Splitting PP arguments from NPs

An argument raising approach and its interaction with lexical semantics

Kordula De Kuthy
Universität des Saarlandes
kdk@dfki.de

Abstract

Constructions in which PP arguments occur separate from their nominal heads have been argued to involve extraction from noun phrases. In this paper we provide evidence against the assumption that these PPs have been extracted. Instead, we argue that an analysis allowing argument raising of PP complements from nominal heads is more appropriate and that it makes additional correct predictions regarding possible word orders. Furthermore we show that restrictions on the construction can be explained on the basis of lexical semantic properties of the involved elements. Finally, an HPSG theory capturing the syntactic and lexical semantic properties on the basis of lexical principles is provided.

1 Introduction

A number of constructions in German have been argued to involve extraction from noun phrases. One of the candidates for this type of constructions are PP arguments occuring separate from their nominal heads (NP-PP split).

(1) a. *Über Syntax* hat Hans sich [ein Buch] ausgeliehen.
About syntax has Hans himself a book borrowed.

b. Ich weiß nicht mehr,
I don't remember

worüber Hans [ein Buch] ausleihen wollte.
about what Hans a book to borrow wanted.

c. Ich kenne kein Gebiet der Sprachwissenschaft,
I don't know any area of linguistics

über das Hans nicht schon [etliche Bücher] ausgeliehen hat.
about which Hans not already several books borrowed has.

The PP argument *über Syntax* has been fronted independently of its nominal head *Buch* in all three example sentences: In (1a) the PP has been topicalized in a verb-second clause, in (1b) it occurs as a *wh*-constituent at the left edge of an embedded question, and in (1c) it is the relative pronoun at the left edge of a relative clause.

Webelhuth (1992), Müller (1996), and others have argued that in such sentences the PP has been extracted from the NP. But as pointed out by Fanselow (1987), sentences like the ones in (2) are problematic for such an assumption, since the extraction source *Buch* and not the extracted element *über Syntax* has been fronted.

(2) a. [Ein Buch] hat sich Hans *über Syntax* ausgeliehen.
A book has Hans himself about syntax borrowed.

b. Ich weiß nicht,
I don't know

[welches Buch] Hans *über Syntax* ausleihen wollte.
which book Hans about syntax to borrow wanted.

c. Die Studenten sollten sich Bücher über Syntax ausleihen. Dies ist das Buch,
The students were supposed to borrow books on syntax. This is the book

[das] Hans *über Syntax* ausgeliehen hat.
which Hans about syntax borrowed has.

For such examples, Müller (1996) argues that the fronted element contains a trace of the PP argument, i.e., the fronted NP is a so-called remnant category.

An alternative analysis was proposed by Bach and Horn (1976) and Chomsky (1977) for similar data in English:

(3) Who did John write a book about?

(4) a. [A book] was written [about Nixon] by John.
b. John wrote [it] [about Nixon].

They argue that the interrogative in (3) derives from the structure indicated in (5b) rather than from the one in (5a) which is shown by the existence of such examples as in (4).

(5) a. John wrote [a book about who]?
b. John wrote [a book] [about who]?

They argue further that (5b) is base-generated in addition to (5a).

Similar to this idea, Fanselow (1987) proposed to employ a rule for the German data that "reanalyses" the complex NP into a simple NP and a PP which are sisters in the VP:

$({}_{VP}({}_{NP}\ \text{det N PP})\ \text{V}) \rightarrow ({}_{VP}({}_{NP}\ \text{det N})\ \text{PP V})$

The examples in (1) and (2) are then straightforwardly accounted for by extracting the NP or the PP complement from the VP.

In the following, we show that the arguments which have been presented in favour of an extraction analysis for NP-PP split are not convincing and that a reanalysis approach like the one proposed by Fanselow (1987) makes the correct predictions regarding possible word orders. We then discuss well-known lexical restrictions of the construction and show that lexical semantic factors are responsible. Building on these conclusions, we propose an HPSG theory which formalises a reanalysis-like approach integrating lexical-semantic restrictions.

2 Reanalysis contra Extraction

2.1 Arguments against extraction

Müller (1996) argues for an extraction analysis by showing that the NP remaining in the Mittelfeld in (1) and the fronted NP in (2) obey the restrictions to be expected from a constituent containing a trace.

Firstly, he claims that fronting a PP argument of a subject NP and the reverse case of fronting an incomplete subject NP result in ungrammaticality, as is shown in (6). Since it is usually assumed that subjects in German must not contain a gap, this behaviour would be predicted under a remnant-movement account.

(6) a. * *Worüber* hat [ein Buch] Karl beeindruckt?
About what has a book(nom.) Karl(acc.) impressed?
'A book about what did Karl impress?'

b. * [Ein Buch] hat Karl *über Syntax* beeindruckt.

Haider (1993), however, presents examples like the ones shown in (7) which show that subject NPs can occur separate from their PP arguments.

(7) a. *Über Strauß* hat [ein Witz] die Runde gemacht.
About Strauß has a joke the round made.
'A joke about Strauß went round.'

b. [Ein Witz] hat *über Strauß* die Runde gemacht.

Secondly, Müller (1996) uses examples like (8) to show that both fronting out of an NP and the reverse case exhibit the "Specificity Effect", a classical restriction on extraction.

(8) a. * *Über Syntax* hat Karl [**das** Buch] gelesen.
About syntax has Karl the book read.

b. ?? [**Das** Buch] hat Karl *über Syntax gelesen.*

Again, it was already shown by Pafel (1993) that the specificity of an NP in German does not disallow fronting of its argument PP in general (9). As shown in (10), this is not even the case for the prime example of specificity, prenominal genitives.

(9) a. Über Syntax hat Karl nur **dieses**, aber nicht **jenes** Buch gelesen.
About Syntax has Karl only this but not that book read.

b. Nur dieses Buch hat Karl über Syntax gelesen.

(10) a. *Über Syntax* hat Karl [nur **Margas** Buch] gelesen.
About syntax has Karl only Marga's book read.

b. [Nur Margas Buch] hat Karl *über Syntax* gelesen.

Finally, Müller (1996) argues that a freezing effect can be observed: constituents appearing at the beginning of the Mittelfeld become opaque for extraction. He provides example (11) to show that this generalisation carries over to the fronting of PP arguments of NPs. However, examples like (12) clearly contradict this claim.

(11) * *Worüber* hat [ein Buch] keiner gelesen?
About what has a book no-one read?

(12) *Worüber* hat [ein so umfangreiches Buch] ja wohl noch keiner geschrieben?
About what has such a voluminous book yet nobody written?

Although the NP *ein so umfangreiches Buch* occurs at the beginning of the Mittelfeld, its PP argument *worüber* can be fronted.

Summing up, none of the above arguments convincingly motivate the remnant-movement assumption that argument PPs are extracted out of NP.

2.2 Predictions of a reanalysis theory

We now turn to the alternative hypothesis, the assumption that the complex NP is "reanalysed" as two sister categories, a simple NP and a PP. Such a theory would predict that the simple NP and the PP should appear separately from each other as other sister constituents do. The following examples show that this is the case.

Regarding the word order possibilities in the Mittelfeld, example (13) illustrates that both the simple NP and the PP can appear independently at the beginning of the Mittelfeld.

(13) a. Hans hat *über Syntax* schließlich [drei Bücher] gekauft.
Hans has about syntax finally three books bought.
b. Hans hat [drei Bücher] schließlich *über Syntax* gekauft.

According to observations made by Webelhuth (1992) and Diesing (1992), material occuring before sentence adverbials like *schließlich* in (13) is realized outside the VP, i.e. such material has been scrambled. Thus the examples in (13) show that both the NP and the PP of an NP-PP split construction can independently be scrambled to the beginning of the Mittelfeld.

The examples in (14) on the other hand show that even if the two parts of NP-PP split occur after a sentence adverbial, other material can appear in between them.

(14) a. Hans hat schließlich [drei Bücher] bei Osiander *über Syntax* gekauft.
Hans has finally three books at Osiander on syntax bought.
b. Hans hat schließlich *über Syntax* bei Osiander [drei Bücher] gekauft.

Further support comes from an observation made by Grewendorf (1989, p. 46): independently of the PP, the NP can be included in the so-called Oberfeldformation (cf., Bech (1955)):

(15) Niemand hätte gedacht,
a. daß Hans *über Becker* würde [einen Sieg] erringen können.
that Hans against Becker would a victory win be able to.
b. daß er über Syntax würde [ein Buch] ausleihen müssen.
that he on syntax would a book to borrow have to.

The above data thus confirm the prediction of a reanalysis-like theory that analyses NP-PP split as involving a PP and a simple NP as two independent sister categories.[1]

3 Lexical Restrictions

So far, we only discussed examples where splitting of a noun and its PP argument *is* possible. Splitting of the two elements, however, is subject to lexical restrictions, a fact which is generally acknowledged but to our knowledge never actually explained and accounted for. In the following we take a closer look at the nature of these lexical restrictions.

3.1 PP arguments

It has often been observed (cf., Grewendorf (1989), Pafel (1995)) that grammatical examples of NP-PP split like the ones presented in (1) and (2) become ungrammatical when the embedding verb is replaced by a verb which has the same syntactic properties but a different semantics.

(16) a. *Über Syntax* hat Hans ein Buch ausgeliehen.
About syntax has Hans a book borrowed.

[1] A discussion of additional data involving the interaction of NP-PP split with (P)VP topicalization is provided in De Kuthy and Meurers (1999).

b. * *Über Syntax* hat Hans ein Buch geklaut.
About syntax has Hans a book stolen.

The only difference between the two sentences in (16) is that the verb *ausleihen* (to borrow) is replaced by the verb *klauen* (to steal). Another example for this kind of contrast can be seen in (17).

(17) a. *Gegen die Germanen* sind [alle Kriege] gewonnen worden.
Against the Germans have all wars won been.
'All wars against the Germans have been won.'

b. * *Gegen die Germanen* sind [alle Kriege] verfilmt worden.

These two example pairs have in common that in the grammatical examples, the verb and its nominal complement embedding the topicalized PP have a different kind of relationship than in the ungrammatical examples: In (16a), the verb *ausgeliehen* and its complement *ein Buch* are semantically "more closely related" than the verb *geklaut* and this NP are in (16b). While the exact meaning of this relationship needs to be further investigated we here mean that 'to borrow a book' (the same holds for to read, to write, to buy a book) is a more common, contextually unmarked action than 'to steal a book'. Additional information in form of the PP argument *über Syntax* can then be separated from the contextually unmarked phrase *ein Buch ausgeliehen*, but not from the contextually marked phrase *ein Buch geklaut*.

As expected, this semantic effect not only occurs if the selecting verb is replaced, but also if the NP complement is replaced with a semantically different one as the following examples show:

(18) a. *Über Quantenpysik* sind schon [viele Aufsätze] veröffentlicht worden.
About physics have already many essays published been.
'Many essays on physics have already been published.'

b. * *Über die Liebe* sind schon [viele Briefe] veröffentlicht worden.
About love have already many letters published been.

Again, the phrase *viele Aufsätze veröffentlicht* in (18a) is contextually less marked than the phrase *Briefe veröffentlicht* in (18b). Thus the PP can be topicalized independently only in (18a).

To include these observations in our HPSG account of NP-PP split presented in section 5, we adopt Pustejovsky (1995) generative lexical approach to semantics. In the generative lexicon, all lexical items are analysed as being relational to a certain degree. This relational force of any lexical item is captured in the 'qualia structure'. In such a framework it is possible to make our above notions more precise.

Another interesting fact about all the above ungrammatical examples is that they become much more acceptable in the appropriate context. For example, (16b) is much improved if it occurs in a context where it is discussed what kind of books Hans has stolen last night. This observation fits into our above explanation based on a generative lexical approach to semantics. The idea of such an approach to semantics is to provide a model of meaning in language that "captures the means by which words can assume a potentially infinite number of senses in context while limiting the number of senses actually stored in the lexicon" (Pustejovsky 1995, p. 105). To account for this polymorphic behaviour of language, a set of generative devices (such as type coercion or co-composition) connect the different levels of lexical semantics, providing for the compositional interpretation of words in context. To account for the context dependency of the acceptance of an example like (16b) one would need a device that allows the qualia structure of a noun like *Buch* to be changed such that it can be combined with the verb *klauen* in the same way as it is combined with *ausleihen*.

While we show how the general approach can be integrated into our account of NP-PP split, the above described context dependency needs to be further investigated.

3.2 PP adjuncts

So far, we have only been concerned with nominal PP arguments. But, similar to verbs, nouns can be modified by a PP, as example (19) shows, where the noun *Freundin* is modified by the PP *mit roten Haaren*.

(19) Peter hat eine neue Freundin mit roten Haaren.
Peter has a new girl friend with red hair.

It is generally acknowledged in the literature that such adjunct PPs cannot occur separate from the noun they modify. The following two examples where an adjunct PP has been topicalized are in fact ungrammatical.

(20) a. * *Mit roten Haaren* hat Peter [eine neue Freundin].
With red hair has Peter a new girl friend

b. * *Aus Peru* habe ich [meinen Schal] verloren.
From Peru have I my scarf lost.

What has so far gone unnoticed is that there are examples which show that topicalization of an adjunct PP does not always result in ungrammaticality of a sentence. The sentences in (21) from the "Frankfurter Rundschau Korpus" are such grammatical examples.

(21) a. *Aus dem 17. Jahrhundert* erklangen in dynamisch differenziertem Spiel [Tanzsätze von Johann Sebastian Bach].
From the 17th century were played in dynamically differentiated manner dances by Johann Sebastian Bach.

b. *Aus dem "English Theater"* stehen [zwei Modelle] in den Vitrinen.
Of the English Theatre are two models in the display.

The explanation at hand for these data follows from our observations in the last section: Splitting of PP adjuncts from the NP they modify seems to be possible but is restricted by lexical-semantic factors. Thus the verbs and their nominal complements modified by the fronted PPs in (21) are so closely related that even an PP adjunct can be separated from the NP.

And, as also observed in the last section, the right context plays an important role.

(22) Auf der großen Show in Düsseldorf wurden die neuesten Frisurmodelle vorgestellt.
The newest haircuts were presented at the big show in Düsseldorf.

a. *Mit kurzen Haaren* wurden dabei nur [drei Modelle] gezeigt.
With short hair were there only three models presented.

The example in (22) shows that with the right kind of context the sentence in (22a) is totally acceptable even though we saw in (20a) that this kind of example on its own is ungrammatical.

4 Comparison with other kinds of partial NP phenomena

To situate the construction dealt with here in the general landscape of splitted NPs, in this section we provide an overview of constructions which have been argued to involve extraction from noun phrases:

- *was-für* Split:

  (23) *Was* hast du *für Bücher* gekauft?
  What have you for books bought?
  'What kind of books did you buy?'

- *w-alles* Split:

  (24) *Was* hast du *alles* erlebt?
  What have you all witnessed?

- Quantifier Floating:

  (25) *Die Kinder* haben *alle* ein Eis bekommen.
  The children have all an ice cream got.
  'All the children got an ice cream'.

- NP Split:

  (26) *Ein schöneres Buch* habe ich noch *keines* gelesen.
  A nicer book have I yet none read.
  'I haven't read a nicer book yet.'

- Partitive Split:

  (27) *Von uns* hat *jeder* ein Eis gegessen.
  Of us has everyone an ice cream eaten.
  'Each of us ate an ice cream.'

In the following we want to examine how these constructions behave with respect to the possible word orders of the two parts of the splitted NPs and whether there are similar lexical semantic restrictions as the ones we observed for NP-PP split.

4.1 *Was-für* Split

Was-für split is the most restricted kind of extraction form NP. It appears in verb-second and embedded questions where the *wh*-pronoun *was* is fronted and the *für*-phrase remains in the Mittelfeld:

(28) a. *Was* hast du *für Bücher* gekauft?
What have you for books bought?

b. Ich weiß nicht, *was* er *für Bücher* gekauft hat.
I don't know what he for books bought has.

The reverse placement of the *was* and the *für*-phrase is not possible:

(29) * *Für Bücher* hast du *was* gekauft?
For books have you what bought?

Neither is the occurrence of *was* at the beginning of the Mittelfeld:

(30) a. * Du hast *was* schließlich *für Bücher* gekauft?
You have what finally for books bought?

b. Du hast schließlich *was für Bücher* gekauft?

The only possible word order is the placement of the *was* as the leftmost constituent of a *wh*-question. These facts clearly show that *was-für* split is an instance of extraction from NPs and a different construction than the splitting of PP arguments from NPs.

Another difference is the behaviour with respect to lexical semantic factors: there are no restrictions on *was-für* split similar to those for NP-PP split[2] (cf. (Pafel 1995)):

(31) a. Was haben die Nazis für Bücher *gelesen*?
What have the Nazis for books read?

b. Was haben die Nazis für Bücher *zerstört*?
What have the Nazis for books destroyed?

If NP-PP split also was an instance of extraction from NPs it would be very difficult to explain, why in one case there are some semantic restrictions for extraction whereas in the other case these do not occur.

4.2 *W-alles* Split and Quantifier Floating

The characteristic of these two constructions is that a *wh*-pronoun or an NP is fronted while the quantifier *alle* remains in the Mittelfeld.

(32) a. *Was* hast du *alles* erlebt?
What have you all witnessed?

b. *Die Kinder* haben *alle* ein Eis bekommen.
The children have all an ice cream got.

Sometimes the quantifier can be fronted while the rest of the NP remains in the Mittelfeld. But this is only possible if the remaining NP is a pronoun as in (33b).

(33) a. *Alle* haben *sie* ein Eis bekommen.

b. * *Alle* haben *die Kinder* ein Eis bekommen.

The fronted NP in example (32b) can also occur at the beginning of the Mittelfeld as observed in Pafel (1993), but the quantifier *alle* cannot:

(34) a. Doch haben *die Kinder* erst gestern *alle* ein Eis bekommen.
But have the children yesterday all an ice cream got.

[2] But, as observed by (Pafel 1995), there are some other restrictions on *was-für* split. For example, extraction from the subject of a property predicate is impossible:

i. * Was sind für Feuerwehrleute intelligent?
What are for firemen intelligent?
'What kind of firemen are intelligent?'

b. * Doch haben *alle* erst gestern *die Kinder* ein Eis bekommen.
But have all yesterday the children an ice cream got.

Similar to *was-für* split there are no lexical semantic restrictions on the embedding verb:

(35) *Die Bücher* habe ich *alle* gelesen/gewonnen/ausgeliehen/geklaut.
The books have I all read/won/borrowed/stolen.

The above examples show, that *w-alles* split and quantifier floating behave different from NP-PP split. Thus, if these phenomena are analysed as instances of extraction, NP-PP split should be accounted for by a different mechanism, i.e. reanalysis.

4.3 NP Split

In the cases of NP split the possibilities of which element can be fronted are again very restricted:

(36) a. *Bücher* hat sie *noch keine spannenden* geschrieben.
Books has she yet none exciting written.

b. * *Noch keine spannenden* hat sie *Bücher* geschrieben.
Yet none exciting has she books written.

Only the part of the NP containing the head noun can be fronted while the rest remains in the Mittelfeld.

None of the two parts of the split NP can occur at the beginning of the Mittelfeld:

(37) a. * Dieses Jahr hat *Bücher* sie *noch keine* geschrieben.
This year has *books* she yet none written.

b. * Dieses Jahr hat *noch keine* sie *Bücher* geschrieben.
This year has yet none she books written.

There is one construction which from a first point of view gives the impression that NP split has similar properties as our cases of NP-PP split: the split NP can be part of a topicalized VP similar to the interaction of NP-PP split and VP topicalization as discussed in De Kuthy and Meurers (1999):

(38) *Bücher* geschrieben hat sie *noch keine*.
Books written has she yet none.

On the other hand there are cases of NP split which are problematic for any theory assuming that the two sorts of a split NP originate from one constituent:

(39) a. *Schönere Bücher* habe ich noch *keine* gelesen.
Nicer books have I yet none read.

b. Ich habe noch *keine schöneren/*schönere Bücher* gelesen.
I have yet no nicer books read.

In (39a) the adjective *schönere* as part of the topicalized NP has to be in the strong form whereas in the non-split NP in (39b) it must occur in the weak form. This corresponds to the general pattern of adjective forms within NPs: NPs lacking a determiner require strong declension on adjectives and NPs without a determiner require weak declension. The morphological shape of the topic constituent in (39a) thus suggests that it is an independent determiner-less NP.

Thus on the one side the observations made here suggest that NP split should not be analysed as extraction from NP. On the other side this construction should also not be analysed along the lines of NP-PP split because the two parts of split NPs behave like two completely independent categories as shown above, whereas the PP and the NP of the NP-PP split construction can always occur as one single constituent, for example in the Vorfeld.

4.4 Partitive Split

In the case of partitive quantifiers like *niemand von uns* (none of us), *viele von den Büchern* (many of the books) either the quantifier or the *von*-PP can be fronted independently of each other:

(40) a. *Niemand* hat *von uns* gestern das Fußballspiel gesehen.
No-one has of us yesterday the football match watched.

b. *Wer* hat *von euch* gestern das Fußballspiel gesehen?
Who has of you yesterday the football match watched?

c. *Von uns* hat gestern *niemand* das Fußballspiel gesehen.
Of us has yesterday no-one the football match watched.

Similar to NP-PP split, either the quantifier or the partitive PP can occur at the beginning of the Mittelfeld:

(41) a. Erstaunlicherweise hat *niemand* gestern *von uns* das Fuballspiel gesehen.
Astonishingly has no-one yesterday of us the football match watched.

b. Erstaunlicherweise hat *von uns* gestern *niemand* das Fußballspiel gesehen.
Astonishingly has of us yesterday no-one the football match watched.

Finally, the quantifier can also take part in the Oberfeldformation:

(42) a. Ich hätte nicht gedacht,
I would not have believed,

daß er *von den Büchern* würde *so viele* kaufen wollen.
that he of these books would so many buy want.

All these data show that partitive split behaves parallel to NP-PP split and thus should also be analysed via reanalysis of the quantifier and the partitive PP and not as extraction from NP. The only difference is the behaviour of partitive split with respect to the embedding verb:

(43) *Von den Büchern* habe ich *nur eines* ausgeliehen/geklaut/gelesen/verloren.
Of the books have I only one borrowed/stole/read/lost.

As quantifiers like *viele*, *eines* have a structural kind of semantics, one could possibly argue that they always combine with any verb in such a way that splitting of the *von*-PP is possible.

All the constructions investigated in this section have been argued in the literature to be instances of extraction from NP. We have shown that none of these phenomena, except for partitive split, has the same syntactic and semantic properties as NP-PP split. This further supports our claim that NP-PP split should not be analysed as extraction from NP but as being the result of some kind of reanalysis.

5 An HPSG Analysis

In section 2, we showed that the empirical facts support a reanalysis-like approach over an account that extracts PP arguments from NPs. We now turn to the question of formalising such a reanalysis-like theory in an HPSG architecture.

To employ the notion of reanalysis in HPSG we will use the argument raising technique as introduced by Hinrichs and Nakazawa (1989) for verbal complement taking verbs. We propose to apply this technique also for nominal complement taking verbs. To formalise this approach, we define lexical principles in the style of Meurers (1997b) which express generalisations over the mapping between the argument structure and the valence specifications of verbs.

Following a proposal by Meurers (1997a) we distinguish valence lists from which an argument can be raised and those from which raising is not permitted. For this purpose, we introduce two subtypes of the valence-type *valence* as shown in Figure 1. Only valence objects of sort *dependent-valence* can have a non-empty COMPS list providing the possibility of argument raising.

$$\begin{bmatrix} \textit{valence} & \\ \text{SPR} & \textit{list} \\ \text{SUBJ} & \textit{list} \\ \text{COMPS} & \textit{list} \end{bmatrix}$$

$$\begin{bmatrix} \textit{dependent-valence} & \\ \text{COMPS} & \textit{ne-list} \end{bmatrix} \qquad \begin{bmatrix} \textit{independent-valence} & \\ \text{COMPS} & \textit{e-list} \end{bmatrix}$$

Figure 1: Valence subtypes and their appropriateness conditions

Next, we formulate the lexical principle expressing how the argument structure specified in the ARG-ST list of the lexical entries of verbs determines the values of the valence attributes (SUBJ and COMPS)[3] as shown in figure 2.

$$\begin{bmatrix} \textit{word} \\ \text{SYNSEM}\,|\,\text{LOC}\,|\,\text{CAT}\,|\,\text{HEAD}\ \ \textit{verb} \end{bmatrix} \rightarrow \begin{bmatrix} \text{S}\,|\,\text{L}\,|\,\text{C}\,|\,\text{VAL} & \begin{bmatrix} \text{SUBJ} & \langle \boxed{1} \rangle \\ \text{COMPS} & \boxed{2} \oplus \textit{raised}(\boxed{3}) \end{bmatrix} \\ \text{ARG-ST} & \langle \boxed{1} \mid \boxed{2} \rangle \ \wedge \ (\textit{list-of-sat-synsem} \bigcirc \boxed{3}) \end{bmatrix}$$

Figure 2: A principle specifying the mapping between ARG-ST and the valence features

The first element of the argument structure is always assigned to be the subject; the rest of the arguments are identified with the elements of the COMPS list. The relation *list-of-sat-synsem* ensures that the valence requirements of all elements on the ARG-ST list have been saturated[4]

[3] Note that we assume argument raising to take place only with respect to the valence attributes, not on ARG-ST. The intuition behind this is that the argument structure should be a direct syntactic reflection of the semantic roles of a predicate.

[4] Throughout the paper, attributes are sometimes abbreviated by their first letter. Relations are written in the functional notation traditionally used in HPSG.

Definition of *list-of-sat-synsem*:

$$\textit{list-of-sat-synsem} := \langle \rangle.$$

$$\textit{list-of-sat-synsem} := \left\langle \begin{bmatrix} \text{L}\,|\,\text{C}\,|\,\text{VAL} & \begin{bmatrix} \text{SPR} & \langle \rangle \\ \text{SUBJ} & \langle \rangle \\ \text{COMPS} & \langle \rangle \end{bmatrix} \end{bmatrix} \mid \textit{list-of-sat-synsem} \right\rangle.$$

except for the list of SYNSEM that is picked out by the shuffle relation ($\bigcirc$).

The relation *raised* defined in figure 3 then adds the unsaturated arguments of the elements of $\boxed{3}$ to the COMPS list of the verb. In our case the possibility of raising is restricted to nominal

$$
\begin{array}{l}
\textit{raised}\left(\left\langle\left[\text{L}\mid\text{C}\begin{bmatrix}\text{HEAD}\ \textit{noun}\\ \text{VAL}\begin{bmatrix}\textit{dep-val}\\ \text{SPR} & \langle\rangle\\ \text{COMPS} & \boxed{1}\textit{list-of-PP}\end{bmatrix}\end{bmatrix}\right]\right\rangle\right) := \boxed{1}.\\
\textit{raised}(\langle\rangle) := \langle\rangle.
\end{array}
$$

Figure 3: Restrictions on raising arguments

arguments, more precisely to one nominal argument that has a *dependent-valence*. The definition of the relation *raised* could be extended so that raising from verbal arguments would also be permitted. Furthermore, the elements left on the noun's COMPS list are restricted to be PPs[5] as these are the only kind of nominal arguments that can be raised.[6] If there is no element on the ARG-ST list appropriate for raising then no additional element is added to the verb's COMPS list.

This approach only allows raising of PP arguments. To handle those cases where a PP adjunct occurs separate from an NP (as mentioned in section 3.2) in terms of raising one could assume that adjuncts occur on the COMPS list of the element they modify as proposed by Bouma, Malouf, and Sag (1998). The principle in figure 2 would then also licence raising of PP adjuncts.

Next we need to determine when a noun can have a *dependent-valence* so that it can be the source for argument raising. Following our observations in section 3 we assume that the possibility of argument raising is triggered by the semantic properties of the verb and of the nominal argument from which a PP has to be raised.

First of all we need a way of encoding the relational properties of nouns in their CONTENT value. Pustejovsky (1995) proposes to encode the "relational force" of lexical items, especially nouns, in the so called *qualia structure*. This structure serves to express "that set of properties or events associated with a lexical item which best explain what the word means". The core elements of a noun's meaning can thus be captures by the four features CONSTITUTIVE, FORMAL, TELIC, AGENTIVE. To encode this qualia structure in lexical entries of noun's values, we extend their CONTENT value in the following way: the semantic relation of a noun is expressed in one of the *qfpsoas* in its CONTENT|RESTRICTION set. We assume that *qfpsoas* are

[5] Definition of relation *list-of-PP*:

$$
\begin{array}{l}
\textit{list-of-PP} := \langle\rangle.\\
\textit{list-of-PP} := \left\langle\left[\text{L}\mid\text{C}\begin{bmatrix}\text{HEAD}\ \textit{prep}\\ \text{VAL}\begin{bmatrix}\text{SPR} & \langle\rangle\\ \text{SUBJ} & \langle\rangle\\ \text{COMPS} & \langle\rangle\end{bmatrix}\end{bmatrix}\right] \mid \textit{list-of-PP}\right\rangle.
\end{array}
$$

[6] Separating a verbal complement from its nominal head always results in ungrammaticality, as the following examples show:

i. * *Nach Afrika zu reisen* hat er [das Angebot] abgelehnt.

ii. * *Daß er inkompetent sei,* hat er [die Behauptung] zurückgewiesen.

all appropriate for the feature QUALIA[7] taking an object of sort *qualia* as its value which itself is appropriate for the four above cited features. The value of RESTRICTIONS is no longer a set, but a list of *psoa*. The semantic relation of the head of an NP is always the first element on this RESTRICTIONS list.[8] This enables us to have access to the semantic relation and the qualia structure expressed by the head noun in any NP. The revised nominal CONTENT value can be seen in figure 4. We only specified the feature TELIC as being appropriate for the

$$\begin{bmatrix} \textit{npro} & \\ \text{INDEX} & \boxed{1}\begin{bmatrix} \text{PER} & \textit{person} \\ \text{NUM} & \textit{number} \\ \text{GEND} & \textit{gender} \end{bmatrix} \\ \text{RESTR} & \left\langle \begin{bmatrix} \textit{psoa} & \\ \text{QUANTS} & \langle\rangle \\ \text{NUCLEUS} & \begin{bmatrix} \textit{qfpsoa} & \\ \text{INST} & \boxed{1} \\ \text{QUALIA} & \begin{bmatrix} \text{TELIC} & \textit{qfpsoa} \\ \text{AGENTIVE} & \textit{qfpsoa} \end{bmatrix} \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

Figure 4: CONTENT value of nouns

qualia structure because this is the only one which is of interest for our approach. In a more explicit account of nominal lexical semantics the other three features would also have to be specified in the qualia structure.

We now have a way of specifying how the semantics of a verb and its nominal argument must interact so that argument raising of a PP complement is possible. To illustrate this interaction the lexical entries of *lesen* and *Buch*, a verb-noun combination where argument raising of the noun's PP complement is possible (as for example in example (10)), are shown in figure 5 and 6.

$$\begin{bmatrix} \text{PHON} & \langle \textit{las} \rangle \\ \text{S} \mid \text{L} & \begin{bmatrix} \text{CAT} \mid \text{HEAD} & \textit{verb} \\ \text{CONT} \mid \text{NUCLEUS} & \textit{read-rel} \end{bmatrix} \\ \text{ARG-ST} & \langle \textit{NP, NP} \rangle \end{bmatrix}$$

Figure 5: Lexical entry for *las*

$$\begin{bmatrix} \text{PHON} & \langle \textit{Buch} \rangle \\ \text{S} \mid \text{LOC} & \begin{bmatrix} \text{CAT} \mid \text{HEAD} & \textit{noun} \\ \text{CONT} \mid \text{RESTR} & \left\langle \begin{bmatrix} \text{NUCL} \mid \text{QUAL} \mid \text{TEL} & \textit{read-rel} \end{bmatrix} \right\rangle \end{bmatrix} \\ \text{ARG-ST} & \langle \textit{PP} \rangle \end{bmatrix}$$

Figure 6: Lexical entry for Buch

As explained in section 3.1, the reason why argument raising is possible with these two elements is that they are semantically closely related. In our theory this relatedness is expressed

[7] We are only concerned with nominals here. Whether other parts of speech should be treated along the same line must be left to future research.

[8] Singling out the central predicate as the first element is similar to the KEY attribute used in minimal recursion semantics (Copestake, Flickinger, and Sag 1997).

by the fact that the verb's CONTENT|NUCLEUS value (the semantic relation expressed by the verb) and the noun's TELIC value are identical. Thus, in exactly those cases where these values are identical argument raising of then noun's PP complement must be permitted.

We therefore formulate the principle shown in figure 7 expressing that a nominal argument can be the source for argument raising, i.e. can have a *dependent-valence*, only if its TELIC value is identical with the verb's NUCLEUS value.[9]

$$\begin{bmatrix} \textit{word} & \\ \text{SYNSEM}\,|\,\text{LOC}\,|\,\text{CAT}\,|\,\text{HEAD} & \textit{verb} \\ \text{ARG-ST} & \textit{list-of-indep-val} \bigcirc \left\langle \left[\text{LOC}\,|\,\text{CAT} \begin{bmatrix} \text{HEAD} & \textit{noun} \\ \text{VAL} & \textit{dep-val} \end{bmatrix} \right] \right\rangle \end{bmatrix} \rightarrow$$

$$\begin{bmatrix} \text{SYNSEM}\,|\,\text{LOC}\,|\,\text{CONTENT}\,|\,\text{NUCLEUS} & \boxed{1} \\ \text{ARG-ST} & \textit{list-of-indep-val} \bigcirc \left\langle \left[\text{L}\,|\,\text{C}\,|\,\text{RESTR}\,|\,\text{FIRST}\,|\,\text{NCL}\,|\,\text{QUAL}\,|\,\text{TELIC} \;\boxed{1} \right] \right\rangle \end{bmatrix}$$

Figure 7: Restriction on the occurrence of dependent valences

An example: Now that the relevant machinery has been introduced, let us look at an example where a nominal head and its PP argument occur separate from each other. The structure for such an example as licenced by our theory is shown in figure 8. The important detail here is how the partial NP *ein Buch* and its PP argument *zu diesem Thema* are licenced as sister constituents. The relevant lexical entry for the verb *las* triggering the argument raising was already shown in figure 5, and for the noun *Buch* in figure 6.

As the CONTENT values of these two elements interact as specified in the principle in figure 7, the partial NP *ein Buch* in the tree in figure 8 has a *dependent-valence*. The occurrence of *las* in the tree in figure 8 thus raises the PP argument *zu diesem Thema* from its nominal complement, as specified in the principle in figure 2. The subject NP *Hans*, the trace of the topicalized partial NP *ein Buch* and the raised PP *zu diesem Thema* are then all realized in a flat head-subject-complement structure.

6 Summing up

Investigating the nature of NPs occurring separate from their PP argument, we showed that there are no convincing arguments for the assumption that the PP has been extracted from the NP. Instead, we provided evidence that the two elements behave like sister constituents with respect to possible word orders. We argued that an analysis allowing argument raising of PP complements from nominal heads is thus the appropriate approach.

[9]Definition of *list-of-indep-val*:

$$\textit{list-of-indep-val} := \langle\rangle.$$

$$\textit{list-of-indep-val} := \left\langle \left[\text{L}\,|\,\text{C}\,|\,\text{VAL} \begin{bmatrix} \textit{indep-val} & \\ \text{SPR} & \langle\rangle \\ \text{SUBJ} & \langle\rangle \\ \text{COMPS} & \langle\rangle \end{bmatrix} \right] \;\middle|\; \textit{list-of-indep-val} \right\rangle.$$

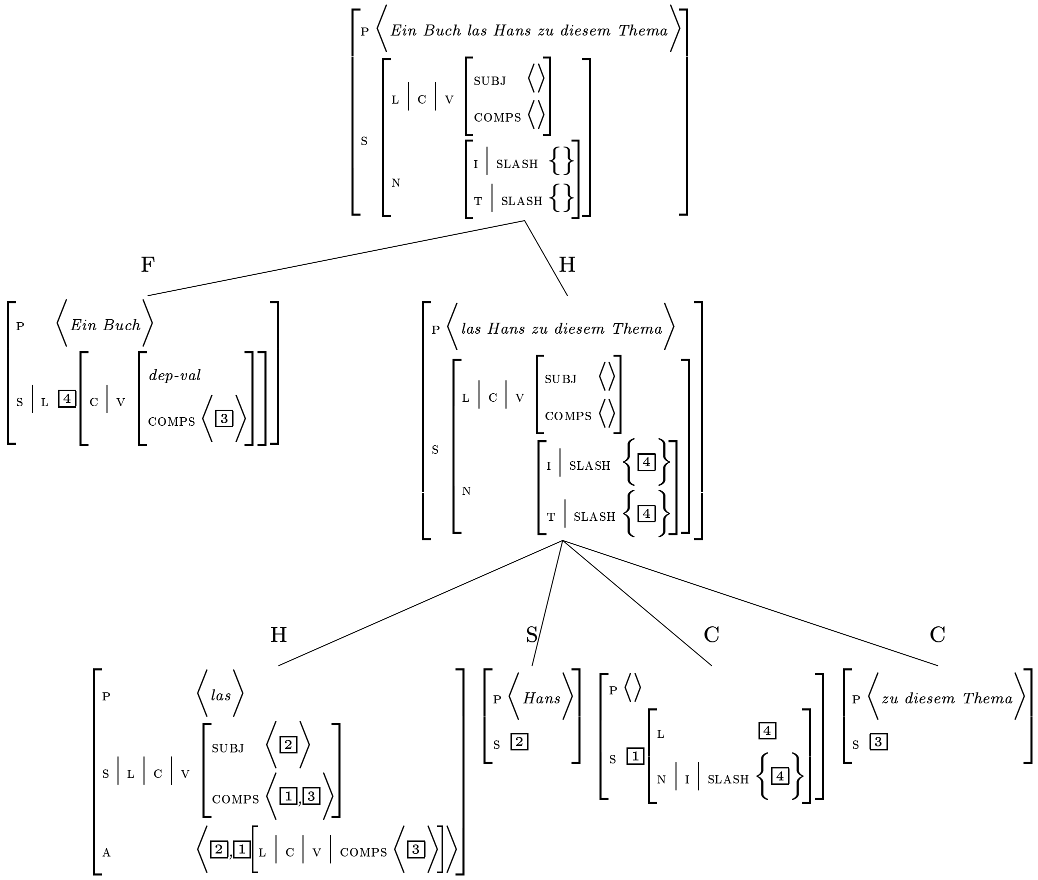

Figure 8: An example for argument raising from an NP argument

We formalised this account in terms of lexical principles licencing argument raising from nominal heads within HPSG.

We also investigated the lexical-semantic restrictions that influence the possibility of separating a PP from its nominal head. The important observation here is that only if the embedding verb and its nominal complement are semantically closely related, the noun and its PP argument can occur separate from each other. We extended the CONTENT value of nouns so that also their relational properties are encoded and formulated a principle that triggers argument raising only if some of these properties and the embedding verb's semantic relation are identical.

References

Bach, E. and G. Horn (1976). Remarks on 'Conditions on Transformations'. *Linguistic Inquiry 7*, 265–299.

Bech, G. (1955). *Studien über das deutsche Verbum infinitum.* reprinted 1983, Tübingen: Max Niemeyer Verlag.

Bouma, G., R. Malouf, and I. A. Sag (1998). A Unified Theory of Complement, Adjunct, and Subject Extraction. In G. Bouma, G.-J. Kruijff, and R. Oehrle (Eds.), *Proceedings of FHCG'98*, Saarbrücken.

Chomsky, N. (1977). On Wh-Movement. In P. Culicover, T. Wasow, and A. Akmajian (Eds.), *Formal Syntax*, pp. 71–132. New York: Academic Press.

Copestake, A., D. Flickinger, and I. A. Sag (1997). Minimal Recursion Semantics: An Introduction. Ms. Stanford University.

De Kuthy, K. and W. D. Meurers (1999). On Partial Constituent Fronting in German. In E. Kordoni (Ed.), *Tübingen Studies in Head-Driven Phrase Structure Grammar*, Arbeitsberichte des SFB 340, Nr. 132. Universität Tübingen.

Diesing, M. (1992). *Indefinites*, Volume 20 of *Linguistic Inquiry Monographs*. Cambridge, Massachusetts: MIT Press.

Fanselow, G. (1987). *Konfigurationalität. Untersuchungen zur Universalgrammatik am Beispiel des Deutschen*, Volume 29 of *Studien zur deutschen Grammatik*. Tübingen: Gunter Narr Verlag.

Grewendorf, G. (1989). *Ergativity in German*. Number 35 in Studies in Generative Grammar. Dordrecht: Foris.

Haider, H. (1993). *Deutsche Syntax - generativ*. Tübingen: Gunter Narr Verlag.

Hinrichs, E. and T. Nakazawa (1989). Flipped Out: Aux in German. In *Papers from the 25th Regional Meeting of the CLS*, Chicago, Illinois, pp. 193–202.

Meurers, W. D. (1997a). Statusrektion und Wortstellung in kohärenten Infinitkonstruktionen des Deutschen. In E. Hinrichs, W. D. Meurers, F. Richter, M. Sailer, and H. Winhart (Eds.), *Ein HPSG-Fragment des Deutschen. Teil 1: Theorie*, Number 95 in Arbeitspapiere des SFB 340, pp. 189–248. Universität Tübingen.

Meurers, W. D. (1997b). Using Lexical Principles in HPSG to Generalize Over Valence Properties. In G.-J. M. Kruijff, G. V. Morrill, and R. T. Oehrle (Eds.), *Proceedings of the Third Conference on Formal Grammar*, Aix-en-Provence, pp. 137–146.

Müller, G. (1996). Incomplete Category Fronting. SfS Report 1-96, Universität Tübingen.

Pafel, J. (1993). Ein Überblick über die Extraktion aus Nominalphrasen im Deutschen. In F.-J. d'Avis, S. Beck, U. Lutz, J. Pafel, and S. Trissler (Eds.), *Extraktion im Deutschen I*, Volume 34 of *Arbeitspapiere des SFB 340*, pp. 191–245. Universität Tübingen.

Pafel, J. (1995). Kinds of Extraction from Noun Phrases. In U. Lutz and J. Pafel (Eds.), *On Extraction and Extraposition in German*, Volume 11 of *Linguistik Aktuell*, pp. 145–177. Amsterdam: Benjamins.

Pollard, C. and I. A. Sag (1994). *Head-Driven Phrase Structure Grammar*. Studies in Contemporary Linguistics. Chicago and London: University of Chicago Press.

Pustejovsky, J. D. (1995). *The Generative Lexicon*. Cambridge, London: MIT Press.

Webelhuth, G. (1992). *Principles and Parameters of Syntactic Saturation*. Oxford Studies in Comparative Syntax. New York, NY: Oxford University Press.