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The Syntax of "Complex Prepositions" in German: An HPSG Approach

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1 Introduction

Many modern languages commonly use expressions that seem unpredictable regarding standard grammar regularities. Among these expressions, sequences consisting of a preposition, a noun, and another preposition are particularly frequent. The issue of these expressions, usually termed in linguistic literature as "complex prepositions", "phrasal prepositions" or "preposition-like word formations", can certainly be considered to be a cross-linguistic problem.[1] In this paper, I will focus exclusively on German data, because they provide very explicit and convincing linguistic evidence

I would like to thank Frank Richter, Gisbert Fanselow, Bob Borsley, Adam Przepiórkowski, and particularly Manfred Sailer for discussions and comments on the issue presented in this paper, and Carmella Payne for help with English.

[1]On "complex prepositions" in German and in other languages see, e.g., Beneš (1974), Buscha (1984), Lindqvist (1994), Meibauer (1995), Quirk and Mulholland (1964), Wollman (1996).

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

2 The empirical domain

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

(1) an Hand von ('by means of'), an Stelle von ('in place of'), in Form von ('in terms of'), mit Hilfe von ('by dint of'), im Hinblick auf ('in terms of'), in Verbindung mit ('in connection with'), im Gegensatz zu ('in contrast to'), im Verhältnis zu ('in proportion to'), im Vergleich zu ('in comparison to'), ...[2]

It is obvious that the expressions in (1), when combined with NPs, result in PPs, acting as modifiers within the entire sentence. Some illustrating sentences are exemplified in (2).

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

b. *Im Gegensatz zu ihren Eltern* fangen die heutigen Jugendlichen
in contrast to their parents begin the today's teenagers
schon sehr früh an, eigene Wege zu gehen.
already very early own ways to go
'In contrast to their parents, today's teenagers begin to cut their own path very early.'

More problematic is the question of the interdependence between the particular elements of those expressions. However, it is clear that they cannot be treated as typical PPs.

3 Previous analyses

3.1 The structure of typical PPs

To illustrate the fact that the discussed expressions cannot be treated as ordinary PPs, 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'

[2]The above collection of German "complex prepositions" is in no-way exhaustive. Moreover, it is unclear how extensive this collection, at least approximately, is. For German, e.g., Schröder (1986) specifies more than 90 "complex prepositions", while, e.g., Beneš (1974) itemizes 160 examples, whereby emphasizing the incompleteness of his list. In any case, "complex prepositions" do not form a marginal class of expressions in contemporary German.

The standard analysis assumed for such PPs is given in Figure 1.

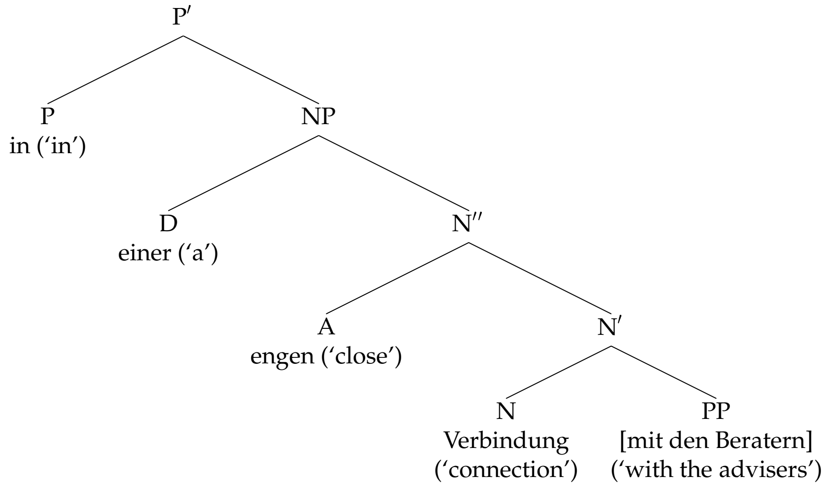

Figure 1: The structure of the PP *in einer engen Verbindung mit den Beratern* ('in a close connection with the advisers')

As we can see in Figure 1, the preposition *in* ('in') acts as the head of the entire phrase taking the NP *einer engen Verbindung mit den Beratern* ('a close connection with the advisers') 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* ('connection') as its complement. It has to be emphasized that the PP *mit den Beratern* ('with the advisers') can be omitted here without causing ungrammaticality, since relational nouns in German usually realize their arguments facultatively.

3.2 Problems with the traditional analysis

Trying to apply the above approach for analysis of "complex prepositions" presents several problems. To understand these problems, we will consider one of the "complex prepositions" combined with a NP in relationship to the structure in Figure 1. The examined PP looks very similar to the PP in Figure 1 (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 see that these PPs have other properties with respect to their internal syntactic structure than the traditional PPs in (3).

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

'In connection with this problem, I would like to point out that ...'

The first observation that can be made is that the noun *Verbindung* ('connection') in (4) is different from the noun *Verbindung* ('connection') in (3) in that it appears without any determiner or quantifier. This is atypical for this kind of noun in German. The introduction of such an element into the above phrase will cause the ungrammaticality as in (6).

(6) in *einer / *der / *dieser Verbindung mit diesem Problem ...
in a the this connection with this problem

The next observation is that the noun *Verbindung* in (4), as opposed to the noun *Verbindung* in (3), cannot be modified by adjectives or attributive participles, nor by PPs or relative clauses as we can see in (7).[3]

(7) in *enger / *unerwarteter [Verbindung mit diesem Problem] *von der
in close unexpected connection with this problem from the
letzten Woche / *die uns betrifft möchten wir ...
last week which us concerns would_like we

Finally, we can observe that the PP *mit diesem Problem* ('with this problem') in (4) cannot be deleted in opposition to the appropriate PP in (3) (see (8)).

(8) *in Verbindung möchten wir ...
in connection would_like we

3.3 Fries (1988)

Based on these observations, the assumption can be made that the string: *in Verbindung mit* ('in connection with') in the PP exemplified in (4) is a lexical category evincing prepositional character. Thus, Fries (1988) proposes for these PPs the structure which is exemplified in Figure 2.

[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).

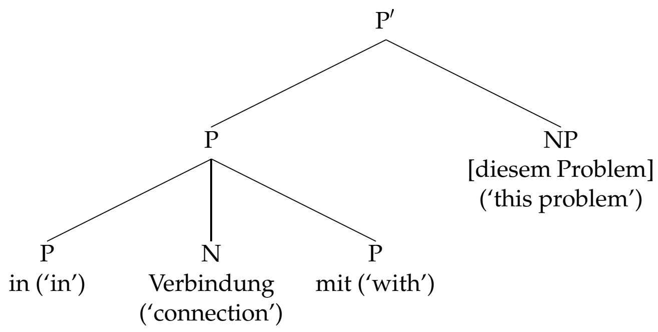

Figure 2: The structure of the PP *in Verbindung mit diesem Problem* ('in connection with this problem') proposed in Fries (1988)

The preposition heading the entire phrase is a projection of three lexical categories which form together a complex lexical category: a preposition *in Verbindung mit* ('in connection with'). This complex preposition then selects an NP forming a prepositional phrase.

This proposal seems to be adequate for the above observations, but it emerges as highly problematic with respect to the set of several further empirical factors.

3.4 Problems with the proposal of Fries (1988)

The main problem with the analysis of Fries (1988) consists in the assumption that the second preposition in the structure (in Figure 2 *mit* ('with')) belongs to the complex preposition, and, thus, cannot form a constituent with the NP *diesem Problem* ('this problem'). However, the fact remains that there are several data demonstrating the opposite.

We will consider the examples below which have been pointed out by Fries (1988) himself as counter-arguments to his own proposal. The first problem concerns the alternation between postnominal *von*-PPs and the genitive NPs. It is well-known that this alternation is ruled by special restrictions. As we see below the restrictions on distribution of postnominal *von*-PPs and genitive NPs which hold for ordinary constructions hold also within the PPs under consideration.

The phrases in (9) for instance obey the constraint saying that whenever the postnominal NP appears with a determiner the preposition *von* is normally excluded.

(9) a. ??mit Hilfe von dem Buch
with help of the book

b. mit Hilfe des Buches
with help the_{GEN} book_{GEN}
'by dint of the book'

Another restriction says that if the postnominal NP is modified by a numeral higher then three and there are no additional premodifiers, the NP should be introduced by *von*. This is illustrated by examples in (10).

(10) a. an Hand dreier / *vier(er) Fälle
by means three$_{\text{GEN}}$ four$_{\text{GEN}}$ cases$_{\text{GEN}}$
'by means of three/ *four cases'

b. an Hand von vier Fällen
by means of four cases
'by means of four cases'

c. an Hand vier/?vierer klarer Fälle
by means four$_{\text{GEN}}$ clear cases$_{\text{GEN}}$
'by means of four clear cases'

Another argument against the analysis proposed by Fries (1988) is the fact that the sequences, second preposition + second NP, can be substituted by *wo/da* expressions as exemplified in (11).

(11) a. im Hinblick worauf/darauf
in view WO_on/DA_on
'in terms of what/of it'

b. im Unterschied wozu/dazu
in_the difference WO_to/DA_to
'in opposition to what/to it'

These observations imply that the sequences such as *mit diesem Problem* ('with this problem') in PPs such as those in example (4) form a constituent exactly like those in example (3).

4 Our proposal

4.1 Summary and further considerations

We have shown that PPs such as *mit diesem Problem* ('with this problem') form a constituent in PPs such as those in (4). Therefore, we are confronted with two questions. What are these constituents selected by, and how are their syntactic features determined? There are actually only two candidates for syntactic selectors and feature assigners: the preposition *in* ('in') and the noun *Verbindung* ('connection'). Let us consider both possibilities.

We will first concentrate on the syntactic realization of the PP *mit diesem Problem*. In assuming the noun *Verbindung* to syntactically select the PP *mit diesem Problem* and thereby forming a constituent, we return to the traditional analysis, exemplified in Figure 1. It my be recalled that we have already ruled out this analysis for specific syntactic reasons. In contrast, assuming the preposition *in* to subcatetgorize the PP *mit diesem Problem* as well as the noun *Verbindung* as its complement, we get the explanation for all empirical facts discussed in Section 3.4.

On the other hand, the syntactic properties of the PP *mit diesem Problem* seem to be determined by the noun *Verbindung* since these properties are identical with the properties of PPs selected by this noun in its free occurrence. Moreover, considering the thematic relationship, it is plausible to assume that the PP *mit diesem Problem* is an argument of the noun *Verbindung* rather than an argument of the preposition *in*. Some further evidence suports this assumption.

If the preposition *in* takes both the noun *Verbindung* and the PP *mit diesem Problem* as its arguments assigning theta roles to them,[4] then it is inexplicable why the semantical relationship between these two arguments differs from the semantical relationship between the referential arguments of all other transitive predicates. As we can see in (12), no coindexing is possible between the noun *Verbindung* and the anaphora *sich selbst* ('herself'). Rather, the anaphora *sich selbst* belongs to the argument structure of the noun *Verbindung* possibly being bound by a PRO-like element which belongs to the same argument structure and which is controlled by the noun *Sarah*.

(12) Sarah$_i$ wollte was sagen in Verbindung$_j$ mit [sich selbst]$_{i/*j}$.
Sarah$_i$ wanted sth. say in connection$_j$ with [her self]$_{i/*j}$
'Sarah$_i$ wanted to say something in connection$_j$ with herself$_{i/*j}$.'

All these observations seem to indicate the following: The PP *mit diesem Problem* acts as an argument of the noun *Verbindung* in terms of being determined by this noun with regard to its syntactic properties such as the form of the preposition heading this PP; further on, the PP *mit diesem Problem* is theta-marked by the noun *Verbindung*; and finally, the PP *mit diesem Problem* is expected to be syntactically selected by the noun *Verbindung* as its complement. Thus, we proceed according to the standard methods of handling relational nouns taking prepositional arguments. This explains why the sequences noun + the following PP within the discussed PPs share many grammatical properties with the appropriate phrases occurring within other syntactic contexts.

4.2 Solution: applying raising mechanism

How shall we proceed? We stated above that we cannot assume that the noun *Verbindung* ('connection') selects the PP *mit diesem Problem* ('with this problem') to form a constituent. The only selector for this PP can therefore be the preposition *in* ('in'). But as we mentioned above, it is problematic to assume a predicate-argument relationship between the preposition *in* and the PP *mit diesem Problem*, and it is highly unplausible to assume the syntactic features of the PP *mit diesem Problem* to be determined by the selection requirements of the preposition *in*. Thus, if the preposition *in* selects the PP *mit diesem Problem* syntactically (which is the only possibility here), then *in* selects this PP not as its own argument, but as an argument of the noun *Verbindung*. If we have this situation, we normally talk about *argument raising*.

To illustrate what the argument raising in terms of the HPSG grammar framework in the tradition of Pollard and Sag (1994) (to which my approach relates) consists in, 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 and to raise the arguments of their complements. Thus, the auxiliary *will* ('wants') in the structure below selects for the verb *lesen* ('read') first, and then it selects the arguments of *lesen* ('read') as its own complements.

[4] We ignore the fact that there exist no bivalent prepositions in contemporary German.

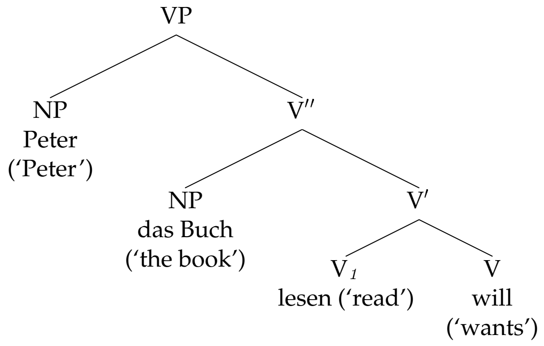

Figure 3: The structure of the VP *Peter das Buch lesen will* ('Peter wants to read the book')

If we look again at the examples in (3) and (4) repeated here in (13), then we can see that both phrases are headed by the same preposition *in*. But as we saw above, the two PPs show different behavior with respect to their internal syntactic properties.

(13) 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'

We act on the assumption that these contrasts are caused by the fact that the preposition *in* in (a) is an "ordinary", that is, non-raising preposition, while the preposition *in* in the example in (b) is a raising one. The question is, what should our grammar look like to describe both structures correctly.

4.3 HPSG formalization

Avoiding redundancies in the lexicon, we have decided to specify only one lexical entry for *in*, whereby underspecifying the information about its argument. In Figure 4 we can see the relevant part of the lexical entry of the preposition *in* in AVM notation. 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.

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

Figure 4: The relevant part of the lexical entry of the preposition *in* (‘in’)

The syntactic selection properties of *in* are licensed by a 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 5.

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

Figure 5: 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 to select also the complements of those nouns, the above principle has to be reformulated in the way shown in Figure 6. Here, the list of complements syntacticly selected by a preposition is a concatenation of its own ARG-ST list and the list of complements of its argument.[5]

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

Figure 6: ARG-ST Mapping Lexical Principle for Prepositions

[5]I assume, as Meurers (1997) does, that argument raising takes place only with respect to the valence attributes, not to the ARG-ST. The intuition behind this has to do with the character of the ARG-ST list as the direct syntactic reflexion of the semantic argument structure.

In order to block raising of more than one nominal complements which would result in ungrammatical constructions like those in (14), in the antecedent of the above constraint, 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.

(14) *in Verbindung der Regierung mit diesem Problem ...
in connection the government$_{\text{GEN}}$ with this problem

4.4 An example

The structure in Figure 7 exemplifies the interaction of the above assumptions in the licensing a PP headed by a raising preposition. Due to the ARG-ST Mapping Lexical Principle for Prepositions in Figure 6 a preposition *in* can be licensed, which takes one nominal argument with one unrealized complement. Thus, the syntactic and semantic properties of that complement are determined not by the preposition, but by the noun. Both the noun and its unrealized complement are mapped to the COMPS list of *in* and, according to the constraints on the head-complement-structures for prepositions, they are syntactically selected by *in*.

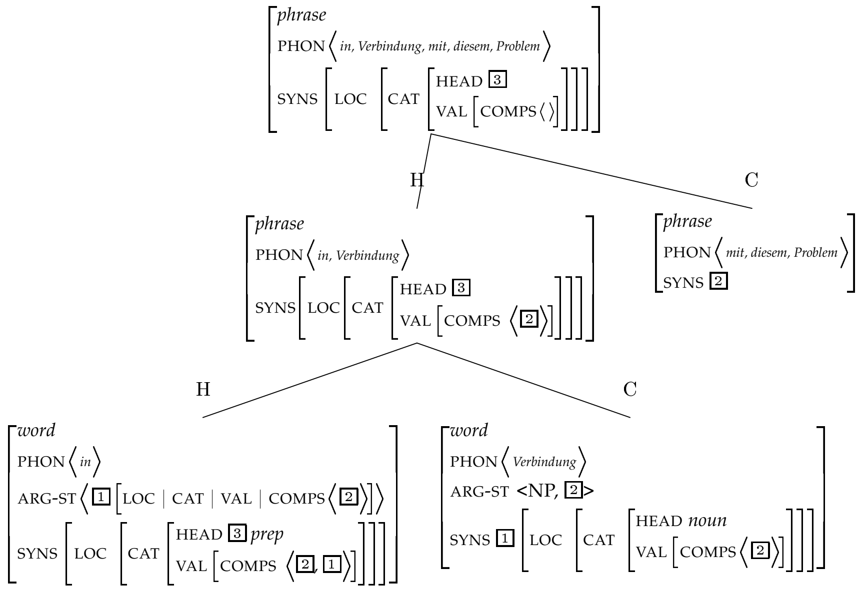

Figure 7: The structure of the PP *in Verbindung mit diesem Problem* (‘in connection with this problem’)

The first complement that *in* selects is the noun. By virtue of the obliqueness hierarchy of German nouns, fixed within constraints on the phrase structure of German, the modifying and determining/quantifying of complement-unsaturated nouns are blocked. This explains the apparent lexical fixedness of the appropriate sequences without additional theorization. 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').

5 Summary

Here, the syntax of the word sequences in German commonly labeled "complex prepositions" have been investigated. We have thereby seen that the previous approaches to this problem are highly problematic. I 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. There is also strong evidence that the same technique can be applied for analyzing corresponding data in other languages such as Polish or English.

The proposed analysis entails a technique which is already well established in the HPSG-based studies, especially the studies related to the German language. We have shown that there are parallels between the raising analysis proposed here for "complex prepositions" and the raising analysis of German verbal complexes as proposed in Hinrichs and Nakazawa (1989).[6] Given this situation, the need of designing a satisfactory uniform raising theory within the HPSG grammar framework becomes more and more apparent.

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[6] On further applications of the raising mechanism in the HPSG-based grammar fragments of German see, e.g., Meurers (2000) or De Kuthy (2000).

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