Chapter 13

A New Application for Raising in HPSG: Complex Prepositions

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ABSTRACT. One of the most popular techniques used in HPSG-based studies to describe linguistic phenomena is the raising mechanism. Besides ordinary raising verbs or adjectives, this tool has been applied for handling verbal complexes and discontinuous constituents, among other phenomena. In this paper, a new application for raising within the HPSG paradigm will be discussed, thereby investigating data from the prepositional domain. We will analyze linguistic properties of word combinations in German consisting of a preposition, a noun, and another preposition (such as *auf Grund von* ('by virtue of')), thus arguing that raising is the most appropriate method for satisfactorily describing the crucial syntactic features which are typical for those expressions. The objective of this paper is thus to demonstrate the efficiency of the raising mechanism as used in HPSG, and therefore, to emphasize the importance of designing a satisfactory uniform theory of raising within this grammar framework.

13.1 Introduction

In describing linguistic phenomena, grammar frameworks apply various techniques that are generally accepted and well established, although they might be differently instantiated in various linguistic theories, depending on the formal tools provided by a given theory. Besides concepts such as movement, binding, or case assignment, the idea of raising plays an important role in many formal approaches to natural language. Particularly frequently used is the raising technique in HPSG-based studies, especially in studies of German.

In this paper, we will discuss a new application for raising within the HPSG grammar framework in the tradition of Pollard and Sag (1994), thereby investigating data from the prepositional domain. We will analyze the syntax of word sequences commonly labeled "complex prepositions" (CPs) consisting of a preposition, a noun, and another preposition ($P_1N_1P_2$). Although CPs can certainly be considered to be a cross-linguistic phenomenon, we will focus exclusively on German data, because they provide very explicit and convincing linguistic evidence

Proceedings of Formal Grammar 2003
G. Jäger, P. Monachesi, G. Penn & S. Wintner (editors).

which motivates and supports our approach.[1] However, we assert that the analysis proposed here for German can also be applied to other languages such as Polish or English.

Presenting our analysis for German CPs and depicting parallels between this approach and the analysis of German verbal complexes, our objective is to indicate the efficiency of the raising technique as used in the lexicalist constraint-based grammar systems such as HPSG, thus demonstrating the need of designing a satisfactory uniform theory of raising within this grammar framework.

13.2 Raising in HPSG

Besides ordinary raising verbs and adjectives, the raising mechanism is used in HPSG-based studies for handling several linguistic issues such as verbal complexes (cf. Hinrichs and Nakazawa 1989, Meurers 2000), or discontinuous constituents (cf. De Kuthy 2000).

To illustrate how argument raising in terms of the HPSG functions, we will look at the essential aspect of the German verbal complex analysis in style of Hinrichs and Nakazawa (1989). According to this analysis, the lexical entries of German auxiliaries are specified to subcategorize for verbal complements, as well as to raise the arguments of their complements. Thus, the German auxiliary *will* ('wants') in the structure below selects the verb *lesen* ('read') first, and then the arguments of *lesen*, the NP *das Buch* ('the book') and the NP *Peter* ('Peter'). This idea underlies most current HPSG approaches to verbal complexes in Germanic and Romance languages.

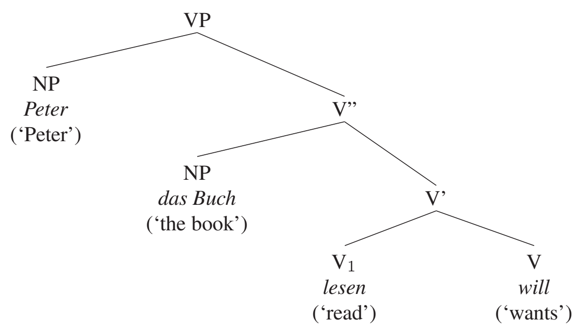

Figure 13.1: The structure of the VP *Peter das Buch lesen will* ('Peter wants to read the book')

[1]On "complex prepositions" in various languages see e.g. Beneš (1974), Buscha (1984), Lindqvist (1994), Meibauer (1995), Quirk and Mulholland (1964), Schröder (1986).

13.3 Complex Prepositions: Empirical Characteristic and Possible Analyses

In this section, we will discuss the issue of "complex prepositions" in German, and we will show that their specific syntactic properties can convincingly be explained by dint of the same method.

We have taken into account word combinations such as those in (1).

(1) an Hand von ('by means of'), in Hinblick auf ('in terms of'), in Verbindung mit ('in connection with'), mit Hilfe von ('by dint of') ...

Expressions in (1), when combined with NPs, result in PPs, acting as modifiers within the entire sentence (cf. (2)).

(2) *In Bezug auf Privatsphäre* gibt es im WWW immer noch keine
in regard to private_sphere is there in_the WWW still yet no
einheitlichen Richtlinien.
uniform rules
'With regard to privacy, there are still no uniform rules in the WWW.'

However, the interdependence between the particular elements of those expressions seems to defy standard constraints on the PP structure of German. To illustrate this, we will consider a typical PP in (3).

(3) in einer engen Verbindung mit den Beratern
in a close connection with the advisers
'in close connection with the advisers'

The standard analysis for such PPs assumes that the preposition *in* ('in') acts as the head of the entire phrase taking the NP as its complement. The selected NP is headed by the noun *Verbindung* ('connection') and contains the adjective *engen* ('close') and the determiner *einer* ('a'). Furthermore, we have the PP *mit den Beratern* ('with the advisers'), which is selected by the noun *Verbindung* as its complement and can be omitted without causing ungrammaticality (cf. Figure 13.2).

Trying to apply the above approach to an analysis of PPs containing CPs presents several problems. To show this, we will consider one of the CPs combined with an NP, which looks very similar to the PP in (3) (cf. (4)).

(4) in Verbindung mit diesem Problem
in connection with this problem
'in connection with this problem'

Using PPs such as those in (4) in contexts exemplified in (5), we can observe many contrasts with the traditional PPs such as those in (3).

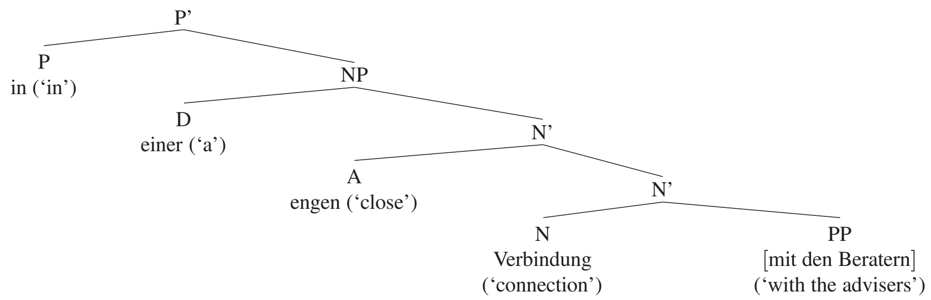

Figure 13.2: The structure of the PP *in einer engen Verbindung mit den Beratern* ('in a close connection with the advisers')

(5) In Verbindung mit diesem Problem möchte ich darauf hinweisen, dass ...
in connection with this problem would_like I DA_on point_out that
'In connection with this problem, I would like to point out that ...'

First of all, the noun *Verbindung* cannot syntactically select for a determiner or a quantifier, nor it can be combined with possessive pronouns or prenominal genitives (cf. (6a)).[2] Secondly, it cannot be modified (cf. (6b) and (6c)).[3] Finally, the PP *mit den Beratern* ('with the advisers') cannot be deleted (cf. (6d)).

(6) a. in *einer/ *der/ *seiner/ *Peters Verbindung mit diesem Problem ...
in a/ the/ his/ Peter's connection with this problem

b. in *enger/ *unerwarteter Verbindung mit diesem Problem ...
in close/ unexpected connection with this problem

[2]However, the definiteness information can be provided directly by P_1s, since $P_1N_1P_2$NP sequences as well as other PPs allow for expressions referred to as preposition-determiner contraction (e.g. *in dem* → *im*). Such expressions can be considered as a special kind of prepositions, that additionally carry the definiteness specification. For an analysis proposal for preposition-determiner contraction within the HPSG paradigm see Winhart (1997).

[3]However, there are a couple of cases in German where the nouns allow modification (cf. (i) quoted after Gisbert Fanselow, p.c.):

i. *In deutlichem Gegensatz zu / in großem Unterschied zu seinen Behauptungen* haben wir Tom
in clear opposition to / in big difference to his claims have we Tom
niemals mit Maria sprechen sehen.
never with Maria talk seen

Nevertheless, the number of nouns appearing within discussed PPs which allow for such modification is marginal in German and the set of adjectives approved within such expressions is limited to a very small semantical class. Moreover, no other types of adjuncts are possible within the PPs such as those in (i). Because of their irregular collocation-like character, I do not account for data such as those in (i) as arbitrative for my analysis. Instead, I presume another part of grammar to be responsible for licensing of such expressions. For considerations in handling collocational phenomena within the HPSG framework see e.g. Richter and Sailer (2002).

c. in [Verbindung mit diesem Problem], *die uns betrifft ...
in connection with this problem which us concerns

d. * in Verbindung ...
in connection

Based on these observations, the following assumption can be made: The string *in Verbindung mit* ('in connection with') in the PP exemplified in (4) is a lexical category evincing prepositional character. Thus, Fries (1988) assumes for these PPs that the preposition heading the entire phrase is a projection of three lexical categories which form together a complex lexical category, in this case, a preposition *in Verbindung mit*. This complex preposition then selects an NP forming a prepositional phrase (cf. Figure 13.3).

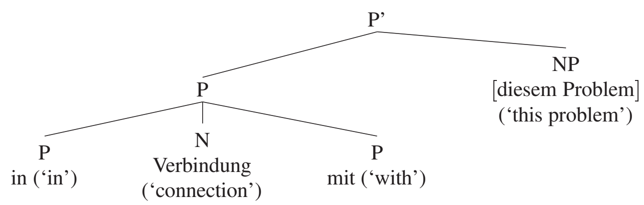

Figure 13.3: The structure of the PP *in Verbindung mit diesem Problem* ('in connection with this problem') proposed in Fries (1988)

The main problem with the Fries's analysis consists in the assumption that the preposition *mit* ('with') belongs to the complex preposition and cannot form a constituent with the NP *diesem Problem*. However, there are several data demonstrating the opposite.

Firstly, the P_2NP combinations where the preposition is realized by *von* ('of') can be replaced by the genitive; this replacement of *von* adheres to the restrictions on distribution for postnominal genitives and *von*-PPs in German (cf. (7a)). Secondly, the discussed sequences can be substituted by *wo*/*da* expressions as in (7b), which are usually handled as proforms for PPs.

(7) a. mit Hilfe ??von dem Buch/ des Buches
with help of the book/ the book$_{GEN}$
'by dint of the book'

b. in Verbindung womit/damit
in connection WO_with/DA_with
'in connection with what/with it'

These observations imply that the discussed sequences form a constituent. Thus, another analysis seems to arise, that assume P_1N_1 combinations to constitute complex lexical categories, requiring prepositional complements (cf. Figure 13.4).

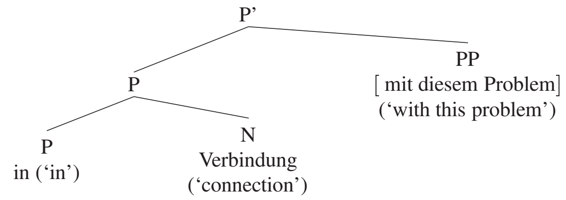

Figure 13.4: The structure of the PP *in Verbindung mit diesem Problem* (‘in connection with this problem’) assuming the *in Verbindung* string to be a complex lexical category

However, the following fact argues against the analysis in Figure 13.4: There is a type of nouns in German that allows for two options in realizing the dative case. While the first eventuality relates to suffixless forms, the second one relates to forms ending in *-e*. The choice of a given form is usually determined by stylistic effects. Examples in (8) show that dative nouns of the discussed declension class can occur within P_1N_1 sequences in both forms.

(8) a. im Verlauf/Verlaufe von Jahrhunderten
in course/course_e of centuries
‘in the course of the centuries’

b. im Fall/Falle von Mängeln
in case/case_e of deficit
‘in case of deficit’

These examples illustrate that the declension form of N_1s is determined not by P_1N_1 combinations, but by the same factors that otherwise determine the form of inflection realization. Therefore, the data above clearly eliminate the analysis in Figure 13.4.

Further on, we will consider one more possible analysis, assuming prepositions heading $P_1N_1P_2$NPs as selecting for two arguments: a noun and a PP, which would result in structures such as those in Figure 13.5.

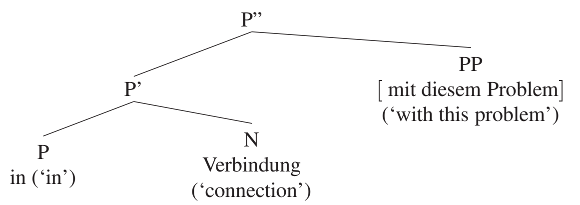

Figure 13.5: The structure of the PP *in Verbindung mit diesem Problem* (‘in connection with this problem’) assuming *in* to select for two complements

However, this assumption seems unmaintainable for the following reason: It cannot enforce that whenever a noun x appears, a PP headed by a preposition y is required. In consequence, ungrammatical PPs such as those in (9) cannot be ruled out.

(9) a. * in Verbindung zu diesem Problem
in connection to this problem

b. * in Bezug mit diesem Problem
in regard with this problem

Rather, the assumption seems plausible that syntactic properties of P_2NP sequences are determined by N_1s since these properties are identical with the properties of PPs selected by the corresponding nouns in their free occurrences.

All these observations seem to indicate the following: P_2NP sequences such as *mit diesem Problem* in (4) act as arguments of N_1s such as *Verbindung* in (4) in terms of being determined by these nouns with regard to their syntactic properties such as the form of the preposition heading these PPs. However, the discussion on constituency of $P_1N_1P_2$NP expressions above indicates that P_2NP sequences are realized syntactically by P_1s.

This idea can easily be formalized within the HPSG paradigm by use of the raising mechanism.

13.4 Using Raising Mechanism

Based on the above observations, we assume two uses of prepositions: the raising and the non-raising use. The preposition *in* in (10a) occurs in a non-raising context, while the preposition *in* in (10b) occurs in a raising context.

(10) a. in einer engen Verbindung mit den Beratern
in a close connection with the advisors
'in close connection with the advisors'

b. in Verbindung mit diesem Problem
in connection with this problem
'in connection with this problem'

Our assumption is that both strings *mit den Beratern* in (10a) and *mit diesem Problem* in (10b) act as arguments of *Verbindung* in terms of being determined by the noun *Verbindung* with regard to their syntactic properties. We expect both *mit diesem Problem* and *mit den Beratern* to be selected by *Verbindung* syntactically. Thus, in both cases, we proceed according to the standard methods of handling relational nouns selecting prepositional arguments. This explains why the PP *mit diesem Problem* shares grammatical properties with the PP *mit den Beratern* and other ordinary PPs.

Furthermore, we assume that the preposition *in* in (10b) in opposition to *in* in (10a), which subcategorizes the saturated NP, selects first the noun *Verbindung* (which does not realize its complement) and then *in* selects the complement of *Verbindung*, the PP *mit diesem Problem*. That is, by virtue of an appropriate lexical principle of grammar specifying the valence of prepositions (cf. Figure 13.8), the complement of the noun *Verbindung* is raised by *in* to become the complement of *in*, and be realized by *in* syntactically.

Thus, avoiding redundancies in the lexicon, we specify only one lexical entry for *in*, thereby underspecifying the information about its argument. In Figure 13.6 we can see the relevant part of the lexical entry of the preposition *in* in AVM notation.[4]

$$\begin{bmatrix} \textit{word} \\ \text{PHON} \ \langle\ \textit{in}\ \rangle \\ \text{SYNS} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{HEAD}\ \textit{prep} \\ \text{ARG-ST} \left\langle \begin{bmatrix} \text{LOC} \mid \text{CAT} \mid \text{HEAD}\ \textit{noun} \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

Figure 13.6: The relevant part of the lexical entry of the preposition *in* (‘in’)

The only information about potential arguments of *in* which this lexical entry provides is that *in* can take only one argument, and this argument has to be a noun. Here, information about the selection requirements of that noun will not be specified; nor will information about the selection requirements of the preposition *in* be specified.

The syntactic selection properties of *in* are licensed by a lexical constraint on the mapping of the elements of the ARG-ST list to the valence lists. For prepositions, the principle on mapping of the elements of the ARG-ST list to the valence lists is traditionally assumed to have the form as in Figure 13.7.

$$\forall \boxed{1} \left(\begin{bmatrix} \textit{word} \\ \text{SYNS} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{HEAD}\ \textit{prep} \\ \text{ARG-ST}\ \boxed{1} \end{bmatrix} \end{bmatrix} \longrightarrow \begin{bmatrix} \text{SYNS} \mid \text{LOC} \mid \text{CAT} \mid \text{VAL} \mid \text{COMPS}\ \boxed{1} \end{bmatrix} \right)$$

Figure 13.7: ARG-ST Mapping Lexical Principle for Prepositions (preliminary version)

That is, the ARG-ST value is assumed to be identical with the COMPS value. In order to facilitate prepositions to subcategorize nouns which are complement-unsaturated, and then select the complements of those nouns, the above principle has to be reformulated in the way shown in Figure 13.8. Here, the list of complements syntacticly selected by a preposition is a concatenation of its own ARG-ST

[4] For the formalization of the language used in Pollard and Sag (1994) and for the formal definition of AVM syntax see Richter (2000).

list and the list of complements of its argument.[5]

$$\forall \boxed{1} \forall \boxed{2}$$

$$\left(\begin{bmatrix} \textit{word} \\ \text{SYNS} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} \text{HEAD } \textit{prep} \\ \text{ARG-ST } \boxed{1} \left\langle \begin{bmatrix}\text{LOC} \mid \text{CAT} \mid \text{VAL} \mid \text{COMPS } \boxed{2}\end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix} \longrightarrow \left(\boxed{1} = \left(\left\langle \begin{bmatrix} \text{LOC} \mid \text{CAT} \mid \text{VAL} \begin{bmatrix} \text{SPR } \langle\, \rangle \\ \text{SUBJ } \langle\, \rangle \\ \text{COMPS } \langle\, \rangle \end{bmatrix}\end{bmatrix}\right\rangle \lor \left\langle \begin{bmatrix} \text{LEX } + \\ \text{LOC} \mid \text{CAT}\mid\text{VAL}\mid\text{COMPS } \langle \textit{synsem}\rangle\end{bmatrix}\right\rangle \right) \land \begin{bmatrix}\text{SYNS}\mid\text{LOC}\mid\text{CAT}\mid\text{VAL}\mid\text{COMPS } \boxed{2} \otimes \boxed{1}\end{bmatrix} \right)\right)$$

Figure 13.8: ARG-ST Mapping Lexical Principle for Prepositions

It has to be mentioned that the raising of more than one nominal complement result in ungrammatical constructions like those in (11).

(11) a. *in [Verbindung] [der Regierung] [mit diesem Problem] ...
in connection the government$_{GEN}$ with this problem

To avoid this problem, we have restricted the ARG-ST value of prepositions to the lists containing either one saturated element, or to the lists containing one element with a singleton COMPS list. Additionally, we have specified the LEX value of the second disjunct to be + with the idea of marking objects that have realized none of their complements. This restriction rules out the selection of relational nouns that have already realized one of their complements (cf. 12).

(12) a. *in [Verbindung der Regierung] [mit diesem Problem] ...
in connection the government$_{GEN}$ with this problem

The structure in Figure 13.9 exemplifies the interaction of the above assumptions in the licensing of a PP headed by a raising preposition.

Due to the ARG-ST Mapping Lexical Principle for Prepositions in Figure 13.8, the preposition *in*, which takes one nominal argument with one unrealized complement can be licensed. Thus, the syntactic and semantic properties of that complement are determined not by the preposition, but by the noun. Thereby, ungrammatical PPs such as those in (9) can be blocked. Both the noun and its unrealized complement are mapped to the COMPS list of *in* and, according to the constraints

[5]We assume, as Meurers (1997) does, that argument raising takes place only with respect to the valence attributes, and not with respect to the ARG-ST list.

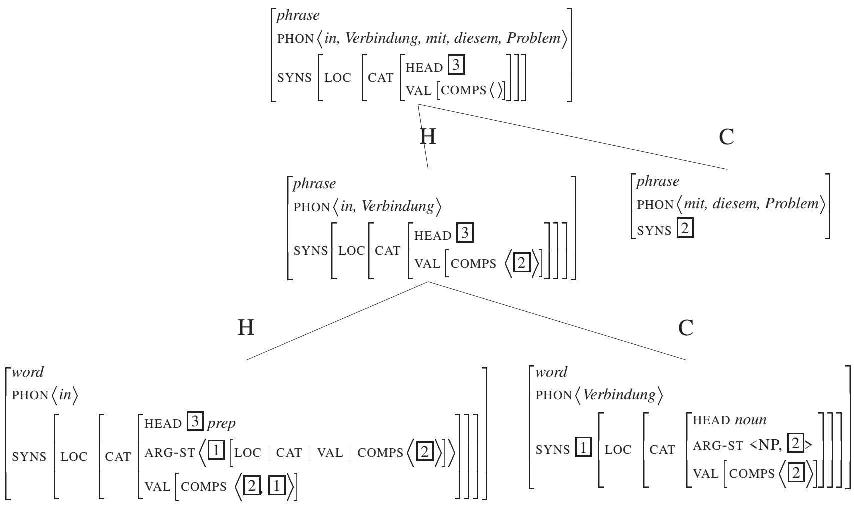

Figure 13.9: The structure of the PP *in Verbindung mit diesem Problem* ('in connection with this problem')

on the head-complement-structures for prepositions, they are syntactically selected by *in*.

The first complement that *in* selects is the noun. By virtue of selectional requirements of restrictive adjectives as well as prepositions modifying nouns, that are specified as combining with complement-saturated nouns only, the modifying of complement-unsaturated nouns is blocked. The same restriction holds for determiners and quantifiers in German. These constraints, existing in the grammar independently of the principles of the CPs syntax, explain the apparent lexical fixedness of the P_1N_1 sequences (cf. (6a) and (6b)) without additional stipulations.

In the next and the last step the preposition *in* selects the complement of the noun as its own complement, forming a PP.

Exactly the same lexical entry for preposition *in* and the same set of principles license PPs headed by non-raising prepositions such as the PP *in einer engen Verbindung mit den Beratern* ('in close connection with the advisers').

13.5 A cross-Linguistic Excursus

There is a strong evidence suggesting that the same technique can be applied for analyzing corresponding data in other languages. Quirk and Mulholland (1964) provide for instance a detailed description of sequences of the form $P_1N_2P_2NP$ in English, and isolate a class of expressions whose syntactic behavior corresponds to our observations of German data. According to Quirk and Mulholland (1964), N_1s within English expressions such as *in spite of* or *by way of* cannot combine with determiners, cannot be premodified by adjectives, do not allow the P_2NP deletion, etc. Thus, they can probably be described in the same way as the corresponding

German expressions.

Examples in (13) used in contexts such as those exemplified in (5) for German provide some evidence from Polish, that seems to substantiate our analysis as well. Here again, neither the selection of determiners by N_1s (cf. (13b)), nor the premodification (cf. (13c)) or the P_2NP deletion (cf. (13d)) are possible.

(13) a. z uwagi na ten problem
with regard to this problem
'with regard to this problem'

b. z *tej/*jego uwagi na ten problem
with the/ his regard to this problem

c. z *wielkiej uwagi na ten problem
with great regard to this problem

d. * z uwagi
with regard

Word combinations of the discussed type occurs in many other languages, thereby showing nearly uniform properties (cf. examples below quoted from Lindqvist 1994).

French: *en face de, en dépit de, au milieu de*
Spanish: *al lado de, en casa de*
Swedish: *i början av, med hjälp av, i stället för*

These parallels in the data strongly suggest that they can be described by the method presented in the previous section.

13.6 Summary

Here, the syntax of CPs in German have been examined. We have thereby seen that the previous approaches to this problem are highly problematic. We then proposed an analysis based on the raising mechanism assuming prepositions to be able to raise complements of their arguments. Underspecifying valence information within lexical entries of prepositions and applying appropriate lexical constraints, the presented theory offers a non-redundant description of linguistic facts about both the raising and non-raising prepositions.

The proposed analysis applies a technique which is already well established in HPSG-based studies. Due to this technique, a treatment of different linguistic phenomena is possible that does not require any extensions of the existing description apparatus. We have shown, for instance, that there are parallels between the raising analysis proposed here for CPs and the raising analysis of German verbal complexes as proposed in Hinrichs and Nakazawa (1989). Possibly, a more precise investigation of these two empirical domains could result in generalizations that would contribute to formulating a consistent theory of raising within the HSPG grammar framework.

Acknowledgments

I would like to thank Gisbert Fanselow, Frank Richter, Manfred Sailer, and the anonymous reviewers of the *8th Conference on Formal Grammar* in Vienna for their interesting comments on the issue presented in this paper and Carmella Payne for help with English.

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