# Advanced Topics in HPSG*

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# 1 Introduction

This chapter is an attempt to survey some of the major areas that have seen significant work from an HPSG perspective in the past decade or so. For most of this work, Pollard & Sag 1987; Pollard & Sag 1994 continues to be an important point of reference, but many of the analyses summarized here go significantly beyond the original theory, both in terms of empirical coverage (of English and other languages) and analytic depth and comprehensiveness. The present survey is necessarily biased both in the selection of topics and the way that the various analyses are presented and compared. But these caveats nothwithstanding we hope that it will give the reader a reasonable idea of the research efforts around the middle of the second decade of HPSG's existence.

In keeping with HPSG's emphasis on lexical information, the first section concentrates on the licensing of phrasal dependents. We begin with the highly influential idea of argument composition as a way to dynamically determine the valence information of certain heads and continue with the conceptual separation between argument structure and valence in much of recent HPSG work. A third major topic involves the argument/adjunct distinction (or the lack thereof). In §2, we concentrate on issues of linear order, first on lexicalist equivalents of configurational analyses and second on departures from the "phrase structure grammar" part of HPSG. The common thread of the topics covered in §3 is the notion of "syntactic abstractness". This pertains to both the issue of whether extraction phenomena involve "traces" and the limits of a radically lexicalist view of syntactic licensing. One of HPSG's design features that distinguish it rather strongly from transformational grammar its integrative view with respect to semantic and pragmatic information. In §5 we discuss a number of recent developments in this area, in particular the treatment of scope and distinctions in illocutionary force as well as information structure and the representation of speaker beliefs and intentions. After reviewing a selection of work dealing with morpho-syntactic issues in §6, we conclude with a summary of recent developments in the logical foundations of the HPSG formalism (§7).

# 2 Argument structure

One of the most significant conceptual changes that distinguish Generalized Phrase Structure Grammar from HPSG is the treatment of combinatorial properties. While in GPSG, lexical items are linked to the subcategorization frame in which they can occur by means of an numerical index, HPSG folds the

More generally, since HPSG coreference tags may act as variables over any kind of structure, they can range over the the entire list of valence elements of the subcategorized for predicator. The valence list of that predicator consists of the verbal complement appended to (notated by "$\oplus$") the list of dependents of that very complement. This is illustrated in (3), where "$\boxed{1}$" now acts as a variable over lists.

(3) $\left[\text{SUBCAT}\ \boxed{1} \oplus \left\langle \left[\text{V}\left[\text{SUBCAT}\ \boxed{1}\ \textit{list}(\textit{synsem})\right]\right] \right\rangle\right]$

As a result, the arguments of the higher predicator are composed from those of the selected (typically) verbal complement. Another way of thinking about such cases is in terms of the higher predicator "attracting" the valence requirements of the lower one. Many phenomena for which separate operations of "clause union" have been assumed in other syntactic frameworks can thus be treated in terms of a rather straightforward head-driven extension of HPSG's original valence mechanism.

Among the original applications of argument composition is Hinrichs and Nakazawa's analysis of the German verb cluster, that is the clause-final sequence of verbal forms (Hinrichs & Nakazawa 1989, 1994). Starting with Bech 1955, two modes of verbal complementation have been assumed for German. The first (also referred to as "incoherent" construction) is very similar to English VP-complement constructions, as for instance in (4):

(4) a. Sandy tries [$_{\text{VP}}$ to read the book].

b. daß Otto versucht [$_{\text{VP}}$ das Buch zu lesen].
that Otto tries the book to read

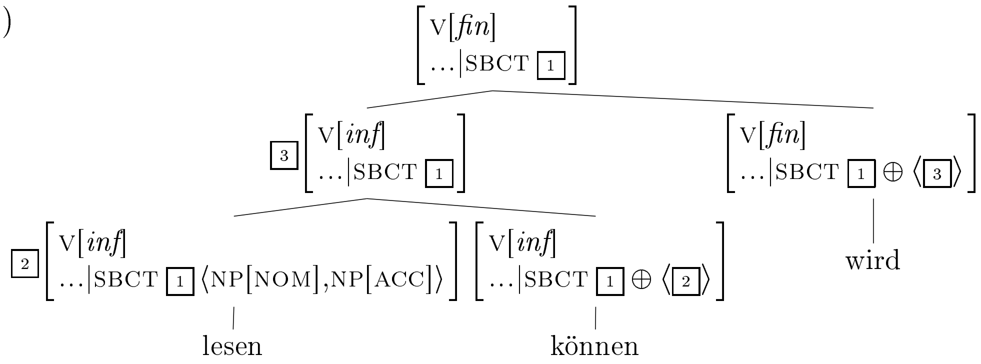
A plausible analysis of (4) states that *lesen* combines with its NP complement (*das Buch*) and the resulting phrase serves as the (VP) complement to *versucht*.

However, it is highly debatable whether the same should be assumed for the relation between *gelesen* and its notional object *das Buch* in constructions such as (5), where the main verb cooccurs with the tense auxiliaries *haben* and *werden*.

(5) a. daß Peter das Buch **gelesen** **haben** **wird**.
that Peter the book read-PSP have-INF will-FIN
'that Peter will have read the book.'

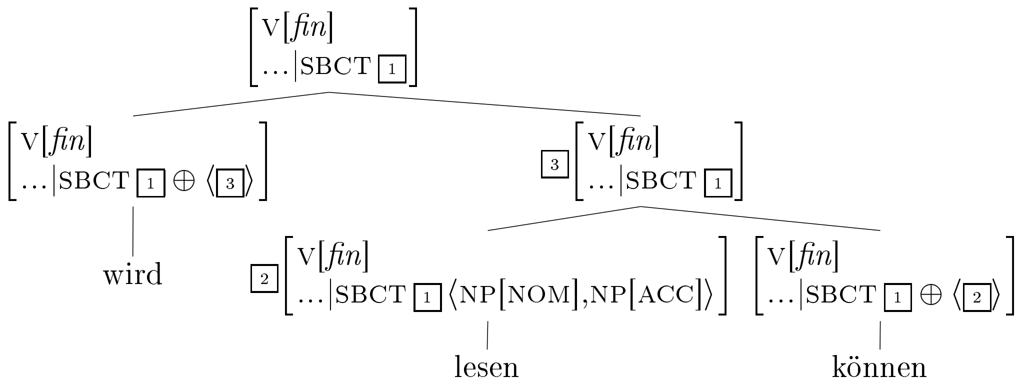
Hinrichs and Nakazawa propose that in "coherent constructions" of this kind, the valence requirements of the main verb (here: *lesen*) are inherited by the governing tense auxiliaries (*haben* and *wird*), so that the satisfaction of the with left-branching structure (Hinrichs & Nakazawa 1989; Kathol 2000) illustrated in (8):[3]

(8)




Empirical evidence in favor of structures of this kind is presented by Hinrichs & Nakazawa (1989), who point out, among other things, that the order variation known as *Oberfeldumstellung* (or "aux-flip") receives an elegant account in terms of reordering of constituents under their left-branching analysis:

(9)




In §3, we will return to evidence presented by Kathol (2000) that a purely phrase structure-based view fails to cover the full range of order variation among verb cluster elements seen in German and Dutch.

Argument composition analyses in effect establish "extended" valence relations between governing verbs and the phrasal argument of more deeply embedded verbs. This property has been the basis for novel proposals for the treatment of passives suggested by Kathol (1994) and Pollard (1994b). Instead

[3]Chung (1993) argues that similar constructions in Korean should be handled by means of a valence feature distinct from SUBCAT that is exclusively responsible for combining verbal material. Rentier (1994) makes a closely related proposal for Dutch verb clusters, which is extended and further motivated empirically by Kathol (2000).

with the unified valence list approach. For instance, consider prepositions in English. Since typical prepositions only require one NP argument for phrasal well-formedness, we obtain a singleton SUBCAT-list, as in (10a). As the least oblique element on the preposition's SUBCAT list, this NP would be expected to have the status of a subject; yet in terms of case marking and post-head occurrence, it is clearly on a par with nonsubject arguments of verbs. This is not apparent from the valence representations in (10a) vs. (10b).

(10) a. $\begin{bmatrix} \text{HEAD } \textit{prep} \\ \text{SUBCAT } \langle \text{NP} \rangle \end{bmatrix}$

b. $\begin{bmatrix} \text{HEAD } \textit{verb} \\ \text{SUBCAT } \langle \text{NP} \rangle \end{bmatrix}$

Thus, least oblique elements on SUBCAT lists have to do double duty as subjects of verbs and objects of prepositions.

In contrast, with Borsley's divided valence proposal, the different status of the NP argument in these two cases can be accounted for quite straightforwardly:[4]

(11) a. $\begin{bmatrix} \text{HEAD } \textit{prep} \\ \text{VAL} \begin{bmatrix} \text{SUBJ } \langle\rangle \\ \text{COMPS } \langle \text{NP} \rangle \end{bmatrix} \end{bmatrix}$

b. $\begin{bmatrix} \text{HEAD } \textit{verb} \\ \text{VAL} \begin{bmatrix} \text{SUBJ } \langle \text{NP} \rangle \\ \text{COMPS } \langle\rangle \end{bmatrix} \end{bmatrix}$

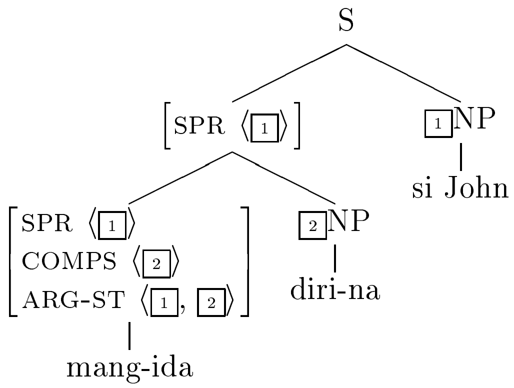
The idea of a single representation of all the dependents of some predicator has recently been revived in the form of the ARG-ST feature on lexical elements. However, while SUBCAT as a valence feature records the level of syntactic

[4]Somewhat ironically, the SUBJ/COMPS distinction has been obliterated in much of the HPSG-based literature on German which assumes a nonempty SUBJ list only for nonfinite forms (cf. Kiss 1995). Subjects of finite verbs are instead members of the COMPS list. Assuming that SUBJ elements cannot be directly discharged in German phrases, this proposal is intended to account for the fact that nonfinite verbs do not take subjects. However, this seems like a spurious generalization in light of well-known counterexamples such as in (i), in which the subject *eine Concorde* combines with the nonfinite predicate *gelandet* in the preverbal phrase:

(i) [Eine Concorde gelandet] ist hier noch nie.
a concorde landed is here yet not
'A concorde has not yet landed here.'

b.*[Mang-ida si John] diri-na.
AV-saw PM John self-his

c.




Compare this now with objective voice (OV) verbs. Taking again the distribution of reflexives as a diagnostic, we now have to assume that the VP-internal NP has the status of a subject. But this means that in the OV case, valence and argument structure are aligned in a way that is precisely opposite from the AV cases.

(14) a.*[Di-ida diri-na] si John.
OV-saw self-his PM John

b. [Di-ida si John] diri-na.
OV-saw PM John self-his
'John saw himself$_i$.'

the configurational distinction was proposed in Miller 1992 (on the basis of French agreement facts, *inter alia*), van Noord & Bouma 1994 (on the basis of semantic ambiguities in Dutch clusters), and Manning *et al.* 1999 (on the basis of the behavior of Japanese causative constructions). This 'adjuncts-as-complements' approach is further defended on the basis of case assignment facts in Finnish and other languages (Przepiórkowski 1999c, 1999a), and on the basis of diachronic considerations (Bender & Flickinger 1999).

The central idea of all these analyses is that (at least a class of) adjuncts are added to the verb's subcategorization frame already in the lexicon and, hence, are indistinguishable from complements in syntax. For example, in the analysis of Bouma *et al.* 2000, words are specified for the attribute DEPS (dependents), in addition to attributes ARG-ST and VALENCE discussed above. ARG-ST encodes the 'narrow' argument structure, i.e., information about dependents which are more or less idiosyncratically required by the word. This information is eventually mapped into the word's VALENCE attributes, which are responsible for syntactic realization of these dependents. However, on Bouma *et al.*'s (2000) account there is an intermediary level between ARG-ST and VALENCE, namely, DEPS, which encodes all dependents of a verb, both subcategorized (elements of ARG-ST) and non-subcategorized (adjuncts). In other words, DEPS extends ARG-ST to adjuncts, as schematically illustrated in (15).

(15) Argument Structure Extension

$$\begin{bmatrix} \textit{word} \\ \ldots|\text{HEAD} \;\; \textit{verb} \end{bmatrix} \rightarrow \begin{bmatrix} \ldots|\text{CAT} & \begin{bmatrix} \textit{category} \\ \text{DEPS} \; \boxed{1} \oplus \textit{list(adjunct)} \\ \text{ARG-ST} \; \boxed{1} \end{bmatrix} \end{bmatrix}$$

The DEPS list is, in turn, mapped into the VALENCE attributes, according to the following schematic constraint.

(16) Argument Realization

$$\textit{word} \rightarrow \begin{bmatrix} \ldots|\text{CAT} & \begin{bmatrix} \textit{category} & \\ \text{VALENCE} & \begin{bmatrix} \text{SUBJ} \; \boxed{1} \\ \text{COMPS} \; \boxed{2} \ominus \textit{list(gap)} \end{bmatrix} \\ \text{DEPS} \; \boxed{1} \oplus \boxed{2} & \end{bmatrix} \end{bmatrix}$$

According to this principle that all elements of ARG-ST, except *gaps*, must be present on VALENCE attributes. There are two things to note about (16). First, *gaps*, i.e., **(***AK)** information associated with extracted elements, are AK
present on the list value of the attribute DEPS, but they disappear from the

Similar lexical amalgamation is also assumed for the purposes of the lexical analysis of quantifier scoping in Manning *et al.* 1999 and Przepiórkowski 1997, 1998, and for the flow of pragmatic information in Wilcock 1999.

# 3 Phrase structure and linear order

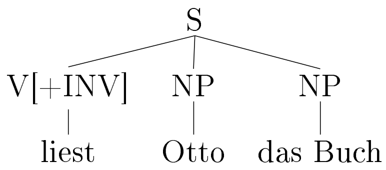
## 3.1 Configurationality

A theme running through much of the HPSG literature has been the lexicalization of relationships that have been treated in tree-configurational terms in other theories. HPSG's binding theory is a prime example of how certain asymmetries among coarguments can be reinterpreted in terms of obliqueness on valence/argument structure. As a result, there is no longer a need for expressing such asymmetries in tree-structure terms such as c-command.

Similarly, variation in phrase order of the kind seen in Japanese or German has typically been seen in terms of liberal linear precedence constraints over flat clausal tree structure rather than the result of manipulating highly articulate phrase structure via scrambling movements (cf., for instance, Uszkoreit 1987 and Pollard 1996 for German and Chung 1998a for Korean).[5] HPSG analyses of this kind thus are similar to recent LFG proposals to nonconfigurational languages in terms of flat clause structures (cf. for instance Austin & Bresnan 1996).

A issue closely related to order variation among phrasal dependent is that of the placement of verbal heads in the Germanic languages (and elsewhere). Given a flat structure analysis for the phrasal constituents of the clause, the different positionings of the finite verb in verb-first and verb-last clauses then reduce to clause-initial vs. clause-final placement of that verb (typically mediated by a binary-valued feature such as INV, familiar from HPSG analyses of English subject-auxiliary inversion), cf. Pollard 1996:

(19) a.




[5]Note however, that this correlation does not follow by necessity. For instance, Kiss 1995 and related works assumes a strictly binary branching clause structure for German of the kind familiar from transformational analyses.

problems involving the locality of the dependency and the existence of dislocated heads. One area in which verb dislocation approaches appear to provide better analyses than those based on ordering variation within local trees is the interaction between finite verbs and complementizers. German and other Germanic languages exhibit a characteristic complementarity of distribution between initial finite verbs and complementizers in root and subordinate clauses, respectively. If verbs and complementizers are not subconstituents of the same local tree, it is not clear how they can be made to interact positionally. In contrast, verb movement analyses are able to express a direct functional analogy between those two categories, which can account for those distributional facts. However, like their transformational counterparts, such analyses fail to generalize to phraal clause-initial categories—that is, *wh*-phrases in subordinate interrogative and relative clauses—which possess basic distributional and functional properties of complementizers (cf. Kathol & Pollard 1995 and Kathol 2000, for extensive discussion on this point). In fact, one of the major motivating factors behind the linearization-based approach to Germanic clausal syntax pursued in Kathol 2000 is precisely to allow for this basic parallelism to be expressed in a comprehensive account of the linear underpinnings of Germanic clause structure. As we will see in the next section, the required extensions of the phrase structure substrate of the HPSG linguistic theory affords a rather flexible and elegant approach to problems of discontinuous constituency within the formalism of HPSG.

## 3.2 Nonconcatenative approaches to linear order

In much of contemporary syntactic theory, the correlation between hierarchical organization and linear order in terms of a left-to-right concatenation of the terminal leaves ("terminal yield") is taken for granted. However, an interesting consequence of the sign-based approach that the very ingredient that gave HPSG its name ("phrase structure grammar") turns out to be a nonessential part of the formalism. While concatenation is one mode of computing the phonology of a sign from the the phonology of its constituent parts, other relations are perfectly compatible with the sign-based approach. There is now a significant literature that explores such alternatives.

Concatenative approaches lends themselves rather straightforwardly to the description of the relation between constituency and order in a language like English. However, it is far less clear whether this also holds of languages such as German. For instance, Reape (1993,1994, 1996) observes that in German nonfinite complementation construction of the kind illustrated in (21a), the verb *zu lesen* occurs separated from its notional object *dieses Buch*—unlike in

Reape's proposal bears a strong resemblance to previous, approaches to discontinuous constituents, in particular Pullum and Zwicky's notion of "liberation" (Pullum 1982, Zwicky 1986). Thus, the the VP in (22) can be thought of as being "liberated" in the sense that its immediate constituents may intermingle with elements from outside that VP. Unlike Pullum and Zwicky's proposals, HPSG order domains provide a level of syntactic representation from which the range of possible intrusion effects can be read off directly. Thus, while the VP *dieses Buch zu lesen* gives rise to two list elements in the clausal domain, the NP *dieses Buch* contributes only one element. Since domain elements cannot themselves be broken apart, it is predicted that discontinuities are allowed only in the former case, but not in the latter. Finally, if order domains take the place of local trees as the range of potential order flexibility, it is natural to interpret linear precedence constraints as well-formedness conditions over order domains.

### 3.2.1 Linearization-based vs. valence-based approaches

The initial appeal of structures such as (22) is that they allow an analysis of German which—notwithstanding the differences in linear order—is remarkably similar to the constituency commonly proposed for the equivalent English sentences in nontransformational approaches.

Therefore, it appears that argument composition and order domains constitute two alternative ways of allowing for embedded verbs and their notional objects to occur separated in a "middle distance dependency" construction. This has occasionally been perceived to be an embarrassment of riches with no obvious way of telling which analysis is to be preferred. However, as is discussed in detail in Kathol 1998, Reape's analysis can be shown to ultimately unsatisfactory in that it fails to link the argument structure of more deeply embedded predicates to that of the governing verbs—which is precisely the leading intuition behind the argument composition approach. Evidence that such linkage is in fact necessary comes from a phenomenon known as 'distant' or 'long' passive (cf. Höhle 1978). In (23), the NP *der Wagen* is the direct object of the embedded verb *zu reparieren*, yet its nominative case marks it as the subject of the passivized predicate *wurde versucht*.

| | | | | |
|---|---|---|---|---|
| (23) | ?Der Wagen | wurde | zu reparieren | versucht. |
| | the car-NOM | was | to repair | tried |
| | 'Someone tried to repair the car.' | | | |

If all predicates of the *versuchen*-class invariably embed VPs, as suggested by Reape, the direct object of the embedded verb (*den Wagen* in (23)) would

### 3.2.2 Further applications

Another area in which the adoption of order domains has arguably lead to significant progress is in the syntax of left-peripheral elements in German. As was pointed out above, the striking interplay between finite verbs and complementizers (and *wh*-phrases, for that matter) which forms the basis of transformational verb movement accounts has been captured only insufficiently in purely phrase structure-based approaches. However, if order domains are combined with the concept of "topological fields" from traditional German grammar, these facts can be described rather straightforwardly in purely non-derivational terms (cf. Kathol 2000). The basic idea is to allow for elements with different grammatical roles within the clause—verbal head, phrasal complements, filler phrase, complementizer, filler phrase etc.—to all occur within the clause's order domain and assign each of them to a topogical field such as *Vorfeld (vf.)* (roughly equivalent to [Spec,CP]) or *linke Satzklammer (l. S.)* (roughly equivalent to Comp), *Mittelfeld (mf.)*, etc., according to various lexical or constructional constraints. With the further constraint that the left-most topological fields (*Vorfeld, linke Satzklammer*) may be instantiated by at most one element, the positional competition between complementizer and finite verb falls out as a natural consequence. Thus, in (25) the finite verb cannot be associated with the same field as the complementizer and must instead occur clause-finally (*rechte Satzklammer (r. S.)*).

(25)

$$\left[\textsc{dom}\left\langle \begin{bmatrix} \textit{l. s.} \\ \textsc{phon}\langle \textit{daß}\rangle \\ \textsc{compl} \end{bmatrix}, \begin{bmatrix} \textit{mf.} \\ \textsc{p'n}\ \langle \textit{Lisa}\rangle \\ \textsc{np}[\textsc{nom}] \end{bmatrix}, \begin{bmatrix} \textit{mf.} \\ \textsc{p'n}\ \langle \textit{die Blume}\rangle \\ \textsc{np}[\textsc{acc}] \end{bmatrix}, \begin{bmatrix} \textit{r. s.} \\ \textsc{p'n}\ \langle \textit{sieht}\rangle \\ \textsc{v}[\textsc{fin}] \end{bmatrix} \right\rangle\right]$$

(26)

$$\left[\textsc{dom}\left\langle \begin{bmatrix} \textit{l. s.} \\ \textsc{phon}\langle \textit{sieht}\rangle \\ \textsc{v}[\textsc{fin}] \end{bmatrix}, \begin{bmatrix} \textit{mf.} \\ \textsc{phon}\langle \textit{Lisa}\rangle \\ \textsc{np}[\textsc{nom}] \end{bmatrix}, \begin{bmatrix} \textit{mf.} \\ \textsc{phon}\langle \textit{die Blume}\rangle \\ \textsc{np}[\textsc{acc}] \end{bmatrix} \right\rangle\right]$$

Typical verb-second declarative clauses involve the instantiation of *Vorfeld* by a non-*wh*-phrase and *linke Satzklammer* by a finite verb, as shown in (27):

(27)

$$\left[\textsc{dom}\left\langle \begin{bmatrix} \textit{vf.} \\ \textsc{phon}\langle \textit{die Blume}\rangle \\ \textsc{np}[\textsc{acc}] \end{bmatrix}, \begin{bmatrix} \textit{l. s.} \\ \textsc{phon}\langle \textit{sieht}\rangle \\ \textsc{v}[\textsc{fin}] \end{bmatrix}, \begin{bmatrix} \textit{mf.} \\ \textsc{phon}\langle \textit{Lisa}\rangle \\ \textsc{np}[\textsc{nom}] \end{bmatrix} \right\rangle\right]$$

Kathol (1999a; 2000) further describes how clausal domains of this kind can be utilized in a constructional approach (see refcg-turn below) to German sentence types with various kinds of illocutionary force potential.

see it as a phrasal element of some category (usually nominal or prepositional) which is phonologically empty and contributes its own local information to the set of nonlocal SLASH information:

(28) $\begin{bmatrix} \text{PHON } \langle\ \rangle \\ \text{SYNSEM} \begin{bmatrix} \text{LOCAL } \boxed{1} \\ \text{NONLOCAL} \mid \text{SLASH } \{\boxed{1}\} \end{bmatrix} \end{bmatrix}$

However, the notion of a phonologically empty syntactic element is somwhat antithetical to the spirit of a surface-true theory such as HPSG. Note also that for a variety of constructions the inaudibilia of transformational analyses have already been dispensed with. This is true in particular for PRO in infinitival constructions (simply an nonsaturated valence requirement) and the trace of A-bar movement (passive subject is not linked to a syntactic object position). Eliminating *wh*-traces thus is tantamount to shedding the last vestiges of a derivational view of grammar.

The abolishment of *wh*-traces poses no technical problem, especially if one adopts the distinction between "static" argument structure and "dynamic" valence. From this perpective, an extracted element is nothing but a locally unrealized element of the ARG-ST list. Rather than licensing a sister constituent of that predicator the SLASH element is realized as a filler (or bound some other way, as in the case of *tough*-constructions). Since the argument structure remains unaffected by the specifics of syntactic realization,[9] any evidence for asymmetries among coarguments can be explained as asymmetries among members of ARG-ST, rather than a valence feature. For instance, this easily accounts for the fact that fillers in English topicalization constructions may be reflexives with an antecedent in the following clause—notwithstanding the fact that the reflexive is presumably in a configurationally higher position than its antecedent (Pollard & Sag 1994:265):

(29) a. (John and Mary are stingy with their children.)
But themselves$_i$, they$_i$ pamper.

While many facts related to extraction phenomena allow for both a trace-based and a trace-less account, this does not entail that both styles of analysis are exactly equivalent in their empirical predictions.

As has been argued by Sag & Fodor (1994), the evidence for the existence of traces proposed in the literature is often extremely weak. At the same time

[9]In addition to being realized as a "gap" matched by a filler, another noncanonical argument realization is as a clitic. See §6.1 below.

syntactic representations is a further step toward reducing syntactic abstractness and representational complexity. This has been made possible by the fact that a "word" in later versions in HPSG is no longer a monolithic entity but instead corresponds to a network of lexical resources each of which associated with different combinatorial possiblities. A further, and to some extent complementary, way of reducing representational complexity is to assume a more fine-grained inventory of licensing schemata.

## 4.2 The "constructional" turn

The development from GPSG to HPSG can be seen, to some degree, as a reaction to the great number of ID rules which had been posited in GPSG. Moreover, in GPSG there did not seem to be any natural correspondence between the semantic valence of a verb and its syntactic frame of occurrence. The lexicalization of combinatorial properties that the feature-based encoding of valence in HPSG makes possible also allows for a rather sparse system of combinatorial schemata which describe all the phrase types of a given language. If the combinatorial potential is lexically encoded then the ID schemata only serve to "execute" those combinatorial possibilities. Conversely, each combination of phrases can be reduced to combinatorial features that are grounded in lexical information.

Even though this view is initially attractive, its shortcomings become apparent when one considers constructions whose combinatorial potential is not ostensibly reducible to the properties of particular lexical elements. A case in point are relative clauses. Being modifiers their combination with a modified noun is licensed by means of the MOD head feature. Yet constructions such as *that*-less relative clauses in English do not appear to have a lexical trigger for their modifier status.[10]

(32) This is the woman I love.

The solution proposed in Pollard & Sag 1994 preserves the idea that combinatorial properties are lexically derived, but at the price of violating HPSG's

[10]Another possibility would be to attribute the relative clause behavior entirely to the verbal head. This would mean that finite verbs have to be treated as ambiguous between a "regular" and a relative clause version which licenses a gap and turns the finite clause into a noun-modifier. However, long-distance dependencies of the kind shown in (i) militate against such an approach.

(i) This is the woman that they say I love.

Here the verb that licensing the gap is *love*, yet the verb responsible for the modification of the noun *woman* is *say*.

constructions can be defined entirely by reference to their topological structure, abstracting away from the combinatorial licensing. In the case of root declarative clauses this makes it possible to have a uniform description of this construction whether the initial element is a filler (as in (27) above) or some other element, such as the positional expletive *es*, illustrated in (34):

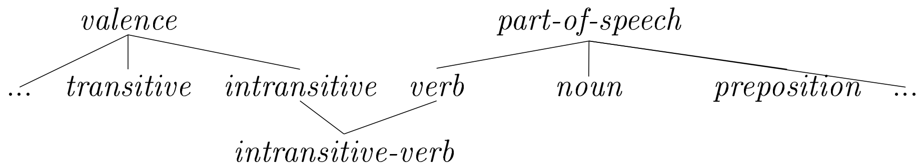
(34)
$$\begin{bmatrix} \textit{root-decl} \\ \text{DOM} \left\langle \begin{bmatrix} \textit{vf.} \\ \text{P'N} \langle \textit{es} \rangle \\ \text{EXPL} \end{bmatrix}, \begin{bmatrix} \textit{l. s.} \\ \text{P'N} \langle \textit{sah} \rangle \\ \text{V[FIN]} \end{bmatrix}, \begin{bmatrix} \textit{mf.} \\ \text{P'N} \langle \textit{niemand} \rangle \\ \text{NP[NOM]} \end{bmatrix}, \begin{bmatrix} \textit{vf.} \\ \text{P'N} \langle \textit{d. Blume} \rangle \\ \text{NP[ACC]} \end{bmatrix} \right\rangle \end{bmatrix}$$

## 4.3 Type hierarchies for nonlexical generalizations

A complaint often levelled against construction-based approaches is that they are merely descriptive and not explanatory and hence do not try to uncover the underlying factors that are responsible for the patterns observed in the data. Proponents of the constructional perspective tend to consider such criticism as misguided given that the reductionist approach often only succeeds because it relies on an arbitrary selection among the data considered worthy of explanation ("core" vs. "periphery"). In addition, the kind of reductionism seen in many varieties of abstract syntax fails to appreciate the degree to which constructional complexity is often simply hidding within a system of phonologically null elements for which little or no empirical motivation is provided.

Finally, critics of constructional approaches fail to realize that the flipside of describing what is special and irreducible about a given entity in the grammar is an account of all the ways in which a given construction SHARES properties with other elements of the grammar. A particularly powerful device in this respect are multiple inheritance hierarchies. Such hierarchies are well-known from the way that lexical information is organized in HPSG. For instance, a verbal form such as *walks* can intuitively be characterized in terms of at least two parameters of variation. The first is the lexical class or part of speech, which groups *walks* together with such forms as *is*, *proved*, and *singing*. The second is valence, which puts *walks* in the same class as *sleeping*, *house*, or *abroad*, cf. (35).

(35)



Lappin & Zadrożny 2000).

In the two subsections below, we will look at recent HPSG approaches to semantics and pragmatics, respectively.

## 5.1 Advances in Semantics

Recent years have witnessed an increase of interest in foundational semantic issues within HPSG. A number of recent works have proposed various novel approaches to HPSG semantics, either building on and further developing the approach of Pollard & Sag (1994) (cf. §5.1.1 and §5.1.2), or replacing their account (cf. §5.1.3).

### 5.1.1 Scope and Recursive Modification

Pollard & Yoo (1998) and Kasper (1997) deal with two major flaws in the standard (Pollard & Sag 1994) HPSG approach to semantics: wrong interaction of raising and scoping, and no account of recursive modification, respectively.

**Raising and Scoping** The first problem is recognized in Pollard & Sag 1994, p. 328, who note that the ambiguous sentences in (36) receive only single meanings on their analysis, namely, the wide scope readings in which the quantifiers *a unicorn* and *each painting* outscope the raising verbs.

(36) a. A unicorn appears to be approaching. (ambiguous)

b. Sandy believes each painting to be fraudulent. (ambiguous)

The problem stems from the fact that, in Pollard & Sag 1994, a quantifier starts its life only at the surface position of the phrase to which it corresponds and from there it can only percolate upwards. Thus, in (36a), the quantifier cannot be in the scope of *appears*, even though it corresponds to the raised subject of *approaching*, which is in the scope of *appears*.

The solution Pollard & Yoo (1998) propose is to make the quantifier corresponding to a raised constituent available at the "initial" position, e.g., in (36a), at the level of the embedded verb *approaching*. The quantifier can then percolate up and be retrieved either inside or outside the scope of *appear*.

Below, we present a modification of Pollard & Yoo 1998, which is simpler than their analysis, and also avoids spurious ambiguities (i.e., multiple analyses of a sentence with the same syntax and semantics) and some other problems in Pollard & Yoo 1998, namely the analysis proposed in Przepiórkowski 1997, 1998.

(41) $\text{Desc}_1 = \left[\begin{array}{ll} \text{SS}|\text{LOC}|\text{CONT} & \left[\begin{array}{l} \textit{nom-obj} \vee \textit{quant} \\ \text{QSTORE } \boxed{1} \end{array}\right] \vee \left[\begin{array}{l} \textit{psoa} \\ \text{QSTORE } \boxed{2} \\ \text{QUANTS } \boxed{3} \end{array}\right] \\ \text{NEW-QS } \boxed{5} & \end{array}\right]$

where $\boxed{1} = \boxed{5} \uplus$ the union of QSTOREs of selected arguments,
$\boxed{4} =$ the set of elements of $\boxed{3}$,
$\boxed{1} = \boxed{2} \uplus \boxed{4}$.

(42) $\text{Desc}_2 = \left[\begin{array}{l} \text{SS}|\text{LOC}|\text{CONT } \boxed{1} \\ \text{ARG-ST } \langle \ldots, [\text{CONT } \boxed{1}], \ldots \rangle \end{array}\right]$

**(I'm still wondering if the preceding could instead be cast in prose)** What this constraint says is that, unless a *word* inherits its CONTENT value from one of its arguments (cf. $\text{Desc}_2$), in which case there is no quantifier retrieval, it must satisfy the description $\text{Desc}_1$. In case the *word* has CONTENT value of type *nom-obj* or *quant*, it simply collects elements of QSTOREs of its arguments (and adds any quantifiers it may introduce in NEW-QS). In case of *word*s with CONTENT values of type *psoa*, though, the set of quantifiers collected from arguments (and from NEW-QS) is split between the *word*'s QSTORE (quantifiers to be retrieved higher in the tree) and QUANTS (quantifiers retrieved locally). AK

Finally, *selected arguments* in (41) is defined in such a way that, e.g., the *synsem* of *a unicorn* in (36a) is a selected argument of the lower verb (*approaching*), but not of the higher verb (*appears*). This way the quantifier is introduced by *a unicorn* at the level of *approaching*.

According to this analysis, (36a) has exactly two readings: *a unicorn* is either retrieved by the word *approaching*, or it is present in the QSTORE value of *approaching* and is retrieved higher, by the word *appears* (note that phrasal retrieval is not allowed by this analysis). See Pollard & Yoo 1998 and Przepiórkowski 1997, 1998 for details.

**Recursive Modification** Kasper (1997) notices that the original semantic theory of Pollard & Sag 1994 does not account for phrases that contain modifiers of their own as, e.g., in (43).

(43) a. Bob showed us an [[apparently] simple] example.

b. Congress reconsidered the [[[obviously] unintentionally] controversial] plan.

In particular, according to the analysis in Pollard & Sag 1994, such cases of recursive modification would receive iterative modification readings; for example,

(47)
$$\left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{word}} \\
\textsc{phon} & \langle\ \textit{potentially}\ \rangle \\
\textsc{ss}|\textsc{loc} & \left[\begin{array}{ll}
\textsc{cat}|\textsc{head} & \left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{adv}} \\
\textsc{mod} & \left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{mod}} \\
\textsc{arg} & \left[\begin{array}{ll}
\textsc{head} & \textit{adj} \\
\textsc{cont} & \boxed{5}\textit{psoa}
\end{array}\right] \\
\textsc{icont} & \boxed{3}\textit{psoa} \\
\textsc{econt} & \boxed{3}
\end{array}\right]
\end{array}\right] \\
\textsc{cont} & \left[\begin{array}{ll}
\textsc{reln} & \textit{potential} \\
\textsc{arg} & \boxed{5}
\end{array}\right]
\end{array}\right]
\end{array}\right]$$

(48)
$$\left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{word}} \\
\textsc{phon} & \langle\ \textit{controversial}\ \rangle \\
\textsc{ss}|\textsc{loc} & \left[\begin{array}{ll}
\textsc{cat}|\textsc{head} & \left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{adj}} \\
\textsc{prd} & - \\
\textsc{mod} & \left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{mod}} \\
\textsc{arg}|\textsc{cont} & \left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{nom-obj}} \\
\textsc{index} & \boxed{1} \\
\textsc{restr} & \boxed{2}
\end{array}\right] \\
\textsc{icont} & \boxed{3} \\
\textsc{econt} & \left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{nom-obj}} \\
\textsc{index} & \boxed{1} \\
\textsc{restr} & \boxed{2}\,\&\,\boxed{3}
\end{array}\right]
\end{array}\right]
\end{array}\right] \\
\textsc{cont} & \left[\begin{array}{ll}
\textsc{reln} & \textit{controversial} \\
\textsc{inst} & \boxed{1}
\end{array}\right]
\end{array}\right]
\end{array}\right]$$

(50) a. #Jackie believed/doubted/assumed... Bo's weight / my phone number.

b. Jackie knows/discovered Bo's weight / my phone number.

Moreover, TF predicates treat proposition-denoting complements purely referentially, in the sense of **(Quine 1961, pp. 139–145)**: AP

(51) a. **Substitutivity**:

The Fed's forecast was that gold reserves will be depleted by the year 2000.
Brendan believes/denies... the Fed's forecast.
Hence, Brendan believes/denies... that gold reserves will be depleted by year 2000.

b. **Existential Generalization**:

Brendan believes/denies... that gold reserves will be depleted by year 2000.
Hence, there is a claim/hypothesis/prediction that Brendan believes/denies...

On the other hand, factive predicates do not seem to treat proposition-denoting complements purely referentially, e.g.:

(52) **Substitutivity**:

The Fed's forecast was that gold reserves will be depleted by the year 2000.
(The Fed's forecast is true.)
Brendan discovered/was aware of the Fed's forecast.
IT DOES NOT FOLLOW THAT Brendan discovered/was aware that gold reserves will be depleted by year 2000.

This suggests that the denotata of complements of TF predicates (i.e., propositions) are different from the denotata of complements of factive predicates (i.e., facts or, more generally, possibilities).

Another difference between facts and prepositions is that the former, but not the latter, may enter into causal relations:

(53) a. The fact that Tony was ruthless made the flight against her difficult.

b. The possibility that Glyn might get elected made Tony's hair turn white.

(57) and (58) below illustrate semantic representations of a simple declarative and a simple *yes/no* interrogative clauses, respectively, within Ginzburg & Sag's (2000) approach. Note that the value of PARAMS in (58) is the empty set, corresponding to the simultaneous abstraction of zero parameters in case of *yes/no* questions, and that background assumptions are represented as *fact*s.

(57) *Brendan left.*

$$\begin{bmatrix} \text{SS}|\text{LOC} & \begin{bmatrix} \text{CONT} & \begin{bmatrix} \textit{proposition} & \\ \text{SIT} & s_0 \\ \text{SOA} & \begin{bmatrix} \textit{soa} & \\ \text{QUANTS} & \langle\rangle \\ \text{NUCL} & \begin{bmatrix} \textit{leave-rel} & \\ \text{LEAVER} & \boxed{1} \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{CONX}|\text{BKGRND} & \begin{bmatrix} \textit{fact} & \\ \text{SIT} & s_1 \\ \text{SOA} & \begin{bmatrix} \textit{soa} & \\ \text{QUANTS} & \langle\rangle \\ \text{NUCL} & \begin{bmatrix} \textit{name-rel} & \\ \text{NAMED} & \boxed{1} \\ \text{NAME} & \text{Brendan} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(58) *Did Brendan leave?*

$$\begin{bmatrix} \text{SS}|\text{LOC} & \begin{bmatrix} \text{CONT} & \begin{bmatrix} \textit{question} & \\ \text{PARAMS} & \{\} \\ \text{PROP} & \begin{bmatrix} \textit{proposition} & \\ \text{SIT} & s_0 \\ \text{SOA} & \begin{bmatrix} \textit{soa} & \\ \text{QUANTS} & \langle\rangle \\ \text{NUCL} & \begin{bmatrix} \textit{leave-rel} & \\ \text{LEAVER} & \boxed{1} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{CONX}|\text{BKGRND} & \begin{bmatrix} \textit{fact} & \\ \text{SIT} & s_1 \\ \text{SOA} & \begin{bmatrix} \textit{soa} & \\ \text{QUANTS} & \langle\rangle \\ \text{NUCL} & \begin{bmatrix} \textit{name-rel} & \\ \text{NAMED} & \boxed{1} \\ \text{NAME} & \text{Brendan} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

See Ginzburg & Sag 2000 for further details and explication in terms of Situation Theory, as well as for extensive application of this approach to an

$$
\text{b.}\quad
\left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{abstraction}}\\
\text{TYPE} & \left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{c-type}}\\
\text{IN} & \boxed{1}\ \textit{entity}\\
\text{OUT} & \boxed{2}\ \textit{truth}
\end{array}\right]\\
\text{VAR} & \boxed{3}\ \left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{var}}\\
\text{TYPE} & \boxed{1}
\end{array}\right]\\
\text{ARG} & \left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{application}}\\
\text{FUNC} & \left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{professor}}\\
\text{TYPE} & \left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{c-type}}\\
\text{IN} & \boxed{1}\\
\text{OUT} & \boxed{2}
\end{array}\right]
\end{array}\right]\\
\text{ARG} & \boxed{3}
\end{array}\right]
\end{array}\right]
$$

In this approach, combinatorial semantics is particularly simple: the CONTENT value of a *phrase* is always the result of functional application of the CONTENT value of one daughter to the CONTENT value of the other daughter (with additional applications of $\beta$-reductions, as needed).

Richter & Sailer 1999a, 1999b also introduce the following Quantifier Raising lexical rule[13] responsible for type shifting.

$$
(60)\quad
\left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{word}}\\
\text{SYNSEM}|\text{LOC}|\text{CONTENT} & \lambda x_1 \ldots \lambda x_i \ldots \lambda x_n.\phi
\end{array}\right] \Longrightarrow
\left[\begin{array}{ll}
\multicolumn{2}{l}{\textit{word}}\\
\text{SYNSEM}|\text{LOC}|\text{CONTENT} & \lambda x_1 \ldots \lambda X_i \ldots \lambda x_n.X_i(\lambda x_i.\phi)
\end{array}\right]
$$

With this type shifting lexical rule in hand, one of the two meanings of, say, *someone loves everyone* may be derived by type shifting the basic meaning of *love* (given in (61a)) to (61b) and, subsequently, to (61c), and then by usual functional applications, indicated in (62).

(61) a. $\lambda y \lambda x.\mathsf{love}'(x, y) \quad \overset{(60)}{\Longrightarrow}$

b. $\lambda y \lambda X.X(\lambda x.\mathsf{love}'(x, y)) \quad \overset{(60)}{\Longrightarrow}$

c. $\lambda Y \lambda X.Y(\lambda y.X(\lambda x.\mathsf{love}'(x, y)))$

[13] They call it *Quantifier Raising Derivational Rule* to indicate that this is a description-level (derivational) lexical rule in the sense of, e.g., Meurers 1995.

distributive readings of plural NPs.

A related approach, which has, however, gained greater attention from HPSG practitioners is the Minimal Recursion Semantics (MRS; Copestake *et al.* 1997), an underspecified version of predicate calculus. Although originally devised (and described in Copestake *et al.* 1997) as a computationally-oriented semantic formalism, it is assumed in various theoretical linguistic works. Below, we will briefly describe MRS on the basis of Pollard 1998.

The main idea of MRS is that grammar does not determine scope relations; they are resolved at a post-grammatical resolution stage (if at all). The grammar proper generates semantic representations such as (63), corresponding to *every dog chased some cat*:

(63)
$$\begin{bmatrix} \textit{mrs} \\ \text{LTOP } \boxed{0} \\ \text{RELS } \left\{ \begin{bmatrix} \textit{every} \\ \text{HNDL } \boxed{1} \\ \text{BV } \boxed{x} \\ \text{RESTR } \boxed{l} \\ \text{SCOPE } \boxed{m} \end{bmatrix}, \begin{bmatrix} \textit{dog} \\ \text{HNDL } \boxed{2} \\ \text{INST } \boxed{x} \end{bmatrix}, \begin{bmatrix} \textit{some} \\ \text{HNDL } \boxed{3} \\ \text{BV } \boxed{y} \\ \text{RESTR } \boxed{n} \\ \text{SCOPE } \boxed{p} \end{bmatrix}, \begin{bmatrix} \textit{cat} \\ \text{HNDL } \boxed{4} \\ \text{INST } \boxed{y} \end{bmatrix}, \begin{bmatrix} \textit{chase} \\ \text{HNDL } \boxed{5} \\ \text{ACT } \boxed{x} \\ \text{UND } \boxed{y} \end{bmatrix} \right\} \end{bmatrix}$$

The main attribute of *mrs* structures is REL: it is a set of semantic predicates together with their argument roles (ignore the attribute HNDL for a couple of sentences). Note, however, that some arguments, namely, arguments of scope-taking relations (*every* and *some* in (63)) are not 'filled', i.e., their values are not determined by this representation. For example, (63) says that the SCOPE of the quantifier *every* is $\boxed{l}$, but does not say whether $\boxed{l}$ represents the predicate *chase* directly, or whether it represents *some*, which in turn scopes over *chase*.

This resolution step is done outside the grammar[14] and it consists in equating such undetermined argument values with HNDL values of other relations. Thus, HNDLs are, at first approximation, used as labels of particular relations.[15] For example, two disambiguations of the meaning represented in (63) are given in (64)–(65) below; they can be represented in the traditional notation as in (64′)–(65′).

[14] An alternative approach might be to have *two* content attributes, say, UNSCOPED-CONTENT and SCOPED-CONTENT, one of which represents underspecified meanings, and the other — resolved meanings. On this approach, the values of these two attributes would be related via a set of constraints encoding the resolution step. (Pollard 1998, fn. 10, and personal communication.)

[15] In fact, HNDL values indicate scope information: two relations with the same scope share their HNDLs.

1997; Pollard 1998), has been employed in an analysis of modification in general and various uses of the locative *on* in particular (Pollard 1998), and in an analysis of English number names (Smith 1999), *inter alia*. An interesting variant of MRS has also been presented in Egg 1998 and used as a basis for a (syntactico-)semantic HPSG account of *wh*-questions. Finally, Richter & Sailer (1999c), following Bos (1995), show how, for any object logical language, a semantic underspecified version of this language can be defined as the semantic representation for HPSG, in a way generalizing over previous HPSG approaches to underspecified semantics.

## 5.2 Forays into Pragmatics

### 5.2.1 Information Structure

Since the HPSG framework is well-suited for studying interactions between various grammatical levels, it is only natural that there is some HPSG work on information structure (also called *topic-focus*, *theme-rheme*, *new-given*, *topic-ground*), which is known to interact with syntax and prosody in interesting ways. The most influential approach is based on Vallduví's (1992) account of information structure, and it includes Engdahl & Vallduví 1994, Engdahl & Vallduví 1996, Vallduví & Engdahl 1996, and Engdahl 1999. We will illustrate this approach with a simple example, from Engdahl & Vallduví 1996.

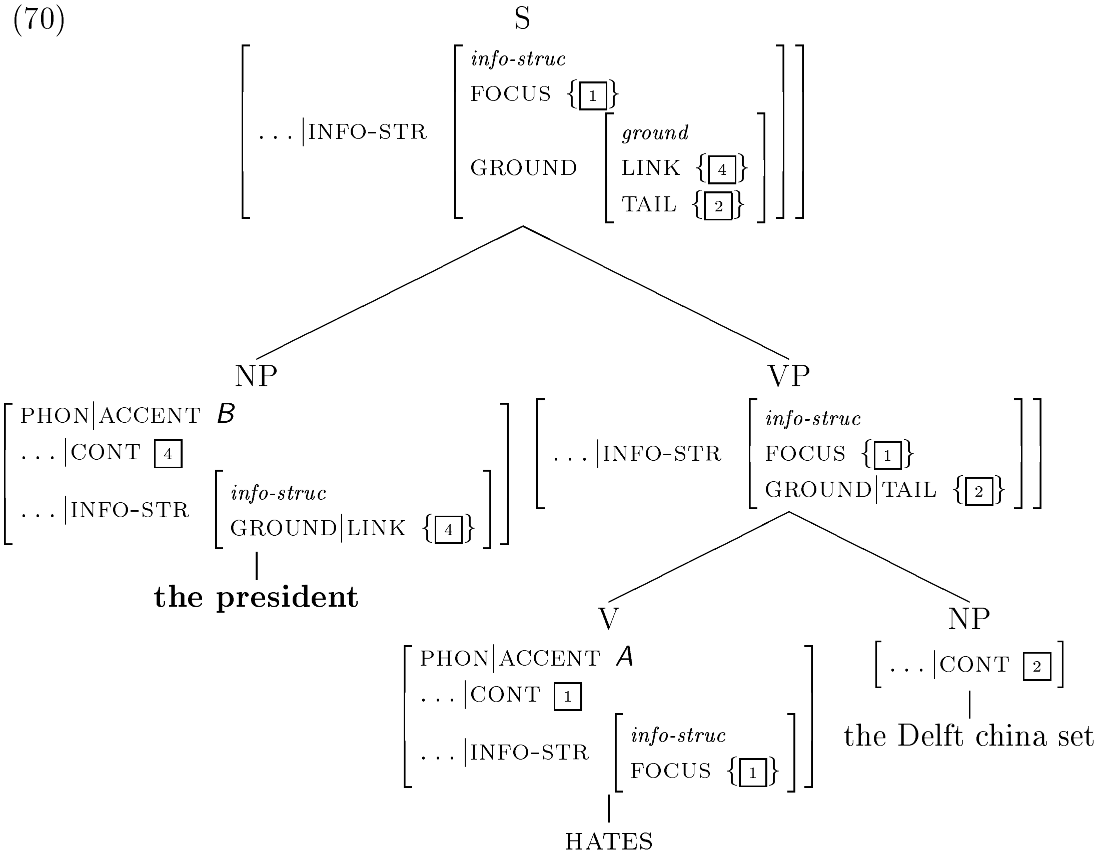
Consider the mini-dialogue in (66), where **bold face** corresponds to so-called B-accent (L+H*), while SMALL CAPITALS correspond to so-called A-accent (H*).

(66) A: In the Netherlands I got a big Delft china tray that matches the set in the living room. Was that a good idea?

B: (Maybe.) The **president** [$_F$ HATES] the Delft china set. (But the **first lady** LIKES it.)

Vallduví (1992) assumes a 3-way partition of information structure of sentences: first, the information conveyed by a sentence is split into new information (*focus*) and information already present in the discourse (*ground*). Second, *ground* is further subdivided into *link* (what the sentence is about, sometimes called *topic*) and *tail*. Under the assumption that every utterance contains new information, this leads to a four-way classification of utterances: *all-focus* (no ground), *link-focus* (no tail), *focus-tail* (no link) and *link-focus-tail*. The sentence in (66B) represents the *link-focus-tail* type.

(70)




Note that this analysis simultaneously accesses and constrains various grammatical levels: prosody (PHON values) and pragmatics (CONX|INFO-STR values), but also semantics (CONT values) and constituent structure (DTRS values; not shown explicitly here). This account clearly illustrates the advantages of constraint-based theories, such as HPSG, over derivational theories, like Minimalism, where it is not clear how such an analysis, making simultaneous use of various levels of grammatical knowledge, could be stated.[16]

Among recent HPSG analyses concerned with information structure in various languages are: Avgustinova 1997, Kolliakou 1998, Kolliakou 1999, Alexopolou 1998 and Przepiórkowski 1999b.

### 5.2.2 Beliefs and Intentions

Green 1994 and Green 2000 seek to spell out in further detail the kind of information normally represented by CONTEXT values and argue that this

[16]See Engdahl 1999 for some discussion on how information packaging could be represented in Minimalism and in HPSG.

Here, *milkshake* may refer to whoever purchased milkshake by virtue of the mutual belief of the speaker and the addressee that, within sales agents' parlance, the thing purchased may designate the purchaser. This means that the BACKGROUND value of the *sign* corresponding to (73) contains the following mutual belief (in addition to the belief that *milkshake* normally refers to a milkshake and other beliefs; see Green 1994 for further details):

(74)
$$\left[\begin{array}{ll} \multicolumn{2}{l}{\textit{mutually-believe}} \\ \text{EXPERIENCER} & \boxed{2}\ \text{(speaker)} \\ \text{STANDARD} & \boxed{3}\ \text{(addressee)} \\ \text{SOA} & \left[\begin{array}{ll} \multicolumn{2}{l}{\textit{normally-believe}} \\ \text{EXPERIENCER} & \textit{sales agents} \\ \text{SOA} & \left[\begin{array}{ll} \multicolumn{2}{l}{\textit{rfunction}} \\ \text{DEMONSTRATUM} & \textit{purchase} \\ \text{DESIGNATUM} & \textit{purchaser} \end{array}\right] \end{array}\right] \end{array}\right]$$

Further, Green 2000 seeks to represent the illocutionary force of utterances within the value of CONTEXT|BACKGROUND[17] as speakers' intentions. For example, the illocutionary force of promising is analysed as a speaker's intention that the addressee recognize the speaker's intention that the addresse believe that the speaker commits himself or herself to be responsible for the content of the promise:

(75) Illocutionary force of promising:
$$\left[\begin{array}{ll} \text{CONX} & \left[\begin{array}{ll} \text{C-INDS} & \left[\begin{array}{ll} \text{SPEAKER} & \boxed{1} \\ \text{ADDRESSEE} & \boxed{2} \end{array}\right] \\ \text{BKGRND} & \left\{ \left[\begin{array}{ll} \multicolumn{2}{l}{\textit{intend}} \\ \text{EXPERIENCER} & \boxed{1} \\ \text{SOA} & \left[\begin{array}{ll} \multicolumn{2}{l}{\textit{recognize}} \\ \text{EXPERIENCER} & \boxed{2} \\ \text{SOA} & \left[\begin{array}{ll} \multicolumn{2}{l}{\textit{intend}} \\ \text{EXPERIENCER} & \boxed{1} \\ \text{SOA} & \left[\begin{array}{ll} \multicolumn{2}{l}{\textit{believe}} \\ \text{EXPERIENCER} & \boxed{2} \\ \text{SOA} & \left[\begin{array}{ll} \multicolumn{2}{l}{\textit{commit}} \\ \text{AGENT} & \boxed{1} \\ \text{SOA} & \left[\begin{array}{ll} \multicolumn{2}{l}{\textit{responsible}} \\ \text{THEME} & \boxed{1} \\ \text{SOA} & \textit{psoa} \end{array}\right] \end{array}\right] \end{array}\right] \end{array}\right] \end{array}\right] \end{array}\right] \right\} \end{array}\right] \end{array}\right]$$

[17] Contrast this with the representation of basic illocutionary types within CONTENT in Ginzburg & Sag 2000; cf. §5.1.2.

In case ARG-ST contains no clitics, the function $F_{\text{PRAF}}$ behaves like the identity function on its first argument, i.e., the value of FORM is identical to the value of I-FORM. However, if there are clitics on ARG-ST, the $F_{\text{PRAF}}$ function encodes a rather complex constraint which 'calculates' the order of clitics with respect to each other and with respect to the verb. For example, in the case of an indicative verb with only one pronominal 3rd person plural accusative 'clitic' on its ARG-ST, the $F_{\text{PRAF}}$ function adds the affix *les* in front of the value of I-FORM:

(79)
$$\begin{bmatrix} \text{MORPH} & \begin{bmatrix} \text{FORM } F_{\text{PRAF}}(\boxed{0},\boxed{1},\boxed{2}) = \textit{les-}\boxed{0} \\ \text{I-FORM } \boxed{0} \end{bmatrix} \\ \text{SYNSEM}|\text{LOC}|\text{CAT} & \begin{bmatrix} \text{HEAD } \boxed{1}\begin{bmatrix} \textit{verb} \\ \text{VFORM } \textit{indic} \end{bmatrix} \\ \text{ARG-ST } \boxed{2}\langle \text{NP, 'clitic'[pron,}\textit{acc,3pl}] \rangle \end{bmatrix} \end{bmatrix}$$

How are 'clitics' distinguished from other ARG-ST elements? Simplifying again, Miller & Sag 1997 assume that *synsem* elements can be partitioned into *canonical* synsems, i.e., those which may be realized as *sign*s, and *non-canonical* synsems, which cannot 'project' to full *sign*s. Two main types of *non-canonical* synsems are *gaps* and *affixes*:

(80)
- *synsem*
  - *canon*
  - *noncan*
    - *gap*
    - *aff*

With this type hierarchy of *synsem* objects in hand, a 'clitic' element of an ARG-ST is a synsem of type *aff*, e.g.:

(81) 'clitic'[pron,*acc*,*3pl*] in (79) =
$$\begin{bmatrix} \textit{aff} \\ \text{LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{noun} \\ \text{CASE } \textit{acc} \end{bmatrix} \\ \text{ARG-ST} & \langle\rangle \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \textit{ppro} \\ \text{INDEX } \textit{3pl} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Of course, the real challenge for any lexicalist approach to Romance cliticizations are the cases of so-called 'clitic climbing', where 'clitics' originating on the ARG-ST of one verb, such as *laver* in (82), are realized on a higher verb, such as the tense auxiliary *avoir* in (82).

(84) a. Ty widział**eś** tę książkę.
you saw that book
'You saw that book.'

b. Ty**ś** widział tę książkę.
you saw that book

This does not mean, though, that Borsley (1999) is forced to postulate two different morphemes *-(e)ś*. On the contrary, there is only one lexical entry for the weak auxiliary *-(e)ś*, i.e., (85).

(85)
$$\begin{bmatrix} \textit{weak-aux} & \\ \text{PHON} & \text{-(e)ś} \\ \text{SYNSEM}|\text{CAT} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix}\textit{verb} & \\ \text{VFORM} & \textit{fin}\end{bmatrix} \\ \text{VALENCE} & \begin{bmatrix} \text{SUBJ} & \boxed{1} \\ \text{COMPS} & \left\langle \begin{bmatrix} \ldots|\text{HEAD} & \begin{bmatrix}\textit{verb} & \\ \text{VFORM} & \textit{part}\end{bmatrix} \\ \ldots|\text{VALENCE} & \begin{bmatrix}\textit{valence} & \\ \text{SUBJ} & \boxed{1} \\ \text{COMPS} & \boxed{2}\end{bmatrix} \\ \ldots|\text{LEX} & + \end{bmatrix} \right\rangle \oplus \boxed{2} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(85) essentially states that *-(e)ś* is a finite verb which subcategorizes for a participle word (cf. the first element on the COMPS of *-(e)ś*), and takes over all arguments of this participle, in a way analogous to *avoir* in (83). As a result , a *syntactic* verbal complex 'participle + *-(e)ś*' is created, whose subcategorizing properties are exactly those of the participle. There is also a separate word order principle which states that the weak auxiliary must occur before (but not necessarily immediately before) the participle it subcategorizes for. A simplified version of this word order principle is given in (86).

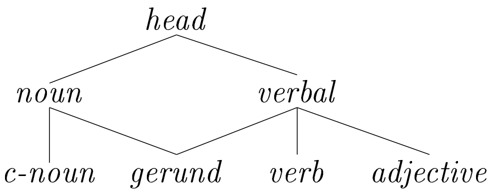
(86)
$$\begin{bmatrix}\textit{weak-aux}\\ \ldots|\text{COMPS}\ \langle \ldots \boxed{1} \ldots \rangle\end{bmatrix} < \boxed{1}\begin{bmatrix} \ldots|\text{HEAD} & \begin{bmatrix}\textit{verb} & \\ \text{VFORM} & \textit{part}\end{bmatrix} \\ \ldots|\text{LEX} & + \end{bmatrix}$$

These two principles are responsible for (84b). In the case of (84a), however, *widziałeś* is analysed as a *morphological* verbal complex, described by (87).

On the nominal side, verbal gerunds have a distribution similar to that of NPs, but not that of VPs or sentences; in particular, they may occur as complements of prepositions and as clause-internal subjects. On the verbal side, they seem to have an internal structure similar to that of verbs. Thus, they take the same complements as the corresponding verbs would, including accusative NPs, and they can be modified by adverbs, and not by adjectives.

Malouf 2000b accounts for this behavior by postulating the (partial) type hierarchy for *head* in (89a) and the lexical rule (89b).

(89) a.




b. $$\begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{verb} \\ \text{VFORM } \textit{prp} \end{bmatrix} \\ \text{VALENCE} & \begin{bmatrix} \text{SUBJ} & \langle \boxed{1}\text{NP} \rangle \\ \text{COMPS} & \boxed{2} \\ \text{SPR} & \langle\rangle \end{bmatrix} \end{bmatrix} \Rightarrow \begin{bmatrix} \text{HEAD} & \textit{gerund} \\ \text{VALENCE} & \begin{bmatrix} \text{SUBJ} & \langle \boxed{1} \rangle \\ \text{COMPS} & \boxed{2} \\ \text{SPR} & \langle \boxed{1} \rangle \end{bmatrix} \end{bmatrix}$$

Since *gerund* is a subtype of *noun* (toghether with common-*noun*s), it is able to occur anywhere an NP is selected for. Since *gerund* is a subtype of *verbal*, and adverbs modify any *verbal* category, it is modifiable by adverbs, but not by adjectives, which—by assumption—modify only *c-noun*s. Further, assuming that *noun*s have the attribute CASE and *verb*s (but not *verbal*s) have the attribute VFORM, *gerunds* have the attribute CASE (morphologically invisible in English), but not VFORM.

Finally, since the external argument of *gerund*s is, according to (89b), their subject and their specifier at the same time, gerundial phrases can instantiate either specifier-head constructions or subject-head constructions. More specifically, according to the type hierarchy of *phrase* assumed in Malouf 2000b, gerundial phrases can be either of type *nonfin-head-subj-cx*, in which case the external argument receives accusative case (cf. (88b)), or of type *noun-poss-cx*, in which case it gets the genitive case (cf. (88a)). Malouf 2000b shows also how this analysis accounts for the difference between POSS-*ing* and ACC-*ing* verbal gerunds in terms of their ability to be pied-piped together with their external argument, cf. (90a).

(90) a. I couldn't figure out [whose being late every day] Pat didn't like __.
(verbal POSS-*ing* gerund)

Assuming that the CASE feature is introduced by the type *cased*, while ASPECT and NEGATION are introduced by the type *aspectual*, the facts mentioned above are accounted for as follows. Since *v-noun* is a subtype of *noun*, verbal nouns have the distribution of NPs and may be modified by adjectival elements. Since it is a subtype of *cased*, they inflect for case. And since it is also a subtype of *aspectual*, they bear the morphosyntactic features ASPECT and NEGATION. Similarly, since *adj-prt* is a subtype of *adjectival*, adjectival participles may modify nouns just like adjectives; since it is a subtype of both *cased* and *aspectual*, they bear the features CASE, ASPECT and NEGATION; and, finally, since it is a subtype of *verbal*, they assign (structural) case to their arguments according to general case assignment rules valid for all verbal elements.

## 6.3 Case and Case Assignment

Although Pollard & Sag (1994:30) suggest that in HPSG, "[t]here is no separate theory of case (or Case). Nominative case assignment takes place directly within the lexical entry of the finite verb," while "the subject SUBCAT element of a nonfinite verb... does not have a CASE value specified", it has since become clear that a (partially) syntactic theory of case assignment is needed.

The most explicit such a theory is that of Heinz & Matiasek 1994.[19] This approach consists of three parts:

**First**, the type hierarchy for *case* does not simply list possible morphological cases (*nom*, *acc*, etc.) as subtypes of *case*, but is structured in such a way that it distinguishes between lexical (or inherent) case, assigned directly within lexical entries, and structural case, assigned in syntax proper.[20] For example, Heinz & Matiasek 1994 propose the following type hierarchy for *case* in German, which says that *nom*inative is always structural, *gen*itive and *acc*usative are either structural or lexical, and *dat*ive is always lexical.

[19]See Przepiórkowski 1999a, ch. 3 for a brief history of approaches to case assignment within HPSG and within other linguistic theories.

[20]This distinction is, of course, based on a similar dichotomy present in Chomskyan theories.

b. **Dem Installateur** wird geholfen.
the.DAT plumber AUX helped
'The plumber is helped.'

Similarly, the subject of most verbs, including *unterstützen* and *helfen*, is unstable in the sense that it is realized as nominative (when the subject is not raised to a higher verb) or as accusative (when the subject is raised to the object position of a higher verb).

**Third**, *str*uctural case is resolved by configurational constraints such as (96).

(96) a.
$$\begin{bmatrix} \textsc{synsem}|\textsc{loc}|\textsc{cat} & \begin{bmatrix} \textsc{head} & \begin{bmatrix} \textit{verb} \\ \textsc{vform}\ \textit{fin} \end{bmatrix} \\ \textsc{subcat} & \langle\rangle \end{bmatrix} \\ \textsc{dtrs} & \begin{bmatrix} \textit{h-c-str} \\ \textsc{head-dtr}|\ldots|\textsc{subcat}\ \langle \mathrm{NP}[\textit{str}],\ \ldots \rangle \end{bmatrix} \end{bmatrix} \rightarrow$$
$$\begin{bmatrix} \textsc{dtrs}|\textsc{head-dtr}|\ldots|\textsc{subcat}\ \langle \mathrm{NP}[\textit{snom}],\ \ldots \rangle \end{bmatrix}$$

b.
$$\begin{bmatrix} \textsc{synsem}|\textsc{loc}|\textsc{cat} & \begin{bmatrix} \textsc{head}\ \textit{verb} \\ \textsc{subcat}\ \langle\rangle \vee \langle \textit{synsem} \rangle \end{bmatrix} \\ \textsc{dtrs} & \begin{bmatrix} \textit{h-c-str} \\ \textsc{head-dtr}|\ldots|\textsc{subcat}\ \langle \textit{synsem},\ \mathrm{NP}[\textit{str}],\ \ldots \rangle \end{bmatrix} \end{bmatrix} \rightarrow$$
$$\begin{bmatrix} \textsc{dtrs}|\textsc{head-dtr}|\ldots|\textsc{subcat}\ \langle \textit{synsem},\ \mathrm{NP}[\textit{sacc}],\ \ldots \rangle \end{bmatrix}$$

What these two constraints say is, roughly, that the first SUBCAT element of a finite verb is assigned nominative case provided this element is *str*uctural and realized locally (as the subject; cf. (96a)), and that the second element of a SUBCAT of a verb is assigned accusative case provided this element is *str*uctural and it is realized locally (as the object; cf. (96a)). Note that, assuming more current feature architecture in which SUBCAT is replaced by VALENCE features and by ARG-ST (cf. §2.2), SUBCAT plays here the rôle of VALENCE attributes SUBJECT and COMPLEMENTS, and not the rôle of ARG-ST.

This theory nicely accounts for data such as (94)–(95), as well as for more complex data, e.g., involving so-called remote passivization in German (Pollard 1994a; Heinz & Matiasek 1994). Nevertheless, as discussed in Przepiórkowski 1999a, such a configurational theory faces a number of conceptual and technical problems which require considerable modifications; in particular, it is incompatible with current HPSG approaches to extraction and to cliticization. In brief, this is because case is crucially assigned on VALENCE attribute(s) here, other languages, as well as Calcagno & Pollard 1997, Chung 1998b, Kupść 1999, Calcagno 1999, Meurers 1999a, 1999b and Malouf 2000a for other applications.

## 6.4 Agreement

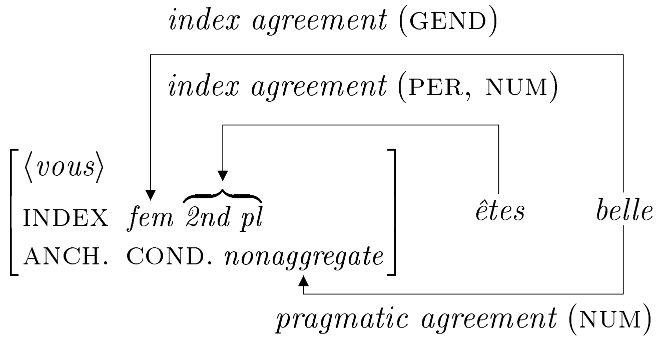
Considerably more detailed attention to agreement phenomena is paid in HPSG than other grammatical frameworks. Part of the reason may lie in the fact that the multiple layers of linguistics information represented simultaneously in HPSG-style signs are particularly amenable to a view of agreement that considers it to straddle (morpho-)syntax, semantics, and pragmatics. In fact, Pollard & Sag (1994) argue that agreement is not actually a unfied phenomenon at all, but instead may involve these three components of the grammar to different degrees, depending on the kind of dependency involved (e.g., NP-internal agreement vs. pronoun-antecedent agreement, etc.) and the choices made by particular grammars.

The central concept of the HPSG theory of agreement is that of an INDEX, a concept that unifies some of the properties of constants and variables from logical formalisms. In the simplest cases an index is an abstract linguistic entity that is referentially linked to some object in the interpretation domain. Indices are also used with quantificational expressions, in which case they behave very much like variables. Unlike constants and variables in logic, however, indices have internal organization that reflects properties of the associated linguistic entities or referential objects, or both. In English, this information includes number, gender, and person. This makes it possible to straightforwardly account for a number of agreement phenomena. For instance, if we assume that the relation between reflexive pronouns and their antecedents involves identity in index values, then the distribution of forms in (98) falls out automatically.

(98) a. I saw {myself/*himself/*herself} in the mirror.
b. He saw {*myself/himself/*herself} in the mirror.
c. She saw {*myself/*himself/herself} in the mirror.

The necessity of indices as essential mediaries between form and meaning has been challenged for instance by Dowty & Jacobson (1988), who propose a strictly semantic approach to agreement relations of the kind illustrated in (99). However, as Pollard & Sag (1994) point out, a purely semantic approach runs into difficulties when there exist conflicting ways of referring to some entity by a linguistic form. For instance, English allows pets to be referred to either in terms of the neuter pronoun or in terms of their natural

(102)




Finally, there exist cases of agreement that do not plausibly involve indices at all. Indices only carry information about number, person, and gender (as reflected by the slots in the pronominal paradigm). However, they do not encode distinctions in case. This is well-motivated because typically pronoun-antecedent relations involve discrepancies in case marking while sharing all the index information (cf. (98)). Yet, in many languages there is covariation of case within NPs, cf. the following data from German:

(103)

| | | | |
|---|---|---|---|
| NOMINATIVE | ein | lieb**er** | Verwandt**er** |
| ACCUSATIVE | ein**en** | lieb**en** | Verwandt**en** |
| | a | dear | relative |

Such cases of what Pollard & Sag (1994) call "case concord" are dealt with by assuming that adjectives have their own CASE feature whose value is constrained to be identical to that of the noun. Thus the potential of morphological variation of the head (noun) and the dependent (adjective) is directly reflected in their own independent CASE features. This contrasts with Pollard & Sag's (1994) view of other agreement relations. In particular verbal agreement morphology is taken to be a mere reflection of the combinatorial potential of a given verb. For instance, English *-s* only tells us something about the ability of a verbal form to combine with a third person dsingular subject—there is no independent reflection of third singular properties within the lexical description of *walks.*

As Kathol (1999b) argues, this position is somewhat unsatisfactory in view of constructions in which there is no subject present. Consider for instance the case of impersonal passives in German. Here, the passive auxiliary instantiates third singular morphology even though there is no agreement "target":

(104) An jenem Abend {wurde/*wurden} viel gelacht.
on that evening was.3.SG/were.3.PL much laughed
'There was much laughter that evening.'

study of these correlations and possible exceptions in Serbo-Croation is undertaken by Wechsler & Zlatić (forthcoming), who also also bring into view the role that declension classes play in determining agreement behavior. As a result, Wechsler & Zlatić distinguish four levels at which agreement-related information can be brought to bear. In addition to semantics (i.e., anchoring conditions), index, and concord, they propose that the declension class should also be represented lexically. While declension class is not a direct parameter of covariation, nevertheless the morphological shape determined by a declension class may be responsible for certain concord facts which are in apparent conflict with the semantically conditioned feature assignment (given in terms of *index* features). Consider the following data from Serbo-Croatian:

(107) a. *det-e* ('child')

| | |
|---|---|
| declension class | I (typically for masc. and neut. nouns) |
| concord | neuter sing |
| index | neuter sing |

b. *det-a* ('children')

| | |
|---|---|
| declension class | II (typically for fem. nouns) |
| concord | feminine sing |
| index | neuter plural |

The morphological realization of the plural *deta (det-a)* ('children') is in terms of declension class II, which is normally associated with femine nouns. The plural form of this noun acts "as if" it were singular feminine for the purposes of adjectival concord (108b):

(108) a. ovo lepo dete
that.NEUT.SG beautiful.NEUT.SG child.NEUT.SG
'that beautiful child'

b. ova lepa deca
that.FEM.SG beautiful.FEM.SG child.FEM.SG
'those beautiful children'

Outside of the NP more semantically based become operative again, as evidenced by plural marking on an agreeing verb, cf. (109):

(109) Ta dobra deca dolaze.
that.FEM.SG good.FEM.SG children come.PAST.3.PL
'Those good children came.'

or less straighforwardly allow to encode large parts of HPSG grammars. However, they lack mechanisms necessary to encode other parts of HPSG analyses, mainly those involving so-called relational constraints and quantification. As Richter *et al.* 1999 and Richter 2000 point out, analyses making implicit or explicit reference to such mechanisms abound in HPSG literature.

One famous case in point is Pollard & Sag's (1994) Binding Theory, cited in (112) below.

(112) The Binding Theory (Pollard & Sag 1994:401):

*Principle A:* A locally o-commanded anaphor must be locally o-bound.
*Principle B:* A personal pronoun must be locally o-free.
*Principle C:* A nonpronoun must be o-free.

This principle relies on notions such as *(local) o-command*, *(local) o-binding* and *(local) o-freeness*, which in turn rely on the notion of obliqueness. Relevant definitions are cited below (Pollard & Sag 1994:401):

(113) a. One *synsem* object is *more oblique* than another provided it appears to the right of the other on the SUBCAT list of some word.

b. One referential *synsem* object *locally o-commands* another provided they have distinct LOCAL values and either (1) the second is more oblique than the first, or (2) the second is a member of the SUBCAT list of a *synsem* object that is more oblique than the first.

c. One referential *synsem* object *o-commands* another provided they have distinct LOCAL values and either (1) the second is more oblique than the first, or (2) the second is a member of the SUBCAT list of a *synsem* object that is o-commanded by the first, or (3) the second has the same LOCAL | CATEGORY | HEAD value as a *synsem* object that is o-commanded by the first.

d. One referential *synsem* object *(locally) o-binds* another provided it (locally) o-commands and is coindexed with the other. A referential *synsem* object is *(locally) o-free* provided it is not (locally) o-bound. Two *synsem* entities are *coindexed* provided their LOCAL | CONTENT | INDEX values are token-identical.

It is clear that the definitions in (113) are really definitions of relations. For example, according to (113a), two *synsem* objects $x$ and $y$ stand in the *more oblique* relation provided there exsists a word $w$ such that $x$ is to the right of $y$ on $w$'s SUBCAT list. Similarly, according to (113b), two objects $x$ and $y$

(115) Principle A of Pollard & Sag's (1994) Binding Theory (in RSRL):

$$\forall x\ ((^{x}[\textsc{loc cont}\ \mathit{ana}]\ \wedge\ \exists y\ \texttt{loc-o-command}(y,x))\ \rightarrow \\ \rightarrow\ \exists z\ \texttt{loc-o-bind}(z,x))$$

**(explain notation here?)** AK

Similarly, taking into consideration the fact that being *(locally) o-free* is tantamount to *not* being *(locally) o-bound* (cf. (113d)), Principles B and C could be formalized in RSRL as follows:

(116) Principles B and C of Pollard & Sag's (1994) Binding Theory (in RSRL):

a. $\forall x\ (^{x}[\textsc{loc cont}\ \mathit{ppro}]\ \rightarrow\ \neg\exists y\ \texttt{loc-o-bind}(y,x))$

b. $\forall x\ (^{x}[\textsc{loc cont}\ \mathit{npro}]\ \rightarrow\ \neg\exists y\ \texttt{o-bind}(y,x))$

For these formalizations of Principles A–C of Pollard & Sag's (1994) Binding Theory to have the intended effect it is necessary to define the meaning of relation symbols `loc-o-command`, `loc-o-bind` and `o-bind`. We will first define the simpler relation `more-oblique`:

(117) $\texttt{more-oblique}(x,y)\ \stackrel{\forall}{\Longleftarrow}$

$$^{w}\begin{bmatrix}\mathit{word}\\ \textsc{ss loc cat subcat}\ \boxed{1}\end{bmatrix}\ \wedge\ \texttt{to-the-right}(x,y,\boxed{1})$$

According to this definition, $x$ and $y$ stand in the `more-oblique` relation if and only if there are $w$ and $\boxed{1}$ such that $w$ is a *word* whose SYNSEM | LOCAL | CATEGORY | SUBCAT is $\boxed{1}$ and $y$ is `to-the-right` of $x$ on $\boxed{1}$.[24] Note that this definition relies on the convention according to which (i) variables present on the left hand side of '$\stackrel{\forall}{\Longleftarrow}$' are quantified universally, while (ii) variables present only on the right hand side of '$\stackrel{\forall}{\Longleftarrow}$' are quantified existentially.

The definition of `loc-o-command` is more complex but its overall logical structure corresponds to the prose in (113b).

(118) $\texttt{loc-o-command}(x,y)\ \stackrel{\forall}{\Longleftarrow}$

$$(^{x}[\textsc{loc}\ \boxed{1}[\textsc{cont index}\ \mathit{ref}]]\ \wedge \\ ^{y}[\textsc{loc}\ \boxed{2}[\textsc{cont index}\ \mathit{ref}]]\ \wedge \\ \neg\boxed{1} = \boxed{2})\ \wedge \\ (\texttt{more-oblique}(y,x)\ \vee$$

[24]See Richter 2000, §4.2 for the straightforward definition of `to-the-right` as used in (117) and `member` as used in (118). Also, note that both letters and tags are used as variables in RSRL descriptions.

$$(121') \quad \forall \boxed{1} \left( \left( \begin{bmatrix} \textit{phrase} \\ \text{SYNSEM} \ldots \ \text{CASE} \ \boxed{1} \end{bmatrix} \wedge \left( \boxed{1} \textit{dative} \vee \boxed{1} \textit{instrumental} \right) \right) \rightarrow \right.$$
$$\left. \rightarrow \ \exists x \ {}^{x}\begin{bmatrix} \textit{inflected-word} \\ \text{SYNSEM} \ldots \ \text{CASE} \ \boxed{1} \end{bmatrix} \right)$$

Constraint (121) illustrates an important aspect of RSRL: this constraint has the effect intended in the informal description (119) only because RSRL quantification is restricted to components of the described object, i.e., to values of paths within the described object. Since (121) is a constraint on *phrase*s with *dative* or *instrumental* SYNSEM|...|CASE values, the existential quantifier $\exists x$ ranges over objects within such a phrase, so the *word* overtly inflected for case must be somewhere within this phrase. Without this restriction on quantification, the existential quantifier could pick up a dative or instrumental element somewhere else within the sentence (or, more generally, anywhere within the model), and the constraint (121) would in effect state that, whenever there is a *dative* or *instrumental phrase*, there must be an *inflected-word* with the same case value *anywhere* in the sentence (or in the model).

Despite its relative novelty, RSRL has already been employed in HPSG accounts of a variety of phenomena, including German clause structure (Richter 1997b; Richter & Sailer 2000), semantic scope (Przepiórkowski 1997), underspecified semantics (Richter & Sailer 1999c), linearization (Penn 1999a), negative concord (Richter & Sailer 1999a, 1999b), Montagovian semantics (Sailer 2000), case assignment (Przepiórkowski 1999a; Meurers 1999a; Wechsler & Zlatić 2000) and morphology (Reinhard 2000).

# 8 Conclusion

More than a well-defined theory of grammar, HPSG is probably best seen as a collection of analyses by a research community that is linked by a common commitment to nonderivational, lexicalist, formally precise, and computationally tractable descriptions of natural language phenomena. Together with LFG it can claim to be the most popular formal grammar paradigm outside of the transformational "mainstream" and the number of researchers working in it has steadily been on the rise. Beginning in 1993 there has been an annual conference exclusively devoted to HPSG-based work that has attracted a truly international audience and done much to foster a sense of community among HPSG researchers of all trades. Given the attention to descriptive precision and sound formal foundations, it should not come as a surprise that there are now numerous implementations of the framework and even a commercial

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