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ON THE POSITION AND INTERPRETATION OF
LOCATIVE MODIFIERS*

This study offers syntactic and semantic evidence that there are three types of locative modifiers within the verbal domain that differ with respect to their syntactic base position and interpretation. Two of them are subject to semantic indeterminacy, thereby leading to multiple utterance meanings. The study aims at showing that the full range of interpretations can be derived within a rigid account of lexical and compositional semantics. Locative modifiers are invariably treated as first-order predicates adding a locative constraint. All semantic differences originate from the structural environment they are embedded in and the pragmatic resolution of semantic indeterminacy. The syntactic distribution of locative modifiers is shown to be derivable from interface conditions.

1. INTRODUCTION

Modifiers are highly adaptive expressions. They arise in a variety of environments from which they take on certain characteristic features. This makes them a very flexible means of natural language expression. Locatives are a particularly interesting case in this respect because they not only function as modifiers but also occur as arguments of locative verbs and as predicatives in copula constructions. Hence, their lexicosemantic content is not bound to modification. In fact, even if taken as modifiers, locatives seem to be able to serve different functions. This is illustrated by the sentences in (1), where each of the locative modifiers has a distinct semantic effect.

- (1) a. Eva signed the contract in Argentina.
b. Eva signed the contract on the last page.
c. In Argentina, Eva still is very popular.

As a first approximation, the locatives in (1) can be characterized as follows. The locative in (1a) relates to the verb's eventuality argument. It refers to the place where the signing of the contract by Eva took place. The locative in (1b), while also being related to the verb's eventuality argument, does not express a location for the whole signing event but only for one of its parts, viz. Eva's signature. Finally, the locative in (1c) is not event-related but sets a frame for the proposition expressed by the rest of the sentence. In the following, these modifiers will be referred to as "external modifiers" in the case

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of (1a), "internal modifiers" in the case of (1b), and "frame-setting modifiers" in the case of (1c).

The present paper aims to determine the exact nature of the differences shown by the locative modifiers in (1a-c) and to identify their linguistic and/or extra-linguistic sources, thereby leading to a better understanding of natural language modification.

If we subscribe to the credo "One Form – One Meaning" – something which I believe should be taken at least as a challenging heuristic for any semantic enterprise – we expect locative PPs to make a constant lexicosemantic contribution irrespective of their particular function. Under this premise, the semantic differences observed in (1), rather than having lexical roots, should follow from the impact of the combinatorial machinery and/or the influence of extralinguistic knowledge.

As for their invariant lexicosemantic contribution, locatives denote the property of being located in a certain spatial region; cf., e.g., Bierwisch (1988, 1996), Wunderlich (1991). More specifically, a locative preposition expresses a two-place relation LOC between a located entity x and a landmark y , stating that x is located in a particular neighborhood region of y ; cf. (2).

- (2) a. in: $\lambda y \lambda x [\text{LOC}(x, \text{IN}(y))]$
 b. in Argentina: $\lambda x [\text{LOC}(x, \text{IN}(\text{argentina}))]$

In the following, (3) will serve as an abbreviation for the lexicosemantic contribution of locative PPs. (The meta-constant 'reg' stands for any spatial region.)

- (3) Locative PP: $\lambda x [\text{LOC}(x, \text{reg})]$

Taken in isolation, locative PPs are one-place predicates of individuals (objects or eventualities). It follows that the task of compositional semantics consists in determining their respective target argument. That is, the combinatorial machinery takes responsibility for linking the property of being located at a certain place to a suitable target referent.

The standard account of (intersective) modification within the Davidsonian paradigm is based on the conjunction of predicates; cf., e.g., Higginbotham (1985), Parsons (1990), Wunderlich (1997), Heim and Kratzer (1998). More specifically, a modifier adds a predicate that is linked up to the referential argument of the modified expression. This operation can be isolated by a template MOD as in (4). MOD takes a modifier and an expression to be modified and yields a conjunction of predicates.

- (4) MOD: $\lambda Q \lambda P \lambda x [P(x) \ \& \ Q(x)]$

In the case of adverbial modification, applying MOD leads to an analysis of the modifier as supplying an additional predicate to the verb's eventuality argument. The result of combining the locative in (5a) with the verb phrase (5b) via MOD is given in (5c). Existentially binding the eventuality variable e (and ignoring the semantic contribution of tense, mood, etc.) yields (5d) as the semantic representation for the sentence meaning.

- (5) a. in Argentina: λx [LOC (x, IN (argentina))]
 b. Eva sign- the contract: λe [SIGN(e) & AGENT (e, eva)
 & THEME (e, the contract)]
 c. Eva sign- the contract in Argentina:
 λe [SIGN(e) & AGENT(e, eva) & THEME(e, the contract)
 & LOC(e, IN(argentina))]
 d. Eva signed the contract in Argentina:
 $\exists e$ [SIGN(e) & AGENT(e, eva) & THEME(e, the contract)
 & LOC(e, IN(argentina))]

The lexical structure for locatives given in (3) and the combinatorial schema MOD in (4) provide the starting points for an investigation of locative modifiers that takes the "One Form – One Meaning" slogan as its guiding assumption.

The paper is organized as follows. Section 2 presents a first set of empirical observations about external, internal, and frame-setting modifiers. Section 3 addresses the syntax of locative modifiers. Using data taken from German, external, internal, and frame-setting modifiers will be shown to occupy different syntactic base positions. Sections 4 – 6 address the semantics of external, internal, and frame-setting modifiers, respectively. The utterance meaning of locative modifiers is accounted for by a compositional semantics that is sensitive to the observed syntactic differences and a pragmatic component of contextual specification. Section 7 draws some conclusions about the syntax/semantics interface of modifiers.

2. SOME OBSERVATIONS ABOUT LOCATIVE MODIFIERS

2.1. *Inferential Behavior*

One of the crucial merits of the Davidsonian treatment of adverbial modification exemplified in (5) is that it accounts straightforwardly for the inferential behavior of intersective modifiers. From the semantic representation (5d) we can draw the inference in (6) simply by virtue of the logical rule of simplification.

- (6) Eva signed the contract in Argentina. \rightarrow Eva signed the contract.

Hence, analyzing adverbial modifiers as eventuality predicates has become something of a trademark of the Davidsonian paradigm. Yet, the data in (1) indicate that this analysis is only well suited for the case of what I have called "external modifiers", whereas internal modifiers and frame-setting modifiers do not seem to follow the classical pattern outlined in (5). Internal modifiers show the expected inferential behavior (cf. (7)), but they do not provide a predicate that holds of the overall event. That is, the template MOD given in (4) won't work for internal modifiers. Frame-setting modifiers do not even allow us to draw the respective inferences; cf. (8).

- (7) Eva signed the contract on the last page. → Eva signed the contract.
- (8) In Argentina, Eva still is very popular. ↗ Eva still is very popular.

Frame-setting modifiers are not part of what is properly asserted but restrict the speaker's claim. Therefore, their omission does not necessarily preserve truth. Hence, it is rather unclear whether frame-setting modifiers can (and should) be analyzed as first-order predicates at all or whether they call for an operator approach in the Montagovian tradition; cf. Thomason and Stalnaker (1973).¹

2.2. *Structural Ambiguities*

The second observation about locative modifiers concerns their notorious ambiguity. Take, e.g., the sentences in (9). They allow for an internal reading according to which the locative specifies an internal aspect of the eventuality as well as an external reading according to which the locative refers to the eventualities' location.

- (9) a. The cook prepared the chicken in a Marihuana sauce.
 b. The bank robbers fled on bicycles.
 c. Paul is standing on his head.

World knowledge discards the external readings in (9) as rather bizarre. In (9a), e.g., we would have to assume that a cook is wading through floods of Marihuana sauce while preparing a chicken. For (9b) we would be forced to construct some fantasy scenario populated by dwarfs crawling around on giant bicycles, etc. So, unless there is explicit evidence to the contrary, world knowledge discards the external reading of the locative modifiers in (9) in favor of the internal one. No such preferences exist in the case of (10). Here, both readings are equally plausible. According to the external reading, the event of making an appointment takes place in the museum. (It might be an appointment for going to the movies.) According to the internal reading, the modifier specifies the location of the appointed event.

- (10) Angela and Bardo made an appointment in the museum.

In German, under neutral stress conditions these two readings come with different accent patterns.² The external reading of the locative modifier is associated with primary sentence accent on the verb; cf. (11a). The internal reading requires primary sentence accent on the modifier; cf. (11b). (The constituent carrying primary sentence accent is

¹ According to Thomason and Stalnaker (1973), locatives are a borderline case between sentence modifiers and predicate modifiers. Some happen to pass (some of) Thomason and Stalnaker's criteria for sentence modifiers and some fail. In the light of the present investigation the reason is that Thomason and Stalnaker (1973) don't differentiate between the uses of locatives as external and frame-setting modifiers.

² For a discussion of the conditions on neutral stress in German cf., e.g., von Stechow and Uhmman (1986), Jacobs (1991, 1993), Féry (1993). Maienborn (1996) discusses the conditions for accent placement on (locative) modifiers.

marked by capital letters; secondary accent is indicated by stress on the accent-bearing syllable.)

- (11) Angela hat sich mit Bardo im Museum verabredet.³
 Angela has REFL with Bardo in.the museum arranged-to-meet.
 a. Angela hat sich mit Bardo im Muséum VERABREDET. *external reading*
 b. Angela hat sich mit Bardo im MUSEUM verabredet. *internal reading*

Sentence (12) below displays an ambiguity between an external and a frame-setting reading of the locative. Given the accent pattern for external modifiers in (12a), the sentence states that an event of freshly producing some rolls (maybe the rolls for a particular hotel) takes place in a certain bakery. In the frame-setting reading, the claim that some rolls are freshly produced is restricted to the inner region of the bakery; i.e. (12) makes an assertion about the rolls of this bakery. Given the particular word order in (12), the frame-setting reading is supported by the so-called "bridge contour" (cf. e.g. Krifka 1998), with rising accent on the modifier and falling accent on *frisch*; cf. (12b). (Rising and falling accents are indicated by '/' and '\', respectively.)

- (12) Die Brötchen werden in dieser Bäckerei frisch hergestellt.
 The rolls are in this bakery freshly produced.
 a. Die Brötchen werden in dieser Bäckerei frísch HERGESTELLT.*external*
 b. Die Brötchen werden in /DIESER Bäckerei FRISCH\ hergestellt.*frame-setting*

The data in (11) and (12) suggest that the grammatical system is sensitive to the three modifier types. That is, the decision whether a locative modifier is interpreted as external, internal or frame-setting is based on structural distinctions.

2.3. *Non-Locative Interpretations*

A particular puzzle concerning locative modifiers is raised by the observation that internal and frame-setting modifiers may take on non-locative interpretations. More specifically, internal modifiers tend to have an instrumental or manner reading (cf. (13)), whereas frame-setting modifiers may have a temporal reading (cf. (14)).

- (13) a. The cook prepared the chicken in a Marihuana sauce.
 b. The bank robbers fled on bicycles.
 c. Paul is standing on his head.

The modifier in (13a) specifies a particular mode of preparing the food. Thus, it makes some sort of manner contribution. The modifier in (13b) supplies information about the means of transport that was used by the bank robbers. It could be replaced by an instrumental phrase like *with the cab*. In the case of (13c), you might even doubt whether the

³ German example sentences are translated by word-for-word glosses. Idiomatic translations are only added if there is a major discrepancy between German and English.

original locative meaning of the preposition is still present at all. In this case, there should be an entity that is located on Paul's head. What could that sensibly be? These cases turn out to be a real challenge to our "One Form – One Meaning" credo! (Cf. Maienborn (2000b) for more details about the manner or instrumental reading of internal modifiers.)

Sentence (14) displays a frame-setting modifier that allows for a temporal interpretation. This can be rendered as: At some/every time when Britta was in Bolivia, she was blond.

(14) In Bolivia, Britta was blond.

Note that the non-locative readings of internal and frame-setting modifiers are questioned by the respective non-locative interrogatives (i.e. manner or temporal interrogatives) rather than by locative ones. That is, the most appropriate questions for the locatives in (13) and (14) are given by (13') and (14'), respectively; cf. Maienborn (2000b, 158f).

- (13') a. How did the cook prepare the chicken?
 b. How did the bankrobbers flee?
 c. How is Paul standing?

(14') When was Britta blond?

Let me add a remark on the temporal reading of frame-setting modifiers in sentences like (14). This reading is peculiar insofar as it can support the Davidsonian inferences discussed in section 2.1. Take, e.g., (14). If this sentence is interpreted as expressing that at a particular time when Britta was in Bolivia, she was blond, then it is also the case that Britta was blond (at some time). Nevertheless, the temporal reading of frame-setting modifiers should not be confused with the contribution of an external modifier. Unlike an external modifier, a locative frame does not have any implications with respect to the location of an embedded eventuality. In (15), the spatial regions referred to by the frame-setting modifier *in Italy* and the external modifier *in France* are not compatible with each other, yet (15) does not yield a contradiction.

(15) In Italy, Lothar bought his suits in France.

A plausible interpretation for sentence (15) is that at the time when he lived in Italy, Lothar used to buy his suits in France. That is, the contribution of a temporally interpreted frame-setting modifier consists of singling out a particular time for which the speaker wants to make a claim. (This is why the corresponding question requires a temporal interrogative; cf. (14').) In the absence of conflicting information the locative might be used to infer the location of, e.g., the subject referent or an eventuality referent introduced by the verb, but such inferences are based on world knowledge and can be

easily overridden; cf. Maienborn (2000a) for a thorough discussion of the semantics and pragmatics of temporally interpreted frame-setting modifiers.

External modifiers, on the other hand, always refer to the location of an eventuality. They do not share the ability of internal and frame-setting modifiers to convey non-locative information, and they can only be questioned by a locative interrogative.

2.4. *Taking Stock and Looking Ahead*

To sum up these initial observations, there are three different types of locative modifiers that differ with respect to their semantic contribution and inferential behavior. They are subject to structural ambiguities and two of them may convey non-locative information.

In the rest of the paper, I will show that the distinctions between internal, external, and frame-setting modifiers are not due to lexical idiosyncracies, nor do they require a separate combinatorial treatment each; rather they reflect a structural difference in combination with semantic underspecification. In particular, I will provide evidence for the following claims.

First, there is a strict correlation between the position of a locative modifier and its interpretation. More specifically, each of the three types of modifiers has a distinctive syntactic base position. Internal modifiers are base-generated at the V-periphery, external modifiers are base-generated at the VP-periphery, and frame-setting modifiers are base-generated at the periphery of TopP (i.e., within the C-Domain).

Second, depending on their particular structural position, modifiers are linked up with different target referents. While external modifiers are linked up to the verb's eventuality argument, internal modifiers and frame-setting modifiers are semantically underspecified in this respect. Internal modifiers are linked up to a referent that is related to the verb's eventuality argument, and frame-setting modifiers are linked up to a referent that is related to the topic of the sentence. The identification of these target referents is shown to depend on discourse and world knowledge.

Third, the non-locative readings of internal and frame-setting modifiers turn out to be a side effect of the pragmatic resolution of semantic indeterminacy.

Finally, I propose a compositional account for these modifiers that is sensitive to the observed structural and pragmatic influences while still preserving the basic insights of the classical Davidsonian approach. The template MOD in (4) will therefore be augmented by a semantically underspecified variant MOD^v which allows grammar and pragmatics to interact. The syntactic distribution of locative modifiers is shown to be derivable from interface conditions. These considerations suggest that the flexibility of natural language modification is the result of (a) having several potential structural integration sites in combination with (b) being subject to a particular kind of semantic indeterminacy.

3. ON THE POSITION OF LOCATIVE MODIFIERS IN GERMAN

In this section, I want to demonstrate that the semantic distinction between external, internal, and frame-setting modifiers that was informally introduced and used in the

preceding sections has a syntactic counterpart. Each modifier type will be shown to have its own syntactic base position, which does not necessarily coincide with the modifier's surface position. These syntactic considerations will be taken as support for the claim that the observed meaning differences are rooted in the grammatical system and should be accounted for in terms of compositional semantics.

3.1. *Syntactic Base Positions of Locatives*

Sentence (16) displays three locative modifiers, each of them belonging to a distinct type.

- (16) In den Anden werden Schafe vom Pfarrer auf dem Marktplatz an den Ohren
 In the Andes are sheep from.the priest on the marketplace at the ears
 gebrandmarkt.
 branded.

The frame-setting modifier *in den Anden* restricts the overall proposition, the external modifier *auf dem Marktplatz* refers to the place where the whole event takes place, and the internal modifier *an den Ohren* refers to the location where the brand is placed.⁴ How can we determine whether the locatives in (16) have distinctive syntactic base positions?

Tests for determining base positions in the German middle field (i.e. the topological region between the position of a finite verb in verb-final sentences and its position in verb-second sentences) are quite subtle, and we are well advised to use a variety of heuristics that have been established on independent grounds. When considered together, these will give us a fairly precise diagnostic. I will use basically four heuristics for testing base positions. These are based on data concerning focus projection, quantifier scope, Principle C effects, and remnant topicalization. In the following, each of the tests will be briefly introduced, and the results that are obtained when applying the test to different types of locative modifiers will be spotlighted by some illustrations. This should suffice to substantiate my claim that the distinction between external, internal, and frame-setting modifiers is rooted in the grammar; cf. Maienborn (1996) for a more thorough discussion of the syntax of locative modifiers, Frey and Pittner (1998) on the placement of different types of adverbials in German, and Frey's (2000a) comparative study of the placement of adverbials in German and English.

3.1.1. *External vs. Internal Modifiers*

Focus Projection:

Focus projection has become one of the standard word order tests for German since the work of Höhle (1982). Höhle points out that normal or unmarked word order is compatible with various focus settings. In particular, unmarked word order allows focus to project from the focus exponent up to the full sentence. Such a sentence can be used as an answer to the question *What happened?* / *What's new?* Focus projection is blocked,

⁴ Note that in German, definites are a regular means for expressing pertinence.

however, if surface structure deviates from the unmarked word order. Given the assumption that unmarked word order reflects the base-generated order of elements in the middle field, focus projection is a suitable device for detecting base positions.

Let us start by checking the order of external and internal modifiers relative to a direct object. The sentences in (17)/(18) illustrate the behavior of external modifiers.

- (17) Paul hat [_{PP} vor dem Capitol] [_{DP} die MARSEILLAISE] gesungen.
 Paul has in front of the Capitol the Marseillaise sung.
 a. What did Paul sing (in front of the Capitol)?
 b. What did Paul do (in front of the Capitol)?
 c. What happened?

- (18) Paul hat [_{DP} die Marseillaise] [_{PP} vor dem CAPITOL] gesungen.
 a. Where did Paul sing the Marseillaise?

In (17) the locative modifier precedes the direct object and primary sentence accent is placed on the constituent that is adjacent to the verb. This configuration allows focus to project up to the sentence level. That is, sentence (17) is a plausible answer to all the questions listed in (17a-c), including the question *What happened?*, which presupposes maximal focus. The reverse order in (18) blocks focus projection. Sentence (18) is only compatible with question (18a), which indicates narrow focus on the locative. Taking an internal modifier leads to the opposite result. Focus projection and therefore normal word order is ensured only in case the locative modifier is placed in near proximity to the verb; cf. (19). The reverse order in (20) is highly marked and signals contrastive focus.

- (19) Die Spieler haben [_{DP} den Torschützen] [_{PP} auf den SCHULTERN] getragen.
 The players have the scorer on the shoulders carried.
 a. Where/How did the players carry the scorer?
 b. What did the players do w.r.t. the scorer?
 c. What did the players do?
 d. What happened?

- (20) ?Die Spieler haben [_{PP} auf den Schultern] [_{DP} den TORSCHÜTZEN] getragen.
 a. Whom did the players carry on their shoulders?

Thus, according to the focus projection test, external modifiers precede direct objects in base structure, whereas internal modifiers have a base position configurationally below the direct object and close to the verb; cf. (21), where '>' stands for 'c-command'.

- (21) external modifier > direct object > internal modifier

These findings are confirmed by a direct comparison of external and internal modifiers next to an intransitive verb as in (22)/(23). Focus projection is possible if the external

modifier precedes the internal modifier as in (22), and it is blocked given the reverse order in (23) (if sentence (23) is grammatical at all).

- (22) Paul hat zuhause in STIEFELN geduscht.
 Paul has at-home in boots taken-a-shower.
 a. How did Paul take a shower?
 b. What did Paul do (at home)?
 c. What happened?

- (23)?? Paul hat in Stiefeln ZUHAUSE geduscht.
 a. Where did Paul take a shower in his boots?

Consider next the minimal pairs in (24) and (25). If an external modifier appears next to an intransitive verb, wide focus is realized by placing the primary sentence accent on the verb; cf. (24a/c). Primary accent on the verb-adjacent modifier supports only narrow focus on the locative; cf. (24b/d). Internal modifiers show the opposite behavior. Wide focus is realized by sentence accent on the locative (cf. (25b/d)), whereas primary accent on the verb indicates narrow focus (cf. (25a/c)).

- (24) a. Paul hat zuhause GEDUSCHT. *wide focus*
 Paul has at-home taken-a-shower.
 b. Paul hat ZUHAUSE geduscht. *narrow focus*
 c. Paul hat auf der Treppe GEPFIFFEN. *wide focus*
 Paul has on the stairs whistled.
 d. Paul hat auf der TREPPE gepfiffen. *narrow focus*
- (25) a. Paul hat in Stiefeln GEDUSCHT. *narrow focus*
 Paul has in boots taken-a-shower.
 b. Paul hat in STIEFELN geduscht. *wide focus*
 c. Paul hat auf den Fingern GEPFIFFEN. *narrow focus*
 Paul has on the fingers whistled.
 d. Paul hat auf den FINGERN gepfiffen. *wide focus*

In sum, the focus projection test suggests that external and internal modifiers are configurationally distinct and differ with respect to the position they take relative to the direct object of the verb.

Quantifier Scope:

Frey (1993) develops a surface-oriented theory of quantifier scope which says that scope ambiguities arise only if surface structure deviates from base order, always provided that intervening factors such as focus are neutralized.

A sentence like (26) is ambiguous. Either the universal quantifier or the existential quantifier can obtain wide scope.

- (26) Paul hat [_{PP} in fast jeder Konzerthalle] [_{DP} mindestens ein Schubert-Lied] gesungen.
 Paul has in nearly every concert hall at least one Schubert song sung.

However, in order to get the wide scope reading of the existential quantifier, additional means have to be taken. This reading requires main accent on the existential quantifier; cf. (26'). That is, switching from the quantifier scope induced by the surface order to the reverse scope reading requires narrow focus on the lower quantifier.

- (26') $\exists\forall$: Paul hat [_{PP} in fast jeder Konzerthalle] [_{DP} mindestens EIN Schubert-Lied] gesungen.

The influence that focus exerts on scope can be precluded by placing the main accent on the constituent in C^0 (finite verb or complementizer). With this accent placement, the truth polarity of the sentence is focused (so-called *verum focus*) and consequently potential interactions between focus and scope are suppressed. This move allows us to isolate the purely structural conditions on scope assignment. A slightly simplified version of Frey's scope principle is given in (27); cf. Frey and Pittner (1998), Krifka (1998), Frey (2000a).

- (27) *Scope Principle*:

A quantifier expression α has scope over a quantifier expression β iff the head of the α -chain c-commands the base of the β -chain.

Frey's scope principle gives us a tool for determining base positions. Whenever we observe scope ambiguities, a quantifier must have been moved into a position where it c-commands a second quantifier which in turn still c-commands the trace of the first one. Sentence (28a) only supports a wide scope reading of the universal quantifier. This indicates that the surface order of the external modifier and the direct object corresponds to their base order. Scope ambiguities arise if the order is reversed, as in (28b). This sentence supports both scope readings. That is, the direct object must have been moved out of its base position below the external modifier. The use of an internal modifier leads to the inverse results. That is, scope ambiguities arise in (29a) but not in (29b).

- (28) a. Paul HAT [_{PP} in fast jeder Konzerthalle] [_{DP} mindestens ein Lied] gesungen.
 Paul has in nearly every concert hall at least one song sung. ($\forall\exists$)
 b. Paul HAT [_{DP} mindestens ein Lied] [_{PP} in fast jeder Konzerthalle] gesungen. ($\exists\forall$)
- (29) a. Paul HAT [_{PP} in fast jeder Sänfte] [_{DP} mindestens einen Pascha] getragen.
 Paul has in nearly every sedan-chair at least one pasha carried. ($\forall\exists$, $\exists\forall$)
 b. Paul HAT [_{DP} mindestens einen Pascha] [_{PP} in fast jeder Sänfte] getragen. ($\exists\forall$)

Thus, the quantifier scope test achieves the same result as the focus projection test.

Principle C Effects:

Further evidence comes from the binding data in (30) and (31).

(30) [In Peters_i Büro] hat der Chef ihn_i zur Rede gestellt. (cf. Frey and Pittner 1998, 22)
In Peter's office has the boss him to task taken.

(31) a. *[An Peters_i Knie] hat der Chef ihn_i operiert.
At Peter's knee has the boss him operated.
b. *[In Peters_i Auto] hat der Chef ihn_i nach Hause gefahren.
In Peter's car has the boss him at home driven.

While the sentence with an external modifier in (30) is fine, the structures with internal modifiers in (31) show a Principle C effect. The trace of the topicalized phrase is c-commanded by the respective binder. That is, sentences (30)/(31) are based on the structures (30')/(31').

(30') [In Peters_i Büro]_j hat der Chef t_j ihn_i zur Rede gestellt.

(31') a. *[An Peters_i Knie]_j hat der Chef ihn_i t_j operiert.
b. *[In Peters_i Auto]_j hat der Chef ihn_i t_j nach Hause gefahren.

Remnant Topicalization:

The idea behind this base order test is the following. If a V-projection that includes a trace is topicalized while the antecedent remains in the middle field, the trace is not properly bound at surface structure, leading to a questionable result; cf. Haider (1993), Frey and Pittner (1998), Krifka (1998). Hence, given an underlying order [XP₁ [XP₂ V]], we find that [XP₂ V] can be topicalized, whereas [XP₁ V] is ruled out. Consider the contrasts in (32) – (34).

(32) a. [Auf den Schultern getragen] haben die Spieler den Torschützen.
On the shoulders carried have the_{NOM} players the_{ACC} scorer.
b. ??[Vor dem Stadion getragen] haben die Spieler den Torschützen.
In-front-of the stadion carried have the_{NOM} players the_{ACC} scorer.

(33) a. [In Stiefeln geduscht] hat Paul zuhause.
In boots taken-a-shower has Paul at-home.
b. *[Zuhause geduscht] hat Paul in Stiefeln.
At-home taken-a-shower has Paul in boots.

(34) a. [Auf den Fingern gepfiffen] hat Paul auf der Treppe.
On the fingers whistled has Paul on the stairs.

- b. *[Auf der Treppe gepfiffen] hat Paul auf den Fingern.
 On the stairs whistled has Paul on the fingers.

In order to arrive at the structure exemplified by the (b)-sentences, a preverbal phrase must have been moved out of its base position first, and the resulting constituent is then topicalized, creating an unbound trace. This leads to the ungrammaticality or at least decreased acceptability of the (b)-sentences. The (a)-sentences, on the other hand, are perfectly grammatical because the topicalized constituent does not include a trace. That is, the sentences in (32) – (34) have the underlying structures given in (32') – (34').

- (32') a. [Auf den Schultern getragen]_i haben die Spieler den Torschützen _{t_i}.
 b. ??[Vor dem Stadion _{t_j} getragen]_i haben die Spieler [den Torschützen]_j _{t_i}.
- (33') a. [In Stiefeln geduscht]_i hat Paul zuhause _{t_i}.
 b. *[Zuhause _{t_j} geduscht]_i hat Paul [in Stiefeln]_j _{t_i}.
- (34') a. [Auf den Fingern gepfiffen]_i hat Paul auf der Treppe _{t_i}.
 b. *[Auf der Treppe _{t_j} gepfiffen]_i hat Paul [auf den Fingern]_j _{t_i}.

The results of the four tests I have worked with here converge. External modifiers precede direct objects, which in turn are followed by internal modifiers in base structure. The next step will be to narrow down the base position of external modifiers and frame-setting modifiers.

3.1.2. External vs. Frame-Setting Modifiers

The sentences in (35) and (36) test the ordering of external and frame-setting modifiers relative to the subject. The data in (35) indicate that the subject precedes external modifiers in base structure, whereas frame-setting modifiers take a base position that is configurationally higher than the subject position as is shown by (36).

- (35) a. [_{DP} Mindestens ein Bariton] HAT [_{PP} in fast jeder Konzerthalle] Schubert-
 At least one baritone has in nearly every concert hall Schubert
 Lieder gesungen. (∃∀)
 songs sung
- b. [_{PP} In fast jeder Konzerthalle] HAT [_{DP} mindestens ein Bariton] Schubert-
 Lieder gesungen. (∃∃, ∃∀)
- (36) a. [_{DP} Fast jeder Opernsänger] IST [_{PP} in mindestens einem Land] berühmt.
 Nearly every opera singer is in at least one country famous. (∀∃, ∃∀)
- b. [_{PP} In mindestens einem Land] IST [_{DP} fast jeder Opernsänger] berühmt. (∃∀)

The Principle C data in (37) and (38) support these findings. (37) shows that a subject but not an indirect object c-commands an external modifier. (38) confirms that a frame-setting modifier lies outside the c-command domain of the subject.

- (37) a. [In Peters_i Büro]_j hat der Chef t_j ihm_i die Akten gezeigt.
 In Peter's office has the boss him the files shown.
 b. *[In Peters_i Büro]_j hat er_i t_j dem Chef die Akten gezeigt.
 In Peter's office has he the_{DAT} boss the_{AKK} files shown.
- (38) [In Peters_i Firma]_j entscheidet t_j er_i allein über die Ausgaben.
 In Peter's business decides he alone about the expenses.

The data in (39) – (42) show that the claim that external modifiers are c-commanded by subjects also holds for (surface) subjects of unaccusative verbs (cf. (39)/(40)) and passives (cf. (41)/(42)).

- (39) a. [_{DP} Fast jeder Wanderer] IST [_{PP} unter mindestens einem Baum] eingeschlafen.
 Almost every hiker has under at least one tree fallen asleep. (∀∃)
 b. [_{PP} Unter mindestens einem Baum] IST [_{DP} fast jeder Wanderer] eingeschlafen.
 (∃∀, ∀∃)
- (40) * [In Peters_i Büro]_j ist er_i t_j eingeschlafen.
 In Peter's office has he fallen asleep.
- (41) a. [_{DP} Mindestens ein Lied] WURDE [_{PP} in fast jedem Raum] gesungen. (∃∀)
 At least one song was in nearly every room sung.
 b. [_{PP} In fast jedem Raum] WURDE [_{DP} mindestens ein Lied] gesungen. (∀∃, ∃∀)
- (42) * [In Peters_i Büro]_j wurde er_i um zwölf t_j angerufen.
 In Peter's office was he at twelve phoned.

The correct generalization seems to be that external modifiers are base generated below the highest (thematic) argument of the verb. The result of testing the placement of external and frame-setting modifiers with respect to the subject (i.e. the verb's highest thematic argument) is summarized in (43).

- (43) frame-setting modifier > subject > external modifier

If (43) is correct, joint topicalization of a frame-setting modifier and a verb should be clearly ungrammatical. This prediction is borne out; cf. the corresponding contrast between frame-setting modifiers and internal modifiers in (44).

- (44) a. [In Stiefeln geschlafen] haben die Cowboys im Wilden Westen.
 In boots slept have the cowboys in.the Wild West.
 b. *[Im Wilden Westen geschlafen] haben die Cowboys in Stiefeln.
 In.the Wild West slept have the cowboys in boots.

We may conclude that frame-setting modifiers precede sentence adverbs in base structure; cf. also Frey and Pittner (1998).⁵ That is, we have provided evidence that frame-setting modifiers are base-generated within the verb's functional shell in a position from which they can c-command sentence adverbs such as *wahrscheinlich*. Finding the exact syntactic position of frame-setting modifiers will be left for future research.

3.2. *Some Conclusions*

The results of the previous section can be summarized as follows. First of all, there is evidence that not only arguments but also modifiers have well-defined syntactic base positions. Secondly, modifiers of one lexical class can exploit more than one integration site. And thirdly, there is a correlation between the syntactic base position of a modifier and its semantic contribution.

Locative modifiers have been shown to occupy three distinct base positions. External modifiers are base-generated between the subject and the remaining arguments of the verb. Internal modifiers are base-generated below the verb's arguments, in close proximity to the verb.⁶ Frame-setting modifiers have a base position above all arguments in some functional projection of the verb. The relevant restrictions are summarized in (49).

(49) *Base Order in the German Middle Field:*

frame-setting modifier > ... > subject > external modifier > ... > direct object >
internal modifier

These findings disprove many convictions about circumstantial modifiers (i.e. temporal, locative, instrumental modifiers, etc.) in general and locative modifiers in particular that can be found in the literature. The standard picture is the following: modifiers differ from arguments in that only the latter receive a theta role from the verb. Having no theta role, the semantic function of a modifier must be derivable from its inherent lexical properties. On this basis, it is generally assumed that modifiers make a single, constant semantic contribution; cf., e.g., the following quote from Dowty (1991, 577): "[...] any adjunct, like the instrumental *with a knife*, must have a constant meaning across every VP it occurs in. Thus there can be many kinds of meanings for 'Patient', but only one for English instrumental *with*." As we have seen, this view is wrong, because it relies on a perception of the relevant data that is too limited. In the case of locatives, the vast majority of the literature takes the external modifier variant as the only existing option, thereby ignoring internal and frame-setting modifiers.

As concerns the placement of modifiers, there are basically two positions which have emerged from the standard view. Either it is assumed that modifiers are freely generated in positions adjoined to verbal or functional projections (cf., e.g., Zwart 1993, Neeleman

⁵ Cf. Frey (2000a) for some qualifications concerning non-referential frames.

⁶ The only intervening elements between internal modifiers and the verb are resultatives and directional PPs; cf. Maienborn (1996, 108ff).

1994), or modifiers are assumed to occupy a single, fixed position, depending on their inherent lexical properties; cf., e.g., Laenzlinger (1998), Müller (1998). Neither claim can be maintained in view of the data presented here. Locative modifiers do not occupy a single, fixed position, nor do they show up arbitrarily. On the contrary, they occur in well-defined base positions where they make a distinctive semantic contribution.

The present investigation also shows that arguments and modifiers may alternate within the verbal projection. Hence, it neither confirms the classical view that verbs first combine with their arguments before being combined with modifiers,⁷ nor does it support the claim advocated by Larson (1988, 1990) that circumstantial modifiers are base generated below the arguments of the verb.

A further assumption often found in the literature focussing on external modifiers is that locatives and temporals show the same distributional behavior and hence can be grouped together; cf., e.g., Abraham (1986), Laenzlinger (1998), Haider (2000). This assumption also turns out to be wrong. As Frey and Pittner (1998) and Frey (2000a) show, temporals precede the subject in base structure, whereas – as we have seen here – locatives follow the subject in base structure. The sentences in (50), taken from Frey (2000a, 113), illustrate this difference. Sentence (50a) is ambiguous, indicating that the subject has been moved out of its base position below the temporal. Sentence (50b), on the other hand, does not show such an ambiguity, indicating that the surface order of the subject and the locative correspond to their base order. Frey (2000a, 112ff) provides further evidence for this word order difference.

- (50) a. WEIL mindestens einer an fast jedem Tag eine Wahlrede halten wird ($\exists\forall, \forall\exists$)
 because at least one on almost every day an election speech make will
 b. WEIL mindestens einer an fast jedem Ort eine Wahlrede halten wird ($\exists\forall$)
 because at least one at almost every place an election speech make will

Finally, the prosodic data discussed in section 3.1.1. call for a revision of the rules governing focus projection. According to the standard view (cf., e.g., Gussenhoven 1983, 1992; Selkirk 1984, 1995; Jacobs 1991, 1993, 1999a), only arguments but not modifiers can form one accent domain with the verb, allowing focus to project to larger constituents; cf. (51) vs. (52). But a comparison of (52) with (53) shows that this is only true of external modifiers. Internal modifiers allow focus to project from the locative to larger constituents. That is, internal modifiers pattern with arguments in this respect. Yet, they are clearly not selected by the verb. That is, they are still true modifiers, adding some piece of extra information that is always dispensable from a grammatical point of view and that cannot be predicted from the lexical structure of the verb. (Hence, there is no reason to believe that internal modifiers are disguised optional arguments.)

⁷ Cf., e.g., Pollock (1989, 379): "What I am assuming here is that there are principles of UG that ban insertion of adverbs between a verb and its complements [...]."

Arguments:

- (51) a. Paul hat den BRIEF gelesen. *wide focus*
 Paul has the letter read.
 b. Paul hat den Brief GELESEN. *narrow focus*

External Modifiers:

- (52) a. Paul hat ZUHAUSE geduscht. *narrow focus*
 Paul has at-home taken-a-shower.
 b. Paul hat zuhause GEDUSCHT. *wide focus*

Internal Modifiers:

- (53) a. Paul hat in STIEFELN geduscht. *wide focus*
 Paul has in boots taken-a-shower.
 b. Paul hat in Stiefeln GEDUSCHT. *narrow focus*

Hence, the formulation of the conditions under which a verb-adjacent constituent can be integrated into the verb to form a single prosodic and semantic unit (cf. Jacobs' notion of 'integration') cannot rely on the argument/modifier distinction, but seems to be based on a distinct difference whose exact nature and structural reflex is still unclear; cf. the outlook in Jacobs (1999a, 78f).

So far we have reviewed some of the empirical shortcomings of current approaches concerning (locative) modifiers. As we have seen, locative modifiers are subject to strict ordering constraints within base structure. What kind of explanation can we provide for this observation? Cinque (1999) has made an influential proposal to explain the order of adverbials in purely syntactic terms, by assuming a universal hierarchy of functional heads that encodes the hierarchy of adverbials. Adverbials are integrated as specifiers, each adverbial having a designated specifier position; cf. Alexiadou (1997) and Laenzlinger (1998) for similar proposals.⁸ Adopting this idea, we could proceed to enlarge the proposed hierarchy of functional heads by introducing three more functional projections – say, FrameP, LocExtP, LocIntP – that account for the distributional behavior of locative modifiers. But this procedure is rather ad hoc. By assuming a hard-wired implementation of the distributional facts within the syntax we are in danger of missing important generalizations. This scepticism is shared, e.g., by Ernst (1998, 1999, 2001) and Haider (1998, 2000), who criticize that Cinque's (1999) proposal leads to an unnecessary inflation of functional heads which duplicate underlying semantically motivated distinctions. Ernst and Haider argue instead that the ordering restrictions on adverbials have no genuine syntactic sources but can be derived from independent semantic properties. According to this view, the syntax does not specify explicit integration sites for modifiers but allows them to be adjoined wherever this is not explicitly forbidden. The distribution of modifiers is accounted for by an interface

⁸ Note that Cinque (1999, 28ff) excludes circumstantial modifiers from his adverb hierarchy because he believes them to lack a rigid ordering, suggesting that they should be treated completely separately. Alexiadou (1997) and Laenzlinger (1998) conceive of the universal adverb hierarchy as also including specifier positions for circumstantials.

condition mapping syntactic c-command domains onto semantic domains.⁹ Once the mapping procedure reaches a higher semantic domain, modifiers that address the lower domain are ruled out.

While I believe Haider's and Ernst's outline of a semantic explanation of the distributional facts to be a promising alternative to a syntactic codification à la Cinque, many of its details remain to be worked out. As Frey (2000, 132) points out, in Haider's and Ernst's approach ordering restrictions are only assumed to hold between modifiers. The placement of modifiers is not expected to be sensitive to the position of arguments. Yet, as we have seen in the preceding section, modifiers are not only ordered with respect to each other but also with respect to a sentence's arguments; cf. (49). This must be accounted for by an appropriate interface condition. The following considerations concerning the semantics of locative modifiers can be seen as a case study into the interface condition licensing modifiers. In the course of developing a compositional semantics we will see to what extent the distributional behavior of locative modifiers can be derived from semantic properties and what the relevant notions are in terms of which the interface condition should be formulated.

For reasons of parsimony, I will adopt the traditional view of locative modifiers as syntactic adjuncts. More specifically, internal modifiers will be treated as V-adjuncts, external modifiers as VP-adjuncts, and frame-setting modifiers are analyzed as adjuncts within the C-Domain.

4. THE INTERPRETATION OF EXTERNAL MODIFIERS

External modifiers constitute the paradigmatic case, which is accounted for straightforwardly by the Davidsonian approach. In the previous section, they were shown to combine with the verb before the subject comes in. Hence, they were analyzed as VP-adjuncts. If we assume, following Kratzer (1996), that subjects are assigned their theta-role by a functional head *Voice* immediately dominating the VP, when external modifiers enter the scene they encounter an argument structure as illustrated in (54). That is, only the verb's eventuality argument *e* is accessible at this stage. All internal arguments of the verb are already saturated. The semantic representation of a locative PP and the template for modification MOD that were introduced in section 1 are repeated in (55) and (56), respectively. Given this constellation, the integration of the locative PP via MOD yields (57). ('ev-type' is a meta-predicate for eventuality-type predicates and '...' is a placeholder for further thematic relations.)

(54) VP: $\lambda e[\text{ev-type}(e) \ \& \ \dots]$

(55) PP_{LOC}: $\lambda x [\text{LOC}(x, \text{reg})]$

(56) MOD: $\lambda Q \lambda P \lambda x [P(x) \ \& \ Q(x)] \quad = (4)$

⁹ Haider (1998, 2000) distinguishes three semantic domains: proposition \supset event \supset process/state. Ernst (1998) assumes a richer hierarchy: speech act \supset fact \supset proposition \supset event \supset specified event.

(57) *External Modifiers:*

[_{VP} PP_{LOC} [_{VP} ...]]: $\lambda e[\text{ev-type}(e) \ \& \ \dots \ \& \ \text{LOC}(e, \text{reg})]$

According to (57), external modifiers supply an additional semantic constraint on the verb's eventuality argument by determining its location. The application of MOD is further restricted by the condition in (58), which ensures compatibility of ontological sorts.

(58) *Condition on Variable Identification:*

Two variables x and y , with x being subject to the sortal restriction A and y being subject to the sortal restriction B , can be identified iff $A \cap B \neq \emptyset$.

The template for modification in (56) together with the condition on variable identification in (58) determine that a structural environment for a locative modifier must provide a target argument that satisfies the sortal restrictions of locatives, i.e., it must belong either to the domain of objects or to the domain of eventualities. If a structural environment does not provide such an argument, the integration of a locative modifier should fail. This is what happens in (59).

- (59) a. * Paul ähnelt an der Straßenecke seinem Bruder.
 Paul resembles at the street corner his brother.
 b. * Vor seiner entsetzten Frau heißt dieser Mann Hermann Saumweber.
 In-front-of his horrified wife is-called this man Hermann Saumweber.
 c. * Eine Flasche Rotwein kostet neben dem Weißwein 15 DM.
 One bottle red wine costs besides the white wine 15 DM.

Stative verbs such as *ähneln* ('to resemble'), *heißen* ('to be called'), and *kosten* ('to cost') belong to the class of individual-level predicates (ILP) in the sense of Carlson (1978) and Kratzer (1995). According to Kratzer, they lack an eventuality argument. Given our assumptions about modification in (56) and (58), it falls out naturally that statives do not combine with an external modifier. Hence, the framework developed so far accounts for the ungrammaticality of the sentences in (59).¹⁰

¹⁰ In Maienborn (2000a), I show, using a set of eventuality tests, that copula-predicative constructions belong to the class of statives, irrespective of whether they denote permanent properties (ILP) or temporary properties (SLP); cf. the ungrammatical combination of a stage-level predicate with an external modifier in (i) – (iii).

- (i) * Paul ist neben der Straßenlaterne betrunken.
 Paul is beside the street lamp drunk.
 (ii) * Luise ist auf dem Sofa ohnmächtig.
 Luise is on the sofa unconscious.
 (iii) * Der Sekt ist im Wohnzimmer warm.
 The champagne is in.the living room warm.

I argue furthermore that statives (including copula-predicative constructions), rather than having an eventuality argument, have a temporal argument. This explains, among other things, why statives do not

Thus, external modifiers are only licensed if the verb provides an eventuality argument. For frame-setting modifiers, on the other hand, VP-internal matters are irrelevant. They do not depend on the presence or absence of an eventuality argument within the VP. Consequently, we should expect stative verbs to combine with frame-setting modifiers. The sentences in (60) show that this expectation is borne out. (In order to check whether the locatives in (60) are frame-setting modifiers, just try to apply the inference pattern discussed in section 2.1; cf. (8). The omission of the locative does not necessarily preserve truth.)

- (60) a. Bei Kerzenlicht ähnelt Paul seinem Bruder.
 In candle light resembles Paul his brother.
 b. In der Wiener Staatsoper heißt der Souffleur "Maestro Suggestore".
 In the Vienna state opera is-called the prompter "Maestro Suggestore".
 c. Eine Flasche Rotwein kostet im Restaurant 45 DM.
 One bottle red wine costs in.the restaurant 45 DM.

In sum, the modification schema (56) and the condition on variable identification in (58) ensure that a VP including an external modifier denotes a set of eventualities that are located in a spatial region. The integration of external modifiers is blocked in structural contexts that lack an eventuality argument, such as stative verbs.

5. THE INTERPRETATION OF INTERNAL MODIFIERS

The discussion in section 2 revealed that internal modifiers do not locate a whole eventuality but an entity that serves some function within that eventuality. Depending on the particular functional embedding, internal modifiers can convey instrumental or manner information about the eventuality.

What kind of individual can count as the entity that is located by the internal modifier? The data in (61) – (64) show that suitable candidates are not confined to the entities referred to by the arguments of the verb, but include also referents introduced by incorporated arguments and modifiers as well as entities that are not overtly expressed but can only be inferred on the basis of conceptual knowledge. In (61), the located entity is given by one of the arguments of the verb (resp. Voice), i.e., the subject in (61a) and the direct object in (61b).

- (61) a. Die Bankräuber sind auf Fahrrädern geflüchtet.
 The bank robbers have on bicycles fled.
 b. Der Koch hat das Hähnchen in einer Marihuana-Tunke zubereitet.
 The cook has the chicken in a Marihuana sauce prepared.

combine with event-related modifiers like locatives, instrumentals, comitatives, manner adverbials, etc., but only accept temporal modifiers.

In (62), the located entity is given by an argument that is incorporated into the verb meaning. This is the appointment in (62a), the brand in (62b), and the signature in (62c).

- (62) a. Angela hat sich mit Bardo im Museum verabredet.
 Angela has REFL with Bardo in.the museum arranged-to-meet.
 b. Das Schaf wurde am Ohr gebrandmarkt.
 The sheep was at.the ear branded.
 c. Eva hat den Vertrag auf der letzten Seite unterschrieben.
 Eva has the contract on the last page signed.

In (63), the located entity is conceptually inferred. None of the linguistically introduced referents qualifies as being the entity that is located at Paul's hair. World knowledge tells us that Maria's hand is a plausible candidate but the actual context might also provide evidence that Maria used her teeth, a pair of pincers or something similar. That is, the internal modifier in (63) has several utterance meanings depending on contextually relevant background knowledge.

- (63) Maria zog Paul an den Haaren aus dem Zimmer.
 Maria pulled Paul at the hair out of the room.

Such conceptually inferred entities can also be referred to explicitly by, e.g., an instrumental modifier as in (64).

- (64) a. Maria zog Paul mit einer Zange an den Haaren aus dem Zimmer.
 Maria pulled Paul with a pair of pincers at the hair out of the room.
 b. Angela kitzelte Bardo mit einer Feder unter den Armen.
 Angela tickled Bardo with a feather under the arms.

The general conclusion to be drawn from (61) – (64) is that the entity that is located by an internal modifier cannot be determined by relying exclusively on grammatical knowledge, but depends also on context and world knowledge. That is, identifying the target referent of an internal modifier is not an issue of the grammatical system but belongs to the realm of pragmatics. Compositional semantics indicates that an internal modifier is linked to a semantically underspecified entity that must be instantiated with respect to the conceptual structure of the verb. This is the invariant meaning of internal modifiers. Everything else is left for conceptual specification. In particular, the conceptual system takes responsibility for identifying the entity that is ultimately located by the internal modifier and for determining its functional embedding within the verb's conceptual structure.

In Maienborn (2000b), I propose to account for the semantic indeterminacy of internal modifiers by assuming a free variable at the level of compositional semantics (= *Semantic Form* or *SF*). This variable is instantiated at the level of *Conceptual Structure*

(CS).¹¹ Let us assume a second template MOD^v that accounts for the semantic integration of internal modifiers. According to the findings in section 3, MOD^v applies in a structural environment in which no argument of the verb has yet been saturated. Thus, in a sentence like (65) the locative in (66a) encounters the argument structure in (66b). (Remember that the subject is licensed by Voice.) Applying MOD^v as given in (67) yields as a result (66c).

(65) Angela hat die Diamanten in einem Kinderwagen geschmuggelt.
Angela has the diamonds in a baby-carriage smuggled.

(66) a. $[\text{PP in einem Kinderwagen}]$: $\lambda x \exists z[\text{LOC}(x, \text{IN}(z)) \ \& \ \text{BABY-CARRIAGE}(z)]$
 b. $[\text{V schmuggel-}]$: $\lambda y \lambda e [\text{SMUGGLE}(e) \ \& \ \text{THEME}(e, y)]$
 c. $[\text{V} [\text{PP in einem Kinderwagen}] [\text{V schmuggel-}]]$: $\lambda y \lambda e \exists z[\text{SMUGGLE}(e) \ \& \ \text{THEME}(e, y) \ \& \ \text{LOC}(v, \text{IN}(z)) \ \& \ \text{BABY-CARRIAGE}(z)]$

(67) MOD^v : $\lambda Q \lambda P \lambda y \lambda x [P(y)(x) \ \& \ Q(v)]$ with an assignment for v such that $Q(v)$ is anchored w.r.t. the conceptual structure accessible through x .

In its present form, MOD^v is devised for transitive expressions only, i.e., the resulting structure inherits one argument which is saturated in turn by the direct object. This could be generalized in such a way that MOD^v licenses the inheritance of an arbitrary number of arguments, depending on the argument structure of the expression to be modified. Let us use (67') with the notational convention in (68) for convenience.

(67') MOD^v : $\lambda Q \lambda P \dots \lambda x [P(\dots)(x) \ \& \ Q(v^x)]$

(68) *Notational Convention*: We use ' $Q(v^x)$ ' to indicate that v is assigned a value such that $Q(v)$ is anchored wrt. the conceptual structure accessible through x .

According to (66c), there is some underspecified entity v whose location in the baby-carriage is required by MOD^v to be anchored within the conceptual structure of the given smuggling event. For (66c) to be interpretable, v must be instantiated at the level of CS. Maienborn (2000b) gives a detailed account of resolving this kind of semantic underspecification within the framework of abduction; cf. Hobbs et al. (1993), Dölling (1997, 2000). My main line of argumentation is that an internal modifier elaborates on independently established spatial constraints which are part of the conceptual knowledge that is associated with the respective eventuality type. The free variable v is assigned a value in the course of merging the condition expressed by the internal

¹¹ Cf. Bierwisch (1982, 1996, 1997) and Bierwisch and Lang (1989) for a 'two-level' approach to meaning in terms of a strictly grammatically determined, context-invariant Semantic Form (SF) and a language-independent Conceptual Structure (CS) encompassing context and world knowledge. Within this framework, free variables are a means of dealing with semantic indeterminacy. They are introduced at the level of SF and they must be instantiated at the level of CS, otherwise the respective expression would not be interpretable; cf. Dölling (1997), Maienborn (2000b).

modifier with an already existing spatial constraint that is part of the conceptual structure of the eventuality.

Let me sketch the advocated analysis using sentence (65) as illustration. According to our conceptual knowledge, the event-type of smuggling is a subtype of the event-type of transport; cf. (69a). Transporting events include a vehicle as an instrument. This vehicle must support the theme during the transport, otherwise the theme could not benefit from the vehicle's motion in the intended sense; cf. (69b). (The function $\tau(e)$ maps an eventuality e onto its temporal extension.) Our conceptual knowledge base furthermore includes knowledge about subkinds of vehicles as exemplified in (70), as well as knowledge concerning the relation between spatial and functional concepts as given in (71). World knowledge tells us, e.g., that if an object x is located at the inner region of an object y then x is supported by y .¹²

(69) *Conceptual Knowledge about Smuggling Events:*

- a. $\forall e$ [SMUGGLE (e) \rightarrow TRANSPORT (e)]
- b. $\forall ex$ [TRANSPORT (e) & THEME (e , x) \rightarrow $\exists y$ [VEHICLE (y) & INSTR (e , y)
& SUPPORT (y , x) AT $\tau(e)$]]

(70) *Conceptual Knowledge about Vehicles:*

- a. $\forall x$ [BIKE (x) \rightarrow VEHICLE (x)]
- b. $\forall x$ [BABY-CARRIAGE (x) \rightarrow VEHICLE (x)]
- c. $\forall x$ [SHIP (x) \rightarrow VEHICLE (x)]

(71) *Conceptual Knowledge about Spatial and Functional Relations:*

- a. $\forall xy$ [LOC (x , ON (y)) \rightarrow SUPPORT (y , x)]
- b. $\forall xy$ [LOC (x , IN (y)) \rightarrow CONTAIN (y , x)]
- c. $\forall xy$ [CONTAIN (x , y) \rightarrow SUPPORT (x , y)]

Using this piece of commonsense knowledge, we can derive a conceptual structure for sentence (65) that fulfills the condition in MOD^v. The spatial constraint expressed by the locative can be integrated into the conceptual structure of the verb if we assume that the baby carriage is used as an instrument in the smuggling event. This assumption is legitimate because the baby carriage is a suitable vehicle (cf. (70b)) and it stands in the required spatial configuration (cf. (71b/c)). By this conceptual reasoning the modifier's free variable is identified as the theme of the smuggling event. The Semantic Form of (65) is given in (72a) and the respective conceptual structure that is inferred on the basis of (69) – (71) is given in (72b).

(72) Angela hat die Diamanten in einem Kinderwagen geschmuggelt.

Angela has the diamonds in a baby-carriage smuggled.

- a. SF: $\exists ey$ [SMUGGLE (e) & AGENT (e , angela) & THEME (e , the diamonds) &
LOC (v^e , IN (y)) & BABY-CARRIAGE (y)]

¹² For expository reasons, the axioms in (69) – (71) are slightly simplified; cf. Maienborn (2000b, 166ff) for an axiomatization of the relevant conceptual knowledge that fits the demands of abductive inferencing.

- b. CS: $\exists y$ [SMUGGLE (e) & AGENT (e, angela) & THEME (e, the diamonds) & INSTR(e, y) & LOC (the diamonds, IN (y)) AT τ (e) & BABY-CARRIAGE (y)]

The conceptual structure in (72b) goes beyond the grammatically determined meaning in (72a) in the following respects: (a) it identifies the baby carriage as the instrument in the given event, (b) it provides a value for the free variable v , and (c) it specifies that the spatial relation holds during the whole event. Note that the last condition is a genuine conceptual constraint, i.e., it is based on world knowledge. In (73), world knowledge tells us that what becomes the sword is located at the given region only during a subinterval of the forging event. This is the period of heating the metal in the case of (73a) and the period of beating it into shape in the case of (73b).

- (73) a. Siegfried hat sein Schwert im knisternden Feuer geschmiedet.
Siegfried has his sword in.the crackling fire forged.
b. Siegfried hat sein Schwert auf einem Amboss geschmiedet.
Siegfried has his sword on an anvil forged.

Similarly, in (74a) the location in a ginger marinade will presumably hold at an early stage of preparing a chicken, whereas in (74b) it is most likely that the chicken is placed into the basil sauce only at the very end. At least this is what a cookbook would tell you. The grammar remains silent about these issues. That is, the compositional semantics does not determine the locative's temporal dependency on a given event.

- (74) a. Der Koch hat das Hähnchen in einer Ingwer-Marinade zubereitet.
The cook has the chicken in a ginger marinade prepared.
b. Der Koch hat das Hähnchen in einer Basilikumsauce zubereitet.
The cook has the chicken in a basil sauce prepared.

Given the condition on the interpretation of free variables expressed in MOD^v , it falls out naturally why a sentence like (75) is conceptually ill-formed under an internal reading of the locative modifier. The spatial constraint expressed by *neben* ('beside') is not compatible with the support relation required by the given event. Consequently, the baby carriage does not qualify as instrument. Since there is no suitable anchoring of the locative with respect to the conceptual structure of the verb, no instantiation of the free variable is obtained. (§ marks conceptual ill-formedness.)

- (75) § Angela hat die Diamanten neben einem Kinderwagen geschmuggelt.
Angela has the diamonds beside a baby-carriage smuggled.

The conceptual analysis of internal modifiers presented here can also account for the positional interpretation of locatives in sentences like (76). In these sentences, the modifier, rather than supplying locative information, seems to supply a constraint on the position of the subject referent.

- (76) a. Bardo steht auf dem Kopf.
Bardo is standing on the head.
- b. Angela hüpfte auf einem Bein zur Tür.
Angela is jumping on one leg to the door.
- c. Paul flehte auf Knien um Gnade.
Paul craved on knees for mercy.
- d. Luise schläft auf dem Rücken.
Luise sleeps on the back.

In Maienborn (2000b), I argue that the positional use of locatives can be explained without giving up the assumption that they are true locatives. The internal modifier in (76a), e.g., indeed does not locate Bardo, yet it expresses that Bardo's head is supporting the rest of his body. The internal modifier adds the information that Bardo is standing in a way such that his remaining body is located on his head. That is, the positional use of the locatives in (76) can be traced back to a locative relation between body parts. More generally speaking, whenever conceptual knowledge about an eventuality type involves constraints on the canonical or typical position of participants, internal locative modifiers may be used to provide additional information about these constraints, thereby exploiting conceptual knowledge about the part-whole organization of physical objects. Thus, even the cases that appear on first glance to challenge the assumption of a uniform meaning contribution of locatives can be explained by applying the very same conceptual machinery to an underspecified semantic representation; cf. Maienborn (1996, 2000b) for a detailed analysis of the positional uses of locatives.

This leads us to a straightforward explanation of the instrumental or manner reading that occasionally seems to be superimposed on an internal locative modifier; cf. section 2.3. It turns out to be simply a side effect of the conceptual parameter fixing. Note that in the course of anchoring the locative within the conceptual structure of the verb the internal argument of the locative must be identified with an independently established entity that serves some function within the given eventuality. If this entity is used, e.g., as an instrument, this carries over to the locative and we obtain the instrumental reading; cf. e.g. (72). The manner reading basically follows the same pattern; cf. the positional use in (76). Thus, the approach developed here does not have to assume that locatives are sometimes defective or somehow have a mutated semantic content, but accounts for the peculiar interpretation of internal modifiers by emphasizing exactly their genuinely locative meaning contribution.

The virtual ubiquity of conceptual integration sites for locatives follows from the fact that our conceptual knowledge about eventualities includes knowledge about functional relations holding among their participants. These functional notions are often based on spatial configurations. That is, participants must meet certain spatial conditions in order to perform their designated function. Here is where internal modifiers come in: they elaborate on implicit spatial constraints that form the backbone of an eventuality's functional skeleton.

To sum up, the general schema accounting for the compositional semantics of internal modifiers is given in (77) – (80).

(77) V: ... $\lambda e[\text{ev-type}(e) \ \& \ \dots]$

(78) PP_{LOC} : $\lambda x [\text{LOC}(x, \text{reg})]$

(79) MOD^v : $\lambda Q \lambda P \dots \lambda x [P(\dots)(x) \ \& \ Q(v^x)] = (67')$

(80) *Internal Modifiers*:

$[\text{v PP}_{\text{LOC}} [\text{v} \ \dots \]]: \dots \lambda e[\text{ev-type}(e) \ \& \ \dots \ \& \ \text{LOC}(v^e, \text{reg})]$

The proposed analysis accounts for the inferential behaviour and the observed meaning variation of internal modifiers. Internal modifiers provide an additional constraint on the verb's eventuality argument that is mediated by a free variable. This free variable must be instantiated with respect to the conceptual structure of the verb. If we assume that the verb's conceptual structure is only accessible at the lexical level and becomes inaccessible as soon as the process of saturating the verb's arguments has started, this explains why internal modifiers show up as V-ad adjuncts. I will return to this issue in section 7.

6. THE INTERPRETATION OF FRAME-SETTING MODIFIERS

Frame-setting modifiers were informally characterized in section 2 as restrictive devices that set the scene for the rest of the sentence. They do not relate to the verb's eventuality argument but to the asserted proposition.¹³ According to our syntactic considerations in section 3, frame-setting modifiers are base-generated in the verb's functional shell within the C-Domain. In the following, I will argue that the interpretation of frame-setting modifiers follows the same pattern as the interpretation of internal modifiers. That is, both are semantically underspecified with respect to the located entity. While internal modifiers are embedded within the conceptual structure of the verb, frame-setting modifiers must be embedded within the discourse structure of the sentence. To substantiate this claim, I will first provide evidence that frame-setting modifiers are indeed subject to semantic indeterminacy in the relevant sense; cf. section 6.1. I will then propose a semantic account of frame-setting modifiers that relates them to the topic/comment structure of a sentence and reflects their similarities with internal modifiers; cf. section 6.2.

¹³ According to Bellert's (1977) classification of sentence adverbs, frame-setting modifiers could be categorized as *domain adverbials*; cf. Bellert's (1977, 347) original examples (i) – (iii) and McConnell-Ginet's (1982, 176) comments on (iv):

- (i) Linguistically, this example is interesting.
- (ii) Mathematically, there is no answer to your question.
- (iii) Logically, John is wrong.
- (iv) Botanically, a tomato is a fruit.

6.1. *Semantic Indeterminacy*

Consider sentence (81). According to our informal characterization of frame-setting modifiers, the claim that Pinochet enjoys diplomatic immunity is restricted to the inner region of Chile.

- (81) In Chile genießt Pinochet diplomatische Immunität.
 In Chile enjoys Pinochet diplomatic immunity.

There are several options of how to spell out what this restriction actually means. Sentence (81) could express (a) that Pinochet is free from legal action taken by Chilean authorities. It might express (b) that Pinochet is diplomatically immune (maybe throughout the world) whenever he stays in Chile. Or it might be used to express (c) that the people of Chile believe Pinochet to be diplomatically immune. Depending on the utterance meaning of (81), different entities qualify as the target referent for the locative modifier: legal authorities in (a), Pinochet in (b), and a relevant set of citizens in (c). The actual context may also support a mix of these readings. A natural example is provided by (82).

- (82) In Deutschland ist die Hooligan-Szene unter Kontrolle. (Schwieriger wird es bei
 In Germany is the hooligan scene under control. (More difficulties are posed
 internationalen Begegnungen wie Rotterdam gegen Mönchengladbach.)
 by international encounters like Rotterdam vs. Mönchengladbach.)
 (TV-report, Mar 18, 1999)

In the given linguistic context the most plausible interpretation of (82) can be rendered as: For the hooligan scene of Germany during their stay in Germany it is the case that they are under control.¹⁴

Let me add a remark on the (c) reading of (81). We observe a kind of epistemic reading of the frame-setting modifier here. That is, the modifier sets a frame for the source of belief of a given proposition; cf. Parsons' (1990, 211f) distinction of "real" and "unreal" frames. Such an epistemic interpretation of the modifier yields the preferred reading for the sentences in (83). For instance, (83a) is understood as a claim by Harald Juhnke (a popular German entertainer) that people in Germany believe him to be world-famous.¹⁵

- (83) a. In Deutschland bin ich weltberühmt. (Harald Juhnke, radio interview 1998)
 In Germany am I world-famous.

¹⁴ Note that in (82) *Rotterdam* refers to a Dutch soccer team and *Mönchengladbach* to a German team.

¹⁵ Ross (1997) is concerned with a subclass of epistemic frame-setting modifiers, so-called "contensive modifiers". The internal arguments of contensive modifiers refer to media such as books, movies, pictures, etc. Ross makes an interesting proposal how to account for the interpretation of sentences like (83c-e). However, he completely ignores the semantics of the preposition. So his solutions cannot be integrated straightforwardly into a compositional semantics account of modifiers.

- b. In Frankfurt ist der Dollarkurs gesunken.
In Frankfurt has the dollar rate decreased.
- c. Im neuen Duden-Lexikon ist Goethe 1837 gestorben.
In the new Duden lexicon has Goethe 1837 died.
- d. In der Bibel schuf Gott den Himmel und die Erde in 7 Tagen.
In the Bible created God the heaven and the earth in 7 days.
- e. In Herzogs Film tragen Indios das Schiff über einen Berg.
In Herzog's movie carry indios the ship over a mountain.

Actually, if used in an appropriate context, any frame-setting modifier can support an epistemic reading. Take, e.g., (84).

- (84) In Frankfurt ist die Kriminalitätsrate gesunken.
In Frankfurt has the crime rate decreased.

The straightforward interpretation of (84) is that the crime rate of Frankfurt has decreased. The epistemic variant states that the crime rate of a certain population (not necessarily that of Frankfurt) has decreased according to a source of belief that is located in Frankfurt. If the context provides a suitable antecedent, e.g. some institution concerned with criminal statistics, this is a plausible interpretation of (84); cf. the analogous interpretation of (83b), which can draw on the background knowledge that Frankfurt is the seat of the official German stock market. More generally speaking, we may conclude that there is always the option of interpreting a frame-setting modifier as providing an epistemic frame. Whether this yields a plausible utterance meaning depends on the given context.

So far the discussion has shown that the meaning contribution of frame-setting modifiers may vary considerably. There are various ways of how to spell out the idea that a speaker's claim is restricted by a spatial frame. I conclude that frame-setting modifiers are subject to semantic indeterminacy in this respect. They are semantically underspecified restrictive devices whose exact impact on the asserted proposition is determined pragmatically. Thus, frame-setting modifiers will be analyzed as semantically underspecified with respect to the located entity. They lend themselves to restricting the domains of quantifiers and definites but possible targets also include referents that must be inferred on the basis of context and world knowledge. This parallels the case of internal modifiers that was discussed in the previous section.

The pragmatic approach advocated here contrasts with current Diesing-style frameworks (cf. Diesing 1992a, b), where the target of frame adverbials is claimed to be grammatically determined. These approaches account for the semantics of locative frames by mapping the locative into the restrictive clause of a tripartite structure at LF. For instance, sentence (85a) has the LF representation (85b); cf., e.g., Krifka et al. (1995, 26f), Chierchia (1995, 178).

- (85) a. In Australien sind die meisten Schwäne schwarz.
In Australia are the most swans black.

b. LF: Most x [swan (x) & in Australia (x)] [black (x)]

According to such analyses, the contribution of a frame adverbial consists in restricting a particular quantifier domain, and the issue of identifying the target of a frame adverbial is seen as a genuinely syntactic process. Moreover, due to the definition of tripartite structures, the target must be a variable that appears both in the restrictive clause and in the nuclear scope. Given Diesing's (1992a, b) claim that the partition of nuclear scope and restrictive clause coincides with the border of VP, the target of a frame adverbial is assumed to be anchored VP-internally. Thus, Diesing-style analyses predict that potential targets of frame adverbials are either the eventuality referent of the verb (if there is one) or one of the verb's arguments.

The discussion of the sample sentences (81) – (84) indicates that a syntactic approach à la Diesing fails to account for the full range of possible utterance meanings of frame-setting modifiers. Besides the reading indicated by the LF in (85b), sentence (85a) has at least two more readings, an epistemic reading and a temporal one. The former could be rendered as: According to the people in Australia it is the case that most members of a contextually determined set of swans are black. The latter expresses that whenever a contextually given set of swans stays in Australia, most of its members are black. Neither reading can be derived from the LF given in (85b). I can see no evidence that the grammatical system takes a stance on any of these readings. Judging them as more or less plausible is a genuine matter of pragmatics. I therefore conclude that the semantic (and syntactic) structure of a sentence like (85a) should remain neutral with respect to these meaning differences. In sum, Diesing-style analyses neglect the influence pragmatics bears on the interpretation of sentences with frame-setting modifiers and arrive therefore at a wrong conception of their grammatical structure.

6.2. A Proposal: Frame-Setting Modifiers as "Chinese-Style" Topics

In the previous section, we have seen that frame-setting modifiers are subject to semantic indeterminacy. This raises the question what sort of constant meaning contribution lies behind all of their potential contextual specifications. What is the context-independent effect of frame-setting modifiers on compositional semantics, and how do they relate to the rest of the sentence? In the following, I want to make a proposal that relates frame-setting modifiers to the topic/comment structure of a sentence. In particular, I suggest that frame-setting modifiers should best be seen as *Chinese-style topics* in the sense of Chafe (1976, 50f): "What the topics [i.e. Chinese-style topics, C.M.] appear to do is to limit the applicability of the main predication to a certain restricted domain. [...] Typically, it would seem, the topic sets a spatial, temporal, or individual framework within which the main predication holds. [...] In brief, 'real' topics (in topic-prominent languages) are not so much 'what the sentence is about' as 'the frame within which the sentence holds.'" Drawing on this parallel, we may conceive of frame-setting modifiers in subject-prominent languages like English or

German as an optional device for constraining the application of the comment (= the main predication of the sentence) to a topic (= what the sentence is about).¹⁶

The division of a sentence into a topic and a comment is a means of packaging the information presented in a way that signals how the sentence is meant to fit into the discourse; cf. Gundel (1976, 1988), Reinhart (1981), Lambrecht (1994), among others. The topic/comment structure is used to assess the pragmatic appropriateness of a sentence in discourse; cf. von Stechow (1994) and Büring (1997) for two recent proposals on the pragmatics of topic/comment.

Let us make the following background assumptions: first, the term 'topic' is used here as a grammatical notion. It refers to sentence topics in a narrow sense, as opposed to discourse topics. Sentence topics will be understood in terms of aboutness. The topic of a sentence is the referent of a designated constituent which the proposition expressed by the sentence is about.¹⁷ Discourse topics, on the other hand, are pragmatically salient issues that are under debate in a given discourse. Standardly, they are modeled as questions (i.e. as sets of propositions); cf., e.g., von Stechow (1994). Finally, a sentence topic is required to be anchored within the discourse topic; otherwise the respective sentence would not be pragmatically appropriate. Let us assume, following von Stechow (1994), that topic constituents are anaphoric expressions that are bound (or accommodated) within the discourse topic.

As for the syntax of topic/comment, Frey (2000b) provides ample evidence that topics are marked by structural means in German. More specifically, he argues for a designated topic domain in the German middle field. This topic domain is located above the base position of sentence adverbs. For a constituent to qualify as topical it must move into this topic domain. (This does not preclude further movement, e.g., into the prefield.) Let us assume, for the sake of transparency, that Frey's topic domain can be accounted for by a separate functional layer, a *Topic Phrase* (TopP), as was suggested most prominently by Rizzi (1997).¹⁸

Remember that our syntactic findings in section 3.1 revealed that frame-setting modifiers are base-generated above the base position of sentence adverbs. Moreover, according to our semantic considerations developed above, frame-setting modifiers are related to the topic/comment structure of a sentence. Therefore, I conjecture that frame-setting modifiers are TopP adjuncts. They enter into semantic composition at the stage

¹⁶ Jacobs (1999b) notes that languages with morpholexical topic markers like Korean often apply these markers also to frame-setting expressions. This lends further support to the claim that frame-setting is related to the notion of topic/comment.

¹⁷ The literature on sentence topics basically splits up into two rival approaches. Topics are either understood in terms of aboutness or in terms of familiarity (i.e., topics are those referents that the speaker and the hearer are already familiar with); cf. Frey (2000b) for a recent discussion. Frey (2000b) provides evidence that German has grammatical means for encoding aboutness.

¹⁸ Rizzi (1997) suggests splitting up the functional category C into four categories that make up the fine structure of the left periphery of the sentence; cf. (i).

(i) ForceP – TopP – FocP – FinP
(illocutionary force) (topic/comment) (focus/background) (finiteness)

As for TopP and FocP, Rizzi (1997, 288ff) assumes that both are optional and that TopP is moreover recursive. Top⁰ is phonetically null in languages like German, but may be pronounced in other languages; cf. Rizzi (1997, 287).

where topic/comment structuring takes place. I do not want to commit myself to any particular semantic account of topic/comment here. Let us adopt a *structured meaning* approach as was suggested by Krifka (1992) for convenience.¹⁹ A structured meaning is a pair $\langle \alpha, \beta \rangle$ consisting of a comment part α and a topic part β . The comment is of a semantic type that can be applied to the topic. (Under the assumption that topics are of type e , α is of type $\langle e, t \rangle$.) The application of α to β yields the regular semantic representation. For β to qualify as a suitable topic it must fulfill further felicity conditions; cf. Krifka (1992). Using structured meanings, the semantic representation of the functional head Top^0 can be given as in (86).

$$(86) \text{ Top}^0: \lambda P \lambda x [\langle P, x \rangle]$$

When frame-setting modifiers enter the computation, they encounter a structural environment where the argument variable for the sentence topic is still unsaturated. That is, frame-setting modifiers face an argument constellation as sketched in (87), where α corresponds to the respective comment that was supplied by the complement of Top^0 . What licenses the integration of frame-setting modifiers at this stage of semantic composition? I want to propose that we do not need a new template but can use MOD^V again. The general schema is given in (87) – (90).

$$(87) \text{ TopP}: \lambda x [\langle \alpha, x \rangle]$$

$$(88) \text{ PP}_{\text{LOC}}: \lambda x [\text{LOC}(x, \text{reg})]$$

$$(89) \text{ MOD}^V: \lambda Q \lambda P \dots \lambda x [P(\dots)(x) \ \& \ Q(v^x)] = (67')$$

(90) *Frame-Setting Modifiers:*

$$[\text{TopP PP}_{\text{LOC}} [\text{TopP} \dots]]: \lambda x [\langle \alpha, x \rangle \ \& \ \text{LOC}(v^x, \text{reg})]$$

According to (90), frame-setting modifiers constrain a semantically underspecified referent that relates to the sentence topic. Given our background assumption that sentence topics must be anchored within the discourse topic of a sentence, it seems natural to assume that the conceptual structure that is made accessible by a sentence topic is, in fact, the discourse topic. Hence, I claim that frame-setting modifiers express a locative constraint on a semantically underspecified referent embodied in the discourse topic. This is the constant, grammatically determined meaning contribution lying behind all their potential utterance meanings.

A full-fledged account of the pragmatics of topic/comment structuring and frame-setting lies beyond the scope of this paper. Therefore, I will only give an informal characterization of the conceptual resolution of the semantic indeterminacy displayed by frame-setting modifiers; but cf. Jäger (2000) for a formal account within a DRT framework.

¹⁹ Structured meanings were originally designed to handle focus/background structures; cf. Klein and von Stechow (1982), Jacobs (1983). Krifka (1992) extends this to capture the contribution of topic/comment structuring.

Let us explore the range of potential conceptual specifications by examining some typical examples. The discourse topic of a sentence provides two kinds of suitable target referents for a frame-setting modifier. These are the sentence topic on the one hand, as well as further contextually salient referents on the other hand.

As for sentence topics, there are two ways in which a frame-setting modifier can be linked to them. First, the modifier can be used to constrain the domain of a sentence topic. This includes quantifier domains as in (91a) as well as domains of functional nouns and definites as in (91b). The respective interpretation of sentence (91a) can be rendered as: For most swans that are located in Australia it is the case that they are black. (This is the reading that a Diesing-style analysis claims to be syntactically derived; cf. (85b).)

- (91) a. In Australien sind die meisten Schwäne schwarz.
 In Australia are the most swans black.
 b. In Frankfurt ist die Einwohnerzahl gestiegen.
 In Frankfurt has the population increased.

Secondly, by relating to the sentence topic, a frame-setting modifier can also be used to single out a *topic time* in the sense of Klein (1994). Klein (1994) uses this notion for the time for which a speaker wants to make a claim. Put in terms of topic/comment structure, the application of the comment to the topic only holds with respect to a particular topic time a speaker has in mind.²⁰ The respective conceptual specification for (91a) can be rendered as a statement about the members of some set of swans with respect to a topic time when they are located in Australia. This yields the temporal reading of frame-setting modifiers discussed in section 2.3. Note that the temporal interpretation of frame-setting modifiers is pragmatically appropriate only if the topic time is truly restricted by the modifier. This implies that a locative must be understood as expressing a temporary localization of the sentence topic. A predicate denoting a permanent property has no delimiting effect on the topic time. In Maienborn (2000a), I propose a pragmatic explanation for this condition on the temporal interpretation of frame-setting modifiers in terms of conversational implicatures.

The second kind of potential targets provided by the discourse topic are those referents that are contextually salient at a given discourse stage. These do not necessarily show up within the linguistic structure, but they prove to be equally accessible targets for frame-setting modifiers. For the sake of illustration, take the sentence in (92).

- (92) In London war Trafalgar Square abgesperrt.
 In London was Trafalgar Square closed off.

²⁰ Klein (1994) points out that the topic time of a sentence is grammatically introduced via tense and aspect and may be subject to further contextual restrictions; cf. also Reichenbach's (1947) notion of a *reference time*.

The subject *Trafalgar Square* is ruled out as potential target because it does not introduce a quantifier domain that could be restricted by the locative. A temporal reading of the frame-setting modifier is also excluded, because being located in London fails to be a temporary property of Trafalgar Square. Hence, there is no linguistically visible anchor for the locative in (92). Therefore, the relevant target must be supplied by the discourse context. Let us assume that the issues under debate when (92) is uttered are measures concerning public places that were taken in view of, e.g., political disturbances or preparations for a country-wide celebration, etc. This yields an utterance meaning for (92) expressing that the measures taken in London concerning Trafalgar Square were closing it off. The epistemic readings of frame-setting modifiers discussed in the previous section follow the same pattern. They all require that the discourse topic provides a salient source of belief, which then is further delimited by the modifier.

In sum, our venture into the semantics and pragmatics of frame-setting modifiers suggests the following: Frame-setting modifiers are semantically underspecified devices for restricting the application of the comment to the topic of a sentence. Their semantic indeterminacy is resolved with respect to the conceptual structure that is accessible via the sentence topic. This is the discourse topic of a sentence. Thus, frame-setting modifiers express an additional locative constraint on a semantically underspecified referent that is part of the discourse topic. Potential conceptual specifications encompass (a) constraining the domain of a contextually salient discourse referent including the sentence topic, and/or (b) delimiting the topic time by expressing a temporary localization of the sentence topic. This yields a bundle of possible interpretations for sentences with frame-setting modifiers. The evaluation of their pragmatic appropriateness and therefore the identification of the most plausible utterance meaning depends on the relevant context.

The treatment of frame-setting modifiers is still incomplete in several respects. I did not say much about the semantics and pragmatics of sentence and discourse topics and I did not provide a formal account of the conceptual specification of frame-setting modifiers. However, I hope to have made clear that the proposed analysis is both empirically adequate and theoretically attractive. It accounts for the full range of possible interpretations while insisting at the same time that frame-setting modifiers are nothing but simple first-order predicates of objects or eventualities that add a locative constraint. They do not differ from internal and external modifiers in this respect. That is, it is not the locative itself that is responsible for the peculiar appearance of frame-setting modifiers but only its structural environment. This parallels the case of internal modifiers. Being subject to semantic indeterminacy, both modifier types encounter a wide range of potential conceptual targets. Once they are conceptually anchored, they reflect certain features of their respective surrounding. This gives locative modifiers their chameleon-like appearance: they appear as instrumental-/manner-like (internal modifiers) or as temporal-/operator-like (frame-setting modifiers) on the linguistic surface, depending on the conceptual configurations they are merged with.

Appreciating adequately the impact of the conceptual surrounding leads also to a straightforward explanation for the deviant inferential behavior of frame-setting modifiers. If the locative ends up constraining some quantifier domain, the respective

Davidsonian inference does not go through. If the locative is used to single out a particular topic time, the respective inference is valid. Hence, both the non-locative meaning contributions of frame-setting and internal modifiers and the inferential behavior of frame-setting modifiers turn out to be a side effect of their conceptual anchoring.

The present study suggests that frame-setting and internal modifiers, despite all their fundamental differences, show some striking similarities. These are accounted for by licensing both modifier types by the very same template MOD^v ; cf. (67'). Yet MOD^v applies in two distinct structural environments, thereby designating different arguments as pivots for semantic composition. These are the verb's eventuality argument and the sentence topic. These compositional pivots, in turn, open up different conceptual spaces for embedding a modifier: the internal organization of an eventuality in terms of participants, functional and spatial conditions, etc., or an arrangement of contextually salient referents comprising the discourse topic of a sentence. This is why internal and frame-setting modifiers look so different after all.

7. ON THE SYNTAX/SEMANTICS INTERFACE OF MODIFIERS

Our exploration into the position and interpretation of locative modifiers has demonstrated that modifiers are a very flexible means of natural language expression. The major aim of the present study was to show that this flexibility is compatible with a rigid account of lexical and compositional semantics. In this sense, the study provides non-trivial confirmation for the tenet "One Form – One Meaning" as a guiding principle for natural language semantics.

The advocated treatment of locative modifiers confirms the Davidsonian view of adverbial modification as a conjunction of predicates, and it suggests a refinement in accounting for the semantic indeterminacy of modifiers in certain structural environments. The respective combinatorial templates MOD and MOD^v , licensing external, internal, and frame-setting modifiers, are repeated in (93) – (95).

(93) MOD : $\lambda Q \lambda P \lambda x [P(x) \ \& \ Q(x)]$

(94) MOD^v : $\lambda Q \lambda P \dots \lambda x [P(\dots)(x) \ \& \ Q(v^x)]$

(95) *Notational Convention*: We use ' $Q(v^x)$ ' to indicate that v is assigned a value such that $Q(v)$ is anchored w.r.t. the conceptual structure accessible through x .

Both templates guarantee that a modifier provides an additional semantic constraint on the highest-ranked argument x of the modified expression. Whereas MOD constrains x directly, leaving no space for contextual variation, MOD^v establishes an indirect constraint on x which is mediated by a free variable v . MOD^v requires v to be instantiated with respect to the conceptual structure that is accessible through x .

In assuming MOD^v , I claim that modification provides a structural source for semantic indeterminacy. Modifiers are linguistic parasites. They are only loosely tied to

the syntactic and semantic structure, leaving much space for contextual variation and adaptation. However, a contextual augmentation of the underspecified meaning does not take place arbitrarily but is triggered and controlled by the grammar. Free variables are introduced at well-defined stages within semantic composition, they mark exactly the gaps within the grammatically determined meaning that call for conceptual specification, and they delimit the search space for potential conceptual fillers. Thus, the free variable introduced by MOD^V can be seen as a kind of interface between grammar and pragmatics. It allows us to integrate linguistic and extra-linguistic information in such a way that their differences do not become blurred.

What about the syntax/semantics interface of modifiers? An adequate interface condition licensing (locative) modifiers should explain (a) their distributional behavior and (b) their choice between the two templates MOD and MOD^V . It turns out that we can derive (a) and (b) without any further assumptions, apart from taking MOD and MOD^V to apply freely in the course of semantic composition, which is the most liberal hypothesis conceivable. This suffices to make the right predictions concerning the position and interpretation of locative modifiers. Let us see how.

As for MOD , it requires a structural environment where all but the highest-ranked argument are saturated. This yields the VP-periphery as a potential integration site for a locative (and excludes integrations below that). The highest-ranked argument is given by the verb's eventuality argument. Applying MOD in this structural environment leads to an interpretation of the locative as external modifier. Given the common assumption that a verb's eventuality argument is existentially bound immediately above VP, any higher integration site for external modifiers within the IP or CP-Domain is ruled out.

As for MOD^V , no such argument structural limitations obtain. Hence, MOD^V is both syntactically and semantically more liberal than MOD . However, MOD^V alludes to the conceptual structure associated with the highest-ranked argument, and it seems plausible to assume that the accessibility of conceptual structures for further linguistic constraints is restricted by principles governing the grammar/pragmatics interface. That is, there are well-defined "windows" through which compositional semantics allows linguistic expressions to access and constrain conceptual structures. More specifically, I have suggested that the conceptual structure associated with verbs can only be taken up and further constrained at the lexical level, whereas the discourse topic of a sentence is only accessible through the sentence topic. This explains why internal modifiers adjoin to V and frame-setting modifiers adjoin to TopP. No other structural environments between V and TopP provide suitable integration sites for locatives via MOD^V .

The present study of locative modifiers confirms the view of Haider (1998, 2000) and Ernst (1998, 1999, 2001) that the ordering restrictions of modifiers have no genuine syntactic sources but can be derived from independent non-syntactic properties; cf. section 3.2. But instead of assuming a kind of mapping mechanism between syntactic and semantic domains as suggested by Haider and Ernst, the present proposal defines the relevant interface condition in terms of argument structural configurations as given by MOD and MOD^V . This allows us to derive the ordering restrictions of modifiers not only with respect to each other but also with respect to arguments.

In sum, we arrive at the following picture. Syntax allows modifiers to adjoin freely. The interface condition given by MOD and MOD^V guarantees that they are only integrated in structural environments that provide the right argument structural configurations and satisfy, if necessary, the accessibility condition on conceptual structures. The existence of base positions for modifiers follows from the fact that there are only a few structural environments that fulfill these conditions.

This overall picture underlines the parasitic nature of modifiers. Wherever they find a suitable integration site, they attach to it and supply additional and uncalled-for information. Precisely because of this simplicity, modifiers prove to be a challenging test case for linguistic theory. They are a valuable diagnostic for structure, because any additional complexity that can be observed with modifiers in a particular environment must originate from structural properties of this environment. Exploring the grammar and pragmatics of modifiers is always also a venture into the grammar and pragmatics of their surroundings.

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