the direct object to the lexical verb, thus also instantiating a case of narrow, and possibly contrastive Focus:

- (2.33) *Der Peter hat den Paul BELEIDIGT.*  
 The<sub>nom</sub> Peter has the<sub>acc</sub> Paul insulted.  
 ‘Peter has INSULTED Paul.’

While it is again fairly uncontroversial, by our configurational heuristic, as well as by Jacobs’ criteria, that “*der Peter*” constitutes the Topic and the participle “*beleidigt*” bears the narrow focus, it is less clear what the Background and the Comment should be, respectively. Since the narrow focus on the lexical verb has to be interpreted either contrastively or as an answer to a question of the form “What happened to Paul?” or “What did Paul do to Peter?”, we can only conclude that all other material in the Comment (plus the Topic) constitutes the background.<sup>10</sup> Hence, the Information Structure of (2.31) should be as represented in (2.34):

- (2.34)  $[[\textit{Der Peter}]_T \textit{ hat den Paul}]_B [\textit{BELEIDIGT}]_F$ .  
 The<sub>nom</sub> Peter has the<sub>acc</sub> Paul insulted.  
 ‘Peter has INSULTED Paul.’

This indicates that the restriction on the context is the following: it must provide an entity (denoted by the Topic) the unique existence of which is known to hold for both speaker and hearer, because it was either explicitly or implicitly brought to their attention. Accordingly, if it is part of the

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<sup>9</sup>The reader may wonder why I left out the labelled bracketing for the Background. The reason is that what is to be assumed as Background in this case depends on which reading (contrastive vs. *Paul* being the information-asked-for vs. *what Peter did* being the information-asked-for) the narrow Focus will get. At any rate, the Background part will be discontinuous, as is the Comment. It seems that the ambiguity alluded to above poses a severe problem not only for phonology, but for the formal rendering of Information Structure advanced here—as long as the ambiguity cannot be resolved, this type of sentence cannot be assigned a two-dimensional Information Structural representation.

<sup>10</sup>I ignore the phenomenon known as “emphatic Focus”, which is used to express astonishment, displeasure or some other kind of emotional involvement on the part of the speaker. It surely also serves to restrict contexts, but in a way that depends even more heavily on the propositional attitudes of speaker and hearer, and thus may be much harder to cast in a formal representation.

background as was claimed above, the unique existence of another individual known as “Paul” should be taken for granted by both *S* and *H*. Finally, the action expressed by the lexical verb must be either asked for, or there must be a contextually salient alternative to the action expressed by the verb. This is witnessed by the coherence of the following sequence, where *A*’s statement fulfills all the requirements given above:

- (2.35) A: Der Peter hat gestern den PAUL verhauen. (Yesterday, Peter beat up Paul.)  
 B: *Nein, das stimmt nicht.* (No, that’s not true.)  
*Der Peter hat den Paul BELEIDIGT.*  
 The<sub>nom</sub> Peter has the<sub>acc</sub> Paul insulted.  
 ‘Peter has INSULTED Paul.’

Again, the increase in contextual restriction is not triggered by any property of the Topic constituent, but rather has to do with moving the Focus around in the Comment part of the sentence.

Given this, it is an obvious question to ask what happens if the Focus is moved to the Topic part, that is, if Topic and Focus coincide. If we keep the word order straight, the result will be the following sentence:

- (2.36) *Der PETER hat den Paul beleidigt.*  
 The<sub>nom</sub> Peter has the<sub>acc</sub> Paul insulted.  
 ‘PETER has insulted Paul.’/‘It was PETER who insulted Paul.’

which can be given the following Information Structural labeling:

- (2.37) [Der PETER]<sub>T=F</sub> [hat den Paul beleidigt]<sub>C=B</sub>.

Evidently, the contribution to contextual restriction coming from the Topic part is affected by the coincidence of Topic and Focus: not only must the context provide an individual named “Peter” accessible to both *S* and *H*, but, intuitively, what must hold in that context, too, is that it was someone other than Peter who insulted Paul for the utterance in (2.36) to be appropriate. For example, this contextual restriction might be instantiated by a sentence like (2.38), as long as both *A* and *B* have accessible representations for the proper names used in the example:<sup>11</sup>.

<sup>11</sup>It is not unimportant here to distinguish between *use* and *mention* of a proper name. For example, if *A* pronounces the name “Peter” incorrectly (e.g. /’bɛ:tə/), then *B* could reply “Nein. Der PEter hat den Paul gestern übel beleidigt.”. The contrast would not apply to the referent then, but rather to the pronunciation of that name, hence the latter would be mentioned, not used; s. Saka (1998) and Steube (2002) for metalinguistic correction.

- (2.38) A: Der Karl hat den Paul gestern übel beleidigt. ('Yesterday, Karl has insulted Paul badly.')
- B: Nein, das stimmt nicht. (No, that's not true.)  
Der PETER hat den Paul beleidigt.  
(‘PETER has insulted Paul.)

The example instantiates a case of a so-called “Contrastive Topic” in its corrective use (see Steube, 2002). As with the examples presented before, the sentence containing the focussed Topic may also be uttered in reply to a question like “Wer hat den Paul beleidigt?” (“Who has insulted Paul?”).

What is the contextual requirement triggered by (2.37)? Firstly, the referent of the topical DP, as well as that of the DP “den Paul” have to have representations accessible in the knowledge of both *S* and *H*. What is added to this default-requirement of the Topic position is the interpretation as a contrastive correction establishing a relation between the proposition to be corrected (the *corrigendum*) and the correcting sentence (expressing the *corrigens*). That is, the context must supply a salient entity that, when replacing the focussed constituent of the corrigendum, yields the corrigens. Thus, the context must not only contain the suitable referents for the proper names, but also the set of propositions which we may render roughly as follows:

$$(2.39) \lambda p[p \mid \exists x [\text{insult}(x, \text{Paul}) \wedge x \neq \text{Peter}]]$$

Note that for the case where the entity denoted by the Focussed Topic is the information asked for (i.e., if (2.37) answers the question “Who has insulted Paul?”), the existential operator in the formula will be replaced by a question operator. Still, the contextual restriction of the overall representation will remain the same.

Summing up the cases we have discussed so far, we might say that by dislocating the Information Structural constituent of Focus, the restriction a sentence imposes on the context is strengthened. Returning to our hypothesis, we can now formulate the following scale of contextual restriction:

- (H2) If  $\Sigma = \{S_1, \dots, S_n\}$  is the set of Information Structurally annotated variants of a sentence type **S** with the syntactic structure of **S** being  $[[_{CP} \alpha ] [_{C'} \beta ]]$ , and if
- (i)  $S_1 \in \Sigma$  is a token of **S** of the form  $[_{CP} \dots ]_{F=C}$  (expressing athetic judgement),
  - (ii)  $S_2 \in \Sigma$  is a token of **S** with  $T = B$  and  $F = C$  of the form  $[_{CP} [\alpha_{nom}]_{T=B} [_{C'} \beta ]]_{F=C}$  (expressing a categoric judgement),

- (iii)  $S_3 \in \Sigma$  is a token of  $\mathbf{S}$  with  $F \subset C$  of the form  
 $[_{CP} [\alpha_{nom}]_T [_{C'} \dots [_{V'} [\beta]_F \dots ]_C$  (expressing a categoric judgement),
- (iv)  $S_4 \in \Sigma$  is a token of  $\mathbf{S}$  with  $T = F$  and  $C = B$  of the form  
 $[_{CP} [\alpha_{nom}]_{T=F} [_{C'} \beta ]_{C=B}]$  (expressing a categoric judgement),

then the degree of contextual restriction is  $S_1 <_R S_2 <_R S_3 <_R S_4$ .

This scale of contextual restrictions may easily be extended to more complex Information Structures as constituted e.g. by sentences with bridge accents (s. Jacobs (1997), Büring (1995), Molnár (1998), and Steube (2001); since in these cases, the Information is structured to an even higher degree, viz.  $F \subseteq T$  and  $C \subseteq B$ , one would expect the set of contexts in which they may be uttered felicitously to be even more restricted, hence that they will occupy the right hand side of the scale (H2). But I will not go into the details of this, since in these cases, it seems that it is the Focus—being an improper or even proper subset of the Topic, as in the cases Büring (1995) discusses extensively—that triggers this restriction, and not a property of the Vorfeld position as such, nor of the constituent occupying it. This is also supported by the observation that in German, the “Topical” part of the bridge accent, i.e. the constituent bearing the rising accent, can occupy various positions in the sentence, not only—though preferred—the Vorfeld. Accordingly, the semantics and pragmatics of these constructions is closely connected to that of contrastive Foci at other positions in the sentence.

So far, we have only looked at cases where the canonical order of the arguments was preserved. Sentences with word orders that deviate from the canonical serialisation pose a problem for Information Structure insofar as it is not evident on the face of it what exactly motivates the movement: e.g. in Scrambling, do the elements that undergo movement to some Mittelfeld position because they want to evade the default Focus assignment in the core VP, or are they in fact targetting positions where they can be assigned non-default (e.g. contrastive) Focus (so-called Focus-Scrambling; s. Neeleman (1994))? The problem is illustrated by the following example, where in (b’), the direct object scrambles to get Focus, whereas in (b’), it evades Focus assignment by scrambling:

- (2.41) (a) *Anna hat erzählt,*  
 Anna has told,  
 ‘Anna has told

*dass anscheinend gestern der Peter den Paul*  
 that seemingly yesterday the<sub>nom</sub> Peter the Paul<sub>acc</sub>  
*beschimpft hat.*  
 insulted has.  
 that apparently Peter insulted Paul yesterday.’

- (b) Anna hat erzählt, dass anscheinend gestern  
 [den Paul]<sub>i</sub> der Peter t<sub>i</sub> beschimpft hat.  
 (b’) Anna hat erzählt, dass anscheinend gestern  
 [[den PAUL]<sub>i</sub>]<sub>F</sub> der Peter t<sub>i</sub> beschimpft hat.  
 (b’’) Anna hat erzählt, dass anscheinend gestern  
 [den Paul]<sub>i</sub> [der PETER t<sub>i</sub> beschimpft hat]<sub>F</sub>.

A further problem is whether in (b’), the Focus on “Peter” is to be conceived of as a narrow focus, or whether it is better understood as the default-Focus assigned to the lexical element which is most deeply embedded, which in this case would be the in situ subject. And if so, could such a Focus project, as it does in the canonical case where it falls on the direct object? To my knowledge, there does not yet exist a conclusive explanation of these data. Haider & Rosengren (1998) eschew any kind of functional explanation for Scrambling, and declare that “[...] the quest for the trigger of Scrambling is mistaken.” (p.86), though they admit that it may support the mapping of syntactic domains onto semantic ones.

What may be true for Scrambling—i.e. that there is no uniquely identifiable property of the sentence itself, nor of the context, that triggers this operation—need not be true of Topicalisation: since the Vorfeld position is peripheral, it has often been argued to serve a kind of connecting or “glueing” function between the sentence it is a part of and the immediately preceding context. In fact, most of the functional literature on Information Structure does assume that the Topic serves such a function, no matter whether it is called “addressation”, “givenness”, or “being old information” (see Gómez-González (2001) for discussion of the relevant literature and the interconnections between the concepts mentioned). It is this property that may be the reason for elements to move to the Vorfeld, be they subjects, or other arguments of the verb. Hence, the motivation for fronting the direct object in the following example may rather be sought in the contextual restriction that this movement imposes on the preceding discourse.

- (2.42) [*Den Peter*]<sub>i</sub> hat<sub>j</sub> anscheinend gestern der PAUL  
 The<sub>acc</sub> Peter has apparently yesterday the<sub>nom</sub> Paul

$t_i$  *beleidigt*  $t_j$ .  
insulted.

‘Peter was apparently insulted by Paul yesterday.’

If we apply Jacobs’ (2001) criteria to (2.42), they clearly tell us that “den Peter” must be the Topic of that sentence. It is informationally separated from the Comment, it is the entity predicated over by the rest of the sentence, and it hence also fulfills the criterion of addressation.

Note that in this case, the element moved to the Vorfeld does *not* have to be assigned a particular accent. More specifically, it does not obligatorily have to bear a rising accent, as in the bridge accent or Hutkontur constructions (the slight rise that it may indeed exhibit is the same that a subject would get in this position and which is due to the performance-related phonetic properties of the sentence-initial phonological phrase; s. Mehlhorn (2001); Alter et al.,(2001)). Thus we may conclude that the Topic is not focal in sentence (2.42), and assign the following Topic-Comment Structure:

(2.43) [Den Peter]<sub>T</sub> [hat anscheinend gestern der PAUL beleidigt]<sub>C</sub>.

As was the case with some of the examples in this section, it is not entirely clear how much material of the sentence the Background comprises here, and what is the Focus—does it contain only the constituent “der Paul”, or the whole comment? For the aim pursued here, namely to pin down the contribution of the Topic to the contextual restriction of a sentence, this question is of secondary interest, since the Topic is clearly *separated* here in Jacobs’ sense. Its contribution therefore consists in constraining the set of contexts to those in which both *S* and *H* are aware of the unique existence of an individual called “Peter”.

As far as presupposition is concerned, the noncanonical variant in (2.42) does not differ from its canonical SVO variant. Wherein the two trivially *do* differ is the case assigned to the sentence-initial DP or Topic, which is the reason why OVS sentences like (2.42) may be perceived as being more marked than their respective SVO variants. However, it is important to be aware of the fact that this is not due to any difference in the complexity of Information Structure (as e.g. between athetic sentence and one with a Bridge Contour), but solely due to the deviance in word order. Although these two types of markedness have to be kept apart, they nevertheless seem to be additive. This is to say that the markedness (in the sense of deviation from canonical order) of the OVS compared to that of the SVO variant in this case is higher *independent* of Information Structural markedness (in the sense of complexity of Information Structure), but that if both kinds of

markedness pull together in one structure (as e.g. in an OVS structure with Bridge Contour), the resulting contextual restriction is stronger.

That the claim that OVS order imposes a restriction on context is not at all new is documented by the following quote from Mistrík (1973):

“In many languages, the order verb - object is so automatised that a fronted object—expecially a sentence-initial one—is perceived as marked. [...] Sentences beginning with an object are connected closer to the preceding context than sentences starting with a subject.”<sup>12</sup>

Categoric OVS sentences with a non-focal Topic therefore will be assigned the following Information Structural form:

- $[_{CP} [\alpha_{acc}]_{T=B} [_{C'} \beta ]_{F=C}]$

or, in case of narrow focus,

- $[_{CP} [\alpha_{acc}]_T [_{C'} \dots [\beta]_F \dots ]_C]$

From this assignment, their place in the revised scale of contextual restriction, which is repeated here in its revised version including categoric OVS sentences, immediately follows:

(H3) If  $\Sigma = \{S_1, \dots, S_n\}$  is the set of Information Structurally annotated variants of a sentence type **S** with the syntactic structure of **S** being  $[[_{CP} \alpha ] [_{C'} \beta ]]$ , and if

- (i)  $S_1 \in \Sigma$  is a token of **S** of the form  $[_{CP} \dots ]_{F=C}$  (expressing a thetic judgement),
- (ii)  $S_2 \in \Sigma$  is a token of **S** with  $T = B$  and  $F = C$  of the form  $[_{CP} [\alpha_{nom}]_{T=B} [_{C'} \beta ]_{F=C}]$  (expressing a categoric judgement),

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<sup>12</sup>The passage is my translation; the original reads as follows:

“In vielen Sprachen ist die Folge Verb - Objekt so automatisiert, daß ein vorgezogenes Objekt — besonders ein am Satzanfang stehendes — als merkmalshaft empfunden wird. [...] [M]it einem Objekt eingeleitete Sätze [sind] enger an den vorangehenden Kontext gebunden [...] als mit einem Subjekt beginnende.” (p. 97 f.)

At least partly, the idea of Information Structure and word order imposing gradual contextual restrictions on context that I propose here owes to Mistrík’s notion of “degree of glutination of a text”.

- (iii)  $S_3 \in \Sigma$  is a token of  $\mathbf{S}$  with  $F \subset C$  of the form  
 $[_{CP} [\alpha_{nom}]_T [_{C'} \dots [_{V'} [\beta]_F \dots ]_C$  (expressing a categoric judgement),
- (iv)  $S_4 \in \Sigma$  is a token of  $\mathbf{S}$  with  $T = B$  and  $F = C$  of the form  
 $[_{CP} [\alpha_{acc}]_{T=B} [_{C'} \beta ]_{F=C}]$
- (v)  $S_5 \in \Sigma$  is a token of  $\mathbf{S}$  with  $T = F$  and  $C = B$  of the form  
 $[_{CP} [\alpha_{nom}]_{T=F} [_{C'} \beta ]_{C=B}]$  (expressing a categoric judgement),

then the degree of contextual restriction is:

$$S_1 <_R S_2 <_R S_3 <_R S_4 <_R S_5.$$

I.e. sentences with this Information structure will be located in between categoric SVO sentences with either  $F = C$  or  $F \subset C$  (depending on the Focus) on the one hand, and categoric SVO sentences with focal Topics, i.e. with  $T = F$  and  $C = B$  on the other. This is to say that OVS sentences with non-focal Topics restrict the context less than SVO sentences with focal Topics, but more than SVO sentences with non-focal Topics. Further, OVS sentences where the direct object is focal (because e.g. being the information asked for, or contrasted with), are more restrictive than OVS sentences that have the Focus on the right periphery of the sentence. In which way the contribution of Topics to contextual restriction can be given a more formal and precise representation will be the subject of the next section.

### 2.2.3 Representing Topics in Context

In this section, I will give an overview of what I take to be the most important semantic properties of Topic phrases, and discuss attempts to represent these properties. The aim of this section is to state what conditions a semantic representation of Topics has to meet if it is to capture the prototypical properties of Topics identified above. However, I will confine myself to *definite* Topic phrases for the simple reason that they constitute the prototypical and thus the simplest case; according to the line of argument followed here, more complex cases have to be explained with recourse to the simpler ones. Besides, indefinite Topics have been subject to extensive investigation in the semantic literature, and I fear I do not have anything to add to that. See Bende-Farkas & Kamp (2001) for a discussion of the problems.<sup>13</sup>

<sup>13</sup>This is not meant to say that definite Topics have not been investigated before—the opposite is the case; for two approaches very much akin to the one put forward here, see Jäger (1996), and Kruijff-Korbayová (1998).

As we have seen in the last section, a definite Vorfeld DP in a German verb-second sentence, be it the subject or a topicalized object, is a quite typical instance of a Topic, since it fulfills three of the four criteria formulated by Jacobs, 2001. To repeat these: it is *informationally separated*, its denotation is the entity *predicated* over by the Comment, and it serves as an *address* for the information contained in the Comment. Jacobs gives the following approximative representation: if  $\alpha$  is the Topic, and  $\beta$  is the Comment, the whole sentence will be represented as  $[\alpha \ \& \ \beta]$ .<sup>14</sup> Obviously, this cannot be the whole story, since conjunction in first-order predicate logic is commutative, hence the asymmetric c-command relation between Topic and Comment could be reversed, which in turn would make symmetric the relation “standing higher in semantic hierarchy” which is used to define *predication*—a consequence we obviously do not wish to hold.

A further problem has to do with a property definite DPs are notorious for: they trigger the presupposition that their referents should be uniquely identifiable in the context of utterance; for an overview of the extensive literature on this topic, see e.g. Beaver (1997). What is meant by this may be illustrated by the following example:

- (2.45) (a) Der Junggeselle kocht einen Schweinsbraten. (‘The bachelor is cooking a roast pork.’)  
 (b) Es ist nicht der Fall, dass der Junggeselle einen Schweinsbraten kocht. (‘It is not the case that the bachelor is cooking a roast pork.’)

Both sentences imply that there is a uniquely identifiable individual which is a bachelor. That is, the presupposition of the sentence (i.e. the information saying that there is a bachelor) is not affected by the negation of the sentence in (b).<sup>15</sup> This property of presuppositions of “being constant under negation” can be expressed by saying that, given a sentence  $\phi$  containing

<sup>14</sup>Jacobs emphasizes that giving a semantic representation of prototypical Topics is not among his aims (p.676, fn. 18). Nevertheless, I will use his “simplified representation” (his term) as a point of departure. Hence, any extension of his original proposal should not be mistaken as a critique of his approach.

<sup>15</sup>Note that the indefinite apparently also is affected by negation if it is in the Topic position, as in ‘It is not the case that a bachelor is cooking a/the roast pork.’ I am fully aware that *the fact that definite DPs trigger presuppositions* is by no means connected to the Vorfeld position—it will trigger the presupposition wherever it appears in the sentence. Nonetheless, since the *prototypical* Vorfeld DP is definite, and definites do trigger presuppositions, *the property of prototypically hosting expressions which trigger presuppositions* is connected to that position after all; hence the connection between the Vorfeld position and presupposition.

some element triggering the presupposition  $\psi$ , both  $\phi \supset \psi$  and  $(\sim \phi) \supset \psi$  are valid.

Späth (subm.) proposes an account of Topic-Comment structures which remedies both problems noted above. He treats Topic-Comment structures as Generalized Quantifiers; the Topic is represented as the restrictor, while the Comment is equated to the nuclear scope:

$$(2.46) \quad \exists x \underbrace{[P(x)]}_{\text{Topic}} \wedge \underbrace{[\exists e[\dots [[\dots x \dots](e)\dots]]]}_{\text{Comment}}$$

This abstract representation essentially captures the properties of Topic-Comment structures described so far: *informational separation* is realised by the fact that Topic and Comment are separate representations connected by conjunction; *predication* is trivially fulfilled by the fact that the Topic—being the restrictor—imposes restriction on the assignment of a value to a variable in the Comment. Furthermore, the property of the presupposition triggered by a Topic to be constant under negation can be accounted for by a mechanism that will apply negation to the Focal part of the sentence only (s. Späth (subm., p.6f.)).

However, one might wonder whether the property of *addressation* is fully captured by the representation given above. Given Jacobs' definition, it surely is: the structure of the Generalized Quantifier warrants that the information carried by the Comment will be stored at the point that the Topic marks. But if we try to capture the dynamic notion of updating a context that was lurking behind the notion of addressation (s. section 2.2.2), it is less clear how the representation can account for the property that the Topic indeed does mark a point in the hearer knowledge conceived of as a context, i.e. an information state. To clarify what I mean by this, I will give a rough sketch of the ideas inherent in the family of theories labelled as “dynamic semantics”.<sup>16</sup>

In these theories, the meaning of a sentence is conceived of as a relation between contexts. More specifically, each sentence brings with it a potential to change or “update” a given context. Truth conditions are derivable from context change potentials. Loosely speaking, sentence meanings in terms of update potentials transform contexts into contexts, i.e. they take a context

<sup>16</sup>The following paragraph owes a lot to the exposition of dynamic semantics given in van Rooy (2001), and Jäger (2001).

as the input and return as output the context updated with the information contained in the sentence.<sup>17</sup> This can be illustrated by the following picture,

$$(2.47) \quad c \rightarrow \llbracket A \rrbracket \rightarrow c'$$

where  $c$  and  $c'$  are contexts, and  $\llbracket A \rrbracket$  is the meaning of  $A$ . Contexts can be represented as sets of possible worlds (cf. Stalnaker, 1978); and a possible world  $w$ , being defined by the propositions that are true in it, is formally rendered as a function that maps atomic formulae onto the classical truth-values. The meaning of an atomic formula  $A$  in context  $c$  then comes down to the following:

$$(2.48) \quad \llbracket A \rrbracket(c) = \{w \in c \mid w(A) = 1\}$$

That is, the meaning of formula  $A$  uttered in context  $c$  is the set of possible worlds which are elements of  $c$  and which make  $A$  true or *satisfy*  $A$ . Since not every sentence can be (felicitously) uttered in every context, the update function is partial. Take, for example, a case where a sentence triggers a presupposition that is not entailed, or satisfied by the context in which the sentence is uttered, the infelicity of the utterance will be mirrored in the mechanism by a—at least temporary—breakdown of the update procedure; below, more on that topic will be said. The picture sketched so far also fits nicely with the idea that with each sentence uttered, the context set, i.e. the set of sets of possible worlds in which the sentences uttered so far are true, will get smaller, because every sentence whose update function is defined, (whose meaning is accepted as true) narrows down the sets of possible worlds (s. Stalnaker (1978)).

So much for the technical background. As the reader may have suspected, the most interesting feature of the family of semantic theories described is that they have the notion of contextual restriction built into them. This allows us to recast the properties of Topic-Comment structures in terms of the relation between a sentence (or rather its meaning) and the context the sentence is uttered in.

Let us begin with Jacobs' dimension of *informational separation*: if we borrow from Späth the idea that definite Topic DPs are generalized quantifiers, then the “dynamified” version of the conjunction of restrictor and nuclear scope corresponding to Topic and Comment, respectively, will only differ minimally from the one in (2.45):

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<sup>17</sup>More accurately, the update function corresponding to sentence meaning is a function from states into generalized quantifiers over states; s. Groenendijk & Stokhof (1991a)

$$(2.49) \quad \exists x \left[ \underbrace{P(x)}_{\text{Topic}} \ \Delta \ \underbrace{[\exists e[\dots [[\dots x \dots](e)\dots]]}_{\text{Comment}} \right]$$

The only difference is that the conjunction is dynamic here (indicated by the underlined wedge), and has the following—slightly simplified—definition (s. van Rooy, 2001):

$$(2.50) \quad ||A \wedge B||(c) = ||B||(||A||(c))$$

This reads as follows: the conjunction of the  $A$  and  $B$  relative to context  $c$  is arrived at by applying the update function  $||B||$  to the result of the application of  $||A||$  to  $c$ . That is, the first step of the interpretation of a dynamic conjunction maps the preceding context  $c$  onto a context  $c'$ , which is  $c$  updated by  $A$ . Now this context serves as the input for the next update, i.e. it is the argument for the update function  $||B||$ , which will, if  $||B||$  holds in  $c'$ , yield the overall output  $c''$ . Consider the following picture for illustration:

$$(2.51) \quad \begin{array}{l} c \rightarrow ||A|| \rightarrow c' \\ c' \rightarrow ||B|| \rightarrow c'' \end{array}$$

In more intuitive terms: combining Topic and Comment by dynamic conjunction puts more emphasis on the property of *informational separation*, because the two parts of the sentence are, as opposed to the representation in (2.45), interpreted with respect to possibly—though not necessarily—*different* contexts. That is, the Topical DP in the restrictor of the Generalized Quantifier will “check” the context  $c$ ; and only if the conditions that it poses are satisfied, it will supply a context with respect to which the Comment can be evaluated. It is, to paraphrase, only then that the *predication* can take place—the Topic can only be predicated over if its contextual restrictions are satisfied in the preceding context. I will shortly get to the formulation of the contextual restrictions in a dynamic setting.

As for the third dimension, *addressation*, it is insofar more adequately reflected here than by (2.45), as the Topic can really be said to point to a place where the information carried by the Comment has to go: this “place” is in fact a referent in the context updated by the information provided by the Topic, although it is important to point out that the information provided by the Comment is not *stored* in this context (as Jacobs’ definition of *addressation* has it), but rather is evaluated with respect to it. Nevertheless, the referent in the context  $c'$  identified by updating  $c$  with the Topic indeed

is the address where the information of the Comment “belongs”.

There are two problems remaining: the first is the treatment of presupposition, and the second is the formal representation of the contextual requirement imposed by a definite Topic DP. A close look reveals that this is one and the same problem: the presupposition triggered by the definite DP just *is* the restriction posed.

In the picture discussed so far, the sense in which the Topical information could be said to be “checked” against the context pertained only to the asserted information. Hence, in the case of an indefinite DP which asserts (and sometimes also presupposes) the existence of a (specific or non-specific) referent, it is this asserted information that is interpreted with respect to the context. But when a definite DP is the Topic, what is checked against the context is not the asserted information (in fact, according to most accounts of definites, the information asserted by definites is null), but the presupposed information, i.e. the information that there is a unique referent in the context which the Topic can bind to anaphorically. To capture this formally, we will have to define what it means to be presupposed in a context; in the definition of the update function for presupposition below, ‘ $\partial$ ’ denotes a special presuppositional connective.<sup>18</sup>

$$(2.52) \quad \|\partial A\|(c) = c, \text{ if } \|A\|(c) = c$$

This means that the information  $p$  expressed by the presupposition  $\partial A$  has to hold in  $c$  already; if it does, updating  $c$  with  $\partial A$  will return  $c$  (this is the case called *presupposition binding*). If it does not, either the interpretation will break down, or  $c$  will have to be minimally changed so as to satisfy  $\|A\|$ . Metaphorically speaking, the presupposition acts as a test on the context: only if the context passes the test, i.e. it satisfies the conditional in (2.51) above, the interpretation can go on. Otherwise, if possible, accommodation will prevent the interpretation from breaking down.

This exactly matches the notion of contextual restriction as we have used it in explaining the different behaviour of Information Structural variants of a sentence. To summarize the properties of the definite Vorfeld DPs schematically, let us consider the case of (2.42), repeated here slightly modified as (2.52) (instead of proper names, I used definite descriptions; nothing hinges on that, it just spares the reader the tedious “individual known as  $X$ ” paraphrases):

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<sup>18</sup>As above, I will follow the definitions given by Jäger, 2001, and van Rooy, 2001, which I take to be uncontroversial. More specifically, I take the formal definitions given in van Rooy (2001) to be neutral with respect his conception of presuppositions as introspective propositional attitudes.

(2.53) [*Den Kellner*]<sub>i</sub> *hat*<sub>j</sub> *anscheinend* *gestern* *der*  
 The<sub>acc</sub> waiter has apparently yesterday the<sub>nom</sub>  
 KOCH *t<sub>i</sub>* *beleidigt t<sub>j</sub>*.  
 cook insulted.

‘The waiter apparently was insulted by the cook yesterday.’

This sentence will be assigned the following Topic-Comment structure:

(2.54) [*Den Kellner*]<sub>T</sub> [*hat anscheinend gestern der KOCH beleidigt*]<sub>C</sub>.

Accordingly, it will be assigned the following dynamic interpretation instruction:

(2.55)  $||\partial[\text{den Kellner}]\|\ \triangle\ ||[\text{hat anscheinend gestern der KOCH } t_i \text{ beleidigt}]\|\$

Let us go through the interpretation step by step.

First, the Topic constituent “den Kellner” has to check its presupposition, i.e. that there is a uniquely identifiable waiter, against the context. That is, first the conditional of the definition of the update function for presuppositions has to be fulfilled:

(2.56)  $||\partial[\text{denKellner}]\|(c) = c$ , if  $||[\text{denKellner}]\|(c) = c$

If we assume that the value for  $||[\text{denKellner}]\|(c)$  is indeed  $c$ , that is that there is a specific waiter in  $c$ , the condition will be fulfilled. This will be the case if either  $c$  explicitly provides a unique referent which has the property of being a waiter (if e.g. a unique referent bearing that property has been mentioned in the discourse track represented in  $c$ ), or if, if this is not the case and e.g.  $c$  is a discourse sequence about a restaurant and has not yet mentioned waiters, then the hearer is nevertheless able to accommodate  $c$  via world knowledge (which contains the information that events involving restaurants normally involve waiters) so as to fulfill the condition. In this case,  $||\partial[\text{denKellner}]\|(c)$  will give us the value  $c$ .<sup>19</sup>

The next step is to update the context  $c$  with the information provided by the Topic; i.e., we have to make sure that there is possible world  $w$  in context  $c$  that fulfills the condition  $w(\exists!x[\text{waiter}(x)]) = 1$ . If this condition is fulfilled, this world  $w$  will be part of the context  $c'$  which will serve as the argument for the function that updates with the Comment part of the

<sup>19</sup>For the discussion here, I will assume that the presupposition of the Topic DP is something like  $\exists!x[\text{waiter}(x)]$ , meaning that there is exactly one entity being a waiter.

sentence. If we assume that the presupposition of the Topic DP is satisfied in  $c$ ,  $c$  and  $c'$  will be identical.

The final step then is to update  $c'$  with the information provided by the Comment; thus we have:

$$(2.57) \text{[[[hat gestern anscheinend den Koch beleidigt.]]]}(c') \\ = \{w \in c' \mid w(\text{[hat gestern anscheinend den Koch beleidigt]}) = 1\}$$

This means we have to make sure that  $c'$  has as an element a world  $w$  in which the information given by the Comment of the sentence is true. This will be the case if in the world  $w \in c'$  in which it is true that there exists a unique waiter, it will be also be true that the waiter apparently was insulted by the cook. If this condition is fulfilled, the world containing the information supplied by sentence (2.52) will be an element of the overall output context  $c''$ . Note that I treated the Comment as an atomic predicate, which it obviously is not. Its internal structure, i.e. the Information Structure as well as the scopal properties of the adverbials etc. will determine in which way the more fine-grained updating has to take place. Also note that the interpretive procedure sketched above conforms to Jacobs' characterization that the semantic processing of Topic-Comment structures involves two steps. Finally, although I will not try to give an account of how more complex Information Structures like bridge accent/Hutkontur constructions will be processed in the dynamic setting, I take it as obvious that the higher degree of complexity exhibited by the Topic part of these structures will translate into a more complex presuppositional structure, and hence a stronger restriction on the input context.

## 2.3 Conclusion

What I tried to argue for in this chapter is that building up Information Structure in systematically proceeding from the most simple to more complex constructions provides us with the possibility to use the increasing contextual restriction as an explanans for the otherwise vague notions of *markedness* of a given Information Structural variant. For this enterprise, Jacobs' (2001) definitions of the dimensions of Topic-Comment turned out to be helpful both as a heuristic for identifying the intra- and extrasentential properties of Topic and as a starting point for representing the contribution of Topics to sentence meanings, conceived of as context change potentials. The representation proposed here will undoubtedly need further refinement. Nevertheless, it seems that by taking the prima facie small step from static to dynamic conjunction

as the connection between Topic and Comment, as well as adopting the dynamic conception of presupposition satisfaction in context, the contribution of Topic-Comment structure to the restriction a sentence with a given Information Structure imposes on the context has become a less vague notion. Hopefully, this approach may be apt to be extended to more complex Information Structures, as I have tried to indicate here and there. In particular, the scalar notion of contextual restriction should be useful in formulating empirical hypotheses that can be put to tested, as well as guiding the intuitions in building semantic representations for more complex Information Structures.

Apart from possible shortcomings in the representation, there is one point that has as yet not been taken into consideration. This is the fact that the contexts that a given sentence may be used to update is conceived of as relatively unstructured entity, namely as a set of possible worlds. It may be suspected that in naturally occurring discourse, the contexts that are updated with the utterances the discourse consists of are much more structured entities than sets of possible worlds.<sup>20</sup> If this suspicion is correct, than this will also affect the way in which the update of these contexts with the meaning of a given formula has to be conceived of. In the next chapter, some possible reactions to this problem will be discussed.

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<sup>20</sup>Jacobs (2001) makes a remark in the same direction: “The speaker-hearer knowledge seems to have more internal structure than a simple set of propositions.”(p.651). Even if we concede that in e.g. Stalnaker’s (1978) theory, the speaker-hearer knowledge (the “context set”) is a set of set of set of propositions, the thrust of the argument remains the same.

# Chapter 3

## Discourse Structure

The aim of this chapter is twofold: firstly, it will argue for the claim that the contextual background that hearer and a speaker have at a given time of their conversation is highly structured, i.e. that their track of the discourse will have to exhibit more structure than just being a set of propositions. The second aim is to show how this internal structure may interact with Information Structure on the sentence level. This will result in a more discourse-related notion of context update. To approach the first goal, I will give a short overview over current theories of discourse structure, and try to make clear what a theory of discourse has to provide for in order to be compatible with the assumptions made about the processing of Information Structure in the last chapter. In the second part, I will show in which way a theory like Asher's (1993) SDRT can be used for this purpose. Finally, I will propose a semantic representation for one of the critical sentences used in the experiments.

### 3.1 Theories of Discourse Structure

As was remarked at the end of chapter 2, the common ground, i.e. the information assumed to be true at a given point in conversation by both speaker and hearer, can be modelled as the set of set of possible worlds as defined by the set of propositions held to be true by both speaker and hearer (cf. Stalnaker (1978); van Rooij (2001)). However, this conception underestimates the structure that this common knowledge may have, since the propositions of which a discourse consists are not solely connected by "inhabiting" the same possible worlds, and maybe by some entailment relations between each other, but rather by a number of relations that constitute what can be called the "backbone" of the discourse. I refrain from using the term "discourse grammar" since I believe that debates starting in the late 1960's and not finishing

before the early eighties have made that term somewhat dubious (see e.g. Lang (1973)). Nevertheless, the most straightforward way to think about discourse structures is taking them as a trees or directed graphs consisting of non-terminal nodes that represent a level where the information contained in the discourse sequence is abstracted over, and terminal nodes which correspond to the propositions, or rather some representational instance of them. Although the analogy to syntax is tempting, discourse trees are insofar less restrictive than e.g. phrase structure trees in generative syntactic theories, as the form of the trees itself is not subject to such principles as e.g. binary branching, headedness, asymmetry, and what not. A property that discourse trees and syntactic phrase structure trees *do* share is what may be called the function of their hierarchical structure: both serve the purpose of restricting the possible serialisations of terminal strings in a way that abstracts over properties of the actual terminal elements by assigning categorial label to them. But this may be all the commonality there is, since the differences between the two kinds of domains prevail: first, syntax may to a certain degree be autonomous, i.e. its principles of representation may be largely independent of the representational principles of other cognitive modules. This does surely not hold for discourse structure, which is highly dependent on the semantics (both lexical and compositional), world knowledge, intentions of the participants, and to certain degree to conventionalized patterns that are not specific to exchange of information by natural language, but also to other kinds of social interaction.

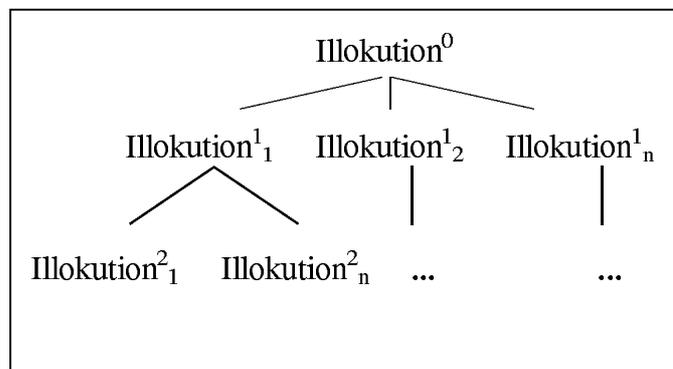
In what follows, I will discuss a three types of theories that have been proposed to describe and explain phenomena related to discourse structure. The guiding questions, and by the same token my evaluative criteria will be the degree to which these theories are able to answer the question how (1) the information contained in a given discourse sequence has to be linearised in order to yield an interpretable string, and (2) how the restrictions on discourse serialisation interact with Information Structure on the sentence level.

### 3.1.1 Illocutionary Hierarchies

It is the connection to social interactions mentioned above that is the starting point for the family of discourse structure theories that I will call “action-based” and whose roots are to find in speech act theory (see Austin (1978)). These are theories that conceive of discourse as the result of action that involves language (for an overview, see Motsch (1996)). That language is involved in these actions however is not considered to be a distinctive feature of these actions—discourse as a product of action involving is subject to the

same principles as any other kind of action: it is oriented towards a goal. It is the goal that gives the overall structure a meaning (“Sinn”; s. Brinker (1992)). This goal can be divided into subgoals, defined as by e.g. a plan structure consisting of executory and test phases (s. Miller, Galanter & Pribram (1960)). Accordingly, the hierarchy imposed on a given discourse sequence is defined by the orientedness of the action towards a goal, and a dominance relation which is derived from the plan structure that determines how to divide the goal into substrategies. Consider the following abstract illocutionary hierarchy (from Heinemann & Viehweger (1991), p.59):

**Figure 3.1:** Discourse as a Hierarchy of Illocutions



The main problem with this approach is that it is the intention of the speaker that decides what has to count as the “dominating illocution” (s. Heinemann & Viehweger (1991) for the details) ) and hence is the root node of the illocutionary hierarchy—depending on the intention of the speaker. Since the dominating illocution (the goal) also determines the meaning of the overall structure, it should also determine the optimal serialisation to achieve the illocutionary goal. However, the hierarchy depicted above makes no reference to the ability of the hearer to parse a discourse string (i.e. to build up a hierarchy over a string) in order to interpret what the speaker may have wanted to convey. Nor does it give us any clue how the meaning (i.e. the intention or goal of the speaker) can be computed from the subgoals or dominated illocutions. Apparently, the “compositional” basis of the hierarchy that has to relate the illocutionary parts together is left to be spelled out by action theory. Taken that the goal of this chapter is to relate the Information Structure on the sentential level to larger parts of discourse, hence to establish relation between information chunks of different size encoded into language, it seems that the “action-based” theories are not the right way to pursue, since they do not take into consideration *how* information is encoded

in language.

### 3.1.2 Macropropositions

A theoretical tradition originating from psycholinguistics that makes explicit reference to the propositions the discourse consists of and how they have to be computed from the natural language input is the propositional model developed over the last 20 years by van Dijk and Kintsch <sup>1</sup>). Although the hierarchical structure of discourse assumed by van Dijk is similar to that of the action-based theories discussed above, there is a fundamental difference. The terminal elements of the tree will not be illocutionary acts, but propositions that are understood as the results of interpreting natural language sentences. Building on these, more abstract levels in the trees represent so-called “macrostructures” which may extract, construe, generalize or omit information contained in the levels below and above them according to “macrorules”. The root node consists of the “macroproposition” which is understood as the “topic of conversation” (van Dijk (1980)) or discourse topic (van Dijk, 1981). In addition to the macrorules, van Dijk (1998) assumes a set of principles that may affect the hierarchisation/serialisation of propositions in a way that transcends their compositional meaning; these are (1) the order of fact sequence (the order the events reported in the discourse have taken place); (2) the order of observation/perception/understanding of the fact sequence (which obviously makes reference to mental representations and the way they have come to representing what they represent, hence to epistemic categories); (3) the role of information transmission (which appeals to “pragmatic” factors like the communicative situation, the common knowledge of speaker and hearer, their communicative intentions and mutual knowledge thereof etc.; and finally (4) the order of illocutionary acts, which, as in action-based theories, is understood as the ordering factor derived from (non-communicative) intentions and goals.

The list of these factors comprises almost all factors that could in some way influence decisions how to serialize a given macroproposition, or how to build a macrostructure from a string of propositions. However, it does not provide us with an explanation of how exactly the principles given above will interact with the language-specific means by which information is encoded. To overuse this point a bit: the principles could equally well be used to determine the serialisation of film scenes given a certain “macroproposition”

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<sup>1</sup>See van Dijk (1980, 1981 and 1998); van Dijk & Kintsch (1983); and Kintsch (1998). Here, I will concentrate on the elaboration of that model by van Dijk, since he explicitly discusses the notion of “discourse topic”

derived from the plot. This of course is not to be meant as a shortcoming of the theory of macropropositions, but it casts doubt on the usefulness of van Dijk's theory for the goal at hand, since it is not only the serialisation of the larger (propositional) chunks of information that I am interested in, but the way in which they may interact with principles of serialisation on the sentential level. Although van Dijk (1980) gives an account of how "sequence topics" are to be constructed from surface strings, this concept is beset with the same problems as it is defined via the notion of referential coherence. Wherein these problems consist will be discussed in the next section.

### 3.1.3 Entity Chains

A further class of theories concerned with discourse sequences and how they relate to each other that do take into the actual surface form of sentences are theories that I call "entity based". Variants of it are proposed in Daneš (1974), Agricola (1975), and Harweg (1979); but I also subsume Grosz & Sidner (1986) and Grosz et al. (1995) under this label. The commonality among these theories is that they assume anaphoric connections between segments of text (which mostly are adjacent) to be the defining feature of what constitutes a segment of text that is *about* a certain entity. What Daneš called "thematic progression with continuous theme" is essentially the same as Agricola's "chain of isotopy", Harweg's "substitue chains", and a sequence with "center continuation" in the sense of Grosz et al.

The reoccurrence of one and the same referent in a certain grammatical role across sentences throughout a discourse sequence is assumed to determine the size of a sequence: as soon as theme continuity or an isotopy chain is interrupted, or a shift of the center of the utterance appears, a new sequence will start, possibly being about a new entity. Although these theories emphasize the sentence internal structuring of information, and hence are able to make claims about e.g. the effects of rheme/focus on anaphor resolution, and about the effect of the grammatical role of an anaphoric element given a certain context (consisting of an antecedent chain), they have two severe shortcomings. Firstly, all three of them claim—though differing in degree of empirical commitment—that entity chains consisting of anaphoric elements surfacing in the same grammatical role will be the preferred way of speaking about that entity. Not only does this disregard the impact of factors affecting the choice of grammatical functions like SUBJECT as e.g. the thematic roles assigned by verbs, or animacy. Moreover, it predicts sequences in which a referent reoccurs (in whatever semantic and pragmatic function) to be syntactically uniform. The second problem is that these theories cannot handle hierarchies—their principles of coherence are formulated on a sequential level

and hence miss a notion of dominance which can capture effects of discourse subordination, as e.g. in cases where an discourse “entity” consisting of a set of things dominates a sequence of sentences where the members of the set get elaborated on. So it seems that anaphoric links between entities should not be based solely on a notion of adjacency between stretches of discourse.

### 3.1.4 Rhetorical Relations: SDRT

The theory of discourse structure theories to be discussed in this section in a way shares the concerns of the other ones. With the action based theories, it assumes that the goal-orientedness of discourse partly determines its hierarchical structure; it is compatible with the propositional model in assuming that the basic elements which define of which a discourse structure consists have to be propositions, or rather: representational instances of propositions; and as the entity based theories, it has the problem of anaphora resolution and the restrictions on this process among its main objectives. It should also be noted that it shares the notion of rhetorical relations with Rhetorical Structure Theory (RST; s. Mann & Thompson (1988)), though it makes a much more parsimonious use it.

However, the main difference between the theories discussed above and the theory of segmented discourse representations (SDRT for short; s. Asher (1993); Lascarides & Asher (1993); Asher & Lascarides (1998a and b)) is that the latter seeks to account for discourse related phenomena in a formally precise way. Since it is SDRT that provides the closest connection between the way information is serialised on the sentence and on the discourse level, I will devote a paragraph to giving a rough sketch of the theory; then I will apply some of its features to the representation of Topics in context proposed in section 2.2.3.

In the version of Asher (1993) and Asher & Lascarides (1998a), SDRT can be conceived of relating representational instances of propositions via rhetorical relations. Natural language sentences are translated into discourse representation structures (DRSs) similar to those in Kamp & Reyle (1993). Each DRS has to be related to the context by a rhetorical relation before the processing of the next sentence can take place. The result are relational discourse structures, called segmented DRSs (SDRSs) that are recursively built up from DRSs which are related by discourse relations like *Narration*, *Background*, *Parallel* etc. These discourse relations can in turn affect the way their relata have to be interpreted in the overall context. The relations as well as the attachment points, i.e. the place where the DRS has to go in the context are inferred by using a so-called “glue logic”, a non-monotonic

logic modelling common-sense entailment. The resulting structure is only partly hierarchical because not all discourse relations are subordinating; e.g. *Continuation* and *Narration* are coordinating. For example in a discourse sequence like the following,

- (3.1) (a) Erwin drank three Pils.  
 (b) Henning ordered an obst schnapps.

the glue logic will by default attach the DRS built up from (b) to the one corresponding to (a) by *Narration*. The axiom on *Narration* formulated in the glue logic states

$$(3.2) \ (\langle \tau, \alpha, \beta \rangle \wedge event(\alpha) \wedge event(\beta)) > Narration(\alpha, \beta)$$

which can be glossed as follows : if the constituent labelled  $\beta$  has to be attached to the constituent labelled  $\alpha$ , and  $\alpha$  is a possible attachment point in the SDRS  $\tau$ , and both  $\alpha$  and  $\beta$  are events, then normally, the relation by which  $\beta$  attaches to  $\alpha$  is *Narration*. Since the glue logic also contains an *Axiom on Narration* stating that if two events  $\alpha$  and  $\beta$  are related by *Narration*, then  $\alpha$  will precede  $\beta$  (see Asher & Lascarides (1998a) for the details), we interpret (3.1) as saying that Henning ordered the obst schnapps *after* Erwin had drunk the three Pils.

To demonstrate to which degree SDRT can be said to be sensitive to sentence-level information, consider the following example:<sup>2</sup>

- (3.3) (a) Am 14.03. ereignete sich ein kleiner Flächenbrand im Bereich der Haitzingallee.  
 (b) *Ausgelöst wurde dieser durch einen Funkenüberschlag einer defekten 30 KV-Leitung.*  
 (c) Der Brand war rasch unter Kontrolle.  
 (d) Es rückten 27 Mann mit 3 Fahrzeugen aus.

The sentence of interest here is the second one. According to our configurational criterion, the participle “ausgelöst” (meaning “caused”) is the

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<sup>2</sup>This is one of ca. 20 small texts about fire incidents from the webpages of small town fire stations in Austria and Southern Germany which I have collected and analysed. It translates approximately as follows: “On March 14, a small surface fire occurred in the area of Haitzingallee. It was caused by a spark from a defective 30 KV cable. The fire was brought under control quickly. 27 firemen and 3 vehicles moved out.” (webpage of the Freiwillige Feuerwehr Hofgastein; url: <http://www.sung.at/ff-hofgastein>, link “Einsätze”).

Topic of the sentence, because it is hosted in the specifier position of CP and informationally separated from the Comment part. Although it is not a definite DP (and it may even be argued not to be referential), it nevertheless addresses or picks out an event from the complex event-sequence that may be termed FIRE FIGHTING, namely the cause for the fire, and the Comment predicates over that entity by saying wherein it consisted. This Topic-Comment structure however will not be easily explained if we assume the context of the hearer or, in this case, the reader, to consist of sets of possible worlds, as we have done in section 2.2.3—what entity of a possible world being an element of the context should the participle link to? It seems that we will have to assume a context that is more structured by knowledge about the world. In order to do so, we have to take a closer look at the example.

The reader of such a text can be assumed to have at least the following knowledge about the kind of complex events reported in such texts.<sup>3</sup> First, that the type of complex event described, let us call it FIRE FIGHTING, consists of two major constituents: of a fire incident, which itself has as subevents a cause and possible consequences, and the countermeasures, which involve giving alarm, getting to the place where the fire is, and the more specific kinds of counter-measures against the fire. The two main constituents are said to *elaborate* on the complex event—hence the discourse relation of *Elaboration* in SDRT, which defines to eventualities  $\alpha$  and  $\beta$  to stand in the *Elaboration* relation if the event denoted by  $\beta$  is a proper subset of the events denoted by  $\alpha$ . Thus, in the example above the critical sentence (b) (or some SDRT-representation thereof) stands in the *Elaboration* relation to the first sentence, because the event causing the fire is a proper subset of the fire itself.<sup>4</sup>

Trivial as this may seem to be, it is this knowledge about event types that influences the way a text about an event token is interpreted. Also note that this knowledge ascribed to the reader closely resembles the knowledge that is part of the intentional plan structure that a fireman involved in the operation may have, as the action-based theories discussed above would predict. How-

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<sup>3</sup>I will not try to draw a distinction here between specific knowledge about a certain text type and more general knowledge about a certain domain, although it is clear that these two do not always have to go together in interpretation. If e.g. the information from a cooking recipe is encoded according to the principles of text generation for abstracts for scientific articles, we would still be able to recover that information, although the interference between text structure and content will probably cause considerable processing difficulties.

<sup>4</sup>Whether it is really *Elaboration* that connects the two sentences, or rather the relation *Explanation*, or *Cause*, does not matter for the analysis proposed here, since the effect on the interaction between discourse relation and Information Structure will be the same.

ever, the way the propositions that (3.3) consists of are related to each other is *not* derivable from this kind of knowledge, because the knowledge related to plans and goals pertains to event types, whereas the text deals with tokens of these events. If event types would determine the structure of texts about event tokens, discourses would not display the degree of variance they do. Hence, knowledge about the kind of goals and intentions involved will only serve as a background on which the actual interpretation may rely. And this indeed is what seems to be the case in sentence (3.3.2): at the moment the reader encounters the sentence initial element of the sentence, he has as yet only the information that the specific token of type FIRE INCIDENT was a surface fire, and that it occurred at a place near “Haitzingallee”. The participle “ausgelöst” addresses the point in the hearer’s knowledge base where the event of type FIRE is causally related to some unspecified event type representing the event causing the fire; and it is exactly this unspecified event type that gets specified by the Comment of the sentence. It is in this sense that (b) can be said to elaborate on (a)—it provides information about an as yet unspecified subtype of (a). The participle is moved to the Vorfeld position because it indicates for which subpart of the prototypical event structure (the elaborandum) it will supply a token, and thus acts as a guide for processing: the whole sentence will be about the subevent CAUSE of the complex event FIRE INCIDENT, and the Comment part will be about which kind of cause it was. With Grabski (2000), the Topic can be said to indicate the *dimension* along which elaboration proceeds. There is always a certain degree of freedom *how* to elaborate a given complex type; e.g. in the case at hand, it is conceivable that the damage done by the fire would get elaborated on first, which would violate what van Dijk (1998) called the “order of understanding the fact” sequence as well as the “order of information transmission”. This choice of a different dimension of elaboration should then be indicated by e.g. making the damage the topic of the first elaborating sentence, and marking it by realising the damage e.g. as the direct object in an OVS structure.

Of course, if (3.b) would have been realised with canonical word order, it would still have supplied the same information, namely that the fire was caused by a defective cable etc.; but, to emphasize this point, this surface structure would not have exhibited the close mirroring of sentence form and the way the information is processed in interpreting the sentence in relation to background knowledge. Thus, the example clearly instantiates a case of Information Structure serving the function of a guide for processing.

As we have seen, goal-based discourse theories will not be able to explain phenomena as the one above, since they only derive the structure of discourse from type knowledge, i.e. knowledge about plans how to reach some type of goal. And the same holds for the other theories, because they lack a formally

precise differentiation between which kind of information is drawn from world knowledge, i.e. information about types, and which kind of information is provided by the linguistic input, namely information about tokens, and how these two relate in interpretation. In SDRT, this differentiation is built into the theory since the analysis of the linguistic input in compositional semantics on the one hand, and the glue logic constraining the establishment of discourse relations on the other, draw on different logics. This being as it is, I think that SDRT can give an adequate account of how certain features of the linguistic input (e.g. word order) relate to discourse structure. I shall conclude this chapter with a closer look at how SDRT deals with this kind of problem.<sup>5</sup>

## 3.2 Information Structure and Discourse Structure

SDRT provides a compositional semantics for sequences of discourse. On the sentence-level, it works on incoming input in a compositional bottom-up fashion, building complex expressions out of lexical entries plus the syntax and possibly other information sources that may be relevant for e.g. argument linking (s. Asher (1993)).

### 3.2.1 Information Structure and Discourse Structure: the Case of Presupposition in SDRT

The treatment of presupposition is similar in most respects to that in dynamic logic, but exhibits one major difference (for the ideas presented in this paragraph, see Asher & Lascarides (1998a and b)). Presuppositions, as assertions, have to be related to context via discourse relations, and thus are subject to the same constraints represented in the glue logic as asserted information. In most cases, presuppositions will be attached to some point in context by the relation of *Background*, which is defined as follows.

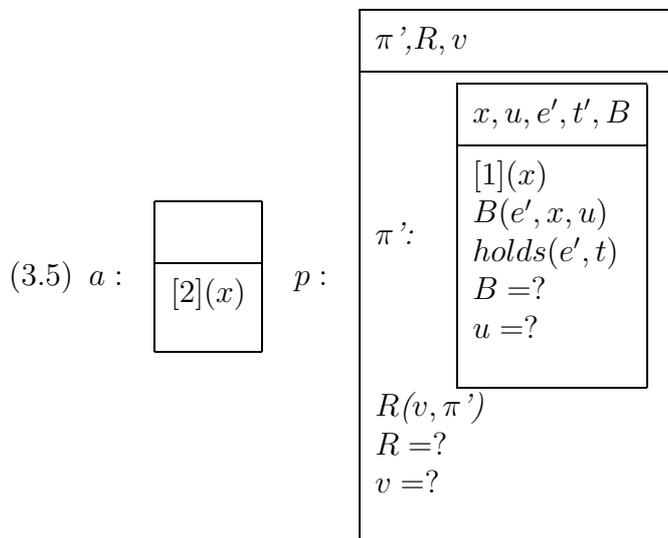
$$(3.4) (\langle \tau, \alpha, \beta \rangle \wedge state(\beta)) > Background(\alpha, \beta)$$

It says that if an eventuality  $\beta$  has to be attached to an attachment point  $\alpha$  in the SDRS of the context  $\tau$  and  $\beta$  is a state, then *Background* applies. The *Axiom on Background* constrains this application to cases where the eventualities overlap (which usually is the case with presupposed and

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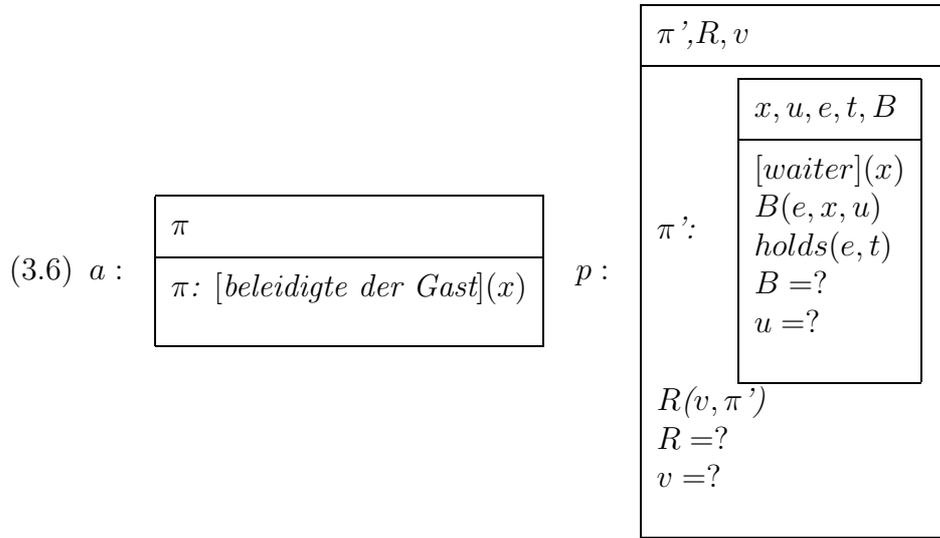
<sup>5</sup>For a closely related account of how to bring SDRT and Information structure into relation, see Kruijff-Korbayová (1995))

asserted eventuality). The information contributed by a definite DP will look as follows (cf. Asher & Lascarides, 1998a, p.257):



Let me go through this in some detail:  $a$  stands for the asserted part of the definite. Its DRS-universe is empty, so no new referent is introduced. However, there is a condition saying that whatever referent ( $x$ ) the DP may have, it has to be [2], i.e. it has to have the property expressed by [2]. Now what [2] is depends on the *grammatical role* of the DP under discussion. If it is to be the subject of the sentence, [2] will be the property denoted by the VP, while the sortal information provided by the NP will be [1]. This is essentially the same as saying that the abstract representation of a definite DP in (3.5) is a generalized quantifier with [2] being the nuclear scope and [1] the restrictor. Now, as we have seen in section 2.2.3, in a sentence where the object is topicalised, i.e. it inhabits the Vorfeld position, we interpret the information supplied by the object DP as the restrictor, and the VP with the in situ subject as the nuclear scope. Hence, a sentence with non-canonical word order and two definite DPs like “Den Kellner beleidigte der Gast.” (‘The<sub>acc</sub> waiter insulted the<sub>nom</sub> guest.’) will approximately have the following form:<sup>6</sup>

<sup>6</sup>I glossed over the exact details of the interpretation of the VP, as well as the semantics of tempus.



In words, this comes down to the following: the asserted speech act  $\pi$  contains the information that someone was insulted by the guest—that the actor of the insulting event is the guest and that  $x$  is the patient can be read off the argument structure of the verb.

The more complex restrictor part can be translated as follows: there is a speech act  $\pi'$  containing the information that there is a waiter standing in an underspecified relation  $B$  to the event  $e$  (which holds at time of utterance  $t$ ) and some other underspecified entity  $u$  (expressed by the condition  $u = ?$ ). Further, there is an underspecified relation  $R$  relating the speech act  $\pi'$  to a further underspecified entity  $v$ .

The interpretation, i.e. the resolution of the underspecified parts of the representation then proceeds as follows: first, the presupposition has to be bound to context via the relation  $R$ , which will resolve the condition  $v = ?$ : it will be the attachment site of the presupposition and hence determine its scope. In the case of the definite DP,  $R$  will be *Background*—the existence of a uniquely identifiable individual being a waiter is taken to be part of the contextual *or* world knowledge. In the first case, i.e. if there was a specific waiter  $w$  mentioned in the previous discourse, then  $u = w$  will be the case. If the track of previous discourse however furnishes no individual which is a waiter, the search for an antecedent (the resolution of the condition  $u = ?$ ) will be extended to world knowledge. If the knowledge about the previous discourse warrants the entailment that there might be a waiter around, e.g. if the discourse is about, or takes place in, a restaurant, the existence of an individual being a (unspecific) waiter  $w$  will be inferred.

Thus, the update of the context with  $p$  will specify  $R$ , and it will specify  $B$ , but only if the context provides the right kind of structure.

Asher & Lascarides (1998a) remark that they do not take a stance on whether presupposed or asserted information has to be computed first (p.26). If I read them correctly, any order of updates for a set of informations and attachment points will do for them. However, this is at odds with the intuitive idea behind the dynamic treatment of presupposition, as well as with van der Sandt's (1992) and Geurts' (1999) binding theory of presupposition, namely that the "condition" that the presupposition imposes on context must be satisfied in order for interpretation to be able to proceed. If we simplify the above notation in terms of a generalised quantifier, it will essentially state the following:

$$(3.7) [p \wedge a]$$

where  $p$  is the presupposed information forming the restrictor part and  $a$  is the asserted information forming the nuclear scope. Given that the processing of the two parts is not ordered in any way, the intuition mentioned above is not captured by the representation, i.e. the intuition that the processing of the presupposition is a precondition for the processing of the assertion.

Hence, I propose to make the following addition to the picture how the contribution of a definite Topic DP is interpreted: presupposition and assertion should be connected by *dynamic* conjunction. That is, the presupposed information has to be processed first in order to resolve the underspecified conditions it contains. If this processing step is successful, i.e. if there is an attachment point (be it explicitly represented, or inferred via world knowledge) for the presupposition that provides an antecedent that resolves the underspecified condition inside  $\pi'$ , then the asserted part in the nuclear scope of the generalised quantifier will be processed. Of course, any other device having the same effect will be adequate, as e.g. a "Topic template" that makes the Comment a function to which the Topic has to be applied (see e.g. Zimmermann (1999)). This slight modification will guarantee that the intuitive idea that the presupposition of the definite Topic DP has to be satisfied *first* can be accounted for.

### 3.3 Conclusion

In this chapter, I argued for viewing the context against which a given utterance of a sentence is interpreted has to have internal structure in order to be sensitive to the Information Structural properties of the sentence uttered. I reviewed different proposals concerning which kind of discourse structure should best be assumed to impose that internal structure on the discourse context. The discussion indicated that we need a theory that can account

both for the fact that the track of discourse exhibits hierarchical structure that depends on the intentions and goals of speaker and hearer; one that treats representational instances of propositions as the basic elements over which this hierarchy has to be formulated; and further one that permits common sense knowledge to interact with discourse structure, as well as with Information Structure. SDRT fulfilled these conditions; it provides us with a compositional semantics for sentences, it respects the difference between presupposition and assertion, and it treated the presuppositions of definite Topic DPs in a way that accounts for the dependence of updating context with presupposed information on common sense knowledge. The slightly modified version proposed in the last section allowed us to account for the idea stemming from dynamic semantics that Topic DPs must be added to the context before further interpretational steps can take place. It thus provides a formal underpinning for the sense in which Information Structure serves as a guide for processing.

As is needless to say, this is to be understood as a first tentative step towards representing the contribution of Information Structure to interpretation, and it remains to be seen whether it is still adequate when more complex Information Structural as well as discourse phenomena are taken into consideration. Still, I think the proposal made indicates what the necessary ingredients for a theory of interpreting Information Structure in context have to be.

# Chapter 4

## The Processing of Word Order Variation in German

In this chapter, I will briefly survey the psycholinguistic evidence pertaining to the processing of word order variation in language comprehension. I will restrict myself to studies that investigated this phenomenon in German. The discussion will mostly center around the robust evidence for a preference for subject-first word order. I will finish this chapter by relating the theoretical considerations of chapters 2 and 3 to the evidence from processing discussed here. This will be the basis for formulating the empirical hypotheses advanced in chapter 5.

### 4.1 The Processing of Word Order Variation

#### 4.1.1 Basic Assumptions

Since others have given detailed accounts of the architecture of the human sentence processing mechanism and how it deals with the problem of assigning a hierarchical structure to a linear input string (s. Frazier (1987, 1998); Bader (1996)), I shall not go into this issue here. For my purposes, it will be sufficient to make the following basic claims, which I take to be relatively untendentious: I assume that the parser tries to assign the input an interpretation as soon as possible, and that it does so in an incremental fashion. This means that the parser will try to interpret a given chunk of input information (e.g. a syntactic phrase) as soon as the information for doing so is available. The type of information most relevant here certainly is syntactic information. It is this type of information that drives the assignment of structure to the sequential input, and it is the basis on which compositional

semantics operates to assign an interpretation to parts of the structure, and to the sentence as a whole.

In the late 1980s, a hot debate centered around the question at which point in online processing other than syntactic types of information start to play a role, i.e. whether such “early” processes as the assignment of syntactic structure to the input could be influenced by “late” processes such as the checking of the pragmatic appropriateness of the assigned structure relative to the context.<sup>1</sup>

I will not take a stance on the question at which point in time certain types of information influence the parsing process, e.g. whether lexical or contextual information is available together with syntactic, or only later in processing. With respect to the question pursued here, namely the interaction between context and the Information Structure of the sentence, it will suffice to state that “discourse influences”, as they have been termed, do play a role in processing, no matter at what time in processing.<sup>2</sup>

The exact locus of Information Structure in the process of computing an interpretation from the linguistic input is also controversial. It has been claimed to influence early syntactic processes; e.g. Bader (1996) has shown that Focus assignment by a Focus particle like *only* or *even* can alleviate the processing difficulties caused by structural ambiguities, and that it does so on-line even in silent reading (i.e. the so-called Implicit Prosody Hypothesis; s. also Fodor (1998)). The question whether Information Structure guides the first-pass parsing, i.e. the initial assignment of structure to the input sequence, or whether it comes in only at a later stage in terms of reanalysis, i.e. at a “readjusting” processing stage, is, at least to my knowledge, not yet decidable on the evidence accrued so far. Lately, claims have however been put forward that Information Structure may even be able to *predict* certain parsing alternatives to be more plausible (s. Muckel (2001); Scheepers & Crocker (2002)). Given the fact that Syntax and Information Structure are closely interwoven, these results do not come unexpected, not least because the Information Structural effects tested by these authors all were related to massive differences in Focus assignment as e.g. induced by Focus particles.

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<sup>1</sup>See Crain & Steedman (1985); Altmann & Steedman (1988); Rayner et al. (1992). The reason for the heat of the debate may be sought in the relevance of the interpretation of the data to the modularity hypothesis (Fodor, 1983). However, the hypothesis seems to have lost its heuristic utility in the meantime. This may also be the reason why Fodor himself has become distant from some of the interpretations the hypothesis has been assigned; see Fodor (2000).

<sup>2</sup>For further corroborating evidence for the influence of context and Information Structure, see Fletcher (1984); Blutner & Sommer (1988); McKoon et al. (1993); Birch et al. (2000); Garrod & Sanford (1994), among many others.

To summarize: since it forms the basis for compositional semantic interpretation, syntactic structure must be processed first. No claim is made as to whether Information Structure can influence the initial assignment of syntactic structure. However, at some point in processing the context which the sentence to be processed appears in will have an influence on the ultimate interpretation assigned. Given the insights from chapters 2 and 3 that Information Structure serves to relate a sentence to context on the one hand, and the psycholinguistic evidence mentioned above on the other, it is not unreasonable to claim that on-line sentence interpretation should be sensitive to Information Structure. The next section will spell this out in more detail.

## 4.2 The Subject-First Preference

The relatively free word order that German exhibits is not entirely compensated for by rich morphology. Hence, local and even global structural ambiguities of the following form can quite easily arise.

- (4.1) *dass die Professorin die*  
 that the<sub>femsg:nom/acc</sub> professors the<sub>fempl:acc/nom</sub>  
*Studentinnen gesehen hat/haben.*  
 students seen has/have.  
 ‘that the professor has seen the students’/‘that the professor was seen by the students.’

Since the element following the complementiser “dass” can either be the subject or the (scrambled) direct object of the clause, and the second argument does not provide disambiguating information either, the parser will have to wait until the finite verb is processed to assign the structure an interpretation, i.e. assigning the thematic roles of EXPERIENCER and THEME to the overt arguments. Note that the lexical verb, realised as a participle, does not help to disambiguate either, since it is, out of context, equally plausible that the professor saw the students, as vice versa.

Early studies devoted to this phenomenon were Bayer & Marlsen-Wilson (1992), and Pechmann et al. (1994). Since the former in a way can be understood as a predecessor of the experiments to be reported in chapter 5, it will be considered in more detail in the next section.

The question Pechmann et al. (1994) were asking was what the preferred word order in the German Mittelfeld is. Since the Mittelfeld is the region where the scrambling operation can apply, the number of possible orders of

the three arguments of a ditransitive verb like “geben” (‘give’) is  $3! = 6$ . To formulate a preference ordering on these orders, the authors conducted a series of experiments applying different methods, including rating, recognition, and generation tasks. The data spoke in favor of a preference ranking of the following form:

$$(4.2) \quad SDA > SAD > DSA > ASD > DAS > ADS$$

where *S* stands for the subject definite DP, *D* for the indirect and *A* for the direct object of DP form. The scale reflects decrease in acceptability from left to right, as well as an increase of processing difficulty in the same direction, and basically accorded to the precedence rules formulated by Uszkoreit (1986).

For the question pursued here, the important point is that the order SDA, together with SAD, performed best in the experiments, which indicates that, in the German Mittelfeld, there is a preference for the subject to precede all other arguments.

This is in accordance with a lot of other findings produced since then, which mainly came from reading time studies and all studied the filler-gap ambiguity induced by topicalised or scrambled direct objects in transitive constructions. That is, the initial DP which is either subject or object postulates a gap, but the structural position of the gap can not be determined until the whole structure is disambiguated.

Thus, Meng (1996) found the subject-first, or subject-before-object preference, as it is sometimes called, to hold also for wh-structures like ( ) in a self-paced reading study:

$$(4.3) \quad \begin{array}{l} \textit{Welche Lehrerin} \quad \quad \quad \textit{der} \quad \textit{Stadtschule} \quad \textit{hat/haben} \\ \textit{Which teacher}_{fem:sg:nom/acc} \quad \textit{of-the} \quad \textit{city-school} \quad \textit{has}_{sg}/\textit{have}_{pl} \\ \textit{die Eltern} \quad \textit{angerufen?} \\ \textit{the parents} \quad \textit{called?} \\ \textit{'Which teacher of the city school called the parents/was called} \\ \textit{by the parents?'} \end{array}$$

The sentences with the plural auxiliary “haben” showed a garden-path effect, which can be explained in terms of the preference to assign the first ambiguous element the grammatical role of subject.

Similar data were obtained by Schlesewsky et al. (2000) for a less complex wh-phrase (‘which women’ instead of ‘which teacher of the city school’), and for wh-phrases moved out of an embedded clause.

The subject-first preference was also found to influence the processing of embedded clauses in a study Bader & Meng (1999), and even in ungrammatical sentences in a further study by the same authors (Meng & Bader, 2000).

Further studies using different methods added evidence to the subject-initial preference effect: ERP-studies by Mecklinger et al. (1995); and a series of experiments using the visual world paradigm conducted by Crocker (2002)..

The subject-first preference was also reported for Dutch by Frazier (1987) and Kaan (1996 and 1998), as well as for a non-Germanic language, namely Finnish, by Kaiser (2001).

Given this overwhelming evidence for the preference of the parser to assign the first argument encountered when parsing a sentence the grammatical role of subject, one may wonder why languages like German provide the option of inverting the order of subject and object in the first place. A possible reply to this is that all the studies reported so far did not embed the critical sentences into contexts, or if they did, these were question contexts. Hence, the conditions that the marked Information Structure of an OS sentence imposes on its context of appearance are not satisfied by that context.

Since it was argued in the preceding chapters that Information Structure serves the function to guide the parser in relating the sentence it is processing to the context, and that this context has to provide the right kind of structure to license word order variation, the question comes up how the parser deals with inverted object-subject order when these contextual requirements are fulfilled.

### 4.3 Processing Word Order in Context

Before I turn to formulating the hypotheses for the experiments that I conducted, the self-paced reading study by Bayer & Marslen-Wilson (1992) mentioned above shall be given a short discussion, not least because to my knowledge it is the only study that employed discourse context as a factor and related it to subject-object (SO) vs. object-subject (OS) word order.

The authors investigated how the processing of non-canonical word order could be influenced by the presentation of a context. They presented subjects both ambiguous and unambiguous scrambled (Exp. 2) and topicalised (Exp. 3) direct objects. Since it is topicalisation, i.e. movement of a direct object into the Vorfeld of the German sentence (see section 2.2.1) that I am inter-

ested in here, I will only give a description of the results of their Experiment 3. It should be noted, however, that the context effect the authors found for the scrambled structures differed from those for topicalised structures, which fact they interpreted as indicating that scrambling in V2-structures and topicalisation invoke different parsing routines.

To turn to Experiment III: the critical sentences were of the following form:

(4.4) (Context: Neulich gab es einen Brand in der Innenstadt. In der Zeitung stand, daß ein Mann/ein Ehepaar von Feuerwehrmännern aus seiner brennenden Wohnung befreit wurde. Später stellte sich aber das Folgende heraus. (*The other day, there was a fire in the city centre. The newspapers reported that a man/a couple was rescued out of his/its burning flat by firemen. Later on, however, the following turned out to be true.*)

(a) *Der Mann hat den Hausmeister gerettet.*  
 The<sub>masc:nom</sub> man has the<sub>acc</sub> janitor saved.  
 ‘The man saved the janitor.’

(b) *Den Mann hat der Hausmeister gerettet.*  
 The<sub>masc:acc</sub> man has the<sub>nom</sub> janitor saved.  
 ‘The man was saved by the janitor.’

(c) *Die Frau hat den Hausmeister gerettet.*  
 The<sub>fem:nom/acc</sub> man has the<sub>acc</sub> janitor saved.  
 ‘The woman saved the janitor.’

(d) *Die Frau hat der Hausmeister gerettet.*  
 The<sub>fem:nom/acc</sub> man has the<sub>nom</sub> janitor saved.  
 ‘The woman was saved by the janitor.’

The contexts the authors used either explicitly introduced an antecedent for the definite Vorfeld DP, i.e. a man or a woman was mentioned in the “supporting context” condition, or only a married couple was mentioned, which would license the use of a definite like “die Frau”, since the indirect anaphor could be accommodated by a bridging inference as being the woman belonging to the couple. Hence, there were three factors: the context was either supporting, or it was not; the Vorfeld DP was either a subject, or an object; and it was either a DP with masculine gender and hence had unambiguous case marking, or it had feminine gender and was ambiguous.

The results Bayer & Marslen-Wilson report give a somewhat inconclusive picture, which the authors themselves attribute to a lack of control over the

semantic reversibility of the verb, i.e. the verbs they used were not equally plausible in both the OS and the SO reading relative to the context. For example, one might argue that (for whatever reason) it is more in accordance with our world knowledge that the woman gets rescued by the janitor than vice versa. Nevertheless, their results at least partly are in accord with findings that were produced later for the subject-first preference.

For the ambiguous Vorfeld DPs, they found a clear subject-first preference, i.e. the OS structures showed a significant increase in processing time as compared to the SO structures when it had feminine gender and therefore was case-ambiguous. Strangely, this effect was only significant in the condition with the supporting context, and not in the non-supporting (where one would expect the word order manipulation to exert a stronger effect, hence a stronger difference should show up). In the condition without the contextual support, the OS structures descriptively show an increase of processing time towards the end of the sentence, but the only point where the difference was significant was the second DP.<sup>3</sup>

For the unambiguous condition, Bayer & Marlsen-Wilson report that the difference between the two context conditions ( $\pm$ supporting) was not significant. But the subject-preference did show a significant effect in both context conditions.

Bearing in mind that the reliability of the results might be questionable due to the problem with the verbs, the overall result may be stated as follows: the subject-first preference in German is not subject to a context effect for ambiguous as well as unambiguous Topic DPs.

Now, one might wonder whether this conclusion is really compulsory given these results. The authors themselves point out several problems with it, and the resulting picture for their Experiment 3 finally remains inconclusive.

I will not try to give an alternative, not to speak of more conclusive, explanation of these data. Nonetheless, it should be remarked that the contexts in combination with the critical sentences resulted in different Information Structural assignments to the critical sentences:<sup>4</sup> thus, in the condition with the supporting context, where the man was mentioned before, a contrastive Focus on the second DP was the result of combining context and critical

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<sup>3</sup>Bayer & Marslen-Wilson call this data point the second NP—they presented the material in a phrase-wise fashion. Hence, the second NP was “den/der Hausmeister” in example (4.4) above.

<sup>4</sup>This can, irrespective of the conditions, be partly attributed to the fact that the context explicitly introduced a contrastive discourse relation by the contrastive particle “aber” (‘but’).

sentence in a coherent sequence, whereas, as the authors themselves note, this reading, although indicated by the sentence structure, was not licensed in the condition where the context was not supporting, i.e. where only the couple was mentioned. The latter resulted in a discourse sequence that had a slightly incoherent feel to it.

To sum up: although caution forbids to draw any strong conclusion, the data collected by Bayer & Marslen-Wilson seem to suggest that OS structures may be harder to process *irrespective* of the properties of the context. This can be taken to suggest that the subject-first preference may only be mildly modulated, but not overridden by a context that supports the inverted word order.

A conclusion that may be drawn more safely from the study, and one that is more important here, is of course methodological: the property of symmetry that the verb in such experiments must exhibit in order to allow the comparison of reading times for lexically identical elements must be controlled for with great care.

A further conclusion that I drew from Bayer & Marslen-Wilson's paper was to look for a factor that may be able to dampen the SO preference without changing the context too much. This factor was found in what is called the Parallel Structure Effect since the work of Frazier et al. (1984). Basically, this effect consists in the processing facilitation for a structure that is preceded by a structure of the same type. Frazier and colleagues conducted a series of experiments that showed that this effect is independent of the respective structure used. They compared active vs. passive pair structures (i.e. active/active vs. active/passive vs. passive/active vs. passive/passive), heavy NP shift vs. non-shift, minimal vs. nonminimal and animate vs. inanimate object sentence pairs. The results clearly indicated that the parallel structures were processed significantly faster for all construction types. They interpret this as indicating that the processing of a structure that the parser just has finished processing will make less cognitive demands because the two structures share features. The results of this study have been corroborated by the results reported in Hoeks (1999), Frazier et al. (2000), and Karlson (2001).

## 4.4 Conclusion

As this section has shown, there is a robust preference for subject-first word order in German. However, most of the studies reporting this preference did not systematically manipulate a context (in the sense of *discourse* context)

that would provide rich enough a structure for the Information Structural manipulation (i.e. SO vs. OS) to relate to, with the notable exception of Bayer & Marslen-Wilson (1992). Given the difficulties with the interpretation of their result, it seems worthwhile to investigate word order variation in German in relation to context.

The experiments to be reported in the next chapter all dealt with SO vs. OS word order. However, as opposed to most other studies in the literature, I did not use ambiguous structures, partly because the Bayer & Marslen-Wilson data already indicated that context has little chance to compete with the structural preference to assign the grammatical role of subject to an ambiguous sentence-initial phrase. Since the aim of these experiments was to seek for contextual properties that could attenuate that preference, thereby telling us something about the relation of Information Structure and context, the unambiguous case marking should supply the parser as early as possible with the information that the word order was inverted. A further difference to other studies is that I used structures that did not have *contrastive* topics in the Vorfeld position—the Vorfeld elements in the critical sentences were not contrasted with any referent from preceding discourse. Hence, they were not focal in any sense. The intuition behind this was to take the least marked Information Structure (see the scale of contextual restriction (H3) in section 2.2.2), and pair it with the word order variation. The reader may wonder why, given the evidence that the subject-first preference exerts such a strong influence, I did not choose any construction for the experiments that is ranked higher in the scale, i.e. one that is assumed to have a stronger contextual restriction (or that is more licensed by context), like e.g. contrastive Vorfeld DPs. The reply to this question is straightforward: I wanted to avoid confounding the possible effects of Focus (which would be involved in the case of a contrastive Topic DP) with those of the Topic or Vorfeld position. This was only possible by establishing a somewhat weaker discourse relation between the critical sentence and the context, namely Elaboration. That is, the aim of the experiments to be reported was to isolate the possible context restricting effect of a definite subject vs. object DP inhabiting the Vorfeld. The reason for this is to be sought in the systematic (and, in fact, explanatory) relation between the increase in contextual restrictiveness and the increase in Information Structural complexity. Only when the effect for non-contrastive Topics can be established on empirical grounds, one may think about how to test hypotheses pertaining to more complex constructions.

# Chapter 5

## Experimental Evidence

The experiments to be described below were all concerned with different factors that were hypothesized to influence the processing of the sentence initial position in German (see chapter 4). These factors are the *inferability* of the sentence initial element, the influence of *parallel structure* of a preceding context sentence, and the impact *explicit antecedents* (the sentence initial element being vs. not being mentioned in the preceding context) may have on processing and interpretation.

For all three experiments, the measure used to investigate these factors was the same, namely reading times per word, and the participants' performance in answering a comprehension question. The method will be explained in detail for Experiment 1. A general discussion of the experimental results in the light of theoretical as well as psycholinguistic considerations will follow the description of Experiment 3.

### 5.1 Experiment 1 – Inferability

Experiment 1 was devoted to the problem whether the inferability of a discourse referent—given a certain context—would influence the time it takes to process it when it is located in the sentence initial position. By “inferability” I mean that the context supports a nonmonotonic inference from the preceding context to the existence of a uniquely identifiable referent of the sentence initial element. This is best illustrated by a well-worn example: in a context describing a visit to a restaurant, a definite noun phrase like *the waiter* should be processed more easily, i.e. faster, than the noun phrase *the butcher*. The reason for this facilitation is that it is part of the reader's or hearer's world knowledge that, prototypically, complex events involving restaurants contain subevents involving waiters, but none involving butchers.

The psycholinguistic evidence for this explanation is abundant, and I will not try to review it here; but see chapter 4 for some discussion of the relevant experimental studies.

The question pursued here is whether the German Vorfeld position is sensitive to the inferability status of the element it hosts, and whether there is an interaction between this status and the grammatical role of that element. By grammatical role, I mean the syntactic as well as the thematic properties of the element in question, as the following example illustrates:

(5.1) *Der Kellner beleidigte den Koch ziemlich heftig.*  
 The<sub>nom</sub> waiter insulted the<sub>acc</sub> cook pretty intensely.  
 ‘The waiter insulted the cook pretty intensely.’

(5.2) *Den Kellner beleidigte der Koch ziemlich heftig.*  
 The<sub>acc</sub> waiter insulted the<sub>nom</sub> cook pretty intensely.  
 ‘The waiter was insulted by the cook pretty intensely.’

As is evident from the gloss and the approximate translation of the examples, the sentence initial positions of (5.1) and (5.2) not only host elements differing with respect to their syntactic function, but also with respect to their thematic role. Whereas in (3.1), the subject, bearing the thematic role of AGENT, occupies its canonical position in SpecCP, in (5.2) this position is occupied by the direct object, to which the verb assigns the thematic role of PATIENT.<sup>1</sup>

Saying that in (5.1) the subject *der Kellner* is placed in its “canonical” position simply means that this construction represents the unmarked, or default case in German V2-sentences (see chapter 2 for details).

As opposed to this, in (5.2) the sentence-initial position is filled by the direct object, giving rise to a marked construction. This markedness is also witnessed by the large number of sentence comprehension studies that show that in parsing OS sentences, readers/hearers show considerable processing difficulties (see chapter 4 for the relevant literature and discussion).

However, most of these studies presented sentences containing SO vs. OS structures in isolation. Now, if the theoretical reconstruction of the function of the left periphery of German sentences given in chapters 2 and 3 is on the right track, these results are not at all unexpected: according to the hypothesis put forward there, moving non-subject constituents into this position should relate the sentence to the surrounding context in a certain

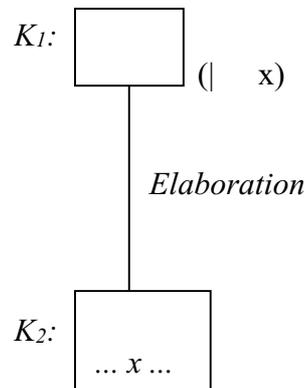
<sup>1</sup>Besides the passive chosen here, yet another possible translation for sentence (5.2) would be a hanging-Topic-construction: “As for the waiter, the cook insulted him pretty intensely.”

way, e.g. by imposing presuppositional constraints on it. In previous studies, these constraints have mostly been investigated in isolated sentences; the reasoning behind these experiments can be paraphrased as “The stronger the constraints, the harder the processing”. Without denying that these studies have brought important insights, we may still maintain that they do not tell us anything about the nature of these constraints, nor about the function they perform in sequences of text.

One way to approach this issue of the function of contextual constraints is to vary certain features of the element moved to the Vorfeld, while keeping the context constant. (The other, obviously, being to keep the critical sentence constant and alternate features of the surrounding context, as in Experiment 3). One such candidate feature of the sentence initial element is its discourse status: is the element part of the preceding context (i.e., has it been mentioned before?), is it part of the physical context (i.e., can it be perceived by both speaker and hearer?), or is it merely inferable from common sense knowledge and from what has been said so far? And how about elements that are neither mentioned, nor salient in the physical context of the utterance, nor inferable?

To approach some of these questions, a discourse structure of the following type was employed in Experiment 1:

(5.3)



The objective was the relation between a context, represented here by the (possibly complex) discourse representation structure  $K_1$ , a sentence initial element (not) inferable from this context, and the grammatical role of this element: given a context that makes a discourse referent  $x$ , but not  $y$ , inferable, does the difficulty of processing  $x$  vs.  $y$  in the initial position

of a sentence differ depending on  $x$ 's or  $y$ 's being the subject or the direct object of that sentence? Or, in other words: is the processing load caused by the marked OS word order modulated by the inferability of the element occupying the initial position?

To further clarify this question, consider the following example:

(5.4) *lead-in sentence:*

*Peter freute sich auf seine Mittagspause.*  
 Peter pleased himself onto his lunch break.  
 “Peter was looking forward his lunch break.”

(5.5) *context sentence:*

*Er ging in die kleine Pizzeria in der Innenstadt, wo*  
 He went to the small pizzeria in the inner city, where  
*allerdings eine feindselige Stimmung herrschte.*  
 however a hostile atmosphere reigned.  
 “He went to the small pizzeria downtown, but there was a hostile atmosphere there.”

(5.6) *critical sentence:*

- (a) *Der Kellner beleidigte den Koch ziemlich heftig.*  
 The<sub>nom</sub> waiter insulted the<sub>acc</sub> cook pretty intensely.  
 “The waiter insulted the cook pretty intensely.”
- (b) *Den Kellner beleidigte der Koch ziemlich heftig.*  
 The<sub>acc</sub> waiter insulted the<sub>nom</sub> cook pretty intensely.  
 “The waiter was insulted by the cook pretty intensely.”
- (c) *Der Metzger beleidigte den Koch ziemlich heftig.*  
 The<sub>nom</sub> butcher insulted the<sub>acc</sub> cook pretty intensely.  
 “The butcher insulted the cook pretty intensely.”
- (d) *Den Metzger beleidigte der Koch ziemlich heftig.*  
 The<sub>acc</sub> butcher insulted the<sub>nom</sub> cook pretty intensely.  
 “The butcher was insulted by the cook pretty intensely.”

When reading the lead-in and the context sentence, the reader establishes a representation of a prototypical event sequence, a *scenario*. The critical sentences differ with respect to two properties: firstly with respect to word order (SO vs. OS) and secondly with respect to the inferability of the discourse

referent occupying the Vorfeld position within the given scenario. Given the strong preference for subject-first word order in German V2-sentences, the sentences containing a subject as sentence-initial element should be easier to process than sentences starting with an object. And, given the large number of studies reporting effects of world knowledge on processing (s. Garrod & Sanford (1994) for an overview), sentences starting with an element that is inferable from the scenario given by the context should be processed with less effort than those starting with a non-inferable element. But do these factors interact?

In chapter 2, it was argued that the topicalization of direct objects is used to signal the hearer a particular relation between the sentence initial element and the preceding context. In the case under discussion, this means that the topicalization of the direct object should alert the hearer to the status of the sentence initial element. Hence, the hearer should be more sensitive to the inferability status of that element when it is a direct object as compared to when it is a subject. Or, more loosely speaking: initial direct objects should profit more from the inferability of their referents than initial subjects because the hearer is sensitized to the contextual relation by the non-canonical word order.

To sum up: the prediction made here is that the processing difficulty the parser runs into when facing OS structures as compared to SO structures should be modulated by the inferability status of the element hosted by the sentence initial position. More technically speaking: what is predicted is an interaction between the two-level factors WORD ORDER (SO vs. OS) and INFERABILITY of the sentence initial element (inferable vs. non-inferable).

### 5.1.1 Method

*Participants.* The participants were 32 students from the University of Leipzig. They were all native speakers of German and were paid for their participation.

*Materials.* A set of 35 items (32 experimental, 3 training texts) was constructed according to the following procedure.

Firstly, a set of transitive verbs that select animate arguments for both argument slots were collected from Ballmer & Brennenstuhl (1986). These were all simplex verbs, in order to make the lexical information fully available to the parser in the second position of the sentence, which would not have been the case with particle verbs due to particle stranding in German V2-sentences. The selected verbs mostly belonged to the class of perception verbs like *beobachten* ('to watch someone'), or speech act verbs like *beschimpfen* ('to

swear at someone’). For a full list of the verbs used in the experimental items, see the Appendix.

In a second step, the contexts were constructed; they were meant to describe a person (the protagonist) becoming part of a prototypical situation, as e.g. Peter in (5.4)-(5.6). The lead-in sentence described how the protagonist got into the situation, the context sentence gave an evaluation of that situation, and the critical sentence reported a subevent of the situation that explained the evaluation in the context sentence (as e.g. the abuse as an explanation for the hostile atmosphere).

The next step was, in order to avoid the flaw of the experiment by Bayer & Marslen-Wilson reported in chapter 4, to make sure that the events reported in the four variants of the critical sentence were *symmetrical* and *plausible* in the following sense: independently of the condition the critical sentence appeared in (whether it appeared in the SO or the OS condition), it should be equally plausible from the reader’s and the protagonist’s perspective that participant *A* can be the subject of the verb and *B* the object, and vice versa. Evidently, the lexical content of the participant NPs had to be controlled for that “symmetry”. Accordingly, care was taken that the participants *A* and *B* were not part of any social, cultural or other conceptual hierarchy which would have made one reading more plausible than the other.<sup>2</sup> Because the reading times for the inferable vs. the non-inferable elements were compared, the length (measured in graphemes) and the frequency of the lexical NPs contained in the sentence initial DP, taken from the CELEX database (Baayen et.al.(1995)), had to be matched. Since DPs with feminine gender would produce local or even global ambiguities, all DPs had masculine gender. For each of the experimental sentences, four versions, corresponding to the  $2 \times 2$  levels of the factors *word order* and *inferability* were constructed. An example of an experimental item in all four conditions is given in Table 5.1.1:

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<sup>2</sup>Of course, the sense of plausibility appealed to here was violated by the condition with the non-inferable elements; but since this was the case for *both* levels of the word order factor, this violation did not result in a systematic bias in any sense.

**Table 5.1.1:** Sample Experimental Item Used in Experiment 1, in German and Approximate English Translation

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<i>lead-in sentence</i>	Peter hatte sich auf seine Mittagspause gefreut. Peter was looking forward his lunch break.
<i>context sentence</i>	Er ging in die kleine Pizzeria in der Innenstadt, wo allerdings eine feindselige Stimmung herrschte. He went to the small pizzeria downtown, but there was a hostile atmosphere there.
<i>critical sentence:</i>	
inferable, SO	Der Kellner beleidigte den Koch ziemlich heftig. The <sub>nom</sub> waiter insulted the <sub>acc</sub> cook pretty intensely.
inferable, OS	Den Kellner beleidigte der Koch ziemlich heftig. The <sub>acc</sub> waiter insulted the <sub>nom</sub> cook pretty intensely.
non-inferable, SO	Der Metzger beleidigte den Koch ziemlich heftig. The <sub>nom</sub> butcher insulted the <sub>acc</sub> cook pretty intensely.
non-inferable, OS	Den Metzger beleidigte der Koch ziemlich heftig. The <sub>acc</sub> butcher insulted the <sub>nom</sub> cook pretty intensely.

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In addition to the 32 experimental items, 48 fillers were constructed to minimize the possibility that subjects develop strategies. The fillers matched the critical items as far as text structure is concerned. They also consisted of a lead-in sentence introducing a protagonist, followed by a context sentence describing a certain situation the protagonist is confronted with, and finally a critical sentence where two participants act upon each other in this situation. Half of the fillers were sentences with topicalized direct objects, in order to mimic the experimental items as closely as possible.

But, in contrast to the experimental items, the fillers were varied along the following lines: in the critical sentences, particle verbs appeared (in 16 of the 48 fillers). Additionally, the symmetry constraint on the “critical” sentences was loosened; for the fillers, it did not seem so important to scrutinize the equal plausibility of SO vs. OS interpretations. Nevertheless, the plausibility was not violated in any systematic fashion, in order not to allow subjects to tell fillers and items apart.

To make sure that subjects did not overlook the word order manipulation and resort to “shallow” parsing, each item and each filler was followed by a comprehension question. These questions were always related to the critical

(third) sentence and essentially asked for the information “Who did it to whom?”. This question could only be given a correct answer if the critical sentences were properly read, and, of course, assigned the intended interpretation. The questions took on six different forms, depending on the form of the item or the filler, respectively.

**Table 5.1.2:** Sample Comprehension Questions Used in Experiment 1, in Approximate English Translation

Element asked for	Example	correct answer*
first	Did the <sub>nom</sub> waiter insult someone <sub>acc</sub> ?	<i>yes</i> (SO)/ <i>no</i> (OS)
first	Did the <sub>acc</sub> waiter insult someone <sub>nom</sub> ?	<i>yes</i> (OS)/ <i>no</i> (SO)
second	Did the <sub>nom</sub> cook insult someone <sub>acc</sub> ?	<i>yes</i> (SO)/ <i>no</i> (OS)
second	Did the <sub>acc</sub> cook insult someone <sub>nom</sub> ?	<i>yes</i> (OS)/ <i>no</i> (SO)
first**	Did the <sub>nom</sub> butcher insult someone <sub>acc</sub> ?	<i>yes</i> (SO)/ <i>no</i> (OS)
second**	Did the <sub>acc</sub> cook insult someone <sub>nom</sub> ?	<i>yes</i> (OS)/ <i>no</i> (SO)

\*) depending on item condition

\*\*\*) in the non-inferable condition

The four versions of each of the experimental texts were divided into four lists such that each list contained each item only once, and in one condition. To these four lists, the filler texts were added, and four parallel semi-randomizations were generated, yielding 16 lists in four different randomizations. The randomization was constrained so as to allow maximally three experimental texts to appear in consecutive order, and maximally twice in the same condition. By reversing the order of the resulting 16 lists, the final number of 32 experimental lists was generated. One list contained 32 item plus 48 filler = 80 texts. All lists were split into two blocks; each block contained an equal number of items and item conditions.

For the warm-up block at the beginning of each session, three of the 35 items were used. They were presented in the same condition for all subjects, namely (1) inferable-SO, (2) non-inferable-SO, and (3) non-inferable-OS.

*Design.* The experimental design consisted of the two 2-level factors WORD ORDER (SO vs. OS) and INFERABILITY (sentence initial DP inferable vs. non-inferable from previous context). By crossing these factors, each experimental item appeared in the four conditions. Each item appeared in each list only once, and each list contained an equal number of items for each condition. Hence, both factors were realised within subjects and within items.

*Procedure.* Participants were tested individually. They were seated in a comfortable chair in front of a table, on which a VGA monitor was posited in a distance of about 60 cm. The experiment was controlled via a PC using the *Experimental Run Time System* software (ERTS) (s. Beringer (1993)). The subjects' responses were registered by an external keyboard.

At the start of an experimental session, subjects would read a short written instruction presented on the screen. They were instructed to read through the texts carefully and to try to approximate their normal reading speed. In addition, they were told that each text would be followed by a comprehension question which they should answer to the best of their knowledge, and that it is their performance in understanding the text the experiment is interested in.

Then, the warm-up session started. Any apparent problems the subjects had with the task were removed by the experimenter after the warm-up. If the participant didn't have any further questions, the actual experiment would start. It consisted of two blocks of 40 trials, separated by a short break.

One trial (a text and the corresponding comprehension question) was built up from three screen pictures: the first screen showed the lead-in and the context sentence, the second the critical sentence, and the last showed the comprehension question. Apart from the screen presenting the question, all verbal material was to be read word-by-word in self-paced, non-cumulative moving window fashion (cf. Just, Carpenter & Wolley (1982)). This is to say that, when a trial started, only the first word of the lead-in sentences was visible; the characters of all the other words on the screen were masked by hyphens. By pressing the button, the next word of the sentence was revealed, while the first word was replaced by hyphens. The next press revealed the third word, and so on. When the last word of the first screen was read and the subject pressed the button, the second screen would be presented, again showing the whole sentence masked by hyphens. After reading the last word of the critical sentence and pressing the button again, the question would appear as a whole (i.e. not in cumulative fashion), and the assignment of the left and right button to the "yes" and "no" response was shown. When

the subjects pressed one of the response buttons, the next trial started after a 1000 ms delay.

After the first 40 trials, the screen showed a “break” signal. Subjects were told that they themselves could determine the length of the break. By pressing the button again, the second block was started. After finishing the second block, subjects were debriefed. Each experimental session lasted about 45 minutes.

### 5.1.2 Results

The dependent variables in Experiment 1 were the reading times for the five words the critical sentence consisted of, and the percentage of wrong responses to the comprehension question.

In a first step, the reading time raw data were screened for outliers. All reading times faster than 100 ms and slower than 3000 ms were treated as missing values. One subject had to be replaced for having excessively long reading times (mean RT per word > 3000 ms). After this preliminary screening, all observations were excluded which deviated more than 2 SDs from both the subject and the item means at a given position in each condition; 1 % of the original observations was removed by these procedures. Then, the percentage of wrong responses to the comprehension question was computed. These variables were subject to the descriptive statistical analysis.

Table 5.1.3 shows the mean reading times per word for the critical sentence, and the error rates in the comprehension question for each condition.

**Table 5.1.3:** Mean Reading Times (in ms) and Error Rates (in %) in Experiment 1

Condition	Det	NP1	V	Det	NP2	Errors
non-inferable, SO	463	516	560	460	584	12,9
inferable, SO	469	474	492	454	532	13,3
non-inferable, OS	473	561	582	497	629	18,4
inferable, OS	477	494	545	495	556	11,3
	<i>Der/</i> <i>Den</i>	<i>X</i>	<i>V-te</i>	<i>den/</i> <i>der</i>	<i>Y.</i>	

Two ANOVAs for repeated measurements were conducted with the two

factors WORD ORDER (SO vs. OS) and INFERABILITY (sentence initial DP was vs. was not inferable). The  $F_1$ -ANOVA treated participants, and the  $F_2$ -ANOVA items as the random factor. The results will be reported successively for each position.

On the determiner of the first NP, there were no significant differences between the conditions (WORD ORDER:  $F_1(1,31) < 1$ ;  $F_2(1,31) = 1.33$ ,  $p > .10$ ; INFERABILITY: both  $F$ s  $< 1$ ; the same holds for the interaction WORD ORDER  $\times$  INFERABILITY).

On the first NP, both main effects were significant (WORD ORDER:  $F_1(1,31) = 9.28$ ,  $p \leq .01$ ;  $F_2(1,31) = 4.30$ ,  $p \leq .05$ ; INFERABILITY:  $F_1(1,31) = 12.38$ ,  $p \leq .001$ ;  $F_2(1,31) = 7.24$ ,  $p \leq .05$ ). The interaction however did not reach significance: WORD ORDER  $\times$  INFERABILITY:  $F_1(1,31) < 1$ ;  $F_2(1,31) = 1.66$ ,  $p > .10$ .

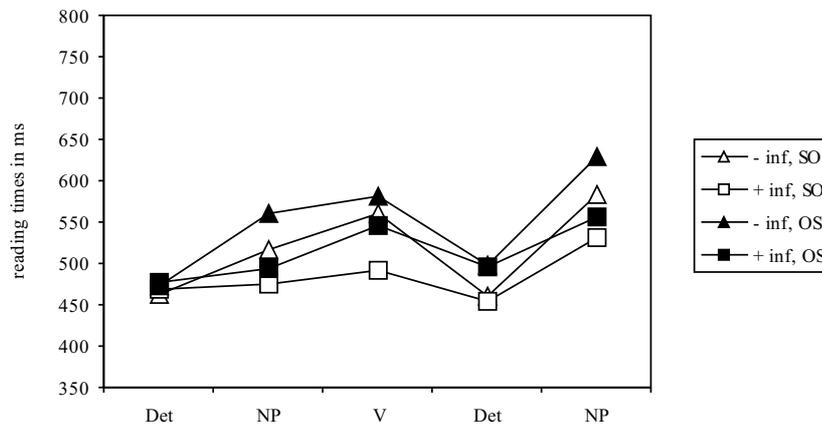
The verb showed a significant effect of word order, though it was only marginally significant by items (WORD ORDER:  $F_1(1,31) = 7.05$ ,  $p \leq .01$ ;  $F_2(1,31) = 3.77$ ,  $p = .06$ ). The inferability of the sentence initial element also showed an effect on the reading time of the verb: INFERABILITY:  $F_1(1,31) = 8.60$ ,  $p \leq .01$ ;  $F_2(1,31) = 6.89$ ,  $p \leq .01$ . But the interaction was not significant in either of the analyses (WORD ORDER  $\times$  INFERABILITY:  $F_1(1,31) = 1.25$ ,  $p > .10$ ;  $F_2(1,31) < 1$ ).

On the determiner of the second NP, a significant effect was found for word order only (WORD ORDER:  $F_1(1,31) = 6.34$ ,  $p \leq .05$ ;  $F_2(1,31) = 7.39$ ,  $p \leq .01$ ), while inferability did not have a significant effect at this position (both  $F$ s  $< 1$ ). The interaction was not significant in either analysis (WORD ORDER  $\times$  INFERABILITY:  $F_1(1,31) = 1.06$ ,  $p > .10$ ;  $F_2(1,31) < 1$ ).

For the second NP, the pattern was reversed: while the effect of word order was only marginally significant (WORD ORDER:  $F_1(1,31) = 3.08$ ,  $p = .09$ ;  $F_2(1,31) = 3.14$ ,  $p = .09$ ), inferability turned out to have a significant effect (INFERABILITY:  $F_1(1,31) = 8.49$ ,  $p \leq .01$ ;  $F_2(1,31) = 6.59$ ,  $p \leq .05$ ). No significant interaction was found for this position (both  $F$ s  $< 1$ ).<sup>3</sup> Figure 5.1.1 illustrates the results reported so far.

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<sup>3</sup>No reading time data were available for the sentence final adverbial, since the adverbials partly consisted of only one word (like ‘häufig’ – often), and partly of two (like ‘ziemlich heftig’ – quite intensely), or even three elements (e.g. ‘auf unangenehme Weise’ – in an unpleasant manner). This flaw was removed in experiment 2 and 3, where the adverbial always consisted of only one word.

**Figure 5.1.1:** Mean Reading Times for All Positions in Experiment 1

The error rates failed to exhibit significant effects, though there were marginally significant effects of word order and inferability in the subject analysis (WORD ORDER:  $F_1(1,31) = 3.02$ ,  $p = .09$ ;  $F_2(1,31) = 2.04$ ,  $p > .10$ ; INFERABILITY:  $F_1(1,31) = 2.86$ ,  $p = .10$ ;  $F_2(1,31) = 1.57$ ,  $p > .10$ ). The error rates did not show a significant interaction either (both  $F$ 's  $< 1$ ). Figure 5.1.2 shows the error rates for all conditions:

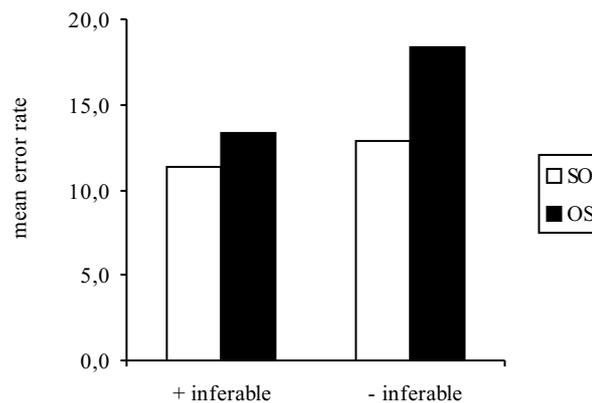
**Figure 5.1.2:** Mean Error Rates by Condition for Experiment 1

Table 5.1.4 summarizes the effects found in Experiment 1.

**Table 5.1.4:** Effects for Reading Times and Error Rates in the subject ( $F_1$ ) and item analysis ( $F_2$ ) in Experiment 1\*

Factor		Position					
		Det	NP1	V	Det	NP2	Errors
WO	$F_1$	< 1	**	**	*	+	+
	$F_2$	—	*	+	**	+	—
INF	$F_1$	< 1	***	**	—	**	+
	$F_2$	< 1	*	**	—	*	—
WO×INF	$F_1$	< 1	< 1	—	—	< 1	< 1
	$F_2$	< 1	—	< 1	< 1	< 1	< 1

\*)‘WO’ stands for the effect of the factor WORD ORDER (SO vs. OS), ‘INF’ for INFERABILITY (non-inferable vs. inferable). ‘—’ abbreviates:  $p > .10$ ; ‘+’ :  $p < .10$ ; ‘\*’ :  $p < .05$ ; ‘\*\*’ :  $p < .01$ , and ‘\*\*\*’ :  $p < .001$ .

### 5.1.3 Discussion

As noted in section 5.1, it was the interaction of the two factors WORD ORDER and INFERABILITY that Experiment 1 was interested in. Since no such interaction was found to be statistically reliable at any position in the critical sentences, the discussion of the results is pretty straightforward: word order variation, more specifically: movement of direct objects into the sentence initial position, does not seem to interact with the inferability status of the moved element.

However, since the two main factors involved did show effects on the reading times, as well as on the error rates, their respective influence on the reading times shall be given a short discussion.

On the first element, the determiner of the first NP, neither an effect of word order, nor of inferability, nor of their interaction was found. This does not come as a surprise, since one would not expect the case information

supplied by the determiner to exhibit an effect on such an early point in processing.

Turning to the first NP, this position clearly does show an effect of the word order manipulation: processing the NP in SO-sentences takes less time than in OS-sentences. This effect can be interpreted as a spill-over from the processing of the determiner bearing the case information which influences processing on the NP one word downstream from the element bearing the relevant information. This finding is in line with the strong subject-first preference in German discussed in chapter 4).

Interestingly, inferability shows an effect on the NP, too. That is, if the referent of the NP is inferable, the NP is being processed faster than one denoting a non-inferable referent. This effect shows up on the relevant input element itself, but also carries over to the verb.

However, there was no interaction of the two factors on the NP, though, as the data indicate, both the case *and* the inferability information were in principle accessible to the parser at this point.

The same holds for the verb: preference for subject-first structures and for inferable elements in initial position exert their respective effects and yield faster reading times, but they do not interact.

The first point where the two main effects diverge is the determiner of the second NP: word order still has a significant effect here, whereas inferability of the first element does not. This makes sense, since it was the word order manipulation that had an effect on the input here (the determiner appeared either in accusative or in nominative case), whereas the inferability of the first element had no impact on the input at this point and seemed to play no major role for the processing of the determiner.

Turning to the second NP, we face the reversed pattern: here, the inferability status of the first NP showed an effect: second NPs that were part of sentences with an inferable initial element were processed significantly faster than those that were not. The marginally significant effect of word order may be due to the spill-over from the case-marked determiner already mentioned in connection with the first NP. The fact that inferability turned out to have a significant effect at this late position, after its effect intermediately vanished on the determiner of the second NP, may be ascribed to its importance for the overall integration of processed information that takes place in the sentence final region.

Still, the inferability status of the sentence initial element does not seem to be strong enough a factor to interact with word order variation. One possible explanation for this could be that discourse referents of sentence initial subjects equally profited from being inferable as those of the direct objects – hence no interaction. But if we look at the data more closely, it seems that,

except for the reading times for the verb, the difference between inferable and non-inferable sentence initial elements simply was not big enough.<sup>4</sup> It was for this reason that Experiment 2 was dedicated to a contextual factor that was assumed to exert a stronger influence on the critical sentence.

To summarize: as the results indicate, processing sentences with direct objects—as compared to subjects—occupying the Vorfeld position of German V2 sentences seems to pose a problem for the parser *irrespective* of the inferability status of the element in the sentence initial position. Given the well-established findings for a subject-first preference in German, we may conclude that inferability is too weak a contextual factor to modulate that preference.

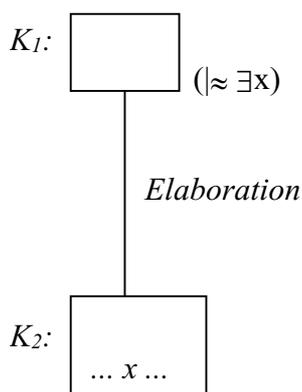
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<sup>4</sup>This could also be an effect of the fact that all comprehension questions were related to the critical sentence; the reading times for the critical sentences were relatively high, especially when compared to those of the context sentences. For this reason, only half of the comprehension questions referred to the critical sentences in Experiment 2.

## 5.2 Experiment 2 – Parallel Structure

To recapitulate: Experiment 1 was designed to test a relation the sentence initial element enters into with the preceding context. The discourse configuration was as depicted in (5.7),

(5.7)

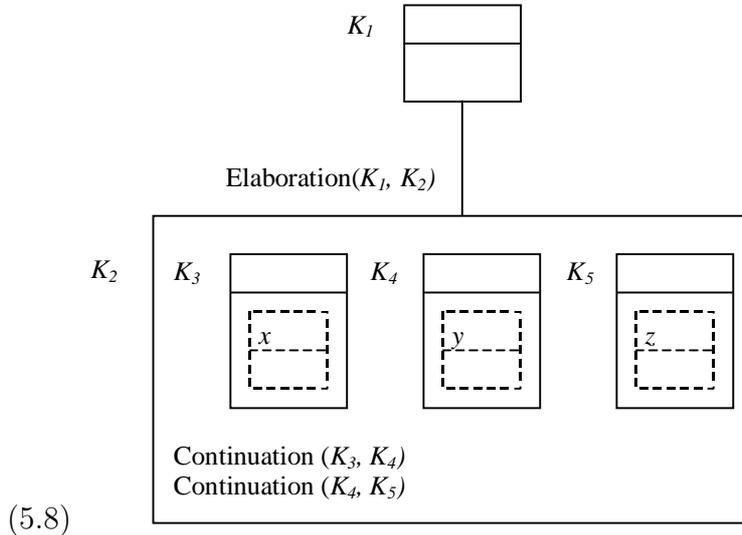


where the SDRS  $K_1$  is elaborated by the sentence represented by  $K_2$ , and the scenario described by  $K_1$  provides a slot for the referent of the sentence initial definite description in  $K_2$ . Note that the relation between the latter and the context is anaphorical – the presupposition projected by the definite noun phrase has to be bound or accommodated by the preceding context.

Now, given the observation from chapter 3 that movement of non-subject arguments to the left periphery not only serves to relate a sentence to the preceding context, but also imposes requirements on the structure of that context, the question arises what this structure could be. The simplest case imaginable is of course where the topic of sentence  $S_n$  serves as the topic of sentence  $S_{n+1}$ ; this is just Daneš's (1974) case of "thematic progression with a continuous theme". But this scheme, as we saw in chapter 3.1.3, predicts whole discourse sequences to be extremely uniform and consisting of chains of anaphoric expressions in the topic positions.

The kind of structure I have in mind here is a different one. We may ask ourselves whether the non-default word order of a sentence  $S_n$  does have any influence on (processing of) the word order of sentence  $S_{n+1}$ , the reasoning behind this question being the following: there are discourse contexts where word order variations are used to signal a parallel structure between two (or more) sentences that stand in the same discourse relation to some discourse

structure  $K_n$ . An example for such a discourse structure is given in the representation in (5.8):



Here, the entity or event given in DRS  $K_1$  is elaborated by the entities or sub-events in the complex SDRSs  $K_2$ , namely  $K_3$  to  $K_5$ , which are linked by continuation. Consider the following example for illustration:

- (5.9) (a) *Hans hatte gestern ein köstliches Abendessen.*  
 John had yesterday a delicious dinner.  
 “John had a delicious dinner yesterday.”
- (b) *Die Suppe schlürfte er genüßlich aus.*  
 The <sub>nom/acc</sub> soup slurped he<sub>nom</sub> delightfully out.  
 “He slurped the soup with delight.”
- (c) *Den Schweinsbraten verschlang der Linguist schmatzend.*  
 The<sub>acc</sub> roast pork devoured the<sub>nom</sub> Linguist smacking.  
 “The roast pork was devoured by the linguist with relish.”
- (d) *Das Gemüse aß er restlos auf.*  
 The<sub>nom/acc</sub> vegetables ate he<sub>nom</sub> without-exception up.  
 “The greens were eaten up by him completely.”

The sentences (5.9.b – .d) each stand in a particular relation to what might be called the sequence topic DELICIOUS DINNER, and they do so in a parallel fashion: they all exhibit the same syntactic (surface) structure, namely a direct object that is moved to the Vorfeld. Furthermore, they constitute a case of what is called “elaboration of a discourse topic” (s. chapter 3.3 for the details). In the present case, the discourse topic is the complex

event DELICIOUS DINNER that is elaborated by the three sentences describing its sub-events. Moreover, each of the three definite Vorfeld-NPs denotes an entity that stands in a part-whole relation to the entity denoted by the discourse topic and thereby constitutes a *dimension* (cf. Grabski, 2000) along which the Elaboration takes place; this dimension itself has to be inferred from world knowledge. Thus, the parallelism between the sentences (5.9.b – .d) is both related to form (they all have the same surface structure) and to content (they all stand in the same discourse relation to the sequence topic).

It is exactly this parallelism that warrants the stability and predictability of this local discourse structure. Once the elaboration relation has become established by the first elaborating sentence, changing the word order of one of the following sentences yields a discourse that intuitively has a slightly deviant feel to it. This is not to say that the resulting discourse could be called *incoherent*—but changing e.g. the word order of the third elaborating sentence by putting the pronominal subject “er” into the Vorfeld position seems to violate the expectation that is triggered by the first two elaborating sentence preceding it.<sup>5</sup>

- (5.10) (a) *Hans hatte gestern ein köstliches Abendessen.*  
 John had yesterday a delicious dinner.  
 “John had a delicious dinner yesterday.”
- (b) *Die Suppe schlürfte er genüßlich aus.*  
 The-nom/acc soup slurped he-nom delightfully out.  
 “He slurped out the soup with delight.”
- (c) <sup>?</sup>*Den Schweinsbraten verschlang der Linguist*  
 The-acc roast pork devoured the-nom Linguist  
*schmatzend.*  
 smacking.  
 “The roast pork was smacked by the linguist.”
- (d') *Er aß das Gemüse restlos auf.*  
 He-nom ate the-nom/acc vegetables restless up.  
 “He ate up the vegetables completely.”

<sup>5</sup>The intuitive differences appealed to here are of course pretty subtle and far from being indisputable. Still, a few non-linguists I've asked about the coherence and “fluency” of the discourse (5.9.a – .d) in comparison to that of (5.9.a – .d') agreed with my judgment. Also note that in (5.9.d'), the in-situ object DP “das Gemüse” may be assigned an accent pattern that, though not indicating a contrastive reading, seems to deviate somewhat from the pattern of a casual new information focus. Furthermore, some of the informants also reported that (5.9.a – .d') relates in a different, namely *causal* way to the preceding context.

Apparently, the marked word order in the first elaborating sentence triggers an expectation about the setup of the local discourse structure: if a dimension for elaboration is given or inferable, and the elaborating sentence preceding it does not elaborate it exhaustively, it predicts the following sentence to stand in the same discourse relation to the sequence topic, and it also predicts it to be of the same form as the first. Note that this does not hold for the reverse case, where a sentence with non-canonical (e.g., OS) word order is preceded by a sentence with canonical (SO) order. A construction lacking any kind of information structural markedness like SO *ipso facto* is not able to constrain the form of the following sentence(s).

As discussed in length in chapters 2 and 3, these constraints also seem to influence the on-line processing of conjoined sentences. The *Parallel Structure Effect* found by Frazier et al. (1984), consisting in a processing facilitation (i.e. shorter reading time) for the second of two conjoined clauses, appears if both clauses exhibit the same syntactic form. Further, it has lately been shown to be sensitive to the Information Structure of the two parallel sentences (s. Hoeks (1999); Carlson (2001)). In a way, this was already implied by the interpretation given in Frazier et al (1984), where the authors found the size of the effect to vary with certain factors like the markedness of the construction in the first and the second conjunct. Their conclusion from these findings was two-fold: firstly, the markedness of the first of two conjoined constructions places severe constraints on the form the second conjunct may take on: “[...] any discourse context that licenses the speaker to mark the topic of the first conjunct explicitly will likely be one that licenses the topic of the second conjunct to be marked also” (Frazier et al. (1984:427)); and secondly, for nonparallel coordinate structures, it is only the order where the marked construction precedes the unmarked that results in a constraint on the second conjunct: “Nonparallel coordinate structures containing explicitly topic-marking structures should generally have the unmarked construction preceding the marked construction rather than vice versa.” (ibd.).

For Experiment 2, these observations then come down to the following questions: is there a parallel structure effect for conjoined clauses with SO vs. OS word order? That is, is the parallel structure effect sensitive to the word order variation SO vs. OS in German conjoined clauses? And: does this parallel structure effect depend on the markedness of the word order in the first conjunct? That is, is there a difference between the parallel structure effect exerted by an SO (unmarked) vs. an OS structure (marked) in the first conjunct?

These two questions result in four possible configurations of these sentence pairs: two parallel ones, SO/SO and OS/OS, where the structure of the first was hypothesized to prime that of the second, and two nonparallel ones, SO/OS and OS/SO, where this should not be the case.

From the reasoning in chapter 3 about the restrictive function of the movement of direct objects into the sentence initial position, as well as the evidence from Frazier et.al. (1984), reported above, the following predictions follow for Experiment 2.

Firstly, a parallel structure effect should be found. That is, a sentence with a structurally parallel sentence preceding it should exhibit shorter reading times than one with a nonparallel preceding it. For example, the processing of an OS structure in the second conjunct should take less time when it is preceded by an OS structure than when it is preceded by an SO structure.

Secondly, if OS structures are—by virtue of their deviation from the canonical word order—marked and therefore more salient, they should have a stronger influence on the following sentence than unmarked structures like SO. That is, the parallel structure effect should interact with the effect of varying the word order of the first sentence.

To sum up: what is predicted is that adjacent structures that are identical, like SO/SO and OS/OS, should exhibit a parallel structure effect, i.e. a processing facilitation for the second sentence. And OS structures should profit *more* from this facilitating effect of a structurally parallel preceding sentence than SO structures. More technically speaking: besides the main effects of the two 2-level factors WORD ORDER (SO vs. OS in the second (target) sentence) and PARALLEL (same structure in prime and target sentence), we predict an interaction between these factors.

### 5.2.1 Method

*Participants.* 24 students from the University of Leipzig participated in this experiment. They all were native speakers of German, and received cash remuneration for their participation.

*Materials.* A set of 28 experimental texts was constructed according to the following procedure.

Firstly, a new set of 28 contexts had to be constructed. The context scenarios from Experiment 1 only contained *two* inferable elements (e.g., in the restaurant scenario the waiter and the cook). In Experiment 2, four such discourse referents were needed for each item, because each of the paired sentences introduced two discourse referents which had to be inferable from

the preceding context. Accordingly, the contexts had to be extended or exchanged altogether, while the verbs could be taken from Experiment 1. The  $2 \times 28 = 56$  verbs were symmetrical in the sense described in connection with Experiment 1. Also, the plausibility of the events reported in the texts was controlled for according to the conditions formulated with respect to Experiment 1. Regrettably, the plausibility constraint imposed on the introduction of the discourse referents made it impossible to match the initial elements of the first and second sentences for length and frequency—there simply were not enough descriptive nouns that would fit all the constraints at the same time. All NPs had masculine gender in order to avoid formal ambiguity between nominative and accusative. The second, henceforth also called *target* sentences, were always connected to the first (*prime*) sentence by the connective *und* ('and'), and they all contained an adverb which should collect the sentence-final processes of information integration.

Furthermore, a coda sentence was added to the texts after the two critical sentences; this was meant to give the texts more of a story-like character and round them up. Besides, these sentences contained information that could be asked for in the comprehension questions (see below).

The material was presented to four naïve subjects who were asked to rate the texts for plausibility and coherence in all four versions. The four texts performing worst on the rating were excluded from the experiment; the three of these that performed best were used as warm-ups in the reading experiment.

For each of the experimental items, four versions were constructed, corresponding to the  $2 \times 2$  levels of the factors WORD ORDER and PARALLEL. An example of an experimental item is given in Table 5.2.1 (for the full item set, see the Appendix):

**Table 5.2.1:** Sample Experimental Text for Experiment 2, in German and Approximate English Translation

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<i>lead-in sentence</i>	Ein Saboteur hatte sich in den kleinen Zirkus eingeschlichen. A saboteur had crept into the little circus.
<i>context sentence</i>	Als die schlechte Nachricht durchgesickert war, wurden alle sehr misstrauisch. When the bad news had leaked out, everybody got very suspicious.

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<i>Condition</i>	<i>prime sentence / target sentence</i>
SO/SO	Der Direktor beschattete den Akrobaten, / und der Dompteur belauerte den Clown argwöhnisch. The <sub>nom</sub> director shadowed the <sub>acc</sub> acrobat, / and the <sub>nom</sub> tamer eyed the <sub>acc</sub> clown distrustfully.
SO/OS	Der Direktor beschattete den Akrobaten, / und den Dompteur belauerte der Clown argwöhnisch. The <sub>nom</sub> director shadowed the <sub>acc</sub> acrobat, and the <sub>acc</sub> tamer eyed the <sub>nom</sub> clown distrustfully.
OS/OS	Den Direktor beschattete der Akrobat, / und den Dompteur belauerte der Clown argwöhnisch. The <sub>acc</sub> director shadowed the <sub>nom</sub> acrobat, / and the <sub>acc</sub> tamer eyed the <sub>nom</sub> clown distrustfully.
OS/SO	Den Direktor beschattete der Akrobat, / und der Dompteur belauerte den Clown argwöhnisch. The <sub>acc</sub> director shadowed the <sub>nom</sub> acrobat, / and the <sub>nom</sub> tamer eyed the <sub>acc</sub> clown distrustfully.

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<i>coda sentence</i>	Die Nachmittagsvorstellung wurde ein totaler Reinfall. The afternoon performance was a complete disaster.
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As in Experiment 1, comprehension questions were posed in order to warrant that the participants would not overlook the word order manipulation. But in Experiment 2, only 50 % of the questions asked for the information given in the two critical sentences. The other half either asked for information from the lead-in sentence, or for information given in the coda sentence (25 % of the overall questions each). By this manipulation, the participants' attention should at least partly be distracted from the critical sentences in order to avoid the high reading times found in Experiment 1 (s. above, fn.4). Table 5.2.2 gives an example of the question types:

**Table 5.2.2:** Sample Comprehension Questions for Experiment 2, in Approximate English Translation

Example	correct answer*
Was there a saboteur in the circus?	<i>yes</i>
Was there a spy in the circus?	<i>no</i>
Was the director being eyed?	<i>no(SO)/yes(OS)</i>
Was the acrobat being eyed?	<i>yes(SO)/no(OS)</i>
Was the tamer being shadowed?	<i>no(SO)/yes(OS)</i>
Was the clown being shadowed?	<i>yes(SO)/no(OS)</i>
Was the afternoon performance a success?	<i>no</i>
Was the afternoon performance a failure?	<i>yes</i>

\*) depending on item condition

The four versions of each of the experimental texts were distributed to four lists such that each list contained each item only once and in one condition. These lists were semi-randomized three times in parallel. The resulting 12 lists were then inverted to yield the sum of 24 lists.

The three warm-up items were presented in the conditions (1) SO/SO, (2) OS/SO, and (3) OS/OS.

*Design.* The experimental design consisted of the two 2-level factors WORD ORDER (SO vs. OS in target sentence) and PARALLEL (same vs. different structure in prime and target sentence). By crossing these factors, each experimental item appeared in the four conditions. Each item appeared in each list only once, and each list contained an equal number of items for each condition. Hence, both factors were realised within subject and within item.

*Procedure.* The procedure was the same as the one in Experiment 1, where the reader is referred to for the details, except for the fact that in Experiment 2, a trial consisted of five successive screens; the first contained the lead-in and the context sentence, the second and the third the two critical sentences, respectively, the fourth showed the coda sentence, and the fifth showed the question, again in non-cumulative fashion. Further, Experiment 2 consisted of only one block with 24 experimental texts. Each experimental session lasted about 25 minutes.

### 5.2.2 Results

Differing somewhat from Experiment 1, there were three measures of interest in Experiment 2. These were the reading times for the prime sentences, those for the target sentences, and the percentage of wrong responses to the comprehension question.

The first step of the analysis was to screen the raw data for outliers. All reading times faster than 100 ms and slower than 3000 ms per word were treated as missing values. After this preliminary screening, all observations were excluded which deviated more than 2 SDs from both the subject and the item means at a given position for each condition. By this procedure, 1.4 % of the observations was removed. The percentage of wrong responses to the comprehension questions was computed. Both measures went into the descriptive statistical analysis.

#### Results for the Prime Sentences

The next step was to analyse the reading times for the first conjunct, i.e. the prime sentence for effects of the word order manipulation. Table 5.2.3 shows the reading time data for each position of the first sentence:

**Table 5.2.3:** Mean Reading Times (in ms) for the Prime Sentence in Experiment 2

Condition	Det	NP1	V	Det	NP2
SO	516	553	565	431	902
OS	515	593	581	450	1114
	<i>Der/</i> <i>Den</i>	<i>X</i>	<i>V-te</i>	<i>den/</i> <i>der</i>	<i>Y, ...</i>

On these data, two ANOVAs for repeated measurements were performed with the two-level factor WORD ORDER. The  $F_1$ -ANOVA treated participants, and the  $F_2$ -ANOVA items as the random factor.

As is evident from the descriptive data, there was no significant effect of WORD ORDER on the determiner of the first NP, both  $F$ s < 1.

On the first NP itself, there was a trend towards a difference in the subject analysis,  $F_1(1,23) = 3.22$ ,  $p = .09$ , but none in the item analysis:  $F_2(1,23) = 1.01$ ,  $p > .10$ .

The verb did not show any significant differences for the WORD ORDER factor,  $F_1(1,23) = 1.21$ ,  $p > .10$ ;  $F_2(1,23) < 1$ .

On the determiner of the second NP, the effect of WORD ORDER was significant in the subject analysis,  $F_1(1,23) = 7.72$ ,  $p \leq .01$ , but only marginally significant in the item analysis,  $F_2(1,23) = 3.52$ ,  $p = .07$ .

However, on the second NP, the effect turned out to be statistically reliable in both analyses,  $F_1(1,23) = 8.78$ ,  $p \leq .01$ , and  $F_2(1,23) = 7.08$ ,  $p \leq .01$ . Figure 5.2.1 illustrates the results for the first sentence.

**Figure 5.2.1:** Mean Reading Times for All Positions in the Prime Sentence of Experiment 2

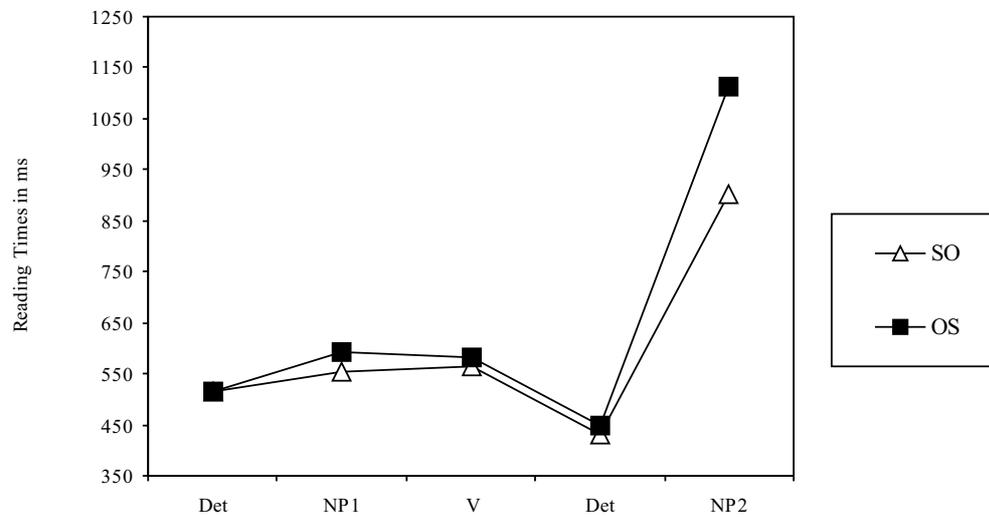


Table 5.2.4 gives an overview of the effects found in the first sentence.

**Table 5.2.4:** Effects for the Reading Times in the Prime Sentence in the Subject ( $F_1$ ) and Item Analysis ( $F_2$ ) in Experiment 2\*

Factor	Position					
	Det	NP1	V	Det	NP2	
WORD ORDER	$F_1$	—	+	—	**	**
	$F_2$	—	—	< 1	+	**

\*)'—':  $p > .10$ ; '+':  $p < .10$ ; '\*':  $p < .05$ ; '\*\*':  $p < .01$ , and '\*\*\*':  $p < .001$ .

These results will be discussed below together with those of the target sentences.

### Results for the Target Sentences

The descriptive analysis of the reading times for the second (target) sentences and the error rates yielded the following results:

**Table 5.2.5:** Mean Reading Times for the Target Sentence (in ms) and Error Rates (in %) in Experiment 2

Condition	Conj	Det	NP1	V	Det	NP2	Adverb	Errors
OS/SO	570	437	557	532	472	630	808	22,2
SO/SO	525	394	504	534	430	621	809	8,3
SO/OS	490	402	546	580	485	757	977	16,7
OS/OS	588	418	498	552	440	660	884	10,4
...	<i>und</i>	<i>der/ den</i>	<i>X</i>	<i>V-te</i>	<i>den/ der</i>	<i>Y</i>	<i>adverblich.</i>	

Two ANOVAs for repeated measurements were conducted with the two two-level factors WORD ORDER (SO vs. OS in the second, the target sentence) and PARALLEL (same vs. differing word order in prime and target sentence). The  $F_1$ -ANOVA treated participants, and the  $F_2$ -ANOVA items as the random factor. The results will be reported for each position successively.

On the coordinating element, no main effects of word order and parallel structure were found (WORD ORDER: both  $F$ s  $< 1$ ; PARALLEL:  $F_1(1,23) = 2.24$ ,  $p > .10$ ;  $F_2(1,23) < 1$ ). The interaction, however, was highly significant (WORD ORDER  $\times$  PARALLEL:  $F_1(1,23) = 14.16$ ,  $p \leq .001$ ;  $F_2(1,23) = 18.51$ ,  $p \leq .001$ ).

The reading times for the determiner of the first NP presented a similar picture: again, there were no main effects (WORD ORDER: both  $F$ s  $< 1$ ; ; PARALLEL:  $F_1(1,23) = 1.55$ ,  $p > .10$ ;  $F_2(1,23) = 1.07$ ,  $p > .10$ ). But, as on the connective, the interaction turned out to be significant (WORD ORDER  $\times$  PARALLEL:  $F_1(1,23) = 7.45$ ,  $p \leq .01$ ;  $F_2(1,23) = 4.37$ ,  $p \leq .05$ ).

For the first NP, still no effect of WORD ORDER was found (both  $F$ s  $< 1$ ). But the parallel structure of prime and target sentence turned out to be significant (PARALLEL:  $F_1(1,23) = 4.59$ ,  $p \leq .05$ ;  $F_2(1,23) = 7.69$ ,  $p \leq .01$ ). No interaction of these factors was found (WORD ORDER  $\times$  PARALLEL: both  $F$ s  $< 1$ ).

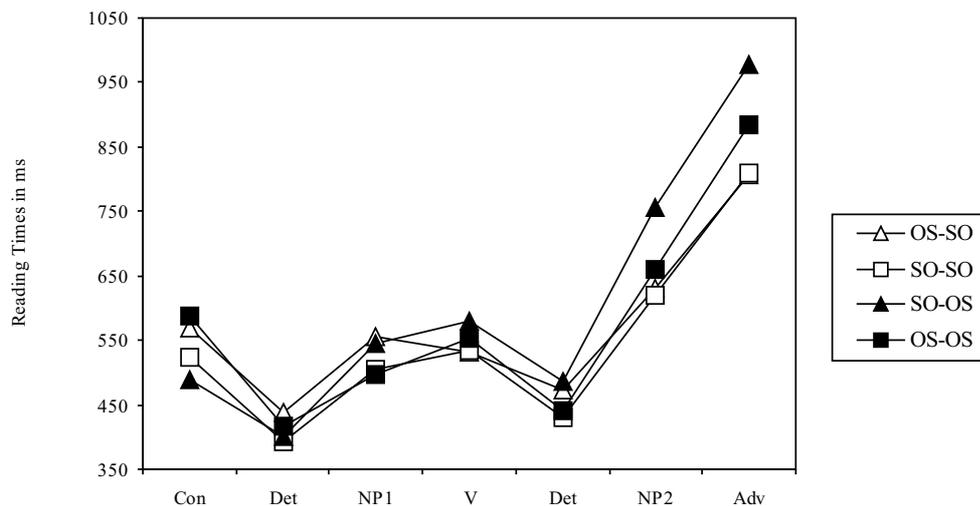
On the verb, this pattern was reversed: there was a main effect of WORD ORDER in the target sentence, though it was only marginally significant in the item analysis ( $F_1(1,23) = 6.80, p \leq .05; F_2(1,23) = 3.15, p = .09$ ). PARALLEL had no effect here (both  $F$ s  $< 1$ ). Also, the interaction failed to reach significance (WORD ORDER  $\times$  PARALLEL:  $F_1(1,23) = 1.19, p > .10; F_2(1,23) < 1$ ).

Interestingly, this picture shifted again on the determiner of the second NP: WORD ORDER had no significant effect (both  $F$ s  $< 1$ ), but PARALLEL did: ( $F_1(1,23) = 12.79, p \leq .01; F_2(1,23) = 12.20, p \leq .01$ ). As on the verb, the interaction did not turn out to be significant (both  $F$ s  $< 1$ ).

The reading times for the second NP revealed a somewhat mixed pattern: WORD ORDER was significant in the item analysis only ( $F_1(1,23) = 1.98, p > .10; F_2(1,23) = 6.31, p \leq .05$ ). The effect of PARALLEL failed to reach significance ( $F_1(1,23) = 2.79, p > .10; F_2(1,23) = 2.09, p > .10$ ). The interaction showed up as a trend in the subject analysis only: WORD ORDER  $\times$  PARALLEL:  $F_1(1,23) = 4.00, p = .06; F_2(1,23) < 1$ .

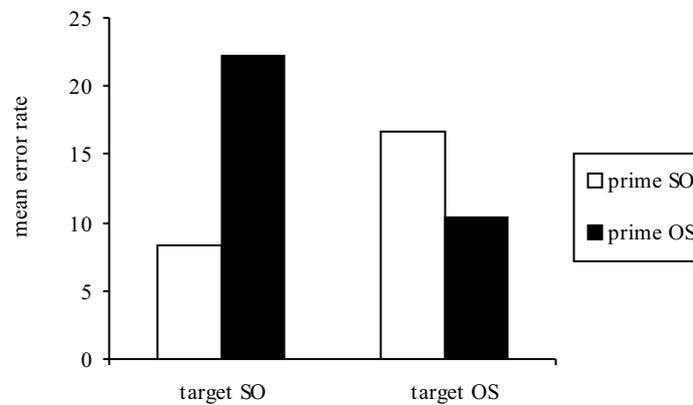
Finally, we found an effect of WORD ORDER on the sentence final adverb position that was significant in both analyses ( $F_1(1,23) = 4.23, p \leq .05; F_2(1,23) = 6.48, p \leq .05$ ), but no PARALLEL effect (both  $F$ s  $< 1$ ). Again, the interaction was only visible as a trend, and only in the subject analysis (WORD ORDER  $\times$  PARALLEL:  $F_1(1,23) = 3.87, p = .06; F_2(1,23) < 1$ ). The results reported so far are summarized in Figure 5.2.2.

**Figure 5.2.2:** Mean Reading Times for the Target Sentence of Experiment 2



The error rates did not show an effect of the WORD ORDER factor (both  $F_s < 1$ ), but a significant effect of PARALLEL ( $F_1(1,23) = 12.22, p \leq .01$ ;  $F_2(1,23) = 8.06, p \leq .01$ ). The interaction was not significant (WORD ORDER  $\times$  PARALLEL:  $F_1(1,23) = 2.42, p > .10$ ;  $F_2(1,23) = 1.41, p > .10$ ). Figure 5.2.3 illustrates these findings.

**Figure 5.2.3:** Mean Error Rates by Condition for Experiment 2



The results obtained for the second sentence are summarized in Table 5.2.6:

**Table 5.2.6:** Effects for the Reading Times in the Target Sentence in the Subject ( $F_1$ ) and Item Analysis ( $F_2$ ) in Experiment 2\*

Factor		Con	Det	NP1	V	Det	NP2	Adv	Errors
WO	$F_1$	< 1	< 1	< 1	*	< 1	—	*	< 1
	$F_2$	< 1	< 1	< 1	+	< 1	*	*	< 1
PAR	$F_1$	—	—	**	< 1	**	—	< 1	**
	$F_2$	< 1	—	*	< 1	**	—	< 1	**
WO × PAR	$F_1$	***	**	< 1	—	< 1	+	+	—
	$F_2$	***	*	< 1	< 1	< 1	< 1	< 1	—

\*) '—' abbreviates:  $p > .10$ ; '+' :  $p < .10$ ; '\*' :  $p < .05$ ; '\*\*' :  $p < .01$ , and '\*\*\*' :  $p < .001$ . 'WO' stands for WORD ORDER, 'PAR' for PARALLEL.

It was the effect of parallel structure in relation to the element hosted by the Vorfeld position that Experiment 2 was most interested in. Though the interaction between the two factors found in the ANOVA gives us some clue that the initial position of the second sentence was sensitive to that relation, and tendentially so at the end of the sentence, it does not quite answer the question posed at the outset of Experiment 2, namely: do OS structures profit more from the hypothesized parallel structure effect than SO structures? A further analysis was dedicated to bring more light into this issue. In this analysis, the sizes of the parallel structure effects depending on word order in the second sentence were compared to each other. Table 3.2.7 shows the effect sizes and should be read as follows: the lines show the result of subtracting the reading times for the second sentence in the nonparallel condition (an SO sentence followed by an OS, and vice versa) from that of the parallel condition (SO followed by SO, and OS by OS), respectively. These differences represent the effect that the parallel structures have on processing: if the processing of the target sentence benefited from a preceding parallel prime, the difference should be a positive integer; if not, a negative one.

**Table 3.2.7:** Effect of Parallel Structure in First and Second Sentence for the Reading Times of the Second Sentence in Experiment 2

Difference	Position						
	Con	Det	NP1	V	Det	NP2	Adv
OS/SO – SO/SO	45	39	53	-2	42	9	-1
SO/OS – OS/OS	-98	-16	48	28	35	97	93

An ANOVA was performed over these differences with the 2-level factor WORD ORDER (i.e., the magnitude of the parallel structure effect in SO vs. OS target sentences). Since this analysis yielded results that were almost identical with those of the general analyses, the reader is spared most of the statistical details. Suffice it to say that the difference between the size of the parallel structure effect in SO vs. OS target sentences turned out to be significant on the connective ( $F_1(1,23) = 14.17, p \leq .001$ ;  $F_2(1,23) = 18.49, p \leq .001$ ), on the determiner of the first NP ( $F_1(1,23) = 7.43, p \leq .01$ ;  $F_2(1,23) = 4.35, p \leq .05$ ). As in the general analysis, a marginally significant effect for the second NP was found, but only in the subject analysis ( $F_1(1,23) = 3.99, p = .06$ ;  $F_2(1,23) < 1$ ) and for the sentence final adverbial ( $F_1(1,23) = 3.87, p = .06$ ;  $F_2(1,23) < 1$ ).

### 5.2.3 Discussion

Before turning to the main objective of Experiment 2, the effect of parallel word order in a pair of conjoined clauses, the results for the first conjunct shall be given a short discussion.

The reading times for the prime sentences found in Experiment 2 quite closely matched those of the inferable conditions in Experiment 1, the only observation point to exhibit a major difference being the second NP (SO condition: 532 ms in Exp.1 vs. 904 ms in Exp.2; OS: 556 vs. 1114). This doesn't come as a surprise, since in Experiment 2, this was the sentence final position, whereas in Experiment 1, it was not due to the sentence final adverbial. Hence, in Experiment 2, this position should show the well-known effect of *sentence wrap-up*, i.e. high reading times reflecting the cognitive effort of integrating the information represented on different representational levels of the input. Apart from this difference, the effect of the word order manipulation essentially turned out to be the same in both experiments: sentences with direct objects in the Vorfeld position are harder to parse than

ones where this position hosts a subject, even if, as was the case in all conditions in Experiment 2, the respective Vorfeld elements are inferable from the preceding context.

I will now turn to the results of the analysis of the second, the target sentence. The interpretation of these results however is less straightforward. Since, to my knowledge, parallel structure effects in the literature on sentence comprehension have only just begun to be investigated with respect to information structural manipulations, the explanation for the effects found has to remain somewhat speculative.

On the first position, the connective “und”, the main factors WORD ORDER and PARALLEL did not show significant effects. However, their interaction was highly significant. This may be interpreted as follows: when reaching the connective, the parser either has parsed an SO or an OS structure. The latter case will lead to a processing difficulty: as we have seen in the discussion of the reading times for the first conjunct, the word order effect there showed up towards the end of the sentence. No matter whether the structure of the second conjunct is SO or OS, the processing difficulty caused by the word order manipulation in the first sentence seems to influence the processing of the connective between the two conjuncts. Rather than being an interaction between the two factors WORD ORDER and PARALLEL (whose respective influences are not yet visible in the input in the second sentence), this may more accurately be interpreted as an effect of the word order manipulation in the first conjunct.

The same explanation can be given for the interaction found on the determiner of the first NP; no main effects were found here, which is consistent with the evidence from Experiment 1, that the effect of the WORD ORDER factor encoded in the case marking on the determiner of the first NP does not show up on that very on the determiner, but only later in processing, when the NP is being processed. The significant interaction of the two factors is due to the spill-over of the processing difficulties associated with the word order manipulation in the first sentence.

Effects of the WORD ORDER factor were found on the verb, on the second NP, where it was only marginally significant, and on the sentence final adverb, where it was significant. This can be taken as evidence for the subject-first preference exerting its influence on these positions in the target sentence, as it did on the preceding prime sentence: even for these parts of the input, the OS structures imposed more difficulties on processing than SO structures. Turning to the PARALLEL STRUCTURE effect, i.e. the effect of a congruent structure of prime and target sentence, it also turned out to be significant: namely, on the first NP, on the determiner of the second NP, and in the error

rates.

The first position to show this priming effect is the first NP. As we have seen in Experiment 1, it is here that the processing mechanism is sensitive to the word order manipulation signalled by the case information on the preceding determiner. Similarly in the data for the first conjunct in Experiment 2, where the subject analysis showed a trend towards a word order effect at this position. However, no such effect of word order was found on the first NP of the second conjunct. Instead, this position showed the priming effect. Taken together with the absence of an interaction of the two factors at this position, this may be interpreted as indicating that the processing difficulty connected to the non-default OS word order was levelled out by the effect of a congruent syntactic structure in the first conjunct. That is, an OS structure, which is more difficult to process than an SO structure when encountered in isolation, is much less difficult to process when it is preceded by a sentence of like (i.e., OS) structure.

A further point deserving discussion is the complementarity of the WORD ORDER and PARALLEL STRUCTURE effect: as a glance at Table 3.2.6 reveals, there is no position in the target sentence onto which *both* factors exert their influence. When we compare this data pattern with that from Experiment 1, where we found an effect of WORD ORDER on the first NP, the determiner of the second NP and the second NP itself, we notice that there is no WORD ORDER effect at these positions in Experiment 2. That is, on these positions, there were no significant differences between the SO and the OS condition. Rather, the effect showing up on these positions in Experiment 2 is PARALLEL, i.e. the reading times on these positions differed only with respect to the structural congruency or incongruency with the preceding sentence. Roughly, this can be taken as indicating that, at least for these positions, the parallel structure effect flattened out the effect of the word order manipulation.

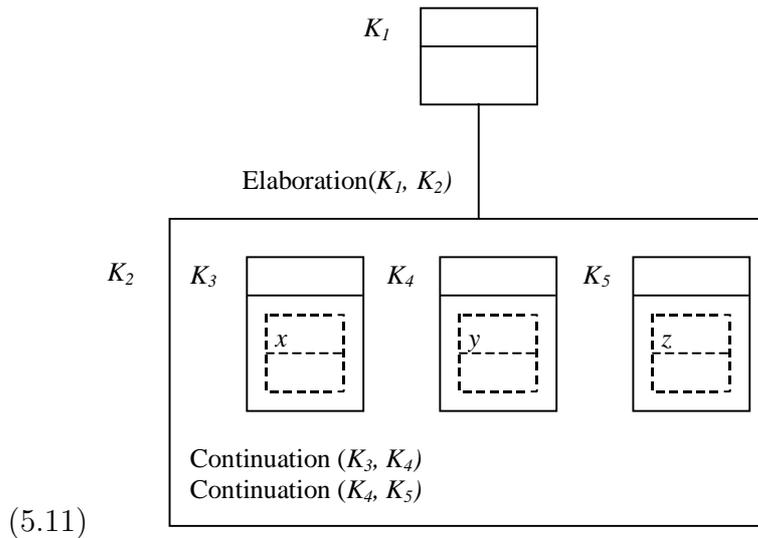
As regards the interaction between the two factors, we have seen that it was significant at the beginning of the second conjunct. Since the information that could bring about the interaction was not available to the parser at that point in processing, we had to conclude that this was not to be conceived of as an interaction in the predicted sense, but rather as a spill-over of the effect of the processing of word order in the first conjunct. Although the interaction seemed to be visible at least in the descriptive data in table 3.2.7, and was tendentially present at least in the subject analysis, the lack of statistically reliable data forces us to conclude that the parallel structure effect did not really interact with the word order manipulation. That is, the facilitation that the parser may gain from a structurally congruent preceding sentence does not vary in a statistically significant manner depending on whether the prime sentence is SO or OS. Moreover, it is not —in a statistically significant

manner—bigger for OS than it is for SO.

To sum up: although parallel structure, pertaining both to the surface form of the two conjoined clauses, as well as to their like discourse function, did have a facilitating effect on processing, and did so on positions where a significant effect of word order was found in Experiment 1, it did not interact with the word order manipulation of the second conjunct in the predicted way. From this we may conclude that the discourse structure tested here (Elaboration along an inferable dimension) does not feature the parallel structure in a way that is salient enough to guide processing in the predicted way: in the discourse structure tested in Experiment 2, parallel structure facilitated processing regardlessly of the word order of prime and target. In order to put more weight on the interaction of information structure on the discourse and the sentence level, Experiment 3 was designed, where a factor that should connect the two levels was introduced.

### 5.3 Experiment 3—Explicit Antecedents

As was noted in the introduction to Experiment 2, it was assumed that the positive effect of two adjacent structures with the same non-canonical surface form should be particularly salient in a local discourse structure of the following form:

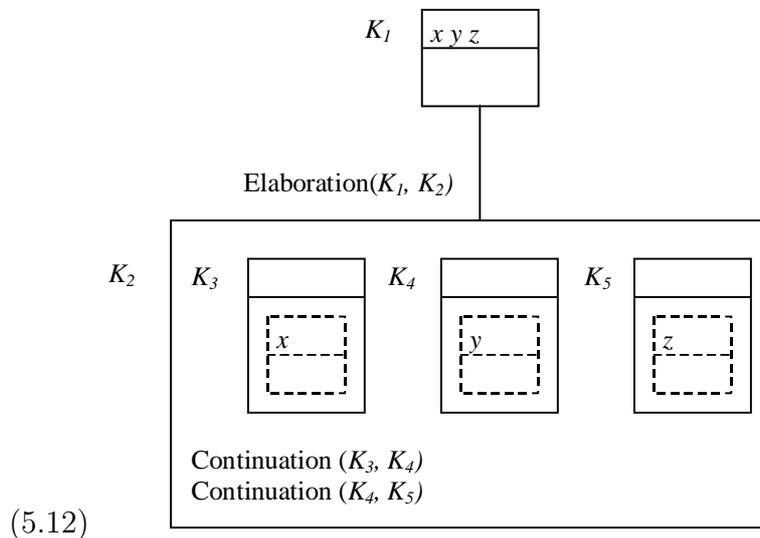


However, this hypothesis was not supported by the data from Experiment 2, and we interpreted this as a lack of interaction between the information structure on the sentence level (OS vs. SO word order) and on the discourse level (elaboration by parallel structures).

Now, when trying to find a factor that would tie these two levels together more closely, one thing that comes to mind is to manipulate the accessibility of the initial phrase of the elaborating clauses. In both Experiments 1 and 2, the discourse referents of these elements were presupposed, and their existence had to be inferred from the previous discourse via the dimension along which elaboration takes place. Only then could the presupposed material get accommodated to the discourse context. This strategy of accommodation does require the place that the presupposed information gets accommodated to be accessible in the DRT sense and that the result of accommodation be informative and consistent with previous information, i.e. the referent does not have to be explicitly represented in the track of previous discourse. For accommodation it is sufficient that the referent is inferable from e.g. the scenario described by the sentences preceding it, as was the case in Experiment 1 and 2.

According to the theory proposed by van der Sandt (1992) and Geurts (1999), there is a mechanism of adding the information supplied by a definite

DP that is *preferred* to accommodation. This is what the authors call *binding*, i.e. a strategy that searches the track of pre-existing (accessible) discourse referents for an explicit antecedent (i.e. a variable that is element of the DRS universe), and, in case that the conditions on the referents (the variables) match, identifies the presupposed information with that of the antecedent (see chapter 3.2 for the details). So, compared to the structure in (5.11), the discourse structure in (5.12) should result in a stronger interaction between the sentence-initial elements—be they subjects or objects—and the preceding context, since it involves chains between the referents presupposed by the Vorfeld constituents and the preceding context—the latter supply explicit antecedents that the former can *bind* to:



As can be seen in (5.12), the discourse referents  $x$ ,  $y$  and  $z$  inside the dashed boxes have *explicit antecedents* in the previous context represented by  $K_1$ . (The dashed boxes represent the presuppositions triggered by some material inside the elaborating sentences, like e.g. their sentence-initial definite DPs.) (5.13) gives an example of a text featuring explicit antecedents for the Vorfeld DPs in the elaborating sentences:

- (5.13) (a) [Context: *Hans hat gestern Schweinsbraten mit Kraut und Knödeln nach einem alten Rezept seiner Großmutter gekocht. Das Abendessen war rundum gelungen.*  
 “Hans cooked roast pork with kraut and dumplings after an old recipe of his grandma yesterday. The dinner was a great success.”]
- (b) *Den Schweinsbraten verschlang er schmatzend.*  
 The<sub>acc</sub> roast pork devoured he<sub>nom</sub> noisily.  
 “The roast pork was devoured by him with relish.”

- (c) *Das Kraut verputzte der Linguist in*  
 The<sub>nom/acc</sub> kraut polished-off the<sub>nom</sub> linguist in  
*Sekundenschnelle, ...*  
 seconds speed, ...  
 “The kraut was polished off by the linguist within seconds, ...”
- (d) *... und die Knödel aß er restlos auf.*  
 ...and the<sub>nom/acc</sub> dumplings ate he without exception up.  
 “...and the dumplings were completely eaten up by him.”

Here, the existential presupposition triggered by the definite Vorfeld DP “den Schweinsbraten” need not be accommodated via inferring some dimension along which elaboration takes place. Rather, elaboration takes the elaborandum (the dish) and enumerates those parts or elements of it that were already mentioned. The fact that this elaboration takes on parallel form makes the structure in (5.12) more robust and strengthens the relation between the discourse structure (Elaboration) and the information structure at the sentence level (DP with explicit antecedent in sentence initial position). Thus, structures like the ones in (5.12) seem to have the desirable property of tying the two levels of discourse structure and information structure on the sentence level more closely together than the structures employed in the previous experiments.

Taken together, these observations led to the following questions in Experiment 3. Firstly, does a context providing an explicit antecedent for a sentence initial definite DP have an effect on the processing of two conjoined elaborative clauses with SO vs. OS word order? And secondly, if the answer to the first question is in the positive, does this effect of an explicit antecedent depend on the markedness of the word order in the elaborative clauses? That is, will there be a difference between the effect of an explicit antecedent for SO as compared to OS structures?

Since we wanted to combine the parallel structure effect with the effect of explicit antecedents (this factor was called  $\pm$  MENTION for convenience), all experimental items exhibited parallel structure. Hence, the possible combinations of the factors were the following: the elaborating sentences either had SO/SO vs. OS/OS structure, and their sentence initial DPs either both had vs. had no explicit antecedent.

Resting on the assumptions laid out above and in the preceding chapters, the following predictions were made for Experiment 3:

Firstly, there should be an effect of an explicit antecedent. That is, if the presuppositions of sentence initial DPs can bind to an explicit antecedent in the preceding context, processing should be faster than if there is no

explicit antecedent. More specifically: if the sentence initial DP of the first of two elaborating sentences with parallel structures does have an explicit antecedent in context, this should facilitate processing the second sentence whose Vorfeld DP also has an mentioned antecedent.

Secondly, if a prime sentence with OS structure *qua* being marked results in a stronger connection to the antecedent than one with the canonical SO order, OS structures should benefit more from the processing facilitation exerted by an explicit antecedent than SO structures. That is, the effect of an explicit antecedent should interact with the word order effect.

To sum up: what is predicted is that having an explicit antecedent for the presupposed information to bind to should facilitate processing of the elaborating clauses. And this facilitation should be stronger for OS/OS than for SO/SO structures. Hence, what is predicted beyond the main effects of WORD ORDER and MENTION is a one-way interaction between these two factors.

### 5.3.1 Method

*Participants.* 24 students from the University of Leipzig participated in this experiment. They were all native speakers of German, and received cash remuneration for their participation.

*Materials.* Since we wanted to combine the parallel structure effect with that of an explicit antecedent, we took the 24 experimental texts from Experiment 2 in the +PARALLEL condition, i.e. SO/SO and OS/OS. The factor  $\pm$ MENTION was realized by adding the antecedents to the second context sentence for the +MENTION condition. The antecedents were definite DPs that contained lexical material which was identical to that of the Vorfeld DPs in the critical sentences. They were realized syntactically as coordinated prepositional objects, e.g. “Als die schlechte Nachricht (*zum Direktor und zum Dompteur*) durchgesickert war, wurden alle sehr misstrauisch.” (s. example in Table 5.3.1). In all other respects, the items were the same as in Experiment 2. Table 5.3.1 below gives an example for an experimental item:

**Table 5.3.1:** Sample Experimental Text for Experiment 3, in Approximate English Translation

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<i>lead-in sentence</i>	Ein Saboteur hatte sich in den kleinen Zirkus eingeschlichen. A saboteur had crept into the little circus.
-------------------------	--

<i>context sentence</i> , – MENTION	Als die schlechte Nachricht durchgesickert war, wurden alle sehr misstrauisch. When the bad news had leaked out, everybody got very suspicious.
<i>context sentence</i> , + MENTION	Als die schlechte Nachricht zum Direktor und zum Dompteur durchgesickert war, wurden alle sehr misstrauisch. When the bad news had leaked out to the director and the tamer, everybody got very suspicious.

---

*critical sentences*

SO/SO	Der Direktor beschattete den Akrobaten, / und der Dompteur belauerte den Clown argwöhnisch. The <sub>nom</sub> director shadowed the <sub>acc</sub> acrobat, / and the <sub>nom</sub> tamer shadowed the <sub>acc</sub> clown distrustfully.
OS/OS	Den Direktor beschattete der Akrobat, / und den Dompteur belauerte der Clown argwöhnisch. The <sub>acc</sub> director eyed the <sub>nom</sub> acrobat, / and the <sub>acc</sub> tamer shadowed the <sub>nom</sub> clown distrustfully.

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<i>coda sentence</i>	Die Nachmittagsvorstellung wurde ein totaler Reinfall. The afternoon performance was a complete desaster.
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Since all the critical elaborating sentences exhibited parallel structure, and half of them had the antecedent of the presupposed referent of the Vorfeld DP mentioned in the context sentence, we had to provide 24 filler items in order to prevent participants from making the following strategic predictions: all critical sentences have parallel structure; whenever there are two human discourse referents mentioned in the context sentence, they will be mentioned again in the Vorfeld position of the critical sentences. A simpler strategy would be: if the first critical sentence starts with a mentioned element, so will the second.

To block these strategies, the fillers were designed as follows: their elaborating sentences all had non-parallel structure. This blocked the prediction of parallelity since the ratio of parallel to nonparallel conjuncts across items and fillers was 50:50. For half of the fillers, the context sentences mentioned two referents in a conjoined PP, the first of which was mentioned again as the Vorfeld DP of the prime sentence; however, the target sentence did not have the second DP mentioned in the context sentence as antecedent, but rather featured a DP denoting an element that was merely inferable from the preceding context. This was to block the strategic inference from “DP in first sentence was mentioned before” to “DP in second sentence will have been mentioned before, too”.

Comprehension questions were posed after each item, with the same distribution of what they asked for as in Experiment 2 (50% pertaining to one of critical sentence pairs, and the other half pertaining to either the lead-in sentence, or the coda sentence).

The four versions of each of the experimental texts were distributed to four lists such that each list contained each item only once and in one condition. These lists were semi-randomized three times in parallel. The resulting 12 lists were then inverted to yield the sum of 24 lists.

As in Experiment 2, the three warm-up items were presented in the conditions (1) SO/SO, (2) OS/SO, and (3) OS/OS.

*Design.* The experimental design consisted of the two 2-level factors WORD ORDER (prime and target sentence both being SO vs. OS) and MENTION (Presupposition of Vorfeld DP had vs. did not have an antecedent in context). By crossing these factors, each experimental item appeared in the four conditions. Each item appeared in each list only once, and each list contained an equal number of items for each condition. Hence, both factors were realised within subjects and within items.

*Procedure.* The procedure was the same as in Experiment 1 and 2, where the reader is referred to for the details. Experiment 3 was divided into two blocks with 24 experimental texts each. Each experimental session lasted about 45 minutes.

### 5.3.2 Results

The dependent variables in Experiment 3 were the reading times for the single words of the prime and the target sentences, and the percentage of wrong responses to the comprehension question.

As in the two experiments reported above, the first step of the analysis

was to screen the raw data for outliers. All reading times faster than 100 ms and slower than 3000 ms per word were treated as missing values. After this preliminary screening, I excluded all observations that deviated more than 2 SDs from both the subject and the item means at a given position for each condition. By this procedure, 2.2 % of the observations were removed.

### Results for the Prime Sentences

The first analysis conducted pertained to the first of the two elaborating sentences, the prime sentence. Table 5.3.2 shows the descriptive data for each position:

**Table 5.3.2:** Mean Reading Times (in ms) for the Prime Sentence in Experiment 3

Condition	Det	NP1	V	Det	NP2
SO, – MENTION	630	654	659	497	1107
SO, + MENTION	665	642	646	469	1101
OS, – MENTION	644	743	713	539	1303
OS, + MENTION	695	710	687	539	1322
	<i>Der/</i> <i>Den</i>	<i>X</i>	<i>V-te</i>	<i>den/</i> <i>der</i>	<i>Y, ...</i>

Two ANOVAs for repeated measurements were performed on these data with the two 2-level factors WORD ORDER (SO vs. OS) and MENTION (sentence initial DP had vs. did not have an explicit antecedent). The  $F_1$ -ANOVA treated participants, and the  $F_2$ -ANOVA items as the random factor. The results will be reported for each position successively.

The determiner of the first DP did not show a significant effect of WORD ORDER in the subject analysis ( $F_1(1,23) = 1.17, p > .10$ ), though there was a trend towards an effect in the item analysis ( $F_2(1,23) = 3.52, p = .07$ ). Further, there was a significant effect of MENTION ( $F_1(1,23) = 5.60, p \leq .05$ ;  $F_2(1,23) = 7.87, p \leq .01$ ). The interaction of the two factor however was not significant in either analysis, both  $F$ s < 1.

On the first NP, there was a highly significant effect of WORD ORDER ( $F_1(1,23) = 10.20, p \leq .01$ ;  $F_2(1,23) = 20.38, p \leq .001$ ), but none of MENTION:

$F_1(1,23) < 1$ , and  $F_2(1,23) = 1.40$ ,  $p > .10$ . The interaction did not turn out to be significant either, both  $F$ s  $< 1$ .

The subject analysis for the position of the verb showed a significant effect of WORD ORDER ( $F_1(1,23) = 5.46$ ,  $p \leq .05$ ), while the item analysis did not ( $F_2(1,23) = 2.08$ ,  $p > .10$ ). There was no significant effect of MENTION on the verb, again both  $F$ s  $< 1$ . The same holds for the interaction.

On the determiner of the second DP, we found a highly reliable effect of WORD ORDER:  $F_1(1,23) = 6.99$ ,  $p \leq .01$ , and  $F_2(1,23) = 14.66$ ,  $p \leq .001$ . The effect of MENTION did not reach significance ( $F_1(1,23) = 1.35$ ,  $p > .10$ ;  $F_2(1,23) < 1$ ). The interaction of the two factors also failed to reach significance:  $F_1(1,23) = 1.48$ ,  $p > .10$ , and  $F_2(1,23) = 1.20$ ,  $p > .10$ .

Finally, on the last element of the prime sentence, the NP, we again found a highly significant effect of the WORD ORDER manipulation:  $F_1(1,23) = 17.64$ ,  $p \leq .001$ ;  $F_2(1,23) = 17.82$ ,  $p \leq .001$ . The effect of MENTION however was not significant, again both  $F$ s  $< 1$ . The same holds for the interaction WORD ORDER  $\times$  MENTION. Figure 5.3.1 illustrates these findings.

**Figure 5.3.1:** Mean Reading Times for All Positions in the Prime Sentence of Experiment 3

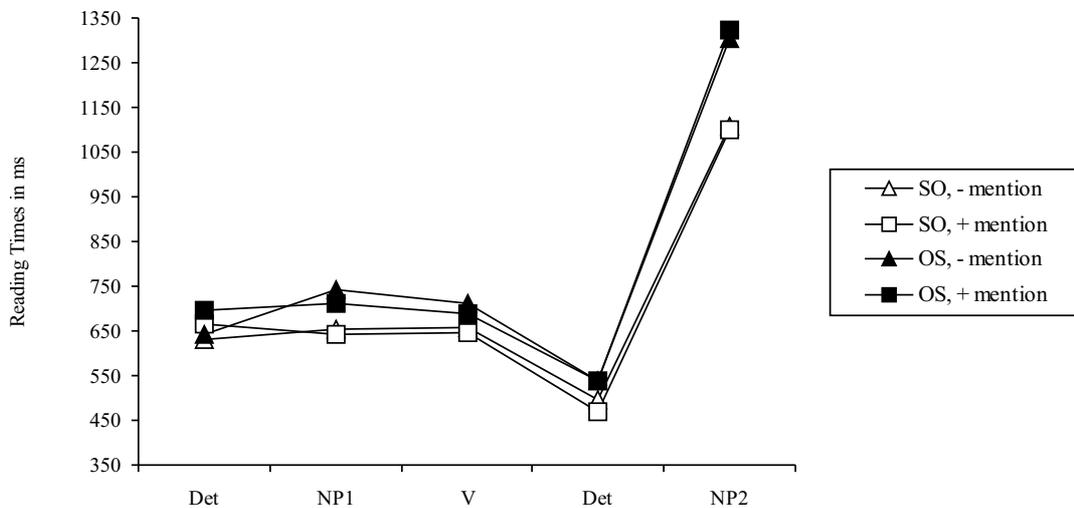


Table 5.3.3 gives an overview of the effects found for the first elaborating sentence of Experiment 3.

**Table 5.3.3:** Effects for the Reading Times in the Prime Sentence in the Subject ( $F_1$ ) and Item Analysis ( $F_2$ ) in Experiment 3\*

Factor		Det	NP1	V	Det	NP2
WORD ORDER	$F_1$	—	**	*	**	***
	$F_2$	+	***	—	***	***
MENTION	$F_1$	*	< 1	< 1	—	< 1
	$F_2$	**	—	< 1	< 1	< 1
WORD ORDER × MENTION	$F_1$	< 1	< 1	—	—	< 1
	$F_2$	< 1	< 1	—	—	< 1

\*)‘—’ abbreviates:  $p > .10$ ; ‘+’ :  $p < .10$ ; ‘\*’ :  $p < .05$ ; ‘\*\*’ :  $p < .01$ , and ‘\*\*\*’ :  $p < .001$ .

The discussion of these results will be combined with that of the data for the target sentence.

### Results for the Target Sentence

The descriptive analyses of the reading times for the second, the target sentence, and of the error rates yielded the following results:

**Table 5.3.4:** Mean Reading Times for the Target Sentence (in ms) and Error Rates (in %) in Experiment 3

Condition	Conj	Det	NP1	V	Det	NP2	Adverb	Errors
SO, -MENTION	626	430	661	692	498	843	928	15,3
SO, +MENTION	622	433	622	649	493	836	945	12,5
OS, -MENTION	742	516	699	702	509	877	1090	14,6
OS, +MENTION	662	456	639	692	523	888	968	11,8
...	<i>und</i>	<i>der/ den</i>	<i>X</i>	<i>V-te</i>	<i>den/ der</i>	<i>Y</i>	<i>adverblich.</i>	

On these data, two ANOVAs for repeated measurements were performed with the two two-level factors WORD ORDER (SO vs. OS in both prime and target sentence) and MENTION (explicit antecedent for presupposition of Vorfeld DP supplied vs. not supplied by context). In the  $F_1$ -ANOVA, participants, and in the  $F_2$ -ANOVA, items were treated as the random factor. The results will be reported for each position successively.

On the conjunction, we found a highly significant effect of WORD ORDER:  $F_1(1,23) = 13.32, p \leq .001$ ;  $F_2(1,23) = 7.01, p \leq .01$ . For the MENTION factor, there was a trend towards an effect ( $F_1(1,23) = 4.21, p \leq .05$ ;  $F_2(1,23) = 2.35, p > .10$ ). There was no interaction of these two factors on the conjunction ( $F_1(1,23) = 2.17, p > .10$ ;  $F_2(1,23) = 1.87, p > .10$ ).

The determiner of the first DP also showed a highly significant effect of WORD ORDER:  $F_1(1,23) = 10.36, p \leq .01$ ;  $F_2(1,23) = 12.47, p \leq .01$ . As on the conjunction, the effect MENTION was only visible as a trend ( $F_1(1,23) = 3.72, p = .07$ ;  $F_2(1,23) = 2.60, p = .12$ ). A similar pattern emerged for the interaction WORD ORDER  $\times$  MENTION:  $F_1(1,23) = 3.66, p = .07$ ;  $F_2(1,23) = 2.27, p = .15$ .

Turning to the first NP, we found no significant effect of WORD ORDER ( $F_1(1,23) = 1.08, p > .10$ ;  $F_2(1,23) = 1.97, p > .10$ ). The factor MENTION didn't have a significant effect, either, though there was trend in the subject analysis ( $F_1(1,23) = 3.56, p = .07$ ;  $F_2(1,23) = 1.97, p > .10$ ). There was no statistically reliable interaction on this position, both  $F$ s  $< 1$ .

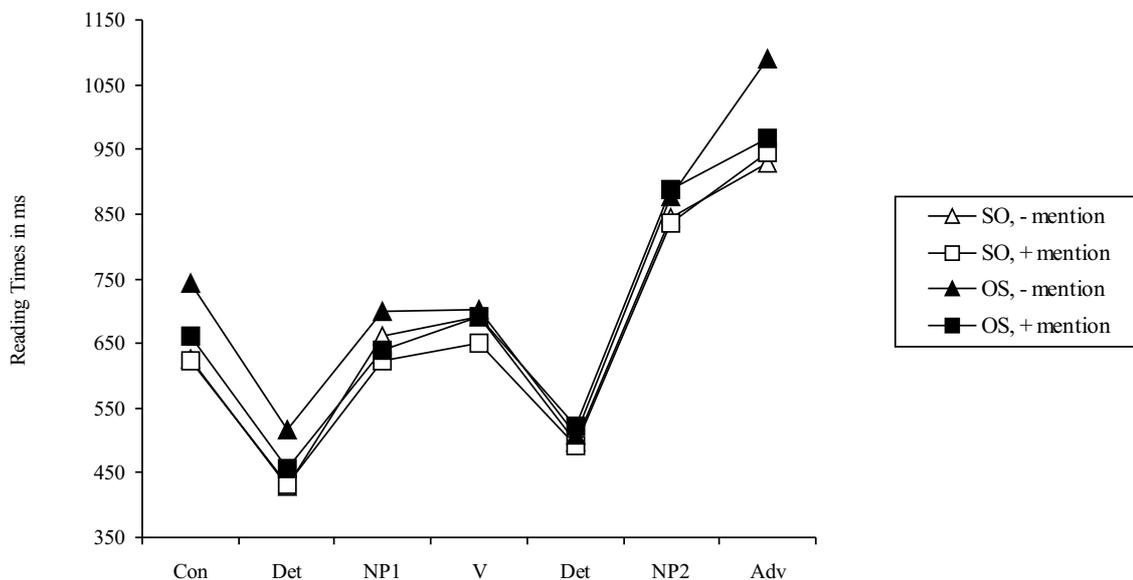
For the position of the verb, we did not find any significant effect of WORD ORDER, both  $F$ s  $< 1$ , nor of MENTION, both  $F$ s  $< 1$ , too, nor did the interaction of these factors reach significance: here also both  $F$ s  $< 1$ .

The same holds for the determiner of the second DP: it didn't show any significant effects either: WORD ORDER:  $F_1(1,23) = 2.09$ ,  $p > .10$ ;  $F_2(1,23) = 2.56$ ,  $p > .10$ ; MENTION: both  $F$ s  $< 1$ ; WORD ORDER  $\times$  MENTION: also both  $F$ s  $< 1$ .

We found a similar patten for the second NP, where there also were no significant effects (WORD ORDER :  $F_1(1,23) = 2.78$ ,  $p > .10$ ;  $F_2(1,23) = 1.91$ ,  $p > .10$ ; MENTION: both  $F$ s  $< 1$ ; and WORD ORDER  $\times$  MENTION: also both  $F$ s  $< 1$ ).

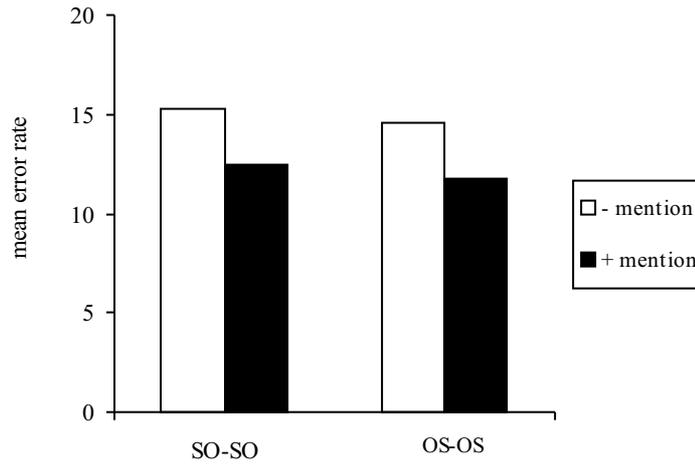
On the sentence final adverbial, the WORD ORDER effect reappeared ( $F_1(1,23) = 6.21$ ,  $p \leq .05$ ;  $F_2(1,23) = 5.39$ ,  $p \leq .05$ ), while there still was no significant effect of MENTION ( $F_1(1,23) = 2.29$ ,  $p > .10$ ;  $F_2(1,23) = 1.55$ ,  $p > .10$ ). However, the interaction WORD ORDER  $\times$  MENTION was visible as a trend in the subject analysis and highly significant in the item analysis ( $F_1(1,23) = 2.96$ ,  $p = .10$ ;  $F_2(1,23) = 8.15$ ,  $p \leq .01$ ). The results for the reading times are illustrated in Figure 5.3.2.

**Figure 5.3.2:** Mean Reading Times for All Positions in the Prime Sentence of Experiment 3



Finally, as Figure 5.3.3 illustrates, the error rates did not show significant effects of either of the factors, all  $F$ 's  $< 1$ .

**Figure 5.3.3:** Mean Error Rates by Condition for Experiment 3



The results for the second sentences in Experiment 3 reported so far are summarized in table 5.3.5:

**Table 5.3.5:** Effects for the Reading Times in the Target Sentence and the Error Rates in the Subject ( $F_1$ ) and Item Analysis ( $F_2$ ) in Experiment 3\*

Factor		Con	Det	NP1	V	Det	NP2	Adv	Errors
WO	$F_1$	***	**	—	< 1	—	—	*	< 1
	$F_2$	**	**	—	< 1	—	—	*	< 1
MENTION	$F_1$	*	+	+	< 1	< 1	< 1	—	< 1
	$F_2$	—	—	—	< 1	< 1	< 1	—	< 1
WO × MENTION	$F_1$	—	+	< 1	< 1	< 1	< 1	+	< 1
	$F_2$	—	—	< 1	< 1	< 1	< 1	**	< 1

\*) 'WO' abbreviates "word order"; '—' is  $p > .10$ ; '+' :  $p < .10$ ; '\*' :  $p < .05$ ; '\*\*' :  $p < .01$ , and '\*\*\*' :  $p < .001$ .

### 5.3.3 Discussion

In Experiment 3, all contextual factors that have proven to have an influence on the processing of OS structures in the earlier experiments were brought into position against the subject-first preference. And indeed it seems that, if these factors conspire, the processing of OS structures is not substantially harder than that of SO structures. But before we turn to the discussion of the broader implications this interpretation of the data may have with respect to the psycholinguistic and theoretical considerations in the next chapter, let us consider the data pattern found in Experiment 3 in more detail.

The reading times for the prime sentence showed a persistent word order effect from the first NP to the sentence final second NP. That OS structures were processed significantly slower than SO structures indicates that the first sentence was prone to the subject-first preference. The only position that did not exhibit a significant effect of the word order manipulation was the determiner of the first NP. On this position, there was an effect of explicit antecedents instead. But it did not consist, as expected, in a facilitation for the + MENTION condition, but in one for the — MENTION condition. Accordingly, the determiner of the first DP was processed faster when the whole DP had no explicit antecedent in context. How this effect should be interpreted is far from clear. The only difference between the conditions exhibiting it up to that point in processing is the explicit mention of the antecedents for the referents presupposed by the whole NP. But since this NP hasn't been processed completely at this point, we may not safely draw the conclusion that the difference between the conditions really pertains to the difference between the strategies of presupposition binding vs. accommodation. Even the fact that, when considering the compositional make-up of the DP (see Appendix A), we might consider the determiner as the real trigger for the presupposition, does not lend itself to any interpretation that would go beyond mere speculation.

The lack of an interaction between the two factors in the prime sentence reminds of the findings for Experiment 1: although binding presupposed information to an explicit antecedent is preferred to inferring the attachment point (as was the case in Experiment 1), it does, for itself, not seem to be strong enough to interact with the highly robust word order effect. That is, the advantage of having an explicit antecedent over having to infer the antecedent alone is not strong enough a factor to interact with word order.

Let us now turn to the results for the target sentence. Here, as in Experiment 2, the word order effect is mostly levelled out by the effect of parallel structure (recall that all items in Experiment 3 had parallel structure). The

only point where word order showed significant effects was on the transitory positions between the two conjuncts: on the connective, and on the determiner of the first DP. If we reconsider the data in table 5.3.4, this effect can be attributed to a spill-over from the first conjunct, where the processing difficulty associated with the OS structure was highly significant in the sentence final region. The fact that no position in the second conjunct except the sentence final adverbial showed a significant effect of the word order manipulation indicates that parallel structure has superseded this effect, and that only when the parser has to integrate the information at the end of the sentence, word order seems to influence that process again.

The reading times for the prime sentence showed a persistent word order effect from the first NP to the sentence final second NP. That OS structures were processed significantly slower than SO structures indicates that the first sentence was prone to the subject-first preference. The only position that did not exhibit a significant effect of the word order manipulation was the determiner of the first NP. On this position, there was an effect of explicit antecedents instead. Contrary to what was expected, it did not consist in a facilitation for the + MENTION condition, but in one for the -MENTION condition. Accordingly, the determiner of the first DP was processed faster when the whole DP had no explicit antecedent in context. How this effect should be interpreted is far from clear. The only difference between the conditions exhibiting it up to that point in processing is the explicit mention of the antecedents for the referents presupposed by the whole NP. But since the lexical content of the NP picking up the antecedent has not been processed completely at this point, the difference found cannot be related to a search process for antecedents. Rather, it seems safe to conclude that the “facilitation” for the -MENTION-condition reflects additional processing costs originating from the +MENTION-condition. That is, the additional memory load due to the storage of the explicitly mentioned antecedents spills over to the first element of the prime sentence, the determiner of the first DP. This is in line with the findings for the determiner of the target sentences, where there was no significant effect of MENTION.

Turning to the effect of the presence of an explicit antecedent for the referent presupposed by the sentence initial DP, I have to admit that it turned out to have much less influence than I expected. It reached significance on the conjunction only, and only in the subject analysis. This effect seems to be carried mostly by the OS conditions, where the processing difficulty for the -MENTION resulted in a difference of 80 ms, whereas it was only 4 ms in the SO condition. This effect remained as a trend in the subject analysis for the two elements of the first DP, but then vanished completely. I would have expected a relatively strong manipulation like the presence/absence of

an explicit antecedent to have an effect on parsing the sentence final region, but it simply did not, at least not as a main effect. However, the  $\pm$ MENTION effect turned up in the sentence final interaction, which we will turn to now.

The reason for predicting an interaction of the two factors was the following: given the results from the first two experiments that both inferability and parallel structure were not strong enough to modulate the word order effect, we concluded that we must induce a factor which not only relates to the structural parallelism between the two elaborating sentences, but which also ties this factor to some property of the individual sentences. This was the explicit antecedent of the referent presupposed by the sentence initial DP. The hypothesized interaction, if found, should indicate that, firstly, OS structures, being marked structures, would profit more from both factors, and secondly, the processing of OS structures, given the right kind of context, would not be substantially harder than that of SO structures. And indeed, the descriptive data in Table 5.3.4 show that, at least for the first five positions of the target sentence, the reading times for the two SO conditions do not differ substantially from those of the OS, +MENTION condition. Still, the interaction showed up only at the sentence final adverb, and was visible as a trend only in the subject analysis. It is due to the two OS conditions, where the difference for the MENTION factor was 122 ms, whereas it was only 17 ms between the two SO conditions. Though this result is not as statistically robust as one would wish, we nevertheless may safely conclude that at this point in processing, i.e. during the integration processes the parser is occupied with in the sentence final region, OS structures do indeed benefit more from the presence of an explicit antecedent in the context than SO structures. Or, to rephrase that point from another perspective: when confronted with two parallel OS structures that elaborate on a discourse topic, the parser appreciates having an explicit attachment point in the context for the presuppositions triggered by the two sentence initial object DPs. How these findings relate to psycholinguistic and theoretical considerations concerning the relation of information structure to discourse context will be discussed in the next chapter.

# Chapter 6

## Concluding Discussion

The final chapter has three objectives: firstly, it will discuss the empirical findings from the experiments described in chapter 5 in relation to other psycholinguistic studies. Secondly, I will discuss the results of the experiments in relation to the theoretical analysis given in chapters 2 and 3 for definite DPs in the Vorfeld of German verb-second sentences. And finally it will point to some questions and problems that remain open, and make some suggestion for further research.

The results of the experiments reported in chapter 5 are largely in line with earlier studies investigating the processing of word order variation in German.

First and foremost, the data clearly showed an effect of the subject-first preference reported in the literature and discussed in chapter 4; see section 4.1.2. As in the study of Bayer & Marlsen-Wilson (1992), the fact that the critical sentences were embedded into small text sequences did not alter this effect. But, and this deserves emphasis, the *form* of these texts obviously did matter. Otherwise the findings for all three experiments for the factors INFERABILITY, PARALLEL STRUCTURE, and MENTION could not be explained, since all three factors systematically varied properties of the context into which the critical sentences were embedded. And from the fact that these factors had significant effects, we may conclude that these contextual properties did influence processing.

The effect of INFERABILITY is in line with e.g. the findings discussed in Garrod & Sanford (1994): if a referent is inferable from world knowledge via a bridging inference, the sentence containing it will be processed faster than when it is not. The hypothesis put forward with respect to Experiment 1 was that this property of being inferable should interact with the manipulation of word order. That the results did not show this interaction however can be argued to be due to the relatively long overall reading times found in

this experiment. These were induced by the comprehension question always pertaining to the information supplied by the critical sentence, which slowed the participants down on this sentence. Since the +INFERABLE condition was fairly similar to the condition that Bayer & Marslen-Wilson (1992) dubbed “non-supporting context”, the results that I have found in Experiment 1 are consistent with the findings in the abovementioned condition of their Experiment 3. However, in the experiment reported here, no contrastive reading of the Topic DP was part of any other condition, which may make it difficult to compare the results.

The lack of an interaction between the effects in presence of the statistically reliable strong main effects can be interpreted as an indication that the inferability of the referent denoted by the Vorfeld DP is not a factor that of itself is able to license the movement of a direct object to the sentence-initial position.

Experiment 2 was designed to see whether the subject-first preference could be dampened by contextual manipulations at all. Since the Parallel Structure Effect is known to be very robust from the literature, and since it has been shown to be sensitive to markedness phenomena, it seemed to be a good candidate to interact with the word order variation factor. The reasoning behind this was that a marked structure like OS should benefit *more* from the effect of a preceding sentence with parallel structure than the canonical SO sentence. Additionally, the discourse structure should reinforce the parallel structure effect, since both sentences stood in the same rhetorical relation to the context, namely Elaboration.

However, the predicted interaction was not found in Experiment 2 either. Both main factors had significant effects on processing, but it was not the case that fronted object DPs profited more from the parallel structure than subjects. It was suspected that this must be ascribed to the fact that in Experiment 2, the DPs also were merely inferable from the context, and that this contextual relation, even when backed up with the effect of Parallel Structure, was not strong enough to license an OS structure.

This was the reason that in Experiment 3, a stronger relation to context was induced, namely that of having an explicit antecedent. According to the theory of presupposition binding of van der Sandt (1992) and Geurts (1999), the presupposition triggered e.g. by a definite DP prefers to have an explicit antecedent (or, in the terms of Asher & Lascarides (1998a and b), an attachment point in the discourse) that it can bind to, rather than having to accommodate the context so as to infer an antecedent. This preference has also been found to be relevant in processing, and hence it seemed reasonable

to have the factor MENTION introduced: the context either did or did not provide an explicit antecedent; in the latter case, it was “merely” inferable. Bringing this factor, backed up by the Parallel Structure Effect (remember all items had parallel structure in Experiment 3), into position against the SO preference should result in an interaction, since the contextual restriction for the second of the two parallel sentences was even stronger due to the fact that the first sentence either did or did not supply the connection to the explicit antecedent in the discourse context.

The results of Experiment 3 seem to indicate that this indeed is the case. The interaction of the factors MENTION and WORD ORDER seemed to indicate that indeed object DPs in the Vorfeld profited more from the explicit antecedent than did the subject DPs. This may be explained along the lines suggested by Frazier et al. (1984) that a marked construction in the first of two parallel sentences increases the processing facilitation induced by parallel structure more than a non-marked first sentence does.

Taken together, the experiments essentially indicate that the subject-first preference may only be modulated when relatively strong contextual factors like Parallel Structure plus an explicit antecedent supplied by the context conspire against the structural preference.

If we relate this to the theoretical analysis of the contextual restriction of topicalised Vorfeld DPs put forward in chapters 2 and 3, these results do not come unexpected. To recapitulate: In chapter 2 I tried to argue for an explanation of the notion of “markedness” a given Information Structure exhibits and which is expressed in terms of the degree of complexity of the Information Structure. This led to the formulation of a scalar notion of contextual restriction that is imposed on a context by the Information Structure of a sentence. In this scale, the structures that were employed in the experiments, namely SO vs. OS structures with non-focal initial elements were ranked below sentences with a focused subject in the Vorfeld position, which in turn would be ranked below a sentence with a focused object in that position. Given that even experiments that employed these highly marked structures (e.g. by having the Vorfeld element focussed by a focus question, s. Bader & Meng (1999)) found only weak effects of context for unambiguous structures, it may come as a surprise that the less marked structure with a non-focal initial element employed here interacted with the contextual factors at all. But given Frazier et al.’s (1984) interpretation of their results that a marked structure can induce a stronger Parallel Structure Effect than a non-marked one, and given the explication of markedness as contextual restriction, this does make sense: at least for Experiment 3, the markedness of the structure,

i.e. its requirement on the context seemed to be satisfied.

An explanation for the relatively weak effects that goes into a different direction is that the discourse contexts constructed in the experimental texts did not meet the restriction imposed by the Topic DPs at all—i.e. that they were basically just the wrong kind of contexts. With the evidence accrued so far, I think this possibility can be precluded, since the fact that the contextual factor in Experiment 3 did interact with the word order factor can be taken as evidence against this explanation. This is to say that, if the contexts indeed would have been of the wrong type, this would raise the question as to why the structure that is harder to parse (OS) should have profited from these contextual features? Since this consequence is absurd, I take the above explanation to be refuted.

It goes without saying that the interaction found in Experiment 3 will not suffice to say anything about the appropriateness of the theoretical constructs proposed in chapter 2 and 3. In order to find evidence for the adequacy of explaining the markedness of a sentence in terms of its Information Structural complexity, one would have to compare more than two of the construction types. So far, the experiments only speak in favor of one of the comparisons, namely that a Vorfeld DP in the grammatical role of the direct object is indeed more restrictive than one being the subject of the sentence.

Further, the data from Experiment 3 are perfectly compatible with the intuition behind van der Sandt's (1992) and Geurts' (1999) theory of presupposition, namely that it is harder to infer a presupposed referent from context than to just bind to it. Indeed, the data show that the discourse structure employed in the experiments, together with the explicit antecedent being available in the +MENTION condition, made the processing of the object-first structure nearly as fast as that of a subject-first structure. If we ascribe this to the fact that, at least in the +MENTION condition the contextual restriction imposed by the OS structure is satisfied by the properties of the discourse structure it is embedded in, then we might conclude that Information Structure indeed serves the function of a processing guide.

It need not be emphasized at this point that the theoretical approach taken here, as well as the empirical studies presented, are but a small step into the direction of a better understanding of the connection between Information Structure and discourse structure. The list of questions remaining open is too long to be listed in entirety. To name only a few of them: the theoretical status of Focus Structure in the conception of Information Structural Markedness; the relation of Topicalization to other kinds of word order variability like e.g. Scrambling; the generalizability of the approach advanced

here for transitive structures to more complex ones like ditransitives, not to speak of more complex sentence structures containing adverbials, etc. Beyond that, the scale of contextual restrictions that I proposed in chapter 2, and which is far from being completed, in itself generates a considerable number of research questions with both theoretical and empirical significance.

This, as well as the results achieved, seems to me to indicate that it may be the right kind of strategy pursued here: by combining different branches of research on Information Structure like formal semantics/pragmatics and psycholinguistics, this problematic notion may become at least a bit more perspicuous. It does not seem unreasonable to apply this strategy to further problems.

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# Appendix A

## Compositional Derivation of an Object-Initial Sentence

The sentence is:

- (A.1) *Den Kellner beleidigte der Gast.*  
The<sub>acc</sub> waiter insulted the<sub>nom</sub> guest.  
'The waiter was insulted by the guest.'

Derivation in compositional SDRT (Asher, 1993) with definites as Generalized Quantifiers containing dynamic conjunction and a presuppositional operator applied to the restrictor; the notation is linear, i.e. [DRS-universe : DRS conditions]

- def. article  $d-$ :  $\lambda P \lambda Q[: \partial[P(x) \Delta Q(x)]$
- *Kellner*:  $\lambda(y)[waiter(x)]$
- *Gast*:  $\lambda(x)[guest(x)]$
- *beleidig-*:  $\lambda x \lambda y \lambda e[ : e-insult(x,y)]$
- *Tense and Mood (C°)*:  $\lambda P[e, n : P(e) \wedge e \prec n]$

bottom-up construction procedure:

- *der Gast*:  $\lambda P \lambda Q[: \partial[P(x) \Delta Q(x)](\lambda(x)[guest(x)])$   
 $\equiv \lambda Q[: \partial[\lambda(x)[guest(x)](x)] \Delta Q(x)]$

$$\equiv \lambda Q[: \partial[\textit{guest}(x)]\Delta Q(x)]$$

(by functional application)

- *der Kellner*:  $\lambda P\lambda Q[: \partial[P(y)]\Delta Q(y)](\lambda(x)[\textit{waiter}(y)])$

$$\equiv \lambda Q[: \partial[\lambda(y)[\textit{waiter}(y)](y)]\Delta Q(y)]$$

$$\equiv \lambda Q[: \partial[\textit{waiter}(y)]\Delta Q(y)]$$

(by functional application)

- $[_{\text{C}}\textit{obeleidigte}]$ :  $\lambda P[e, n : P(e) \wedge e \prec n](\lambda x\lambda y\lambda e[: e - \textit{insult}(x, y)])$

$$\equiv \lambda x\lambda y[\lambda P[e, n : P(e) \wedge e \prec n](\lambda x\lambda y\lambda e[: e - \textit{insult}(x, y)])(y)(x)]$$

$$\equiv \lambda x\lambda y[\lambda P[e, n : P(e) \wedge e \prec n](\lambda e[: e - \textit{insult}(x, y)])]$$

$$\equiv \lambda x\lambda y[e, n : \lambda e[: e - \textit{insult}(x, y)](e) \wedge e \prec n]$$

$$\equiv \lambda x\lambda y[e, n : e - \textit{insult}(x, y)] \wedge e \prec n]$$

(by functional composition)

- *beleidigte der Gast*:

$$\lambda Q[: \partial[\textit{guest}(x)]\Delta Q(x)](\lambda x\lambda y[e, n : e - \textit{insult}(x, y)] \wedge e \prec n]$$

$$\equiv \lambda y[\lambda Q[: \partial[\textit{guest}(x)]\Delta Q(x)](\lambda x\lambda y[e, n : e - \textit{insult}(x, y)] \wedge e \prec n)](y)]$$

$$\equiv \lambda y[\lambda Q[: \partial[\textit{guest}(x)]\Delta Q(x)](\lambda x[e, n : e - \textit{insult}(x, y)] \wedge e \prec n)]$$

$$\equiv \lambda y[: \partial[\textit{guest}(x)]\Delta \lambda x[e, n : e - \textit{insult}(x, y)] \wedge e \prec n]](x)]$$

$$\equiv \lambda y[: \partial[\text{guest}(x)]\Delta[e, n : e - \text{insult}(x, y)] \wedge e \prec n]]]$$

(by functional composition)

- *den Kellner beleidigte der Gast:*

$$\lambda Q[: \partial[\text{waiter}(y)]\Delta Q(y)](\lambda y[: \partial[\text{guest}(x)]\Delta[e, n : e - \text{insult}(x, y)] \wedge e \prec n]])$$

$$\equiv [: \partial[\text{waiter}(y)]\Delta \lambda y[: \partial[\text{guest}(x)]\Delta[e, n : e - \text{insult}(x, y)] \wedge e \prec n]](y)]$$

$$\equiv [: \partial[\text{waiter}(y)]\Delta[: \partial[\text{guest}(x)]\Delta[e, n : e - \text{insult}(x, y)] \wedge e \prec n]]]$$

(by functional application)

See chapter 2.2.3 for the interpretation of dynamic conjunction and the pre-suppositional operator  $\partial$ .

# Appendix B

## Experimental Materials

### B.1 Materials for Experiment 1

The 4 conditions in which the critical sentences, abbreviated here for reasons of space. Thus, “Der/den Kellner beleidigte den/der Koch ziemlich heftig.” represents the two in-ferable conditions SO: “Der Kellner beleidigte den Koch ziemlich heftig.” and OS: “Den Kellner beleidigte der Koch ziemlich heftig.”.

(1) Peter hatte sich auf seine Mittagspause gefreut. Er war in die kleine Pizzeria in der Innenstadt gegangen, wo allerdings schlechte Stimmung herrschte.

Der/den Kellner beleidigte den/der Koch ziemlich heftig.  
Der/den Metzger beleidigte den/der Koch ziemlich heftig.

(2) Esther war ziemlich sauer. Das neue Sofa hätte schon gestern geliefert werden sollen. Sie fuhr im Möbellager vorbei, um sich nach dem Grund für die Verzögerung zu erkundigen.

Der/den Fahrer beschuldigte den/der Lagerarbeiter zu Unrecht.  
Der/den Lehrer beschuldigte den/der Lagerarbeiter zu Unrecht.

(3) Lutz stand vor dem schwersten Verhandlungstag. Sein Mandant war eindeutig des Mordes schuldig, aber Lutz setzte grosse Hoffnung in das Gutachten.

Der/den Staatsanwalt erzürnte den/der Psychiater erheblich.  
Der/den Fernsehstar erzürnte den/der Psychiater erheblich.

(4) Seit Tagen wollte Helga dringend zum Friseur. Kurz vor Ladenschluss kam sie dort an, aber es ging heute alles besonders langsam.

Der/den Lehrling beobachtete den/der Meister sehr sorgfältig.  
Der/den Rentner beobachtete den/der Meister sehr sorgfältig.

(5) Hans freute sich schon auf die Podiumsdiskussion. Sie stellte immer den/der

Höhepunkt der Buchmesse dar und versprach auch diesmal recht spannend zu werden.

Der/den Kritiker verstimkte den/der Dichter ungewollt.  
Der/den Fahrgast verstimkte den/der Dichter ungewollt.

(6) Ansgar graute mal wieder vor der Institutssitzung. Dort herrschte zur Zeit eine eisige Stimmung, aber diesmal war es gar nicht so schlimm.

Der/den Professor behandelte den/der Dekan sehr nett.  
Der/den Verführer behandelte den/der Dekan sehr nett.

(7) Es war alles in allem ein geruhsamer Flug gewesen. Doch dann kam diese Durchsage aus dem Cockpit, wo es anscheinend drunter und drüber ging.

Der/den Funker irritierte den/der Piloten völlig.  
Der/den Henker irritierte den/der Piloten völlig.

(8) Eigentlich verstanden sich die Mitglieder des Quartetts sehr gut. Als sie aber gestern noch zusammen an der Bar saßen, wäre es fast zum Streit gekommen.

Der/den Sänger unterbrach den/der Geiger andauernd.  
Der/den Mieter unterbrach den/der Geiger andauernd.

(9) Die Verspätung betrug mittlerweile über drei Stunden. Als der Zug zum dritten Mal auf offener Strecke zum Stehen kam, erhob sich plötzlich ein grosses Geschrei.

Der/den Schaffner beschimpfte den/der Lokführer sehr heftig.  
Der/den Hausmann beschimpfte den/der Lokführer sehr heftig.

(10) Je näher die Hochzeit rückte, desto aufgeregter waren die Gäste geworden. Als sie sich in der Kirche trafen, waren alle sehr nervös.

Der/den Brautvater begrüäte den/der Pfarrer umständlich.  
Der/den Kunstmaler begrüäte den/der Pfarrer umständlich.

(11) Die neue Oper hätte ein voller Erfolg werden können. Der Komponist war zur Zeit sehr angesagt. Doch leider waren da diese ewigen Streitereien im Ensemble.

Der/den Tenor verärgerte den/der Dirigenten immer aufs Neue.  
Der/den Spion verärgerte den/der Dirigenten immer aufs Neue.

(12) Matthias hatte schon damit gerechnet, dass es beim Derby im Stadion hoch hergehen würde. Auch auf dem Platz waren die Gemüter sehr erhitzt.

Der/den Trainer belauerte den/der Schiedsrichter pausenlos.  
Der/den Fahnder belauerte den/der Schiedsrichter pausenlos.

(13) Die Taufe wäre beinahe in einem Desaster geendet. Irgendwie waren alle Beteiligten nicht ganz Herr ihrer Sinne.

Der/den Priester betrachtete den/der Paten entsetzt.  
Der/den Forscher betrachtete den/der Paten entsetzt.

(14) In der Chefetage herrschte schon seit Tagen eine seltsame Unruhe. Alle bereiteten sich gründlich auf die Sitzung vor. Dann war der Tag gekommen.

Der/den Direktor kritisierte den/der Betriebsrat sehr scharf.  
Der/den Wanderer kritisierte den/der Betriebsrat sehr scharf.

(15) Der Spielplatzmörder war immer noch nicht gefasst. Die Angehörigen wurde von Tag zu Tag ungeduldiger. Sie hatten bereits eigene Ermittlungen angestellt.

Der/den Cousin befragte den/der Inspektor noch einmal.  
Der/den Segler befragte den/der Inspektor noch einmal.

(16) Die Aufnahmen für den Film über das Amazonasmonster waren fast abgeschlossen. Das Team hatte sich eine schaurige Überraschung ausgedacht.

Der/den Regisseur erschreckte den/der Beleuchter zu Tode.  
Der/den Hausierer erschreckte den/der Beleuchter zu Tode.

(17) Eigentlich sollte der Bestechungsskandal geheim bleiben. Wie die Presse davon erfahren hatte, wusste keiner. Jetzt musste man schnell handeln.

Der/den Minister informierte den/der Staatssekretär sofort.  
Der/den Besitzer informierte den/der Staatssekretär sofort.

(18) Als sie mit ihren Freundinnen in Urlaub fuhr, befürchtete Annette, dass es bei ihr zuhause das Chaos ausbrechen würde. Aber da lag sie ganz schief.

Der/den Vater bekochte den/der Schwiegersohn rührend.  
Der/den Clown bekochte den/der Schwiegersohn rührend.

(19) Schon seit Tagen kursierten in der Unterwelt Gerüchte über eine bevorstehende Razzia. Niemand wusste, wann es so weit sein würde.

Der/den Hehler warnte den/der Trickdieb rechtzeitig.  
Der/den Pastor warnte den/der Trickdieb rechtzeitig.

(20) Peter war engagiert worden, einen Bericht über einen verwickelten Prozess zu schreiben. Am dritten Verhandlungstag kam es zu einer entscheidenden Wendung.

Der/den Verteidiger enttäuschte den/der Angeklagten zutiefst.  
Der/den Botschafter enttäuschte den/der Angeklagten zutiefst.

(21) Die ganze Familie freute sich schon auf Weihnachten. Alle wollten sich über die Feiertage entspannen. Aber der Verwandtenbesuch war den Eltern unangenehm.

Der/den Lieblingsonkel empfing den/der Vater zuerst.  
Der/den Volksvertreter empfing den/der Vater zuerst.

(22) Der/den Tod ihrer Oma war für Rita sehr hart gewesen. Die Formalitäten waren fürchterlich für sie. Aber das schlimmste war die peinliche Situation auf dem Friedhof.

Der/den Sargträger kränkte den/der Großonkel ungewollt.  
Der/den Hersteller kränkte den/der Großonkel ungewollt.

(23) Seit Wochen sollte das Treppengeländer repariert werden, aber es tat sich einfach nichts. Auch bei der Mieterversammlung konnte kein Beschluss gefasst werden.

Der/den Hausmeister belog den/der Vermieter gleich mehrmals.  
Der/den Herausgeber belog den/der Vermieter gleich mehrmals.

(24) Daniel war seit langem mal wieder beim Eishockey. In der Halle herrschte eine Bombenstimmung. Leider war es ein äusserst ruppiges Spiel.

Der/den Stürmer foulte den/der Torwart ein dutzend Mal.  
Der/den Kanzler foulte den/der Torwart ein dutzend Mal.

(25) Monika war mit einer internationalen Reisegruppe in den Vatikan gereist. Auf dem Petersplatz spielten sich recht erstaunliche Szenen ab.

Der/den Reiseleiter filmte den/der Japaner ohne Unterlass.  
Der/den Arbeitgeber filmte den/der Japaner ohne Unterlass.

(26) Beinahe wäre gestern ein schwerer Kunstraub im Museum für Moderne Kunst gelungen. Offenbar ist das Gebäude jedoch sehr hellhörig.

Der/den Wachmann hörte den/der Eindringling rechtzeitig.  
Der/den Konditor hörte den/der Eindringling rechtzeitig.

(27) An dem Jörgs neuem Haus wurde nun schon seit anderthalb Jahren gebaut, aber es ging einfach nicht voran. Immer wieder gab es neue Streitpunkte.

Der/den Ingenieur beteiligte den/der Architekten nur ungern.  
Der/den Passagier beteiligte den/der Architekten nur ungern.

(28) Die Umstände von Tante Hedwigs Ableben hatte Paula schon schäbig genug gefunden. Aber was dann bei der Testamentsöffnung passierte, war endgültig zu viel für sie.

Der/den Notar täuschte den/der Witwer völlig skrupellos.  
Der/den Jäger täuschte den/der Witwer völlig skrupellos.

(29) Tanja hatte ziemliche Angst vor der Promotion. In der Kommission herrschte eine gespannte Stimmung. Aber es war dann halb so schlimm wie befürchtet.

Der/den Gutachter erheiterte den/der Vorsitzenden sofort.  
 Der/den Einwohner erheiterte den/der Vorsitzenden sofort.

(30) Lange war die Arbeit im Untersuchungsausschuss fruchtlos geblieben. Es ging einfach nicht vorwärts. Aber gestern machte ein Zeuge eine wichtige Aussage.

Der/den Waffenhändler kontaktierte den/der Politiker häufig.  
 Der/den Bademeister kontaktierte den/der Politiker häufig.

(31) Die Familienfeier auf dem Landgasthof war ein voller Erfolg gewesen. Alle waren ein wenig angetrunken. Nun war die Frage, wie man nach hause kommen würde.

Der/den Schwager fuhr den/der Onkel zuerst.  
 Der/den Juwelier fuhr den/der Onkel zuerst.

(32) Auf dem Baggersee war ziemlich viel los. Ziemlich viele Wassersportler waren unterwegs, als plötzlich ein Gewitter aufzog.

Der/den Taucher rettete den/der Surfer in letzter Sekunde.  
 Der/den Gammler rettete den/der Surfer in letzter Sekunde.

## B.2 Materials for Experiment 2 and 3

As in the materials for Experiment 1, the SO and OS versions are abbreviated by the slash '/'; s. above. The  $\pm$ MENTION condition is abbreviated by the round brackets in the context; thus, in the +MENTION condition, the material in the bracket was present, and in the -MENTION, it was not.

(1) Dank der guten Ergebnisse der letzten Saison sicherte sich die Damen-Volleyballmannschaft höhere Sponsorengelder. Als auf der Versammlung die gute Nachricht (vom Manager und vom Trainer) verkündet wurde, wurde die Stimmung euphorisch.

Der/den Manager lobte den/der Sponsor,  
 und der/den Trainer herzte den/der Kassenwart innig.

Im Vereinsheim wurde an diesem Abend noch lange gefeiert.

(2) Die neue Abendrobenkollektion, die bei der Modenschau vorgestellt worden war, schlug in der Modewelt ein wie eine Bombe. Als der Erfolg anschliessend (vom Veranstalter und vom Designer) ausgiebig gefeiert wurde, war die Stimmung sehr ausgelassen.

Der/den Veranstalter umarmte den/der Photographen,  
 und der/den Designer küsste den/der Modepapst unentwegt.

Die Party ging noch bis in die frühen Morgenstunden.

(3) In dem neuen Bistro kam es regelmäßig vor, dass sich Gäste über das Essen beschwerten. Als ein tadelloses Tintenfischgericht (vom Restaurantkritiker und vom Gewerbeaufseher) beanstandet wurde, verhärteten sich die Fronten augenblicklich.

Der/den Restaurantkritiker demütigte den/der Kellner,  
und der/den Gewerbeaufseher verärgerte den/der Koch gehörig.

Erst als der Besitzer einschritt, klärte sich das Missverständnis auf.

(4) Die Polizeiaktion gegen die Drogenmafia war eine einzige Pleite. Als der V-Mann versehentlich (vom Privatdetektiv und vom Kommissar) enttarnt wurde, wurde allgemein Unmut wegen der Ermittlungsmethoden laut.

Der/den Privatdetektiv beschuldigte den/der Innenminister,  
und der/den Kommissar belastete den/der Staatsanwalt arg.

In der Presse wurde der Fall ausführlich diskutiert.

(5) Die Livediskussion mit dem als launisch bekannten Schauspieler war bei dem Team des kleinen Lokalsenders mit Spannung erwartet worden. Als bereits die Begrüßung (durch den Aufnahmeleiter und den Moderator) ziemlich daneben ging, befürchteten alle Schlimmstes.

Der/den Aufnahmeleiter behinderte den/der Kameramann,  
und der/den Moderator verwirrte den/der Tontechniker völlig.

Zum Glück bekam der Schauspieler davon überhaupt nichts mit.

(6) Es war nur eine Frage der Zeit, wann die gefürchtete Bande von Jessie James in Santa Fe einreiten würde. Als sie schließlich (vom Sheriff und vom Marshall) gesichtet wurde, machten sich alle in der Stadt auf ein Gemetzel gefasst.

Der/den Sheriff erschoss den Anführer,  
und der/den Marshall erledigte den/der Kompagnon kaltblütig.

Die Bewohner von Santa Fe hielten sich in ihren Häusern versteckt.

(7) Der junge Traberhengst hatte das hochdotierte Rennen souverän gewonnen. Als das Preisgeld (dem Jockey und dem Besitzer) überreicht wurde, begann ein ausgelassenes Feiern.

Der/den Jockey umtanzte den/der Stallknecht,  
und der/den Besitzer umschlang den Züchter freudig.

Das Pferd bekam zur Belohnung einen Bananen-Hafer-Brei.

(8) Am Institut wussten alle, dass die mündliche Prüfung dieses Semester besonders schwierig sein würde. Als die fleißigen Studenten (vom Dozenten und vom Beisitzer) hereingebeten wurden, waren alle Beteiligten ziemlich nervös.

Der/den Dozent verblüffte den/der Protokollanten,  
und der/den Beisitzer überraschte den/der Prüfling angenehm.

Der Notenschnitt wurde durch das Ergebnis deutlich angehoben.

(9) Die Sitzungen des Fakultätsrates wurden angesichts der kritischen Finanzlage immer mehr zu einem Existenzkampf. Als in der Sitzung die Stellenkürzung (vom Dekan und vom Prorektor) bekanntgegeben wurde, war sich plötzlich jeder selbst der Nächste.

Der/den Dekan täuschte den/der Assistenten,  
und der/den Rektor belog den/der Studentenvertreter eiskalt.

Die Atmosphäre war für immer vergiftet.

(10) Schon lange bekämpfte die italienische Justiz die Verbindungen zwischen dem Vatikan und der/den Mafia. Als die Abhöranlage (vom Paten und vom Kardinal) im Beichtstuhl entdeckt wurde, bahnte sich ein Machtkampf an.

Der/den Pate attackierte den/der Justizminister,  
und der/den Kardinal kritisierte den/der Richter öffentlich.

Selbst die Intervention des Papstes war erfolglos.

(11) In den kleinen Zirkus hatte sich ein Saboteur eingeschlichen. Als die Nachricht (zum Zirkusdirektor und zum Dompteur) durchgesickert war, wurden alle sehr misstrauisch.

Der/den Zirkusdirektor beschattete den/der Messerwerfer,  
und der/den Dompteur belauerte den/der Clown argwöhnisch.

Die Nachmittagsvorstellung wurde ein totaler Reinflall.

(12) Das neue Kolleg in Norddeutschland war als Begegnungsstätte für Wissenschaftler und Künstler konzipiert. Als der Bericht über die erste Laufzeit (vom Physiker und vom Maler) vorgestellt werden sollte, waren alle sehr gespannt.

Der/den Physiker beeinflusste den/der Komponisten,  
und der/den Maler inspirierte den/der Psychologen nachhaltig.

Die Geldmittel für die Projekte wurden umgehend bewilligt.

(13) Das Autorengespräch war jedes Jahr ein Höhepunkt der Buchmesse. Als dieses Jahr einige verdiente Alt Autoren (vom Kritiker und vom Verleger) eingeladen wurden, gingen alle äußerst behutsam miteinander um.

Der/den Kritiker rühmte den/der Romancier,  
und der/den Verleger würdigte den/der Dramatiker wortreich.

Die Veranstaltung wurde von den Medien später als Farce bezeichnet.

(14) Das Konzert der Hamburger Punkband war ein Riesenerfolg. Als jedoch anschliessend jemand im Publikum (vom Roadie und vom Drummer) angepöbelt wurde, kam es zu einer Saalschlacht.

Der/den Roadie vermöbelte den/der Rausschmeisser,  
und der/den Drummer verdrosch den Saalordner furchtbar.

Die Gage für den Auftritt wurde nie überwiesen.

(15) Am Tag der Hochzeit waren natürlich alle ungeheuer aufgeregt. Als die Hochzeitsgesellschaft dann endlich (vom Priester und vom Kaplan) in die kleine Dorfkirche gebeten wurde, löste sich die Nervosität.

Der/den Priester belustigte den/der Brautvater,  
und der/den Kaplan erheiterte den/der Bräutigam ziemlich.

Es wurde eine rundum gelungene und unvergessliche Hochzeit.

(16) Eigentlich hatte der Bestechungsskandal der Partei unbedingt geheim gehalten werden sollen. Als die undichte Stelle (dem Staatssekretär und dem Minister) bekannt wurde, war es beinahe schon zu spät.

Der/den Staatssekretär informierte den/der Parteifreund,  
und der/den Minister warnte den/der Pressesprecher schnell.

Die Veröffentlichung des Artikels in einem Nachrichtenmagazin ließ sich allerdings nicht mehr verhindern.

(17) Die Familienfeier auf dem Landgasthof war ein voller Erfolg gewesen. Als die Gesellschaft beim Aufbruch (vom Onkel und vom Schwager) zu einem letzten Schnaps eingeladen wurde, waren alle schon sturzbetrunken.

Der/den Onkel stützte den/der Neffen,  
und der/den Schwager trug den Vater heimwärts.

Wie durch ein Wunder kamen alle unversehrt nach hause.

(18) Das Duell zwischen den beiden ortsansässigen Vereinen war immer ein sehr hitzig umkämpftes Spiel. Als sich nach einem Foul die Gemüter (beim Verteidiger und beim Torwart) nicht beruhigen wollten, musste das Spiel abgebrochen werden.

Der/den Verteidiger verfolgte den/der Schiedsrichter,  
und der/den Torwart reizte den/der Linienrichter maßlos.

Auch im Nachholspiel ging es dann wieder äußerst unschön zur Sache.

(19) Mit dem Tod der alten Herzogin hatte der Landadel seine beliebteste Repräsentantin verloren. Als beim Leichenschmaus die Verdienste der alten Dame (vom Markgrafen und vom Baron) aufgezählt wurden, wurden alle Anwesenden sehr rührselig.

Der/den Markgraf tröstete den/der Gärtner,  
und der/den Baron bemitleidete den/der Diener aufrichtig.

Die Tränen flossen reichlich an diesem Abend.

(20) Die dauernden Auseinandersetzungen mit den Indianern hatten die Arbeit der Eisenbahngesellschaft sehr erschwert. Als die Durchquerung des Reservats (mit dem Häuptling und dem Krieger) verhandelt werden sollte, herrschte eine äußerst misstrauische Stimmung.

Der/den Häuptling beargwöhnte den/der Regierungsvertreter,  
und der/den Krieger beobachtete den/der Eisenbahner heimlich.

Die Indianer merkten erst später, dass man sie übervorteilt hatte.

(21) An der Autobahnbaustelle passierten häufig unschöne Auffahrunfälle. Als die Massenkarambolage (dem Feuerwehrmann und dem Notarzt) gemeldet wurde, musste alles sehr schnell gehen.

Der/den Feuerwehrmann instruierte den/der Sanitäter,  
und der/den Notarzt chauffierte den/der Einsatzleiter selbst.

Sie kamen gottlob alle noch rechtzeitig am Unfallort an.

(22) In letzter Zeit hatte es im Kloster einige mysteriöse Todesfälle gegeben. Als die Sache offiziell (vom Inquisitor und vom Abt) untersucht werden sollte, verdächtigte plötzlich jeder jeden.

Der/den Inquisitor bespitzelte den/der Bettelmönch,  
und der/den Abt observierte den/der Glöckner ununterbrochen.

Erst spät stellte sich heraus, dass der Mörder mal wieder der Gärtner war.

(23) Nach Ende der Dreharbeiten sah sich das Team die Rohfassung des Films an. Als der vermeintliche Schnittfehler (vom Produzenten und vom Regisseur) entdeckt wurde, überschlugen sich die Schuldzuweisungen.

Der/den Produzent beschwichtigte den/der Kameramann,  
und der/den Regisseur besänftigte den/der Darsteller schnell.

Die Stimmung besserte sich augenblicklich.

(24) Die Aufführung des zeitgenössischen Musikstückes war eine totale Pleite. Als danach dem Ensemble die Liste der Fehler (vom Komponisten und vom Arrangeur) vorge-

halten wurde, entstand urplötzlich ein Handgemenge.

Der/den Komponist schubste den/der Geiger,  
und der/den Arrangeur ohrfeigte den/der Trompeter schallend.

Im Nachhinein war die Situation allen sehr peinlich.



## Appendix C

### Theses for the Disputation (in German)

# Informationsstrukturierung als Verarbeitungsanweisung: die linke Peripherie deutscher Verbzweitsätze und ihre Interpretation im Kontext

Thesen zur Verteidigung der Dissertation  
von Thomas Weskott,  
eingereicht im Dezember 2002  
an der Philologischen Fakultät der Universität Leipzig

## C.1 Einleitung

Gegenstand der vorliegenden Arbeit ist die Informationsstruktur deutscher Verbzweitsätze und ihr Verhältnis zum Kontext. Die Wortstellung des Deutschen weist eine relative Freiheit unter anderem in bezug darauf auf, welche Konstituente eines Satzes die sogenannte Vorfeldposition einnimmt, das heisst in einem Verbzweitsatz: die Position vor dem finiten Verb. Bevorzugt ist dies das Subjekt; die Variante mit dem direkten Objekt einer Transitivkonstruktion im Vorfeld ist allerdings ebenso syntaktisch wohlgeformt, wie folgendes Beispiel verdeutlicht:

- (C.1) (a) Der Kellner beleidigte den Koch.  
(b) Den Koch beleidigte der Kellner.

Variante (1.b) wird als abweichend oder *markiert* bezeichnet, da sie die Inversion der kanonischen Wortfolge (Subjekt vor direktem Objekt) darstellt (s. Höhle (1982)). Daran schließt sich jedoch unmittelbar die Frage an, was als Auslöser für eine solche Abweichung betrachtet werden kann, bzw. wodurch eine solche “Markierung” bedingt ist.

In der Dissertation wird dafür argumentiert, dass die Antwort auf diese Frage in der Interaktion zwischen der Informationsstruktur auf Satzebene einerseits und der Struktur des den Satz umgebenden Kontexts andererseits zu finden ist. Dabei wird der Begriff der Markiertheit zugunsten des substantielleren Begriffs des *Grades der Kontextrestriktion* aufgegeben. Die Informationsstruktur eines Satzes ist demzufolge als Anweisung zu verstehen, wie ein Satz in einem Kontext zu interpretieren ist. Die Markiertheit eines gegebenen Satzes ist dann auffassbar als der Grad, in welchem er spezifische Anforderungen an den ihn umgebenden Kontext stellt. Diese Auffassung ist formal wiedergegeben durch die Repräsentation informationstruktureller Eigenschaften von Sätzen im Rahmen der dynamischen Semantik.

Sowohl die theoretische Konzeption als auch der interdisziplinäre Anspruch, die aus ihr destillierten empirischen Hypothesen in psycholinguistischen Experimenten zu überprüfen, bedingen eine Einschränkung der Erörterung auf die Vorfeldposition in Verbzweitsätzen des Deutschen, und zwar auf den Vergleich Subjekt-Verb-direktes Objekt (im folgenden SO genannt) vs. direktes Objekt-Verb-Subjekt (OS).

## C.2 Informationsstruktur und Kontext

Um sich dem Verhältnis von Informationsstruktur und Kontext schrittweise zu nähern, wird zunächst nur die informationsstrukturelle Zweiteilung des Satzes in *Fokus* und *Hintergrund* herangezogen. Um zwischen Fällen wie (1.a) und (b) zu unterscheiden, erweist sich diese jedoch als nicht ausreichend: beide Sätze können gleichermaßen angemessen als Antwort auf die Frage “Wer beleidigte den Koch?” geäußert werden. Das heisst, dass die Kategorie Fokus nicht hinreichend ist, um zwischen diesen Fällen zu differenzieren.

Daher wird eine weitere Ebene der Informationsstruktur, nämlich die Partition eines Satzes in *Topik* und *Kommentar* hinzugezogen. Während Fokus letztlich nur intonatorisch oder kontextuell bestimmbar ist, lässt sich die Kategorie Topik im Deutschen in vielen Fällen rein konfigural bestimmen: das Topik fällt mit der Konstituente, die das Vorfeld besetzt, zusammen, sofern diese referentiell ist, und es geht dem Kommentar immer voran; die von Frey (2000) identifizierte Mittelfeldposition für Topiks wird hier nicht berücksichtigt. Die Einschränkung auf referentielle Vorfeldelemente schließt Fälle wie Einstellungsadverbien (z.B. “leider”) im Vorfeld als Topiks aus.

Beim Vergleich thetischer mit kategorischen Sätzen ergibt sich die Feststellung, dass sich die unterschiedliche Kontextanforderung dieser Satztypen aus dem Unterschied im Grad ihrer informationsstrukturellen Untergliederung ableiten lässt. So weist ein Satz wie

(C.2) FRIEDRICHS ist gestorben.<sup>1</sup>

der ein thetisches Urteil ausdrückt, keine Untergliederung hinsichtlich Topik-Kommentar und Fokus-Hintergrund auf, weil er nur aus Fokus bzw. Kommentar besteht. Demgegenüber ist der Satz

(C.3) Friedrichs ist GESTORBEN.

insofern informationsstrukturell gesehen *komplexer* als (2), als er ein Topik (Friedrichs) auszeichnet, über den der fokale Teil der Äusserung — der

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<sup>1</sup>KAPITÄLCHEN signalisieren den Hauptakzent des Satzes

in diesem Fall mit dem Kommentar zusammenfällt — eine Aussage macht (s. Eckardt (1996)). Mit der *aboutness*-Charakterisierung des Topiks als “Gegenstand der Satzaussage” (s. Reinhart (1981, 1995)) verbinden sich eine Reihe weiterer prototypischer Eigenschaften von Satztopiks, die von Jacobs (2001) ermittelt wurden: informationelle Separation (Trennung von Topik und Kommentar), Prädikation, und Addressierung. Vor allem die letztgenannte Eigenschaft erweist sich bei der Betrachtung von Fällen mit komplexerer Informationsstruktur als fruchtbar, da sie die Intuition erfasst, dass ein Topik eine im Kontext verankerte Adresse identifiziert, an der die Information, die der Kommentar enthält, “gespeichert” werden muss.

Auf der Grundlage dieser Beobachtungen lässt sich der Begriff der Kontextrestriktion formal definieren: nämlich als der Grad, in dem die Komplexität der informationsstrukturellen Gliederung eines Satzes dem Kontext Anforderungen auferlegt, “Adressen bereitzuhalten”. Das Maß der Komplexität ist dabei als der Grad der Partitionierung des Satzes durch die informationsstrukturellen Kategorien definiert.

Formal lässt sich die durch das Topik gestellte Anforderung eines Satzes an den Kontext, Verankerungsadressen für neue Information bereitzustellen, als die Präsupposition der Topikkonstituente wiedergeben (s. dazu Beaver (1997)). Legt man eine Bedeutungskonzeption wie die der dynamischen Semantik zugrunde, die die Bedeutung eines Satzes mit seinem Potential, einen Kontext zu verändern, gleichsetzt, so ergibt sich als Bedeutungsbeitrag einer definiten Topik-DP die Präsupposition, dass es im Kontext einen unik identifizierbaren Referenten gibt, der die Deskription der NP erfüllen muss. Diese vom Topik an den Kontext gestellte Anforderung fungiert dem dynamischen Ansatz zufolge als Filter: alle Ausgangskontexte, die die Bedingung nicht erfüllen, werden ausgefiltert und liefern keinen Kontext, auf den die weiteren Interpretationsschritte anwendbar wären. Nur in dem Fall, wo der Kontext die vom Topik gestellte Bedingung erfüllt, kann der nächste Interpretationsschritt vollzogen werden, nämlich die Anwendung der Prädikation des Kommentars auf die durch das Topik identifizierte Adresse.

Die von der Präsupposition gestellte Anforderung an den Kontext ist trivialerweise erfüllt, wenn der präsupponierte Referent im Kontext explizit erwähnt wurde. Ist dies nicht der Fall (etwa bei der Äusserung von Satz (1.b) im Rahmen der Schilderung eines Restaurantbesuchs, in der bis zur Äusserung von (1.b) kein Koch erwähnt wurde), so muss der Kontext mithilfe des Weltwissens so angereichert werden, etwa um die Information “Ereignisse vom Typ RESTAURANTBESUCH beinhalten typischerweise Subereignisse, in denen Individuen vom Typ KOCH figurieren”. Der Fall der Anbindung an ein explizites Antezedens wird in der Präsuppositionsliteratur als *Bindung*, der der Ableitung der Adresse aus dem um Weltwissen erweiterten Kontext

als *Akkommodation* bezeichnet (s. u.a. van der Sandt (1992) und Geurts (1999)).

Aufgrund des Grades ihrer informationsstrukturellen Unterteilung werden Sätze mit einer definiten Vorfeld DP in der Rolle des direkten Objekts in der Skala der Kontextanforderung zwischen Sätzen mit initialer nicht-fokaler Subjekt-DP einerseits angesiedelt, die eine geringere, und Sätzen mit fokalem Subjekt im Vorfeld andererseits, die eine grössere Kontextanforderung stellen.

### C.3 Diskursstruktur

Die in Abschnitt 2 angesprochene Konzeption der dynamischen Semantik fasst den Kontext als Menge von Mengen möglicher Welten auf (s. Stalnaker (1978)). Sie misst ihm, insbesondere dem Diskurskontext, in dem ein Satz in einem Text steht, jedoch nicht das Maß an Strukturiertheit zu, das in der Textlinguistik als definierende Eigenschaft eines Diskurses angenommen wird. So verschieden theoretische Modelle der Textstruktur im einzelnen sein mögen, so ist ihnen doch allen gemeinsam, dass sie der Organisation der einzelnen propositionalen Einheiten, die den Sätzen im Text entsprechen, eine hierarchische Struktur zugrundelegen.

Illuktionsbasierte Modelle wie das von Heinemann & Viehweger (1991) betonen den handlungsorientierten Charakter von Texten, können aber das Problem der Ableitung einer linearen Struktur aus der durch Handlungsziele definierten Hierarchie nicht lösen.

Der propositionsbasierte Ansatz von van Dijk (1981, 1998) formuliert zwar zusätzlich zu den Makroregeln, die die hierarchische Struktur verwalten, Linearisierungsprinzipien; allein auch diese erweisen sich als nicht sensitiv genug, wenn es darum geht, Wortstellungsphänomene auf Satzebene zu Eigenschaften der Ebene der Diskurssequenz in Beziehung zu setzen.

Eine Familie von Theorien, die sich dem Problem der Diskurssequenzierung aus der Perspektive satzinterner Phänomene wie Zuweisung von grammatischen Rollen und Pronominalisierung nähert und daher informationsstruktursensitiv genannt werden kann (Daneš (1974); Agricola (1975); Harweg (1979); sowie Grosz et al. (1995)), sieht sich wiederum mit dem Problem konfrontiert, die hierarchische Organisation von Textsequenzen nur aus den Oberflächeneigenschaften adjazenter Einheiten ableiten zu können. Die Determination von Diskursstrukturen durch satzinterne Phänomene wie Pronominalketten stellt jedoch eine zu restriktive Annahme dar.

Die Theorie, die den hier aufgestellten Kriterien weitestgehend genügt, ist die Theorie der segmentierten Diskursrepräsentation von Asher (SDRT;

s. Asher (1993); Lascarides & Asher (1993)). Sie formuliert nicht nur eine Komponente, die für den kompositionalen Aufbau der Satzbedeutung zuständig ist, sondern erweitert darüberhinaus den Ansatz von Mann & Thompson (1988) um ein eingeschränktes Inventar auf Axiomen basierender rhetorischer Relationen, die zwischen den Textsätzen bestehen. Die Formulierung der Axiome in einer nicht-monotonen Logik, die begrenzten Zugriff auf das Weltwissen hat, liefert, gegeben einen bestimmten vorangegangenen Diskurskontext, für jeden Satz eine Diskursrelation und einen Anknüpfungspunkt im Kontext, an den die im Satz enthaltene Information durch die Relation angebunden werden kann. Es muss jedoch nicht nur explizit im Satz enthaltene, sondern auch präsupponierte Information mittels Diskursrelationen verankert werden (s. Asher & Lascarides (1998a und b)). Die von einer definiten Vorfeld-DP ausgelöste Präsupposition wird mittels der Diskursrelation *Background* an eine als vorausgesetzt verstandene "Adresse" angebunden. Eine Erweiterung der formalen Repräsentation aus Abschnitt 2 trägt dem Umstand Rechnung, dass der Kontext vermöge der Diskursrelationen einen hohen Grad an interner Organisation aufweist, und zeigt weiterhin, in welchem Sinne Informationsstruktur als Verarbeitungsanweisung fungiert.

## C.4 Die Verarbeitung von Wortstellungsvariation

Die im Deutschen präferierte Wortstellung ist diejenige, bei der das Subjekt allen anderen Argumenten des Verbs vorangeht. Dies ist durch eine Vielzahl von psycholinguistischen Studien nachgewiesen worden.

So haben Pechmann et al. (1994) unter Verwendung verstehens- und produktionsseitiger Methoden gezeigt, dass diese Abfolge im Mittelfeld des deutschen Satzes, also im Bereich zwischen linker Satzklammer und finitem Verb, allen anderen vorgezogen wird.

Die SO-Präferenz ist in der Nachfolge auch für eine Vielzahl von Konstruktionstypen, darunter auch für w-Fragen (Schlesewsky et al. (2000)) und sogar für ungrammatikalische Sätze (Meng & Bader (2000)) nachgewiesen worden. Angesichts der robusten empirischen Evidenzen stellt sich die Frage, warum eine so wenig präferierte Struktur wie OS von Sprechern überhaupt gewählt werden sollte. Der Umstand, dass die erwähnten Studien den Kontext allenfalls in Form von Fragen modelliert haben, wirft die Frage auf, ob die in den Abschnitten 2 und 3 erörterte Kontextanforderung der OS-Struktur in diesen Studien erfüllt war.

Vor diesem Hintergrund kommt der Studie von Bayer & Marslen-Wilson

(1992) besondere Bedeutung zu, da sie SO- vs. OS-Strukturen im Kontext kleiner Texte präsentierten, die systematisch variiert waren. Allerdings fanden die Autoren keinen Einfluss des Kontexts auf den Verarbeitungunterschied zwischen OS- und SO-Strukturen. Methodische Probleme, sowie Unklarheiten bezüglich der induzierten Beziehung zwischen Diskursstruktur und Informationsstruktur erschweren jedoch eine unzweideutige Interpretation der Daten als Beleg für die Kontextunabhängigkeit der SO-Präferenz.

## C.5 Experimentelle Evidenzen

In den drei Lesezeitexperimenten wurden die Erkenntnisse über den Zusammenhang von Informationstruktur und Kontextrestriktion systematisch umgesetzt. Allen drei Experimenten war gemeinsam, dass die Wortstellung eines kritischen Satzes variierte, und zwar SO vs. OS. Diese kritischen Sätze waren in kurze Texte eingebettet, die die Versuchspersonen in selbstbestimmtem Tempo lasen, und zu denen sie Verständnisfragen beantworten mussten. Neben dem prozentualen Anteil richtiger Antworten auf diese Frage war das Maß für die Verarbeitungsschwierigkeit vor allem die pro Wort erhobene Lesezeit. Zusätzlich zu dem bereits erwähnten Faktor Wortstellung wurde in den Experimenten jeweils eine Eigenschaft des Kontexts variiert. War der Zielsatz beispielsweise ein Satz wie in Beispiel (1.a und b) oben in den Varianten SO und OS, so wurden in den Experimenten folgende zusätzliche Faktoren manipuliert:

- Experiment 1: die satzinitiale DP war entweder aus dem Kontext inferierbar, oder nicht. D.h., im vorliegenden Fall wurde im Text ein Restaurantbesuch geschildert. Das kritische Element war nun entweder “der/den Kellner” (inferierbar), oder “der/den Metzger” (nicht inferierbar). Die Hypothese war, dass OS-Strukturen mehr von der Inferierbarkeit des kritischen Elements profitieren sollen, da ihre Kontextrestriktion stärker ist als die von SO-Strukturen, ihre Kontextsensitivität also höher ist.
- Experiment 2: dem kritischen Satz ging entweder ein Satz mit der gleichen Wortstellung voran (SO-SO, OS-OS), oder einer mit gegenläufiger Wortstellung (SO-OS, OS-SO). Alle DPen waren definit und inferierbar. Auch hier war die Hypothese, dass OS-Strukturen von einem Vorgängersatz mit paralleler Struktur mehr profitieren sollten.
- Experiment 3: hier wiesen alle experimentellen Texte Satzpaare mit paralleler Struktur auf (dies wurde durch die gleiche Anzahl nicht-paralleler Filleritems ausgeglichen). Zusätzlich wurden die satzinitialen

Elemente der beiden Sätze entweder im Diskurs explizit vorerwähnt, oder sie waren nicht vorerwähnt (und somit lediglich inferierbar). Hier war die Vorhersage ebenfalls, dass OS-Strukturen (bzw. OS-OS-Strukturen) von einer durch die vorerwähnten Antezedenten induzierten potentiellen Verarbeitungserleichterung mehr profitieren sollten als die entsprechenden SO-Strukturen.

Die Ergebnisse ergaben folgendes Bild: das Ausbleiben einer statistisch signifikanten Interaktion zwischen den beiden in Experiment 1 manipulierten Faktoren deutet darauf hin, dass die Inferierbarkeit eines satzinitialen Elements allein nicht stark genug ist, um die Subjekterstpräferenz zu überschreiben. Probanden lasen Sätze mit inferierbaren Elementen im Vorfeld signifikant schneller als solche mit nicht-inferierbaren, und SO-Strukturen schneller als OS-Strukturen. OS-Strukturen profitierten also von der Inferierbarkeit ihres initialen Elementes aus dem Diskurskontext ebenso wie SO-Strukturen, aber eben nicht wie vorhergesagt vergleichsweise mehr.

Obgleich der Faktor der Parallelstruktur in Experiment 2 die Wortstellungspräferenz stärker modulierte als der der Inferierbarkeit in Experiment 1, ergab sich wiederum keine signifikante Interaktion. Zwar wurden Parallelstrukturen schneller gelesen als nicht-parallele, aber nicht in Abhängigkeit von der Wortstellung.

In Experiment 3 schliesslich zeigte sich eine signifikante Interaktion zwischen den Faktoren Vorerwähntheit und Wortstellung. Dies kann so gedeutet werden, dass die Kontextanforderung der OS-Struktur hier durch die Vorerwähntheit und die parallele Struktur erfüllt war. Nur wenn diese beiden kontextuellen Faktoren sich gleichsam gegen die strukturelle SO-Präferenz verschwören, ist die Verarbeitung von OS-Strukturen annähernd so leicht oder schwer wie die von SO-Strukturen.

## C.6 Abschlussdiskussion

Die theoretischen Annahmen zur kontextrestringierenden Funktion der satzinitialen Position können vor dem Hintergrund der experimentellen Ergebnisse — bei aller gebotenen Vorsicht angesichts der schmalen Datenbasis — als in die richtige Richtung weisend gedeutet werden. Da der untersuchte Konstruktionstyp auf der Skala der Kontextrestriktion vergleichsweise weit unten angesiedelt ist, ist es nicht verwunderlich, dass die strukturelle Präferenz für die Subjekterststellung nur dann modulierbar scheint, wenn kontextuelle Faktoren wie Parallelstruktur und Vorerwähntheit gleichzeitig gegen sie in Anschlag gebracht werden. Im Umkehrschluss bedeutet das, dass “stärker

markierte" Konstruktionstypen, wie etwa OS-Strukturen mit kontrastivem Topik, die den Überlegungen in Abschnitt 2 zufolge aufgrund ihrer stärker untergliederten Informationsstruktur eine höhere Anforderung an den Kontext stellen, ebenso gut oder womöglich sogar besser verarbeitbar sein sollten als SO-Strukturen, wenn ihre Restriktion vom Kontext erfüllt wird.

Die Subjekterstpräferenz ist durch die hier ermittelten Befunde abermals bestätigt worden. Weiterhin konnte der verarbeitungserleichternde Effekt von Parallelstrukturen für den hier gewählten Konstruktionstyp nachgewiesen werden, ebenso wie ein Erleichterung der Verarbeitung für *Bindung* der Präsupposition der Vorfeld-DP gegenüber *Akkommodation*.

Der Verdienst der hier gewählten Vorgehensweise ist meines Ermessens zwiefältig: zum einen erlaubt die formale Repräsentation der Informationsstruktur eines Satzes als Kontextrestriktion konkrete theoretische Vorhersagen über die Eigenschaften des Diskurs- und Wissenskontexts, die erfüllt sein müssen, damit ein Satz als eine von mehreren informationsstrukturellen Varianten realisiert werden kann. Umgekehrt gesprochen: die Interpretation eines Satzes wird durch seine jeweilige informationsstrukturelle Realisierung abhängig vom Kontext, in dem er auftritt. Informationsstruktur dient demzufolge als Anweisung, wie der Satz im Kontext zu verarbeiten ist. Und zweitens kann diese Funktion als Verarbeitungsanweisung, wie hier exemplarisch gezeigt, einer systematischen experimentellen Überprüfung unterzogen werden, deren Ergebnisse wiederum für die Theorie nutzbar gemacht werden können.

Neben einer weiteren Differenzierung der formalen Repräsentation informationsstruktureller Varianten deutscher Sätze bleibt als Desiderat eine breitere empirische Untermauerung der hier gefundenen Effekte.

Dies mag zu einem besseren Verständnis der Interaktion von Kontext und Informationstruktur beitragen.