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An Extended Account of "Modal Flip" and Partial Verb Phrase Fronting in German

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Contents

1. Introduction **3**

2. Some Phenomena from German 3

2.1. V2 . . . 4

2.2. Scrambling . . . 5

2.3. Raising of Verbal Arguments . . . 5

2.4. Double Infinitive . . . 6

25. ModalFlip . . . 9

2.6. Partial Veib Phrase Fronting . . . 11

2.7. Partial Veib Phrases and Spurious Ambiguity . . . 12

2.8. Unaccusative Verbs . . . 14

2.9. Fronting Base Form Verbs with Subjects . . . 15

3. **Background on** V2 **in HPSG** **16**

3.1. The HPSG Features SUBJ and COMPS . . . 17

3.2. Subcategorization: The Valence Principle . . . 17

3.3. Fillers and Traces . . . 17

3.4. The Head Feature INV . . . 18

3.5. IDRules . . . 19

3.6. Linear Precedence Rules . . . 20

4. HPSG Grammar Fragment for Our Analysis **20**

4.1. Verbal Sorts . . . 21

4.2. LP Rules for Modal Flip . . . 21

4.3. ID Rule R2: Flat S Structures . . . 22

4.4. ID Rule R2': Partial Verb Phrase Rule . . . 24

5. **Modal Flip** **26**

5.1. Hinrichs & Nakazawa's Account of Modal Flip . . . 26

5.2. Revised Account of Modal Flip: Subcategorizing for PVP . . . 32

5.3. Remaining Problems for the Modal Flip Analysis . . . 35

6. Partial Verb Phrase Fronting **36**

6.1. Neibonne's Account of PVP Fronting . . . 36

6.2. Revising Neibonne's PVP Rule: Auxiliaries Subcategorize for Lexical Heads . . . 38

6.3. Problems for the PVP Fronting Analysis . . . 41

6.4. Veibs With Non-Agentive Subjects . . . 41

6.5. Fronting of Subjects With Base Form Veibs . . . 42

7. Conclusion **44**

8. Acknowledgements **45**

9. References **45**

1. Introduction

The puipose of this paper is to integrate the observations I have made about verbal phenomena in German, **including *Verb Second (V2), Modal Flip,* and *Partial Verb Phrase (PVP) fronting.* I will build** on the literature from *Head-Driven Phrase Structure Grammar* (HPSG), including primarily the recent analyses of [Pollard and Sag, 1987, Pollard and Sag, 1994], [Neibonne, 1986, Neibonne, 1994], and [Hinrichs and Nakazawa, 1989, Hinrichs and Nakazawa, 1994]. I show that the only places that (P)VPs occur in German arc either extraposed or in fionted position. By bloddng the appearance of (P)VPs in the German *Mittelfeld,* the field of non-fronted verb arguments and adjuncts, I avoid spurious ambiguity in the matrix clause (see [Pollard, in press]).

First I will review the German phenomena to be explained in the paper. Next I will summarize an HPSG account of V2, giving a a rule schema for sentence and verb phrase which are in line with this account Our account will follow [Pollard and Sag, 1994, chapter 9], which assumes a distinguished SUBJ feature for verbs.

I will then present my account of modal flip and PVP fronting. My account of these phenomena differs from previous accounts in these three ways:

1. I offer the following account of German auxiliary subcategorization: First, I propose that German auxiliaries subcategorize for *lexical* heads. And second, to Hinrichs & Nakazawa's account of modal flip, I add the constraint that verb-final auxiliaries which flip over some nominal complements must subcategorize for PVP.
2. Using the subcategorization established for auxiliaries, I present an alternative formulation of Nerbonne's lexical rule for PVP fronting.
3. I allow for the fronting of the non-agentive subjects of some German verbs. Key in this analysis is my proposal that grammatical subjects of these verbs are underiyingly complements in the lexicon.

We will find that my account of veibal phenomena in HPSG is superior to previous accounts for these reasons:

- I establish a common phrase structure for PVPs in modal flip contexts and in fionted contexts.
- I simplify the subcategorization requirements for auxiliaries, eliminating ambiguous lexical entries for auxiliary, which lead to spurious ambiguity.
- I offer for the first time a hypothesis about the lexical structure for German veibs with non-agentive subjects in HPSG.

2. Some Phenomena from German

This section reviews the linguistic phenomena which will be integrated by the analysis. The analysis begins with section 3.

2.1. V2

Verb second, or V2, is the phenomenon in languages such as German, Dutch and Yiddish, such that the verb always appears second in matrix clauses. It has been well-documented in the literature that the first constituent in a German matrix sentence may be almost any part of speech [Uszkoreit, 1987a, section 1.5].[1]

In line with [Uszkoreit, 1987a], [Nerbonne, 1986, Neibonne, 1994], and [Pollard, in press], this paper assumes that all matrix sentences in German are verb-initial, and that constituents which precede the head verb in a matrix sentence are either a) the result of fronting, or *topicalization,* or b) adjuncts. The idea of postulating an underiying verb-initial sentence stnicturc goes back at least to [den Besten, 1983] woiidng in a transformational framework. The phrase structure rule which admits V2 sentences in the grammar will be given in our grammar fragment

A few examples of German V2 sentences follow.

	Er	wird	dasBuch	lesen.
(1)	He[NOM]	will	thebook[ACC]	read

'He will read the book.'

	DasBuch	wird	er	lesen.
(2)	Thebook[ACC]	will	he[NOM]	read

'He will read the book.'

	Lesen	wird	er	dasBuch.
(3)	Read	will	he[NOM]	thebook[ACC].

'He will read the book.'

	Dann	wird	er	dasBuch	lesen.
(4)	Then	will	he[NOM]	the book[ACC]	read

'Then he will read the book.'

Uszkoreit notes that [Drach, 1963] provides a detailed account of the sentential elements which may precede the finite verb in a German sentence.

	In diesem	Zimmer	wird	er	das Buch	lesen.
(5)	in this[DAT]	room	will	he[NOM]	the book[ACC]	read

'He will read the book in this room.'

2.2. **Scrambling**

The definition of *scrambling* from transfonnational theory, offered by Grcwendorf & Stemefeld [Grewendorf and Stemefeld, 1990], is that scrambling accounts for the permutation of constituents within the same clause. For example, the term scrambling is used to describe an account of the occurrence of a Gennan subject between two non-subject complements in a matrix sentence. Though we do not base our account of this phenomenon on movement, we will use the term *scrambling* somewhat loosely to refer to the free ordering of subject and other complements of V. An example of a sentence with scrambling is example 6 [Uszkorcit, 1987a, example 45c].

	Dann	wild	die Kile	derDoktor	demPatienten	geben.
(6)	Then	will	thepill[ACC]	the doctor[NOM]	to-the patient[D AT]	give

"Then the doctor will give the pill to the patient'

In this sentence, the subject, *Doktor* ('doctor'), has been *scrambled* between the verb's accusative and dative objects, *die Pille* ('pill') and *dem Patienten* ('patient').

In a transfonnational framework, one account of scrambling phenomena is that constituents are moved out of their underlying positions and adjoined to the front of a VP, IP (inflectional phrase, or, sentence) or AP (adjective phrase) [Grewendorf and Stemefeld, 1990]. Accounts of free word order without movement, such as the analysis offered here, take a different approach. We include phrase structure rules in the grammar which can generate subjects in either their canonical or scrambled positions. Our Gennan phrase structure rules, compatible with scrambling, are in section 4.3.

23. **Raising of Verbal Arguments**

Raising is a term from transfonnational grammar in which a constituent is mapped from a position in an underlying embedded clause to a position in the main clause in the surface representation.[2]. For example, the subject of an embedded clause may be *raised* to the subject position of the main clause. This is known as *raising to subject* We will give an English example of raising-to-subject here for the sake of familiarity [Pollaid and Sag, 1994, chapter 3, note 32]:

[2]**The explanation in this section is due to [Pollard and Sag, 1994, chapter 3]**

$$\begin{bmatrix} \text{CAT:} \begin{bmatrix} \text{HEAD:}\textbf{verb} \\ \text{VALENCE:} \begin{bmatrix} \text{COMPS:}\langle \begin{bmatrix} \textbf{vp} \\ \text{VFORM:}\textbf{inf} \\ \text{SUBJ:}\langle \boxed{2}\textbf{np} \rangle \end{bmatrix} : \boxed{1} \rangle \\ \text{SUBJ:}\langle \boxed{2} \rangle \end{bmatrix} \end{bmatrix} \\ \text{CONTENT:} \begin{bmatrix} \textbf{seem} \\ \text{SOA-ARG:}\boxed{1} \end{bmatrix} \end{bmatrix}$$

Lexical entry with raising for English verb *seem*

(7) Kim seems to be happy.

For an explanation of raising facts in HPSG, the reader is referred to [Pollard and Sag, 1994, chapter 3]. In their account of example 7, there is not movement of NP constituents from one clause to another, but rather a *structure sharing* of the subject NP by the raising verb and the head of its verbal complement. Structure sharing means that the subject for each of the two verbs is one and the same object. The subject is shared within a single S node. To illustrate raising in HPSG, we give in figure 2.3 the lexical entry for the English verb *seem*, following [Pollard and Sag, 1994].

In figure 2.3, the verb *seem* subcategorizes both for an infinitive form VP and that VP's subject (tagged with $\boxed{2}$). The complement verb will provide the semantic information for the unexpressed subject (*Kim* in sentence 7).

Figures 1 and 2 give two analysis trees for sentence 7. Figure 1 shows a transformational analysis from *Government Binding* theory, and figure 2 shows a unification-based analysis from HPSG. Note that there are two S nodes in figure 1 and a single S node in figure 2.

This brief introduction to raising will be useful when we show our lexical entries for German auxiliaries in section 5.1. We will follow [Hinrichs and Nakazawa, 1989, Hinrichs and Nakazawa, 1994] and [Pollard, in press] in proposing that all German auxiliaries are *raising verbs*. In particular, we will claim that a German auxiliary raises *all* of its complement verb's arguments, structure-sharing them within a single S node.

2.4. Double Infinitive

The *double infinitive* construction (see [den Besten and Edmondson, 1983]) is a German constituent comprised of the infinitival forms, or *base* forms, of an auxiliary verb and a main verb. Double infinitive occurs in verb-final position, and the auxiliary follows the main verb.

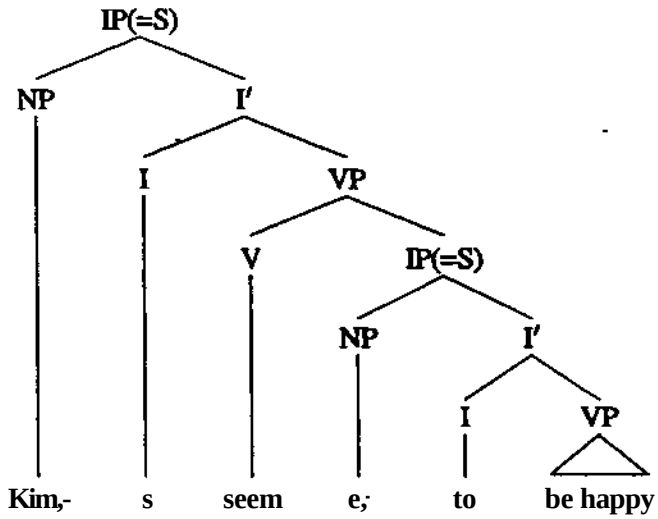


Figure 1: Raising-to-Subject using Government-Binding Theory

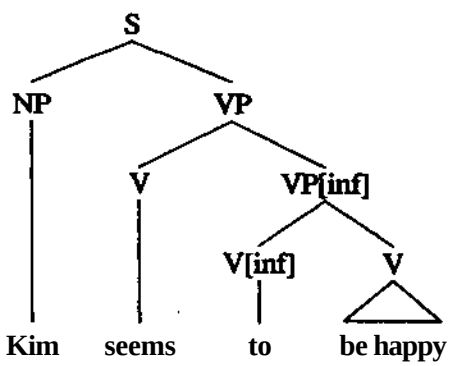


Figure 2: Raising-to-Subject using HPSG

	Er	wird	dasExamen	bestehen	können.
(8)	He	will	the exam	pass[BSE]	be-able-to[BSE]

'He will be able to pass the exam.'

In example 8, *bestehen können* is the double infinitive. *Bestehen* is the main verb and *können* is a modal auxiliary.

A double infinitive may consist of a main verb and a verb which takes a VP complement, such as *sehen* ('see'), *hören* ('hear') or *lassen* ('let'). For example, *singen hören* Csing hear') is **a** double infinitive.

There may be more than two infinitives in the "double" infinitive, as shown in example 9.

	Cecilia wind die		Nilpferde	**füttern**	**dürfen**	**lassen.**
(9)	Cecilia will	the[ACC]	hippos	feed	be-allowed-to	let

'Cecilia will be allowed to feed the hippos.'

We claim that the double infinitive is **a** constituent in German, in contexts including at least verb-final sentences. One argument for the constituency of the double infinitive is that a finite auxiliary may "flip*' over a double infinitive (see section 2.5) but may not come between a base form verb and a base form auxiliary.

(1m)

a.	daB	er	das Examen	**wird**	**bestehen**	**können.**
	that	he	the exam	will	pass	be-able-to
b.	daB	er	das Examen	**bestehen**	**können**	**wird.**
	that	he	the exam	pass	be-able-to	will
c.	*daB	er	das Examen	**bestehen**	**wihl**	**können.**
	that	he	the exam	pass	will	be-able-to

Another observation is that, in a V2 sentence, the double infinitive may be fronted:

	bestehen	**können**	wird er	**das** Examen.
(11)	pass	be-able-to	will he	the exam

'He will be able to pass the exam.'

However, the main verb infinitive may also be fronted in a V2 sentence without the infinitive auxiliary.[3]

	bestehen	wind er	das Examen	können.	
(12)	pass	will he	the exam	be-able-to	

'He will be able to pass the exam.'

This ability to "split" the double infinitive via the fronting of a base form veib, and the contrast between examples 10c and 12, suggest that we will need to look at double infinitive constituency a bit more closely.

2.5. Modal Flip

Noixnally, in German subordinate clauses, the finite verb comes at the end of the clause. For example, in 13, the finite auxiliary follows a double infinitive:

	Ich	wufite,	dafi	er	das Examen	bestehen	**kōnnen**	wūrde.
(13)	I	knew	that	he	the exam	pass[BSE]	be-able-to[BSE]	would[FIN]

"I knew that he would be able to pass the exam.[9]

Modal flip (see [Johnson, 1986]) occurs in German when the auxiliary in an embedded clause precedes its double infinitive complement Example 14, agrammatical alternative to number 13, is [Hinrichs and Nakazawa, 1994, example lb]:

	Ich	wufite,	dafi	er	das Examen	**wūrde**	**bestehen**	**kōnnen.**
(14)	I	knew	that	he	the exam	would[FIN]	pass[BSE]	be-able-to[BSE]

'I knew that he would be able to pass the exam.'

Modal flip is interesting because the finite auxiliary in the "flipped" case separates the main verb from its complements. This fact contradicts any grammar that proposes that the double infinitive, in a complex without the finite auxiliary, heads a contiguous VP.

---

[3]**The auxiliary verb cannot be fronted by itself:**

•kōnnen wīnd er das Examen bestehen
be-able-to will he the exam pass.

This may be a special property of bare auxiliaries. [Nerbonne, **1994]** restricts this sentence with a condition added into his /-PVP **rule. (See section 6.1 of this paper.)**

We also note that modal flip does not (usually) occur around a single base form infinitive:[4]

(15) *Ich glaube, daB er wird kommen.
I believe that he will come[BSE].

For some auxiliaries, such as *werden* ('will'), modal flip is optional; for others, such as *haben* ('have'), modal flip is obligatory. The reader is referred to [Bech, 1955], [Hinrichs and Nakazawa, 1994] for detailed accounts of modal flip phenomena, which are quite intricate.

As pointed out in [Kioch and Santorini, 1991], [Hinrichs and Nakazawa, 1994], and [Nerbonne, 1994], there may in some cases be a constituent between the governing auxiliary and the double infinitive:

	... dafi	er	ihnen	hätte	alles	schicken	sollen.
(16)	that	he	them	would-have	everything	send	should

'... that he should have sent them everything*

In their account with movement, [Kroch and Santorini, 1991] describe a rule of syntactic lowering that moves quantified or emphatically stressed NPs, in sentences in which modal verbs appear in the perfect tense (e.g. *hätte* in sentence 16). In one example, a quantified subject lies between the finite auxiliary and the double infinitive [Kroch and Santorini, 1991, 60c]:

	daB	gestem	hätte	keiner	kommen	diirfen
(17)	that	yesterday	would-have	nobody[NOM]	come	be-allowed-to

"That nobody would have been allowed to come yesterday.'

The ability to have one or more NPs between the flipped auxiliary and the double infinitive seems to vary across speakers. [Hinrichs and Nakazawa, 1994] allow for intervening NPs only when the auxiliary in the double infinitive takes a VP complement[5]

We suggest that sentences 16 and 17 are examples of *extraposition.* We use the term *extraposed* to describe a VP that occurs after the position of the final tensed verb. In example 16, the extraposed phrase is

---

[4][Hinrichs and Nakazawa, 1994,6a] offer the following as a grammatical sentence, citing [den Besten and Edmondson, 1983]:

Weil	er	nicht	anders	hatkönnen
because	he	not	otherwisehas	be-able-to

'because he couldn't do differently.'
The analysis in this paper does not admit this sentence as grammatical.

[5]So sentences 16*and 17 are not admissible by [Hinrichs and Nakazawa, 1994].

alles schicken sollen ('should send everything') and in 17, it is *keiner kommen diirfen* ('nobody be allowed to come'). We introduce these two phrases as *partial verb phrases*^ or PVPs, which arc phrases consisting of a verb and some of the verb's arguments. In the next section, we discuss PVPs and subcategorization.

2.6. Partial Verb Phrase Fronting

Partial Verb Phrases have been observed in the first position of a German sentence.[6] In examples 18- 20 we show sentences that begin with PVP.[7]

	DasMärchen	erzählen	[wird	er	ihr	*]S/PVP-*
(18)	The fairy-tale[ACC]	tell	[will	hefNOM]	to-her[DAT]].	

'He will tell the fairy-tale to her/

	Ihr	erzählen	[wild	er	dasMärchen	*]S/PVP-*
(19)	to-her[DAT]tell		[will	he[NOM]	the fairy-tale[ACC]].	

'He will tell her a fairy-tale.'

	DasExamen	bestehen	[wind	er	*kdunen]s/pvp-*	
(20)	The exam[ACC]	pass	[will	he[NOM]	be-able-to].	

'He will be able to pass the exam.[9]

The tree structure for example 18 is given in figure 3. As we do not wish to delve too far into the analysis while still presenting the data, we will postpone the exposition of the flat S structure in this figure to section 4.3. S

In 18, there is aPVP constituent, *das Mdrchen erzdhlen* ('tell the fairy-tale'), in which the verb, *erzdhlen* ("tell'), and the accusative object, *das Mdrchen* ("the fairy tale'), have been fronted without the verb's dative object, *ihr* Cher'). A full VP would normally consist of the main verb and all of the verb complements, e.g. *ihr das Mdrchen erzdhlen* ('tell her the fairy-tale'). In 19, the verb has been fronted with the dative object rather than with the accusative object Sentences 18 and 19 are both grammatical, but their acceptability seems to vary across speakers, as documented in [Heidolph et al., 1981] and [Uszkoreit, 1987b].

---

[6][den Besten and Webelhoth, 1990] refer to the phenomenon as *remnant topicalizaiion.*

[7]We follow [Nerbonne, 1994] and [Pollaid and Sag, 1994, chapter 9] in not showing a trace in the main clause for the fronted PVR We return to traces in section 33 of this paper. The role which Nerbonne uses to admit sentences with fronted PVPs in the grammar is given in section 6.1.

Also note [Haider, 1990] who claims PVPs are base-generated in topic position.

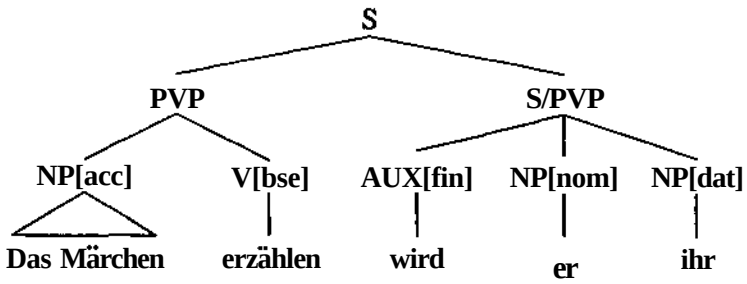


Figure 3: Tree Structure for Fronted Partial Vert) Phrase

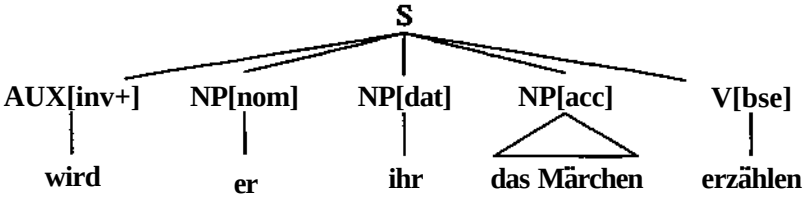


Figure 4: Auxiliary Raising All Verb Complements

2.7. Partial Verb Phrases and Spurious Ambiguity

Pollard (see [Pollard, in press]) notes that it is a fundamental premise of a phrase structure grammar that constituent structure be linguistically significant Our assumption here is that any phrase structures introduced in the grammar must be well motivated. Furthermore, two different phrase structures may not exist for the same bundle of information; there must be a semantic, phonological or pragmatic basis for two syntactic representations for the same utterance.[8] We use the term *spurious ambiguity* to refer to ambiguous phrase structures in the grammar which have no basis for distinction.[9]

In our theory we need a phrase structure rule for PVP in the grammar so that the constituents which are fronted in examples 18 and 19 are defined. However, as shown in [Pollard, in press], there is a potential problem with spurious ambiguity in the grammar when a rule for P^IP coexists in the grammar with raising by the auxiliary verb. When the grammar admits PVPs into the matrix clause and has auxiliaries which are raising verbs, the possibilities for auxiliary subcategorization are the following:

1. **The auxiliary subcategorizes for a verb, raising all of the verb's complements. (See figure 4.)**
2. **The auxiliary subcategorizes for a PVP, raising the complements of the head of the PVP which are not part of the PVP. That is, the head verb's complements are not daughters of the PVP. (See figure 5.)**

---

[8] **Rich Thomason (p.c.) has suggested that there might in fact be other, purely syntactic indications of ambiguity. I leave this issue open to investigation.**

[9] Spurious ambiguity arises in HPSG when two different tree structures have the same **value** for **SYNSEM, the attribute that contains syntactic and semantic information**

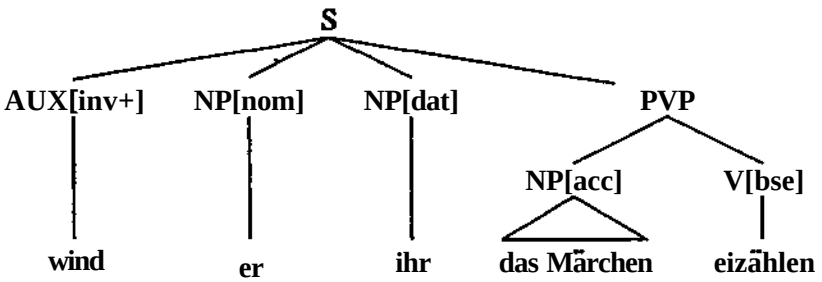


Figure 5: Auxiliary Subcategorizing for PVP in Main Clause

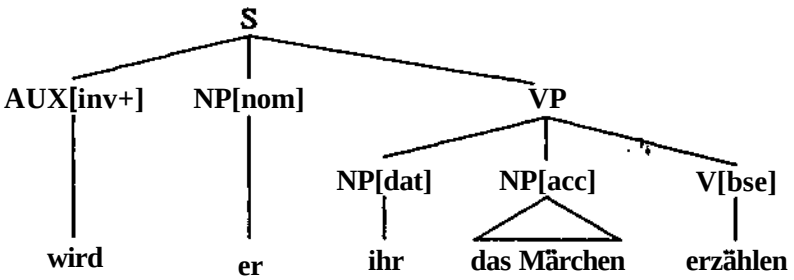


Figure 6: Auxiliary Subcategorizing for VP in Main Qause

3. The auxiliary subcategorizes for a full VP, raising no complements of the head of the VP. (See figure 6.)

Another problem noted by Pollard is that the spurious ambiguity introduced by PVPs compounds with multiple auxiliaries in a single sentence. The reader can imagine the various levels of raising which are possible with multiple auxiliaries.

The approach we are taking here is that we will not invite PVPs to appear where we can already justify the occurrence of another phrase structure - in this case, a flat one. As our analysis is syntactic, we will not be looking at the semantic, phonological or pragmatic factors which may or may not argue in favor of VPs in the German main clause. What we will be doing simply is using facts about word order to argue for a flat structure, and will leave well enough alone in the main clause without introducing competing syntactic analyses which we do not need. Nerbonne [Nerbonne, 1994], who also cites [Haider, 1990], argues convincingly that the topicalization of a PVP constituent is not proof positive of its existence in the *Mittelfeld.* He reminds us that 'constituents' must be analyzed with respect to their position in a phrase.

2.8. Unaccusative Verbs

We move from PVP fronting to a review of unaccusativity; this is a digression of sorts. The purpose of this section is to provide background for the classification of verbs which may be fronted in PVP with their subjects.

The Unaccusative Hypothesis fonnulated by [Perimutter, 1978] states that there are two types of intransitive verbs, *unaccusative* and *unergative* verbs.[10]. An unaccusative vert) is so-called since it cannot take an object with accusative case. In Government Binding theory, this is because an unaccusative verb takes a d-structure object and no subject Two examples of unaccusative veibs in German *die fallen* ('fall') and *ankommen*('arrive').

Perimutter makes the generalization that unaccusative verbs fail to undergo impersonal passivization in German. Example 21 is from [Pollard, 1994,9a,b]:

(21)

a.

Der Zug ist angekommen.
Thetrain[NOM] has arrived *

b.

•Hier ist angekommen worden.
Here has arrived been.

'Here has been arrived.'

There are some syntactic diagnostics for unaccusativity, which do not categorize unaccusative verbs neatly. These diagnostics include the inability to form the impersonal passive, the formation of the adjectival passive, and auxiliary verb selection. [Kathol, 1992], citing [Dowty, 1991] and [Zaenen, ms], points out

[10]Explanation in this section due to [Levin and Hovav, 1992]

that German unaccusative verbs are characterized semantically (in part) by non-agentive properties for their subjects. [Levin and Hovav, 1992] would argue that the semantic and syntactic characterization of these verbs is interrelated; something that is semantically caused may be syntactically active. The formation of the passive, a diagnostic for these verbs, is a syntactic construction. The reader is referred to [Kathol, 1992], [Zaenen, ms], [Levin and Hovav, 1992], etc. since it is beyond the scope of this paper to fully address this topic.

As we move to a discussion of fronting base form verbs with subjects, we note that we have left undone the work of determining whether the unaccusative verbs *fallen* and *ankommen*, which take no objects, are frontable with their subjects.

2.9. Fronting Base Form Verbs with Subjects

[Uszkoreit, 1987a] attributes to Haider (p.c.) the observation that certain German verbs may be fronted with their *subjects*. We show a fronted subject in example 22. These "certain" verbs have subjects which are not agentive.

	Ein wirklicher Fehler			**unterlaufen**	[war ihm	noch	nie].
(22)	a	real	mistake[NOM]	occur	[was to-him[DAT]	still	never]

'He never made a real mistake.' *[Uszkoreit, 1987a, 14a]*

In the normal case, fronting subject together with verb is not permitted:

	*** Er**	**erzählen**	[wird ihr	das Märchen].
(23)	He[NOM]	tell	[will to-her[DAT]	the fairy-tale[ACC]].

'He will tell her the fairy tale.'

And the verb *unterlaufen* ('occur') in example 22 cannot undergo impersonal passivization:

(24)	***Ihm**	**wurde**	**von**	**einem**	**wirklichen**	**Fehler**	**noch nie**	**unterlaufen.**
	to-him	has	by	a	real	mistake	still never	occurred

The classification of verbs which do front their subjects may include not only unaccusative verbs but other verbs as well. In example 25 we show the verb *ausmachen* ('affect'/'matter'). The passives in 25b and 25c are ungrammatical, while fronting is questionable in 25d and 25e.

a. Dim hatderUnfall nichts ausgemacht.
to-him[DAT] hastheaccident[NOM] nothing[ACC?] mattered.

'The accident did not affect him.'

b. *Dim wurde von dem Unfall nichts ausgemacht
to-him has by the accident[DAT] nothing mattered.

c. *Nichts wurde ihm von dem Unfall ausgemacht.
nothing has to-him[DAT] by the accident[DAT] mattered.

(25) d. *?Der Unfall ausmachen wild ihm nichts.
The accident[NOM] matter will to-him[DAT] nothing.

'The accident will not affect him.'

e. ??Nichts ausmachen wild ihm der Unfall.
nothing matter will to-him[DAT] the accident[NOM]

'The accident will not affect him.'

f. Soviel ausmachen kann ihm das nicht.
So much matter be-able to-him[DAT]that[NOM] not

'That can't bother him very much.'

Ausmachen may be a verb for which case assignment goes along with semantic role assignment; such verbs with *quirky* case do not passivize. (See [Belletti and Rizzi, 1988].)

The relation between unaccusative verbs and the set of verbs with non-agentive subjects, and the underlying structures for these in HPSG, is a topic for future research. But, we will lead off by suggesting HPSG feature structures for verbs which front their subjects in section 6.4. We will follow [Perimutter, 1978] in showing no underlying subjects for these verbs.

3. Background on V2 in HPSG

In this section we establish the HPSG framework in which we will be working. We will use the version of HPSG in [Pollard and Sag, 1994, diapter 9]. In particular, we will be using the features SUBJ and COMPS for subjects and complements, in addition to a single SUBCAT list for all arguments. [Pollard and Sag, 1994, diapter 9] also presents a treatment of filler-head constructions that does not include traces in main clauses, and we review this here. We close this section by giving details for the treatment of V2 in HPSG.

3.1. The HPSG Features SUBJ and COMPS

[Pollard and Sag, 1994, chapter 9] gives a detailed account of the treatment of subject in HPSG and propose a revised version of the theory, following [Borsley, 1987], in which there are distinct SUBJ and COMPS features for verbs. We follow Borsley and Pollard & Sag in having the SUBJ feature on verbal heads. One motivation for SUBJ is that, when SUBJ is distinct from COMPS, the phrases S, NP, VP and predicative AP can all have in common the simple specification COMPS(), whether or not their SUBJ lists are saturated. Another reason for SUBJ is that it simplifies the specification of how subject traces are disallowed in HPSG. Still another reason to separate SUBJ from COMPS is to facilitate description of heads with a complement but not subject, such as nonpredicative prepositions and subordinate conjunctions. We make use of the SUBJ distinction later in our discussion of verbs with non-agentive subjects (in section 6.4). We will claim that some lexical entries for German verbs have no subject on the SUBJ list

3*2. **Subcategorization: The Valence Principle**

The Valence Principle is the foimuladonofthe SUBCATEGORIZATION principle (see [Pollard and Sag, 1987]) for the separate features SUBJ and COMPS. Like the Subcategorization Principle, the Valence Principle says that the subcategorization requirements of a phrase are equal to the subcategorization requirements of the head of the phrase minus those requirements satisfied by the phrase's subject daughter and complement daughters.

The valence principle is stated as follows [Pollard and Sag, 1994, chapter 9,4]:

> In a headed phrase, for each valence feature F, the F value of the head daughter is the concatenation of the phrases's F value with the list of SYNSEM values for the F-DTRs value.

F ranges over the valence features SUBJ and COMPS.[11] The value of SUBJ for the head of a phrase is the concatenation of the value of SUBJ for the phrase with the list of the SYNSEM values for the subject daughter of the phrase. The value of COMPS for the head of a phrase is the concatenation of the value of COMPS for the phrase with the list of the SYNSEM values for the complement daughters of the phrase.[12]

33. Fillers and Traces

SLASH is the category in HPSG used for unbounded dependency constructions.[13] [Pollard and Sag, 1994, chapter 9] supports the premise that SLASH originates directly from a head that licenses the slashed element, without the means of a trace for the fronted constituent in the main clause. This paper will not offer evidence for or against the presence of traces in the main clause. We are rather choosing to be consistent in our use of the version of HPSG which is found in [Pollard and Sag, 1994, chapter 9] and [Neibonne, 1994]. Adopting

---

[11] **[Pollaid and Sag, 1994] also consider a third valence feature, SPR, for specifier.**

[12] **We will see in section 4.4 that we assume the relation of *sequence union* in combining the head and complements in our head-complement schema. This suggests that, for the grammar fragment in this paper, the Valence Principle needs to be rewritten in terms of sequence onion rather than concatenation. This is a technical point which bears on the other phrase-structure schemata** in the grammar fragment as well. We leave the specification of the Valence Principle for the future extension of this analysis.

[13] SLASH derives from Generalized Phrase **Structure Grammar [Gazdar, 1981].**

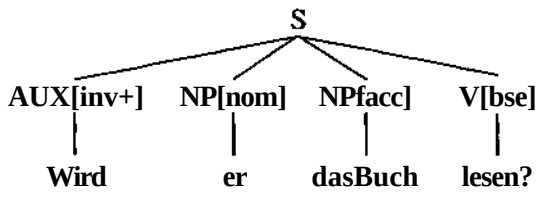


Figure 7: Tree Structure for +INV Sentence

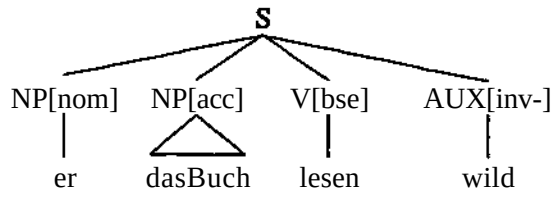


Figure 8: Tree Structure for -INV Sentence

a traceless analysis, however, requires us to state how it is that subcategorization requirements for the head of a phrase "match up" with the subcategorization values that are satisfied in SLASH. We use a lexical rule that transfers local features from the COMPS list of a head to the INHERISLASH set for that head. Example 26 is a *simplifiedvecsion* of the rule in [Pollard and Sag, 1994, chapter 9, 62].

(26) Complement Extraction Lexical Rule:

```
+-                                  —h          +-                        -+
ICOMPS <...,[LOC [1]], ...>|    —>    ICOMPS <. . . . . .>                I
IINHERISLASH {}                      I           IINHERISLASH {[1]}        I
+-                                  -+          +-                        -+
```

Following [Neibonne, 1994], we will be using a rule of this style to handle PVP fronting.

3.4. The Head Feature INV

We follow the HPSG analysis of V2 given in [Pollard, in press] using the head feature INV. The binary feature INV captures the fact that there are two different verbal positions in German: either preceding the subject and complements, or following the subject and complements. We show +INV and -INV sentences in figures 7 and 8, respectively.

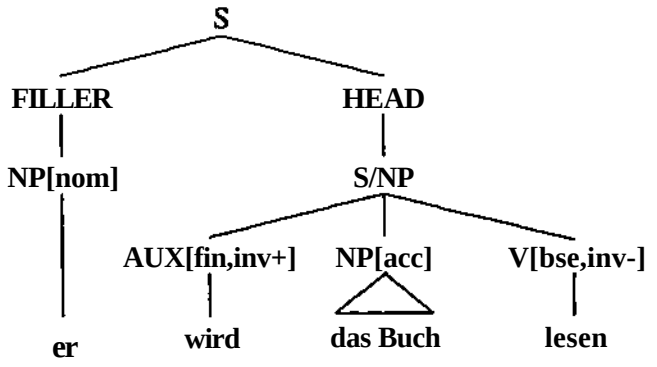


Figure 9: Tree Structure for FILLER-HEAD schema

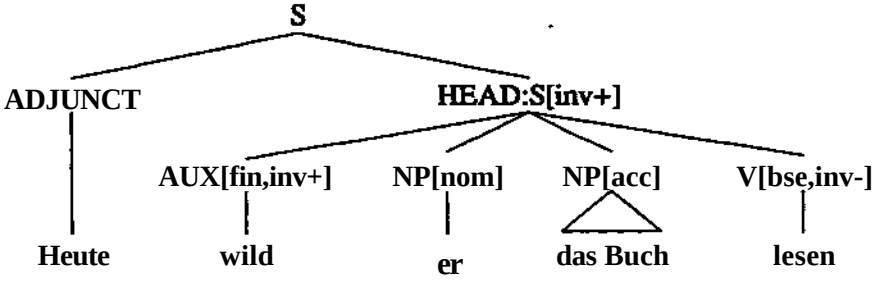


Figure 10: Tree Structure for HEAD-ADJUNCT Sdiema

3.5. ID Rules

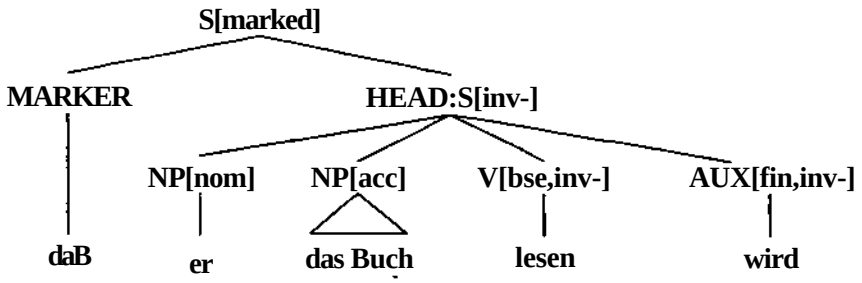
In HPSG, the set of allowable phrases structures is specified by a small set of Immediate Dominance schemata, or *ID rides.* This section reviews how the feature INV interacts with ID schemata in German to result in V2 sentences.[14]

The FILLER-HEAD rale sdiema [Pollard and Sag, 1994, sdiema 6] and HEAD-ADJUNCT rule schema [Pollard and Sag, 1994, sdiema 5] introduce the constituent daughters yi//er and *adjunct, filler* and *adjunct* can be sisters to a phrasal *head* which is a+INV sentence (but an adjunct daughter is not limited to S sisters). The filler precedes the head, and the adjunct may precede the head. V2 sentences result Our sample tree diagrams for these two rules are in figures 9 and 10.

The HEAD-MARKER schema [Pollard and Sag, 1994, schema 4] introduces complementizers or *markers* before -INV sentences. For example, *dafi* ("that") is a maiker which subcategorizes for a -INV sentence. See figure 11. The head in the HEAD-MARKER sdiema is a phrasal head.

The use of the HEAD-COMPLEMENT sdiema with a head daughter which is a subordinate conjunction, and a *complement* which is a -INV sentence, creates a subordinate clause. We show a subordinate clause in

[14]See also [Pollard, in press].



Rgure 11: Tree Structure for HEAD-MARKER Schema

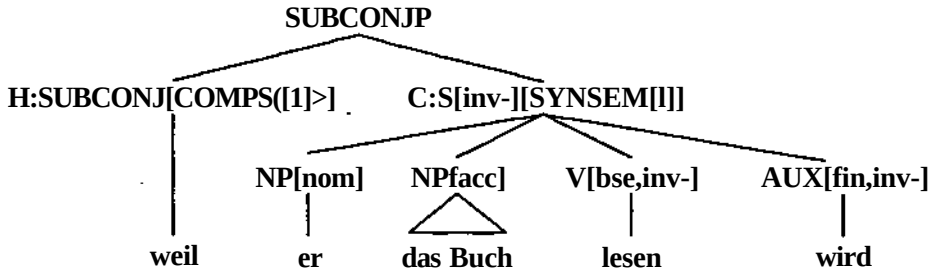


Figure 12: Tree Structure for HEAD-COMPLEMENT Schema

figure 12, where we prefix the head AVM, or *attribute value matrix*, with H, and the complement, with C. The clause may be an adjunct which combines with a +INV sentence using the HEAD-ADJUNCT schema. The HEAD-COMPLEMENT schema takes a lexical head.

3.6. Linear Precedence Rules

Linear precedence rules, or *LP rules*, specify constraints on the relative order of sisters, including heads, subjects, complements, adjuncts, markers, and fillers. For example, a linear precedence rule might order a head such that it follows its nominal complements. Phrase structure is the primary focus of this paper, so we will not elaborate on linear precedence here. In our grammar fragment we include the LP rules on which our account of modal flip relies.

4. HPSG Grammar Fragment for Our Analysis

In this section we present our HPSG grammar fragment for German. The section proceeds as follows:

In section 4.1, we will review the features for the sort *verb* and the AVM for *vp* in our grammar. In section 4.2, we will show the linear precedence rules which ensure the correct ordering of verbs in V2, V final, and modal flip contexts. In section 4.3 we introduce the ID rule that we will use for German sentence

structure, and the notion of a "subjectless" analysis of a German main clause. Finally, in section 4.4, we refine our phrase structure rule such that it becomes the single phrase structure rule in our grammar for sentence, VP and PVR

4.1. Verbal Sorts

We will assume the following feature declarations for the sort verb. Following [Hinrichs and Nakazawa, 1994], we will use the feature FLIP to mark in the lexicon whethenan auxiliary participates in modal flip.

$$\textit{verb:}\ \begin{bmatrix} \text{verb} \\ \text{VFORMrvform} \\ \text{AUXrboolean} \\ \text{INV:boolean} \\ \text{FUPrboolean} \end{bmatrix}$$

We will use vp as an abbreviation for a subsoil of synsem which has the following template:

$$\textit{vp:}\ \begin{bmatrix} \text{synsem} \\ \textit{HEAD}: \begin{bmatrix} \text{"verb} \\ \text{VFORM: [bse V prt]} \end{bmatrix} \\ \text{SUBJ: [list(synsem)]} \\ \text{cxDMPS:[list(synsem)]} \end{bmatrix}$$

Note that VPs do not necessarily have unsatisfied SUBJ values; some verbs may not subcategorize for a SUBJ in the lexicon.

4.2. LP Rules for Modal Flip

In presenting our linear precedence rules, we need to state the head complement ordering for verbs both in the verb-final position (-INV) and in the verb-initial position (+INV). We must also describe how the feature which marks modal flip, FLIP, affects word order. The three LP constraints given below help to facilitate our analysis. They describe an ordering between a head and a complement of the head, and assume the local tree as the domain of application.

- +FLIP verbs, which are the subset of -INV verbs which participate in modal flip, precede their base form PVP complements, and follow everything else.[15] +FLIP verbs include *werden* OwilF) and *haben* ('have').

$$\begin{bmatrix} \text{HEAD: } \begin{bmatrix} \text{verb} \\ \text{FUP:+} \end{bmatrix} \\ \text{LEX:+} \end{bmatrix} \prec \begin{bmatrix} \text{vp} \end{bmatrix}$$

Furthermore, NP complements and other non-verbal complements must precede their +FLIP head; the LP rule or rules responsible for this are assumed, but not specified, here.

[15] This rule may be extendible to infinitive form *(zu-infinitive)* VPs as well; this is a matter for future research.

- +INV verbs precede their subjects and complements. (Refer also to figure 7.)

$$\begin{bmatrix} \text{HEAD:} \begin{bmatrix} \textbf{verb} \\ \text{INV:+} \end{bmatrix} \\ \text{LEX:+} \end{bmatrix} \prec \begin{bmatrix} \textbf{phrase} \end{bmatrix}$$

$$\begin{bmatrix} \text{HEAD:} \begin{bmatrix} \textbf{verb} \\ \text{INV:+} \end{bmatrix} \\ \text{LEX:+} \end{bmatrix} \prec \begin{bmatrix} \text{HEAD:} \begin{bmatrix} \textbf{verb} \\ \text{INV:-} \end{bmatrix} \end{bmatrix}$$

- -INV verbs follow their subjects and complements. (Refer also to figure 8.)

$$\begin{bmatrix} \textbf{phrase} \end{bmatrix} \prec \begin{bmatrix} \text{HEAD:} \begin{bmatrix} \textbf{verb} \\ \text{INV:-} \\ \text{FLIP:-} \end{bmatrix} \\ \text{LEX:+} \end{bmatrix}$$

$$\begin{bmatrix} \text{HEAD:} \begin{bmatrix} \textbf{verb} \\ \text{AUX:-} \end{bmatrix} \end{bmatrix} \prec \begin{bmatrix} \text{HEAD:} \begin{bmatrix} \textbf{verb} \\ \text{INV:-} \\ \text{AUX:+} \\ \text{FLIP:-} \end{bmatrix} \\ \text{LEX:+} \end{bmatrix}$$

The ordering of adjuncts with respect to elements of the verb phrase is not covered in this analysis.

4.3. ID Rule R2: Flat S Structures

[Nerbonne, 1986, Nerbonne, 1994], [Uszkoreit, 1987a], and [Pollard, in press] propose flat structures for German sentences. One of the reasons for this is the manifestation of scrambling in the German Mittelfeld.[16] Recall this example of scrambling from section 2.2, repeated as 27:

	Dann	wird	die Pille	der Doktor	dem Patienten	geben.
(27)	Then	will	the pill[ACC]	the doctor[NOM]	to-the patient[DAT]	give

'Then the doctor will give the pill to the patient.'

The arguments of *geben* (give) in sentence 1, including the subject *Doktor*, may be permuted [Uszkoreit, 1987a, 93a-b]:

[16]Nerbonne has reminded me that he proposes a flat S structure as well because he finds constituent structure tests to be contradictory in indication.

(28)

a. Die Pille gibt der Doktor dem Patienten.
thepill[ACC] gives the doctor[NOM] to the patientfDAT].

b. Dem Patienten gibt die Pille der Doktor.
to-the patient[DAT] gives the pill[ACC] the doctor[NOM].

As we consider flat sentence structure, let us spend a moment discussing case assignment in HPSG. We assume that the finite auxiliary specifies nominative case for its subject by specifying a value of nominative for its subject's case. The auxiliary may specify head features only for the heads of its subcategorized-for arguments, which are the members of its SUBJ and COMPS list, and not for any of those arguments* daughters.[17] If the auxiliary were to subcategorize for some projection of non-finite verb which included the subject,[18] then the auxiliary would not be able to specify the case of the subject Suffice it to say that in order for the finite verb to specify nominative case for its subject argument, the two must be sisters. The subject cannot be the daughter of a verbal projection of a base form verb.

This paper will follow Nerbonne, Uszkoreit, and Pollard in its assumption that all finite verbs and finite auxiliaries in German head flat S structures.

We call the ID rule for flat S *R2* since the name of the head-complement schema for English in [Pollard and Sag, 1994] is R2. As we introduce PVPs into the grammar, this rule will be revised (in 31, below).

Note that in the example below, and in our ID rules which follow, we are using a shorthand notation in that the elements of the COMPS list of the head, marked with ($C_0,\ldots,C_n$), ought actually to be the *synsem* values of the complement daughters $C_0,\ldots,C_n$.

(29) R2. Head-complement rule *or flat rule.*
[COMPS()] => *HEAD[COMPS(C_0,...,C_n)]*,Cb,...,C_n

TTie rule R2 holds good for both S and VP, and here's why: In the case of VP, the SUBJ values of the mother and of the head daughter will be unsatisfied.[19] In the case of sentences (i.e. finite matrix clauses), we are adopting Borsley's "subjectless" analysis for main clauses. The analysis [Borsley, 1989] allows the subject of a finite V to be undistinguished among complements in S. In an application of rule R2 to S, the SUBJ values of the mother and of the head daughter will be empty lists. We use the rule in example 30, below, in order that finite auxiliaries can participate in our R2. Pollard & Sag's [Pollard and Sag, 1994] lexical rule takes as input a base form verb lacking a subject and yields a finite verb not subcategorizing for a subject The plus sign (+) in 30 stands for *list append,* which is an operation on two lists such that their contents are added together in order, first one list and thai the other, to form a new list

[17]The *Locality Principle* [Pollard and Sag, 1987] is a universal constraint on lexical signs such that no lexical sign inherently selects a particular value for the DAUGHTERS attribute of its complements. This principle, however, may have become obsolete in the most current versions of HPSG.

[18]This was proposed in [Uszkoreit, 1987b].

[19]Except in the case of verbs which do not subcategorize for a subjee^see section&4.

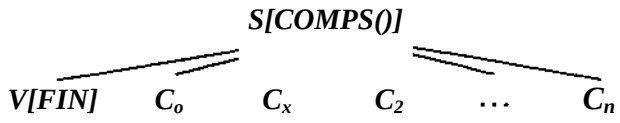


Figure 13: Tree Structure for R2: Head-Complement Rule

Lexical rule for "subjectless" analysis of main clauses. Adapted from [Pollard and Sag, 1994, chapter 9, number 16]

(30)
$$\begin{bmatrix} \textbf{category} \\ \textbf{HEAD:} \begin{bmatrix} \textbf{verb} \\ \textbf{VFORM:bsej} \end{bmatrix} \\ \text{SUBJ:}\langle \boxed{1} \rangle \\ \textbf{COMPS:}\boxed{2} \end{bmatrix} \longmapsto \begin{bmatrix} \textbf{category} \\ \textbf{HEAD:} \begin{bmatrix} \text{verb} \\ \textbf{VFORM:fin} \end{bmatrix} \\ \text{SUBJ:}\langle \rangle \\ \text{COMPS:}\boxed{1} + \boxed{2} \end{bmatrix}$$

In our German grammar fragment we do not have a rule for S —> NP VP, which is P&S Schema 1, the *Head-Subject Schema.* Schema 1 exists e.g. in English. Both word order variation and the desire to avoid ambiguity in matrix clauses are reasons to include but one phrase structure for sentence, R2, in the grammar. R2 is a head-complement schema. We admit, however, that we have not investigated whether we might need Schema 1, a head-subject schema, or a head-subject-complement schema, in the full grammar, for any other kinds of German phrases (i.e. non-verbal phrases).

4.4. ID Rule R2': Partial Verb Phrase Rule

Rule R2 (example 29), as it stands, will not create the (P)VP constituents which may appear either in the first (fronted) position or last (extraposed) position of a German sentence. We need to relax the rule so that it will include the head verb and some number of the head's non-subject complements. Note that we will not require PVP to have an unsatisfied SUBJ list

We will call our revised rule 31 R2' since it is a variant of theiHead-Complement Schema, R2 (example 29). This rale supersedes rule 29. It includes 29 but also allows non-saturated phrases. Like R2, then, R2' is a single phrase structure rule for both S and VP, and it also includes PVP.

(31) R2': Head-complement rule or *flat rule.* A phrase whose daughters are one head daughter and one or more complement daughters. The head daughter is a word.

$$[COMPS(C'_0,...,C'_p)] \Rightarrow HEAD[COMPS(Q_h...,C_n)),Cg,...,CZ$$
$$(n) \geq 0, q, p \leq n$$

A tree structure for ID rule R2' is given in figure 14.[20]

[20] The formulation of this rule is made with help from Carl Pollard (personal communication).

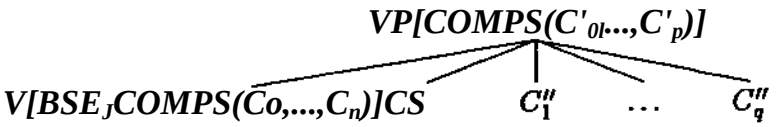


Figure 14: Tree Structure for R2': Partial Veit> Phrase Rule

The two lists (C£,..., C'_p) and (C£,..., C'J) in rale R2[7] list the unsatisfied complements of the PVP and the complement daughters of the PVP, respectively. These two lists can be combined using *sequence union*, a relation suggested in the context of German word order by Reape [Reape, in press]. The sequence union relation conditions how the PVP's list of complement daughters and its list of unspecified complements combine to form the COMPS list of the head of the PVP, (C_o,..., C_n).[21]

Sequence union, a relation between three lists, holds if the third list can be obtained from the first two by taking list elements from each of those two, in turn, in their original relative order. Essentially, it means that we are not limited to a strict *append* operation to join the PVP's list of complement daughters and the PVP's COMPs list

For example, if the first list is (a,b) and the second is (x,y,z), then the following lists are in the sequence-union relation with them:

(a,b,x,y,z)	(x,a,y,b,z)
(aAb;y,z)	(x,a,y,z,b)
(a^,y,b,z)	(x,y,a,b,z)
(a,x,y,z,b)	(x,y,a,z,b)
(x,a,b,y,z)	(x,y,z,a,b)

Our motivation for using sequence union is this: we want to be able to form a PVP from a head verb with some sequence of its complements, in order of obliqueness, but we do not necessarily want to choose the least oblique argument first We want to be able to form a PVP from, for example, a head verb alone with its dative argument, as in example 19 (repeated below as example 33). In the next three examples we stow three valid PVPs formed by rule R2', in boldface:

	DasMärchen	**erzählen**	[wird	er	ihr	*h/pvp-*
(32)	The fairy-tale[ACC]	tell	[will	he[NOM]	to-her[DAT]].	

'He will **tell the story** to **her.**'

[21] **The assumption of the relation of sequence union as a condition on the head-complement schema impacts the specification of the Valence Principle, which we intiodaced in section 3.2. As we noted there, we leave the ievision of that principle for the ongoing extension of the analysis in this paper.**

	Ihr	erzählen	[wird	er	das Märchen	]S/PVP-
(33)	to-her[DAT]	tell	[will	he[NOM]	the fairy-tale[ACC]].	

'He will tell her a fairy-tale.'

	Ihr	**das Märchen**	**erzahlen**	[wird	*tT]S/PVP*.
(34)	to-her[DAT]	the fairy-tale[ACC]	tell	[will	he[NOM]].

'He will tell the story to her.'

Rule R2' allows a verbal head of a PVP to take, for example, either an accusative object or a dative object as a single complement (see examples 32 and 33). *ihr erzählen* ('to-her tell') is a valid PVP as is *das Märchen erzählen* ('the fairy-tale tell'). The head verb in the PVP (here, *erzählen)* will not be required to choose the accusative object first just because it comes first on the COMPS list

The grammaticality of the PVP *ihr das Märchen erzdhlen* (see example 34) in comparison with the ungrammatical PVP **das Märchen ihr erzählen* is determined by LP rules. The ID rule R2' states which constituents may be chosen at one time by the head verb; it does not dictate the final ordering of the complements when they are selected all at once in a flat constituent The relative ordering of unsatisfied complements on the COMPS list remains intact, preserving their relative obliqueness. [22]

5. Modal Flip

5.1. Hinrichs & Nakazawa's Account of Modal Flip

Modal Flip, as explained in section 2.S, motivates Johnson and Hinrichs & Nakazawa (see [Johnson, 1986] and
[Hinrichs and Nakazawa, 1989, Hinrichs and Nakazawa, 1994]) to build a constituent from the finite auxiliary plus the double infinitive. Hinrichs & Nakazawa have proposed that, when an auxiliary appears between the verb complex and its complements, the auxiliary and the double infinitive form a verb complex in the syntax which subcategonzes for the main verb's complements. By their account, the auxiliary is a *raising* verb.

We show the lexical entry for *werden* following [Hinrichs and Nakazawa, 1994] in figure 15. In figure 15, the auxiliary subcategorizes for a verbal head and all of the head's unsatisfied complements. The authors use the feature *NPCOMP* to indicate whether a verbal complex has picked up any NP complements. They restrict the auxiliary's verbal complement to being NPCOMP-. This means that the complement of the auxiliary must be a verb **or** a verb complex which has not picked up any NP complements.

---

[22] See [Uszkoreit, 1987a, Uszkoreit, 1987a] for a non-movement treatment of the order of constituents in the German Mittelfeld.

$$\begin{bmatrix} \text{HEAD:} \begin{bmatrix} \text{verb} \\ \text{VFORM:bse} \\ \text{AUX:+} \end{bmatrix} \\ \text{SUBJ:}[\underline{T}] \\ \text{COMPS:}[\underline{2}]+\left(\begin{bmatrix} \text{HEAD:} \begin{bmatrix} \text{verb} \\ \text{VFORM:bse} \end{bmatrix} \\ \text{COMPS:}[\underline{2}] \\ \text{SUBJ:}[\underline{T}\text{KNP>} \\ \text{NPCOMP:-} \end{bmatrix} \right) \end{bmatrix}$$

Rgure 15: Hinridis & Nakazawa Entry with Raising for Auxiliary Verb *werden*

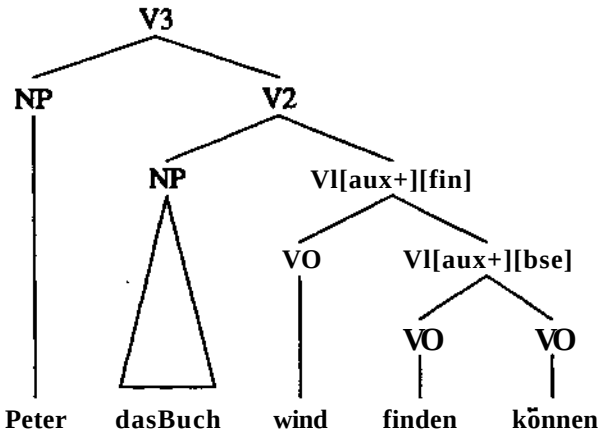


Figure 16: Double Infinitive with Modal Flip [Hinrichs and Nakazawa 1993, example 1la]

Hinridis & Nakazawa use a *binary branching* tree structure to form a verbal complex from the auxiliary verb and the double infinitive. Figures 16 and 17 are examples of Hyirichs & Nakazawa's tree structures for cases of double infinitive with modal flip and without modal flip, respectively. ([Hinridis and Nakazawa, 1994, examples llaand lib])

Hinridis & Nakazawa assume that the governing auxiliary in these two examples, *wird,* will pick up the double infinitive before any other complements. This is because the verbal complex is the most oblique complement of the auxiliary, and, therefore, the last thing on the auxiliary's SUBCAT list[23]

There are three kinds of data that Hinrichs & Nakazawa, using the tree structures in figures 16 and 17 and the lexical entry in figure IS, have left either unclarified or unaccounted for. These are the three cases of modal flip which we list below:

[23] Also, COMPS list, in this paper.

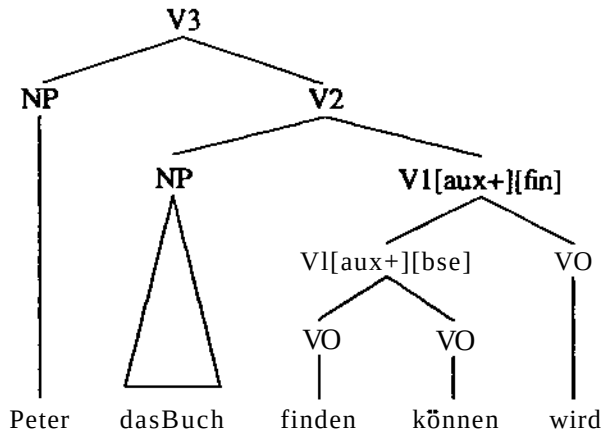


Figure 17: Double Infinitive without Modal Flip [Hinrichs and Nakazawa 1993, example 1 lb])

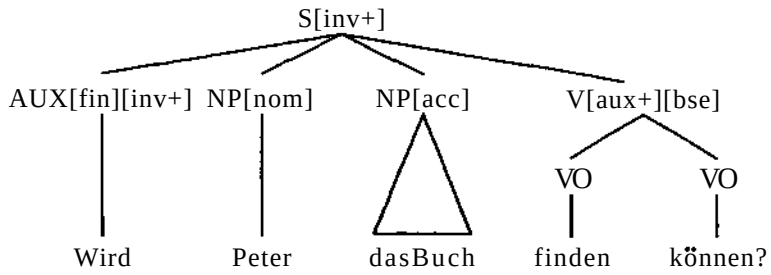


Figure 18: V2 Sentence with Double Infinitive

1. Case 1. The finite auxiliary may be a +INV auxiliary in V2 position. See figure 18.

2. Case 2. Sometimes, some NP complements appear between the double infinitive and the *flipped* auxiliary. Recall example 16, repeated here as 35:

	... da£	er	ihnen	hätte	**alles**	schicken	sollen.
(35)	that	he	them	would-have	everything	send	should

'... that he should have sent them everything '

Hinrichs & Nakazawa would not be able to admit sentence 35 in their grammar, since neither *hätte* nor *sollen* may pick up a PVP complement which includes the NP *alles,* given the **NPCOMP-** constraint on the verbal complements of these auxiliaries in figure 15.

3. Case 3. A base form infinitive, optionally with some NP complements, may be fronted away from a base form auxiliary. Example 36 shows a double infinitive and example 37 shows how the double infinitive is "split."

	Wird Cecilia	das Nilpferd	füttern	dürfen?
(36)	Will Cecilia[NOM]	the hippo[ACC]	feed	be-allowed-to

*Will be allowed to feed the hippo?'

	Das Nilpferd	füttern	[wird Cecilia dürfen]s/vp-	
(37)	the hippo	feed	[will Cecilia be-allowed-to]	

'Cecilia will be allowed to feed the hippo.'

In 37\ *füttern* forms a VP with *das Nilpferd. füttern* has not formed a double infinitive with *dürfen.* This is also a case of a +INV finite auxiliary.

Now we will discuss the three cases.

Case 1 is a point we wish to clarify, rather than a problem for their analysis. A lexical entry for auxiliary with raising, such as is given in figure 15, will work for both +INV and -INV sentences. Hinrichs & Nakazawa's paper is a discussion of verb-final sentences with no explicit mention of the applicability of their analysis to V2. However, Hinrichs & Nakazawa state that they expect the finite auxiliary to pick up a verbal complement first among its complements, since the verbal complement is last on the SUBCAT list Since finite auxiliaries and verbal complexes are clearly discontinuous in the case of V2, this means that they will need a flat S structure in their grammar, such as our rule R2' (example 31), in which the auxiliary combines with all of its complements at once.[24] No other phrase structure would allow a +INV finite auxiliary to pick up the verbal complex first among its complements.

Case 2, that of a modal "flipping" over a VP or PVP, is allowed in [Hinrichs and Nakazawa, 1994] for [1] limited cases involving VP-complement taking verbs such as *sehen, hören, lassen.* Hinrichs & Nakazawa allow a VP-complement taking verb to subcategorize alternatively for either a VP which has picked up some NP complements, or, a verb or verbal complex that has not picked up any NP complements. The former, PVPs in our analysis, are marked in [Hinrichs and Nakazawa, 1994] with the feature NPCOMP+; the latter are marked with NPCOMP-.[25] We show two possible subcategorizations for the verb *helfen* ('help') in figures 19 and 20 (adapted from [Hinrichs and Nakazawa, 1994, 28]). In figure 19, the verb *helfen* has subcategorized for an NP subject, an NP object (which is structure-shared with the PVP complement's subject, tagged with Q]), and a PVR In figure 20, *helfen* has subcategorized for an NP subject, a lexical verb, and whatever complements are on the SUBCAT list for the verb (tagged with [[]), joined with list append (signified by +). In figure 20, all complements of the complement verb are raised. The point of showing examples 19 and 20 is simply that there may be more than one subcategorization for an auxiliary verb in [Hinrichs and Nakazawa, 1994].

We claim that it is grammatical to flip over NP complements in some sentences *without* VP-complement taking verbs, such as example 35. And, we wonder whether we ought to extend the possibility of alternative

[24] Another alternative would be to consider a Head Movement account

[25] Note that in [Hinrichs and Nakazawa, 1994], a verb that picks up an VP marked NPCOMP+ becomes itself an *NPCOMP-* verbal complex.

$$
\textit{helfen}: \begin{bmatrix} \textbf{category} & \\ \text{HEAD:} & \begin{bmatrix} \textbf{verb} \\ \text{VFORM:}\textbf{bse} \\ \text{AUX:-} \end{bmatrix} \\ \text{SUBCAT:} & \langle NP, \boxed{1}, \begin{bmatrix} \textbf{category} \\ \text{HEAD:}\textbf{verb} \\ \text{SUBCAT:}\langle \boxed{1} NP \rangle \\ \text{NPCOMP:+} \end{bmatrix} \rangle \\ \text{LEX:+} & \\ \text{NPCOMP:-} & \end{bmatrix}
$$

Figure 19: Verb helfen with PVP SUBCAT [Hinrichs & Nakazawa, to appear]

$$
\textit{helfen}: \begin{bmatrix} \textbf{category} & \\ \text{HEAD:} & \begin{bmatrix} \textbf{verb} \\ \text{VFORM:}\textbf{bse} \\ \text{AUX:-} \end{bmatrix} \\ \text{SUBCAT:} & \langle NP \rangle + \boxed{1} + \langle \begin{bmatrix} \textbf{category} \\ \text{HEAD:}\textbf{verb} \\ \text{SUBCAT:}\boxed{1} \\ \text{NPCOMP:-} \end{bmatrix} \rangle \\ \text{LEX:+} & \\ \text{NPCOMP:-} & \end{bmatrix}
$$

Figure 20: Verb helfen with Lexical Verb SUBCAT [Hinrichs & Nakazawa, to appear]

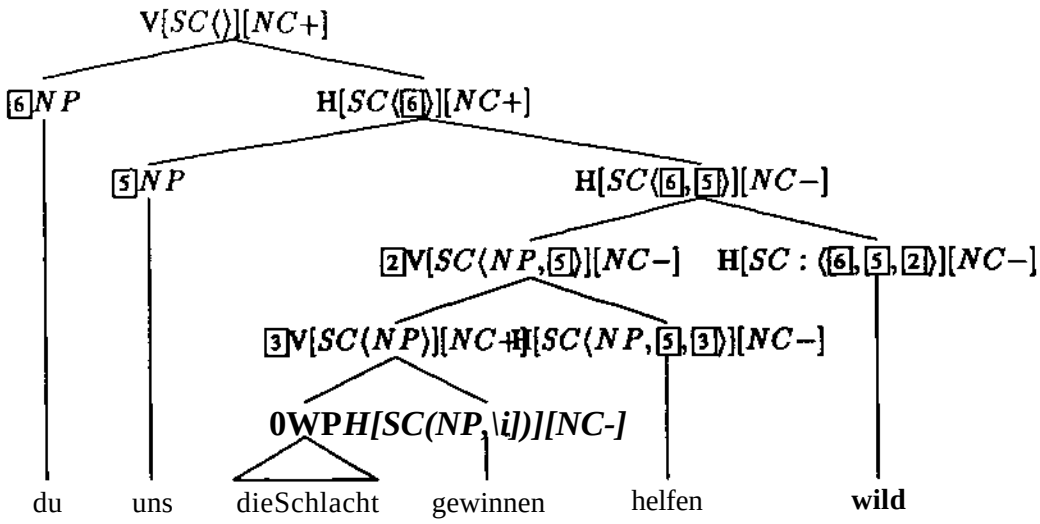


Figure 21: Verb helfen with PVP SUBCAT

subcategorizations to common auxiliary verbs such as *sollen* ('should'), allowing *sollen* to subcategorize for either a PVP or a lexical head in 35. But let us restrict ourselves for the moment to the subcategorization actually in [Hinrichs and Nakazawa, 1994]. We find that ambiguity arises when one allows a verb - *helfen*, a VP-complement taking verb, in this case - to subcategorize for either a PVP or a lexical verb, with raising of any unsatisfied complements.

In figures 21 and 22, we show two competing analyses allowed by [Hinrichs and Nakazawa, 1994] for example 38; in these diagrams, H stands for HEAD. Also, Hinrichs & Nakazawa use a single SUBCAT list for subject and complements, which we abbreviate with SC. We abbreviate the feature NPCOMP with NC. The contrast in the phrase markers is the point of displaying these two figures.

	...dafi	du	uns	die	Schlacht	gewinnen	helfen wirst
(38)	that	you[NOM]	us[DAT]	the[ACC]	battle	win[BSE]	help[BSE]will[FIN].

'that you will help us win the battle.'

In figure 21, *gewinnen* ('win') has satisfied its accusative argument, *die Schlacht* ('the battle'), *helfen* ('help') forms a verb complex with a PVP argument, *die Schlacht gewinnen* ('win the battle'), marked NPCOMP+. The feature structure for *helfen* in **this** context is figure 19. **In** figure 22, *helfen* subcategorizes for a lexical verb, *gewinnen* ('win'), *helfen* has raised the accusative argument of *gewinnen, die Schlacht.* The feature structure for *helfen* in this context is figure 20. The accusative argument, *die Schlacht*; of the double infinitive complex, *gewinnen helfen* ('help win*), has been raised in turn by the finite auxiliary, *wirst* Cwill').

We wish to rule out the ambiguity which arises when an auxiliary is permitted to subcategorize for either a lexical verb or a phrasal verb in two different parses of the same sentence. _

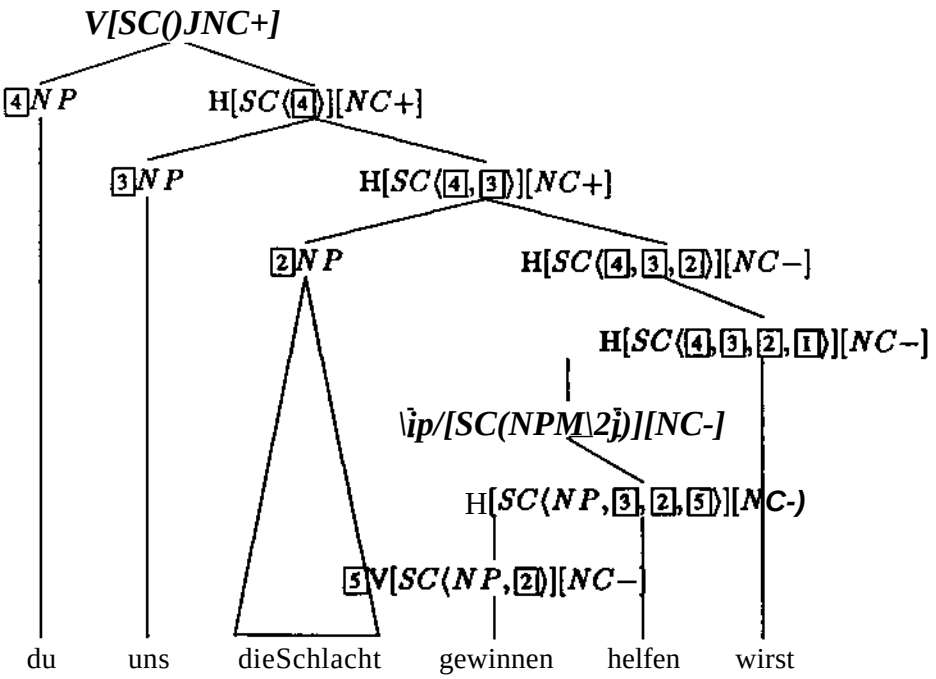


Figure 22: Verb helfen with Lexical SUBCAT

Case 3, that of a fronted VP (example 37), shows that we do not want to require the base fonn auxiliary and the base form main verb to form a constituent Otherwise, we will have to explain why the constituent is sometimes "split"

We will successfully handle the above-mentioned three cases of modal flip in the following subsection (section 5.2) by restricting the subcategorization for auxiliary to be PVP only in cases of extraposition. We will show revised lexical entries for auxiliary. Our specification for sentence 37, a sentence with a base form VP fronted away from a base form auxiliary, will be introduced in section 6.

52. Revised Account of Modal Flip: Subcategorizing for PVP

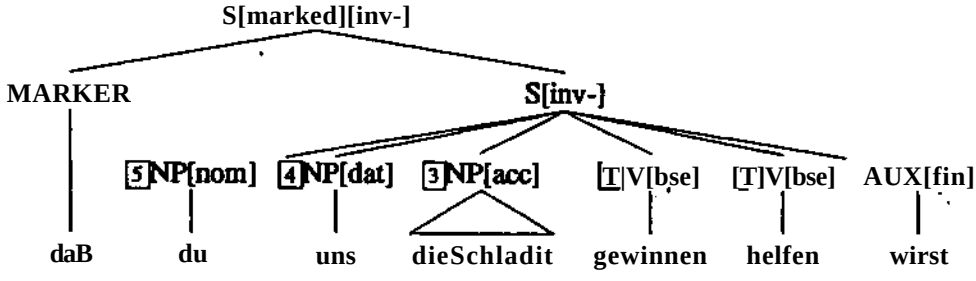
First, we would like to simplify the lexical entry for auxiliary in such a way that there are no entries which give rise to spurious ambiguity. We will say that auxiliaries which do not participate in modal flip subcategorize for lexical heads (+LEX heads) and obligatorily raise all of the complement verb's complements. This means that most auxiliaries will not subcategorize for PVP or VP. Our lexical entry for a -FLIP auxiliary is given in figure 23. Recall the competition between figures 4, 5, and 6 in section 2.7; the tree diagram admissible in our grammar is figure 4.

Our representation of sentence 38 is given in figure 24. In this figure, there are no (P)VP constituents in the sentence structure. The governing verbs *wirst* and *helfen* raise all complements.[26]

[26] **We have not explored whether VP-complement taking verbs like *helfen* should be required, like regular auxiliaries, to raise all of their complements. See also [Kiss, 1994].**

$$\begin{bmatrix} \text{HEAD:} \begin{bmatrix} \text{verb} \\ \text{VFORM:bse} \\ \text{AUX:+} \\ \text{FUP>} \end{bmatrix} \\ \text{SUBJ:}\langle \boxed{1} \rangle \\ \text{CX)MPS:[2]+(} \begin{bmatrix} \text{HEAD:} \begin{bmatrix} \text{[verb} \\ \text{[vroRM:bse V prt} \end{bmatrix} \\ \text{CX>MPS:[]} \\ \text{SUBJ:(Q]NP)} \\ \text{LEX:+} \end{bmatrix} \rangle \end{bmatrix}$$

Figure 23: Revised Lexical Entry for Auxiliary with a Lexical Head and Raising of all Complements



wirst: *[COMPS:* ⟨5,4,3,2,1⟩]
helfen: *[COMPS :* OH],CD)]
gewinnen: *[COMPS:* {[5])]

Figure 24: Flat Representation of Double Infinitive Without Modal Flip

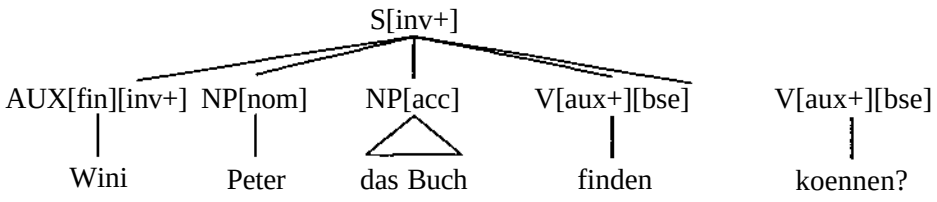


Figure 25: V2 Sentence with Double Infinitive: Revised Representation

$$\begin{bmatrix} \text{HEAD:} \begin{bmatrix} \text{verb} \\ \text{AUX:+} \\ \text{FLIP:+} \end{bmatrix} \\ \text{SUBJ:}\langle \text{NP} \rangle \\ \text{COMPS:}[!]+\left\langle \begin{bmatrix} \text{vp} \\ \text{HEAD:} \begin{bmatrix} \text{verb} \\ \text{VFORM:bse V prt} \\ \text{AUX:+} \end{bmatrix} \\ \text{COMPS:}[|] \\ \text{SUBJ:}([T]\text{NP}) \end{bmatrix} \right\rangle \end{bmatrix}$$

Figure 26: Lexical Entry for Modal Flip Auxiliary Subcategorizing for PVP

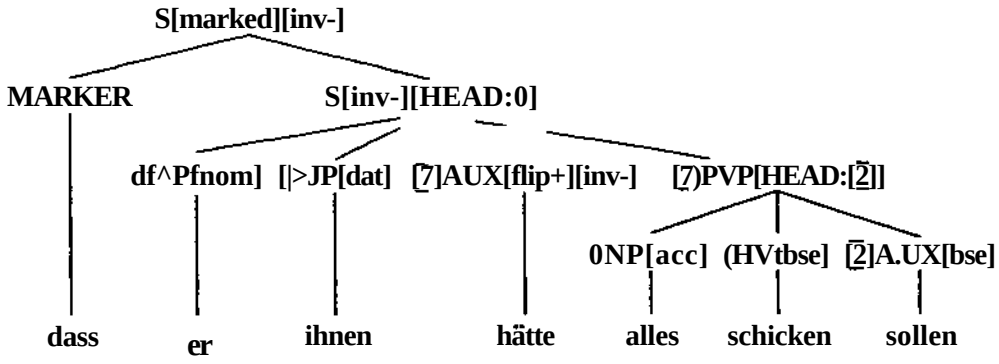
Second, we point out that our lexical entry for auxiliary in figure 23 works equally well for +INV and -INV auxiliaries. Our representation of a +INV sentence with a double infinitive is given in figure 25. Compare this with figure 18 (the analysis of Hinrichs & Nakazawa). We differ from [Johnson, 1986, Hinrichs and Nakazawa, 1989, Hinrichs and Nakazawa, 1994] in not making a constituent from the double infinitive. We are claiming that double infinitive is not a constituent in the case of V2. This is substantiated by cases of VP fronting away from a governing auxiliary. We repeat example 37 here as 39:

(39) Das Nilpferd **füttern** [wird Cecilia **dürfen].**
the hippo feed will Cecilia be-allowed-to

'Cecilia will be allowed to feed the hippo.'

Third, we still would like double infinitive to be a constituent for cases of modal flip, because the flipped auxiliary may not fall in the middle of a double infinitive (refer to example 10). We do this by requiring auxiliaries which flip to subcategorize for a (P)VP which has an auxiliary verb head. We give our lexical entry for a +FLIP auxiliary in figure 26. And our analysis of a sentence with extraposed PVP, sentence 35, is given in figure 27.

We want the PVP to the right of a flipped auxiliary to-be a single constituent, with nothing to the right



schicken: *[COMPS :* ⟨[5],[4]⟩]
sollen: *[COMPS:* ⟨[5],[4],[3]⟩]
[OPVP: *[COMPS*: (H[])]
hätte: *[COMPS*: ⟨[6],[5],[1]⟩]

Figure 27: FLIP+ Auxiliary with PVP SUBCAT

of the governing auxiliary raised out of the PVP. Otherwise, we will have spurious ambiguity. The analysis shown in figure 27 is the only analysis possible given the (assumed) LP constraint that NP complements cannot appear to the right of a +FLIP, -INV auxiliary.

53. Remaining Problems for the Modal Flip Analysis

We have a few problems to note. The first is that the PVP which a +FLIP auxiliary subcategorizes for must not only be headed by an auxiliary, but also must have picked up the verb it governs. This is not guaranteed by the lexical entry in figure 26.

(40) *... dafi er bestehen wird [das Examen können]pvp.
that hepass will the exam be-able-to

'...that he will be able to pass the exam.'

It turns out that we do not want the PVP in example 40 to appear in a fronted context, either. We will return to, but not solve, this problem after we have presented our account of PVP fronting.

The second problem to note is that we may want subjects in extraposed VP, at least when the subjects are quantified; recall sentence 17, repeated here as 41:

	daB	gestem	hätte	keiner	kommen	diirfen
(41)	that	yesterday	would-have	nobody[NOM]	come	be-allowed-to

'That nobody would have been allowed to come yesterday.'

Our grammar fragment, as it stands, doesn't have an ED rule for combining head and subject into a phrase. It could be that *kommen* ('come') is actually an unaccusative verb in example 41, which would tie in rather nicely with our proposed handling of subjects in fronted PVPs (to be discussed in section 6).

A third, more general concern is that there are varying levels of acceptability among speakers for PVPs in position after a finite auxiliary. See [Hinrichs and Nakazawa, 1994] for grammaticality judgments on finding NPs between the flipped auxiliary and the double infinitive. The subcategorization of a +FLBP auxiliary may be one place where the restrictions on PVP complements can be specified. This is a matter for future research.

Furthermore, the acceptability of PVPs in the fronted position also varies. There may be a relation between the fronted PVPs whidi are acceptable for a given speaker and the PVPs whidi the same speaker can "flip" over. This is also a topic for more research. One could examine which constraints on PVP hold in the two contexts.[27]

In the meantime, we need to explain how it is that PVPs appear at all in the fronted position, since we have claimed that regular auxiliaries subcategorize not for PVP but for a lexical head. This is our task in the next section.

6. Partial Verb Phrase Fronting

6.1. Nerbonne's Account of PVP Fronting

Now we set out to handle sentences, including 39, which show the fronting of a PVP.

[Neibonne, 1994] proposes a rule which operates on auxiliary verbs and passes the verbal head of a VP complement of the auxiliary, plus some number of the head's complements, into SLASH. The rule is copied as example 42 below.

[27] In contrast to this analysis, [Nerbonne, 1994] leaves a finite flipped auxiliary free in position in S, subject to LP constraints, with a complex fonned for the double infinitive. He claims that his is an equally plausible hypothesis to explain the appearance of an NP complement to the right of a ~INV auxiliary (as in 35). We feel that extraposition of PVP is a better explanation of the facts because it leaves open a link between the constituency of what can be fronted and that of what can be "flipped over." Although, our LP rules cannot relate the constituent daughters of an extraposed PVP and the constituent daughters of the matrix S, which could be problematic.

Nerbonne's /-PVP Lexical Rule [Nerbonne, to appear]:

$$\begin{bmatrix} \textbf{synsem} \\ \text{LOCAL:} \begin{bmatrix} \textbf{local} \\ \text{CATEGORY:} \begin{bmatrix} \textbf{category} \\ \text{HEAD:} \begin{bmatrix} \textbf{verb} \\ \text{AUX:+} \end{bmatrix} \\ \text{SUBCAT:}\boxed{1}\{\ldots,\boxed{2}\begin{bmatrix}\textbf{vp-bse}\end{bmatrix},\ldots\} \end{bmatrix} \end{bmatrix} \end{bmatrix} \longmapsto$$

(42)

$$\begin{bmatrix} \textbf{synsem} \\ \text{LOCAL:} \begin{bmatrix} \textbf{local} \\ \text{CATEGORY:} \begin{bmatrix} \textbf{category} \\ \text{HEAD:} \begin{bmatrix} \textbf{verb} \\ \text{FIN:+} \end{bmatrix} \\ \text{SUBCAT:}(\boxed{1} \cup \boxed{3}) - \boxed{2} \end{bmatrix} \end{bmatrix} \\ \text{NONLOCAL:} \begin{bmatrix} \textbf{nonlocal} \\ \text{SLASH:}\{\begin{bmatrix} \textbf{bse-verb-ss} \\ \text{SUBCAT:}\boxed{3} \end{bmatrix}\} \end{bmatrix} \end{bmatrix}$$

Condition: for $\boxed{2}$ a *modal-V-sign*, $\neg\exists V \in \boxed{3}$

Rule 42 assumes that, given an auxiliary entry which subcategorizes for VP, there also exists a lexical entry for the same auxiliary where there is a PVP in SLASH. The PVP subcategorizes for some subset of the complements of the head of the VP. Any unsatisfied complements of the PVP are raised to become complements of the auxiliary verb in the matrix S. The condition on the rule prohibits an auxiliary verb from appearing in SLASH in case it governs a verb in SUBCAT.

With his lexical rule Nerbonne gives two PS rules, shown in example 43 (H stands for head, and C*, for any number of complements). Nerbonne's first rule is for a flat sentence, with subject and complements satisfied. His second rule is like our R2, and allows a partial VP, VP or S. However, this phrase has to be FOCUS+, meaning that it occurs in (at least) fronted position.

(43) Nerbonne's PS rules for PVP fronting:

```
a. [SYNSEM|LOC|CAT|SUBCAT{}|]  --> H,C*
                    |SUBJ{}  |

b. [SYNSEM|LOC|CONTENT|FOCUS+]  --> H,C*
```

There is no constraint on the left side of rule 43b on the COMPS or SUBJ values.

Nerbonne's auxiliaries can still alternatively subcategorize for either a VP, or, a V plus the V's complements. It happens that all (P)VPs must be FOCUS+, and so a VP can actually only be found in fronted position (in SLASH, not COMPS).

We want to know if we can use Nerbonne's PVP fronting rule 42 with our rule R2′ (example 31), and with our obligatory raising of all V complements.

6.2. Revising Nerbonne's PVP Rule: Auxiliaries Subcategorize for Lexical Heads

In order to use Nerbonne's PVP rule with our lexical entry for auxiliary (figure 23) and with our PS schemata, we must revise the PVP rule. We will change the input to the rule so that it matches our lexical entry, i.e. so that the input auxiliary is +LEX. We show the rule as example 44.

Revised /-PVP Lexical Rule:

$$\begin{bmatrix} \text{synsem} \\ \text{LOCAL:} \begin{bmatrix} \text{local} \\ \text{CAT:} \begin{bmatrix} \text{category} \\ \text{HEAD:} \begin{bmatrix} \text{verb} \\ \text{AUX:+} \end{bmatrix} \\ \text{COMPS:} [\underline{1}] + [\underline{2}] + \left\langle \begin{bmatrix} \text{category} \\ \text{HEAD:} \begin{bmatrix} \text{verb} \\ \text{VFORM:bseVprtJ} \end{bmatrix} \\ \text{LEX:+} \\ \text{COMPS:} [\underline{2}] \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

$$\longmapsto$$

(44)

$$\begin{bmatrix} \text{synsem} \\ \text{LOCAL:} \begin{bmatrix} \text{local} \\ \text{CAT:} \begin{bmatrix} \text{category} \\ \text{HEAD:} \begin{bmatrix} \text{verb} \\ \text{AUX:+} \end{bmatrix} \\ \text{COMPS:} [\underline{1}] + [\underline{2}] \end{bmatrix} \end{bmatrix} \\ \text{NONLOCAL:} \begin{bmatrix} \text{nonlocal} \\ \text{SLASH:} \left\{ \begin{bmatrix} \text{vp} \\ \text{HEAD:} \begin{bmatrix} \text{verb} \\ \text{VFORM:bse V prt} \end{bmatrix} \\ \text{COMPS:} [\underline{2}] \end{bmatrix} \right\} \end{bmatrix} \end{bmatrix}$$

We will never have VPs in a matrix S in COMPS because -FLIP auxiliaries subcategorize for lexical heads. Rule 44 says that VPs must appear in SLASH. But, we allow PVPs to exist by our Schema R2'.

In this rule, both the input and the output are lexical entries for auxiliary. In both the input and the output, the verbal complement of the auxiliary is uninstantiated. Thus, the tag [2] will be separately instantiated for input and for output, and should not be interpreted as referring to a single object structure-shared across the rule. In the input, the tag [2] refers to all of the complements of the head verb. In the output, the tag [2] refers to the outstanding complements of the VP, i.e. those which the VP has not yet picked up.

There must be no satisfied subject in the input to the rule, since the verb is +LEX, nor in the output of the rule, since we assume that our lexical rule makes explicit all changes to the input, leaving all other features of the input unchanged.

Our PS rule R2' for VPs and PVPs remains general - we have no "FOCUS+" restriction in our PVP rule, as appears on the left hand side of Nerbonne's PS rule 43b. We don't think there should be such a restriction

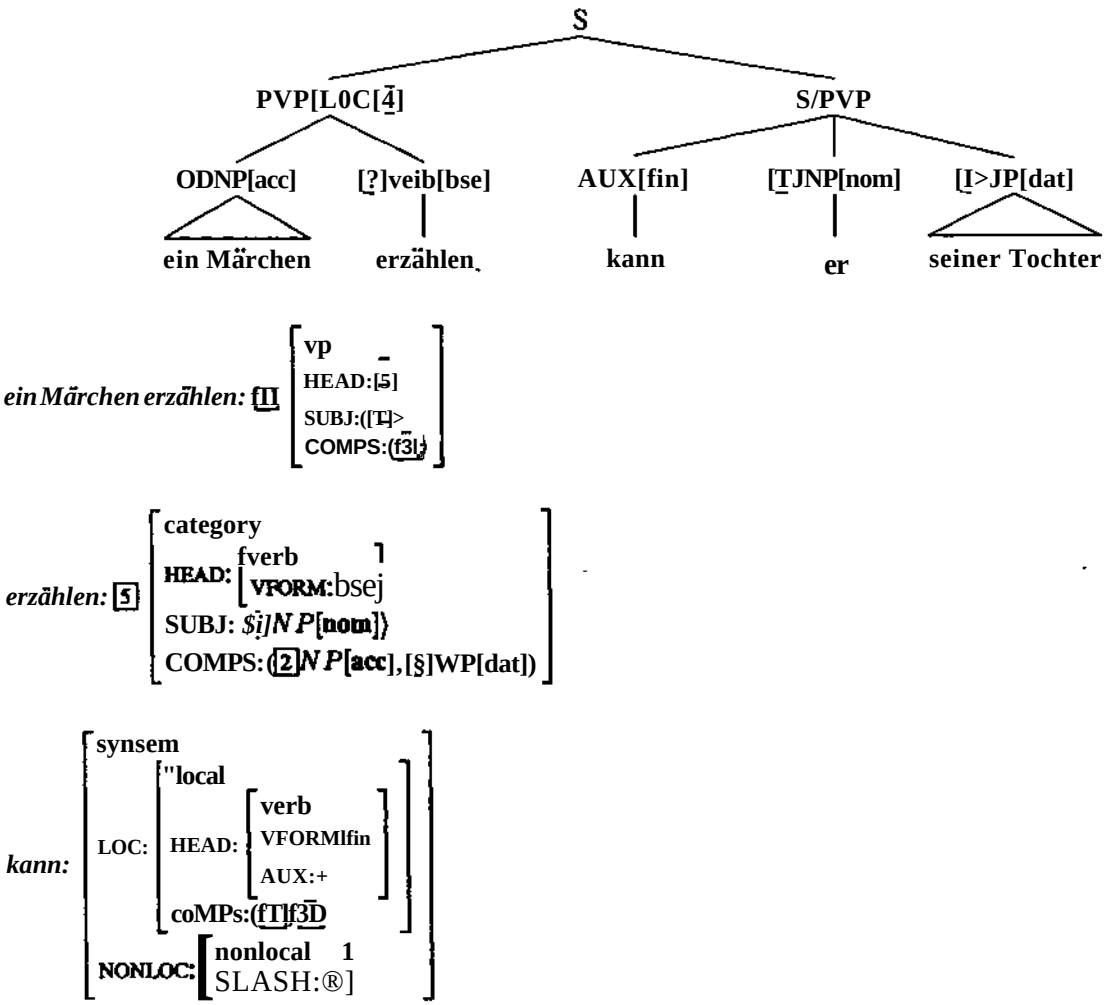


Figure 28: S Analysis for PVP Fronting

in the ID schemata, as we believe that PS rules should define the constituent structures in a language without constraining where they occur. Generality in PS rules enables cross-language comparisons. Also, we point out that we have only one PS rule in the grammar compared with his two, which makes things simpler.

A tree diagram for an application of our revised PVP rule 44 is in figure 28. Figure 2# shows the tree structure and subcategorization for sentence 45.

	Ein	Märchen	erzählen [kann	er	seiner	Tochter.]$_{5/F}$vp
(45)	a	fahy-tale[ACC]	tell[BSE] [can[FIN]	he[NOM]	to-his[DAT]	daughter.]

*He can tell his daughter a fairy-tale.'

Note that rule 44 works also for cases of double infinitive fronting, since PVPs include double infinitive PVPs:

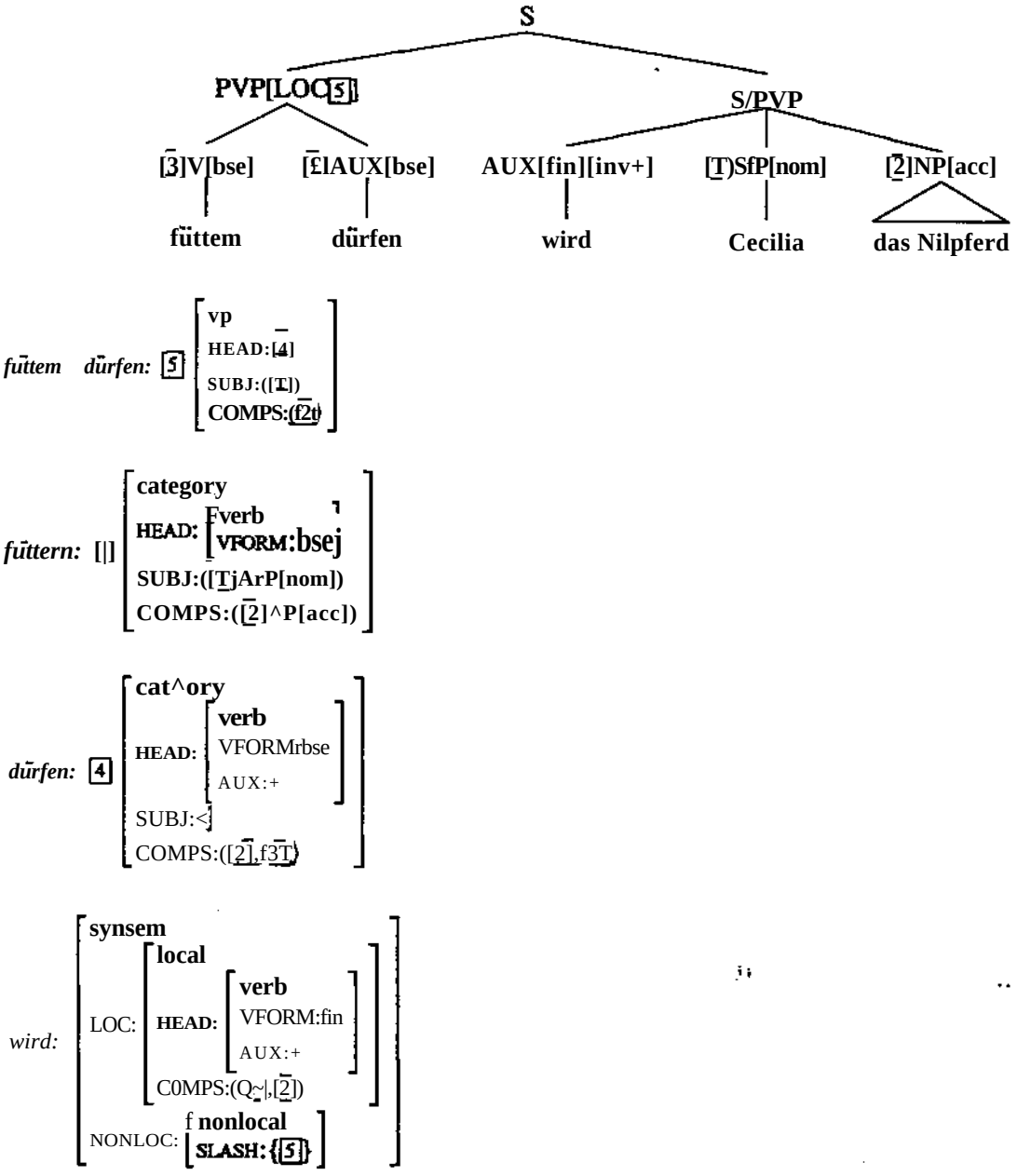


Figure 29: S Analysis for PVP Fronting of Double Infinitive

	Füttern	dürfen	wird	Cecilia das Nilpferd.
(46)	feed	be-allowed-to	will	Cecilia the hippo.

'Cecilia will be allowed to feed the hippo.'

A tree diagram for 46, also showing subcategorization for the verbs, is given in figure 29.

63. Problems for the PVP Fronting Analysis

The PVP in example 40, a PVP which has an auxiliary but no veib, is ungrammatical in a fronted context

	*Das Examen	können	[wild er bestehen]$_5$/pvp-	
(47)	the exam	be-able-to	will	hepass.

'He will be able to pass the exam.'

As we noted above in section 6.1, Nerbonne adds a condition into his rale for PVP fronting to prevent the appearance of auxiliary in SLASH just in case it governs a veib in SUBCAT. Likewise, we don't want our PVP rale, which makes use of sequence union, to unite an base fonn auxiliary and a noun in a phrase, while skipping over a veib. We could adopt a condition similar to Neibonne's into our PVP fronting rale, but our modal flip analysis is not so easy to amend. As it stands, our modal flip analysis is not handled by lexical rule; our modal flip analysis consists of PVP subcategorization by auxiliary, and LP rales. And so, not wishing to be asymmetrical about conditions on PVPs, we leave sentences 40 and 47 unresolved. The condition, however, appears to be on PVPs generally, in both fronted and modal flip contexts.

Another remaining problem is that, by using schema R2' for fronted (P)VPs, we still have not allowed for the fronting of non-agentive subjects of verbs with their governing heads, nor for the potential extraposition of these. Neibonne, in [Nerbonne, 1994], notes fronted subjects as an unresolved problem for his analysis. We find this problem to be resolvable; it is the next problem whicfy we will address.

6.4. Verbs With Non-Agentive Subjects

The lexical structure which we present in this section has been motivated by the underlying structure for unaccusatives given in [Perlmutter, 1978], originally in the framework of Relational Grammar. This is that the grammatical subjects of unaccusative verbs are underiyingly objects. We suggest that for verbs which have non-agentive subjects, their nominative arguments are underiyingly complements on the COMPS list rather than subjects on the SUB J list

The feature structure in figure 30 matches the output of the rale in example 30, the rale for the subjectless analysis of matrix clauses, but the verb is a base form, not a finite form.

$$\begin{bmatrix} \text{category} \\ \text{HEAD:} \begin{bmatrix} \text{verb} \\ \text{VFORM:bse} \end{bmatrix} \\ \text{SUBJ:()} \\ \text{COMPS:} \left\langle \begin{bmatrix} \text{np} \\ \text{CASE:nom} \end{bmatrix}, \ldots \right\rangle \end{bmatrix}$$

Figure 30: Lexical Specification for Verbs with Non-agentive Subjects

$$\begin{bmatrix} \text{category} \\ \text{HEAD} \begin{bmatrix} \text{verb} \\ \text{VFORM:bse} \end{bmatrix} \\ \text{SUBJ:}\boxed{2} \\ \text{COMPS:} \left\langle \begin{bmatrix} \text{category} \\ \begin{bmatrix} \text{verb} \\ \text{VFORM:rpartj} \end{bmatrix} \\ \text{SUBJ:}\left\langle \text{JVp[str]}_{ref} \right\rangle \\ \text{COMPS:}\boxed{2} + \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix}$$

Figure 31: Passive Auxiliary *werden* [Pollard, 1994]

Pollard (see [Pollard, 1994]) gives an account of the German passive in HPSG. Pollard describes a constraint on the subcategorization of the passive auxiliary, such that there must be a referential subject (i.e. a non-dummy subject) in the SUBJ list for the auxiliary's main verb complement Rgure 31 is the lexical entry for the German passive auxiliary *werden* [Pollard, 1994,40, simplified]. Given the description of the German passive auxiliary in figure 31, it would then follow from figure 30 that verbs such as *unterlaufen* (occur) cannot undergo passivization. Recall example 24, repeated here as 48:

(48)	•Dim	wurde	von	einem	wiiklichen	Fehler	nochnie		unterlaufen.
	to-him	has	by	a	real	mistake	still	never	occurred

Verifying that figure 30 is the proper lexical skeleton for some set of German verbs is a task for future research. For example, the non-agentiveness of the subject could be indicated in the semantics of figure 30.

6.5. Fronting of Subjects With Base Form Verbs

Our revision of Nerbonne's PVP rule (example 44) can still apply even when the SUBJ feature of VP is an empty list In this case, the subject will be the first complement on the COMPS list structure shared by the raising auxiliary and the complement verb.

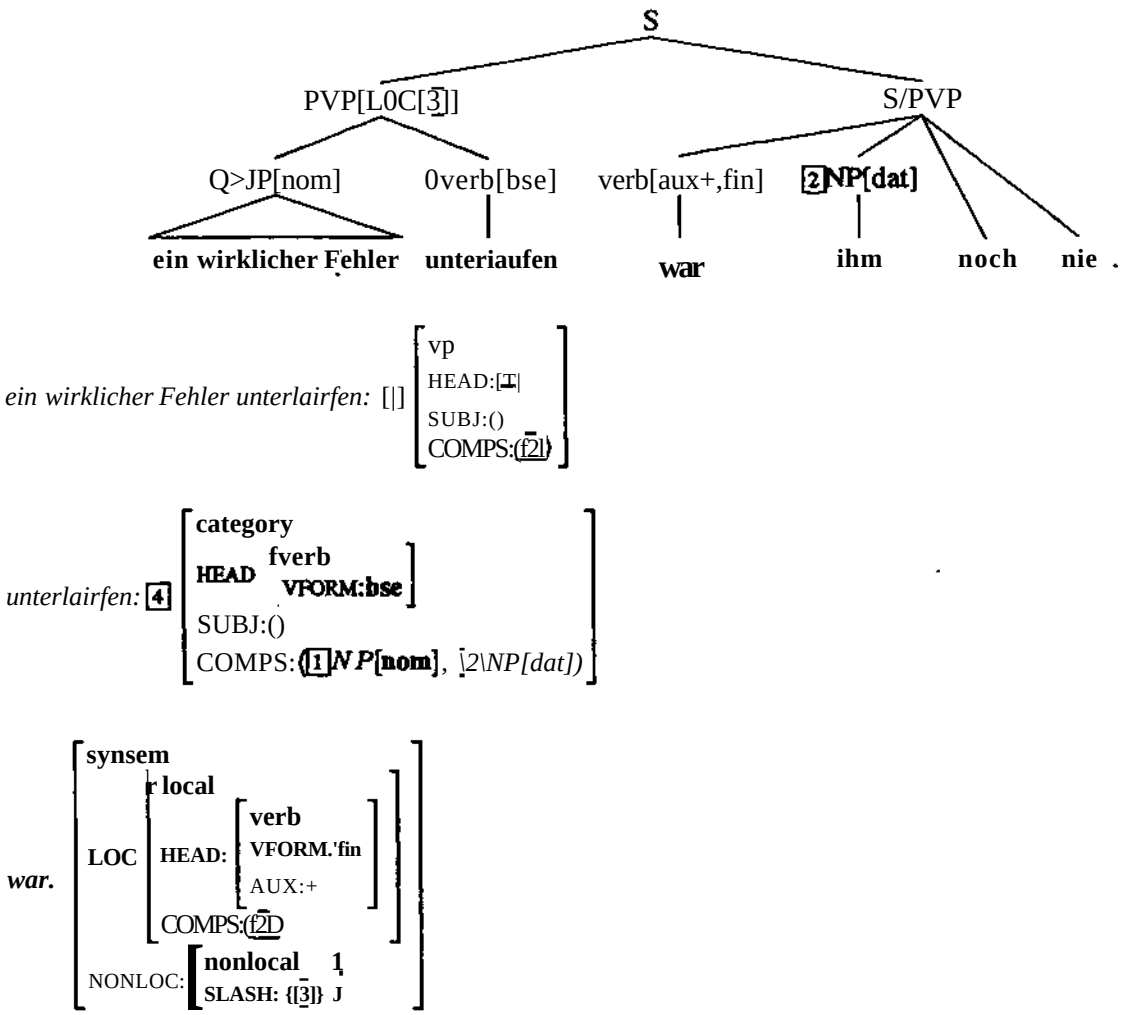


Figure 32: S Analysis for Subjea Fronting with PVP Rule

We repeat example 22 here as 49. A tree diagram and feature structures for 49 are given in figure 32.

	Ein	**wirklicher**	**Fehler**	**unteriaufen**	**[war ihm**	**noch**	**nie].**
(49)	**a**	**real**	**mistake[NOM]**	**occur**	**[was to-him[DAT]**	**still**	**never]**

'He never made a real mistake.' [Uszkoreit, 1987a, 14a]

7. Conclusion

We have shown an account of *Modal Flip* and *Partial Verb Phrase (PVP) Fronting* in which we have required German auxiliaries to raise all of a verb's complements. We have been able to account for the same data for modal flip and PVP fronting accounted for by [Hinrichs and Nakazawa, 1989, Hinrichs and Nakazawa, 1994] and [Nerbonne, 1994]. We summarize the main points of the paper:

- We have shown that the only places that PVPs occur in German are extraposed after an -INV auxiliary or fronted before a +INV auxiliary.
- We have accounted for modal flip facts without ambiguity in the subcategorization requirements for the auxiliary. We have also accounted for a wider range of modal flip sentences than allowed by [Hinrichs and Nakazawa, 1994]. Rather than forming a complex from the governing auxiliary together with the double infinitive, we limit double infinitive to cases of modal flip. Data supports the premise that +FLIP auxiliaries take PVP complements while -FLIP auxiliaries do not. -FLIP auxiliaries subcategorize for lexical heads.
- We have used a single head-complement schema for German sentence and (P)VP. Our phrase structure rule for PVP is more general than that of [Nerbonne, 1994] because it is not restricted to FOCUS+ contexts.
- We allow PVP fronting of a subject to occur only when the subject is listed on the COMPS list of a verb in the lexicon.

We have laid some groundwork for future research. The points in the paper which merit some additional investigation are these:

- The acceptability of PVPs in modal flip contexts or in fronted position varies across speakers. PVPs may also be subject to pragmatic constraints. We would like to explore whether the PVPs in fronted position are subject to the same constraints as PVPs which have been extraposed. Particularly, we would like to explore the constraints on the appearance of subjects in extraposed PVPs.
- We would like to expand the grammar for auxiliaries which take infinitive form (P)VPs, or *zu-infinitive* (P)VPs, which may also be extraposed.
- The relation between unaccusative verbs and the set of verbs with non-agentive subjects, and the underlying structures for these in HPSG, is a topic for future research. Using a version of HPSG with a distinguished feature for subject, we have proposed for the first time that the subjects of these verbs may be listed with non-subject complements.
- The claim that PVPs do not exist in matrix clauses could be tested against data from other parts the grammar besides the syntax, such as facts from phonology.

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