

The one and only handbook of Head-Driven Phrase Structure Grammar

Edited by

Anne Abeillé

Robert D. Borsley

Jean-Pierre Koenig

Stefan Müller

Empirically Oriented Theoretical
Morphology and Syntax 99



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Preface

Acknowledgments

Part I

Introduction

Chapter 1

Basic properties and elements

Bob Borsley

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1 Introduction

Phasellus maximus erat ligula, accumsan rutrum augue facilisis in. Proin sit amet pharetra nunc, sed maximus erat. Duis egestas mi eget purus venenatis vulputate vel quis nunc. Nullam volutpat facilisis tortor, vitae semper ligula dapibus sit amet. Suspendisse fringilla, quam sed laoreet maximus, ex ex placerat ipsum, porta ultrices mi risus et lectus. Maecenas vitae mauris condimentum justo fringilla sollicitudin. Fusce nec interdum ante. Curabitur tempus dui et orci convallis molestie (Chomsky 1957).

Meier (2017)



- (1) Latin (personal knowledge)
 cogit-o ergo sum
 think-1SG.PRS.IND hence exist.1SG.PRS.IND
 ‘I think therefore I am’

Sed nisi urna, dignissim sit amet posuere ut, luctus ac lectus. Fusce vel ornare nibh. Nullam non sapien in tortor hendrerit suscipit. Etiam sollicitudin nibh ligula. Praesent dictum gravida est eget maximus. Integer in felis id diam sodales accumsan at at turpis. Maecenas dignissim purus non libero scelerisque porttitor. Integer porttitor mauris ac nisi iaculis molestie. Sed nec imperdiet orci. Suspendisse sed fringilla elit, non varius elit. Sed varius nisi magna, at efficitur orci consectetur a. Cras consequat mi dui, et cursus lacus vehicula vitae. Pellentesque sit amet justo sed lectus luctus vehicula. Suspendisse placerat augue eget felis sagittis placerat.

Table 1: Frequencies of word classes

	nouns	verbs	adjectives	adverbs
absolute	12	34	23	13
relative	3.1	8.9	5.7	3.2

Sed cursus¹ sapien pulvinar. Sed consequat, magna². Nunc dignissim tristique massa ut gravida. Nullam auctor orci gravida tellus egestas, vitae pharetra nisl porttitor. Pellentesque turpis nulla, venenatis id porttitor non, volutpat ut leo. Etiam hendrerit scelerisque luctus. Nam sed egestas est. Suspendisse potenti. Nunc vestibulum nec odio non laoreet. Proin lacinia nulla lectus, eu vehicula erat vehicula sed.

Abbreviations

COP	copula	NEG	negation
FV	final vowel	SM	subject marker

¹eros condimentum mi consectetur, ac consectetur

²eu scelerisque laoreet, ante erat tristique justo, nec cursus eros diam eu nisl. Vestibulum non arcu tellus

Acknowledgements

References

- Chomsky, Noam. 1957. *Syntactic structures* (Janua Linguarum / Series Minor 4). The Hague/Paris: Mouton.
- Meier, Jane. 2017. *Language universals and linguistic typology*. Oxford: Basil Blackwell.

Chapter 2

The evolution of HPSG

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Carl Pollard

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1 Introduction

Spanish (Chomsky 1957)

Abbreviations

COP copula

FV final vowel

NEG negation

SM subject marker



Dan Flickinger, Tom Wasow & Carl Pollard. 2018. The evolution of HPSG. in Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 7–8. Berlin: Language Science Press. DOI:??

Acknowledgements

Nullam a ullamcorper diam, ut sagittis lorem. Aenean ullamcorper, quam sed interdum sodales, nibh mi venenatis odio, ac elementum sem leo et urna. Ut at laoreet erat. Morbi quis odio enim. Duis pulvinar eget tellus posuere pharetra. Fusce mollis hendrerit magna, eget ornare diam aliquam in. Maecenas condimentum mi a augue consectetur, id sagittis risus tempor. Integer vel velit venenatis, porta tellus nec, hendrerit purus. Mauris nisl justo, elementum et justo a, cursus tincidunt mauris. Nunc fermentum leo sed eros tincidunt, eu placerat dui sodales. In vulputate luctus libero, at pulvinar ligula.

References

Chomsky, Noam. 1957. *Syntactic structures* (Janua Linguarum / Series Minor 4). The Hague/Paris: Mouton.

Chapter 3

Formal Background

Frank Richter

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Frank Richter

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aliquet eleifend. finality

Abbreviations

Acknowledgements

Chapter 4

The nature and role of the lexicon in HPSG

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Chapter 5

Understudied languages

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Abbreviations

Acknowledgements

Part II

Syntactic phenomena

Chapter 6

Agreement

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Steve Wechsler

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aliquet eleifend. finality

Abbreviations

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Chapter 7

Case

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Abbreviations

Acknowledgements

Chapter 8

Argument structure and linking

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1 Introduction

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Jean-Pierre Koenig, Steve Wechsler & Anthony Davis. 2018. Argument structure and linking. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 21–22. Berlin: Language Science Press. DOI:??

quis nunc a turpis porttitor mollis. In luctus nulla id nunc dapibus, id rhoncus lorem pretium. Nunc eget fringilla velit, semper commodo diam. Suspendisse odio odio, euismod ac ornare sed, tincidunt ac arcu. Pellentesque vitae fringilla orci. Donec faucibus metus dui, nec iaculis purus pellentesque sit amet. Sed fermentum lorem non augue cursus, eu accumsan risus ullamcorper. Suspendisse rhoncus magna vitae enim pellentesque, eget porttitor quam finibus. Nunc ultricies turpis at quam vehicula, at tempus justo molestie. Proin convallis augue ut turpis cursus rhoncus. Donec sed convallis justo. Sed sed massa pharetra ex aliquet eleifend. finality

Abbreviations

Acknowledgements

Constituent order

Humboldt-Universität zu Berlin

1 Introduction

(1) Kim likes bagels.

(2) Bagels, Kim likes.

(3) a. [weil] der Mann der Frau das Buch gibt (German)
because the man the woman the book gives
b. [weil] der Mann das Buch der Frau gibt
because the man the book the woman gives



- c. [weil] das Buch der Mann der Frau gibt
because the book the man the woman gives
- d. [weil] das Buch der Frau der Mann gibt
because the book the woman the man gives
- e. [weil] der Frau der Mann das Buch gibt
because the woman the man the book gives
- f. [weil] der Frau das Buch der Mann gibt
because the woman the book the man gives
- (4) Gibt der Mann der Frau das Buch? (German)
gives the man the woman the book
'Does the man give the woman the book?'

(3) shows that in addition to the unmarked order in (3) (see Höhle (1982) on the notion of unmarked order), five other argument orders are possible in sentences with verbs with three arguments.

(4) shows that the verb is placed in initial position in questions in German. This contrasts with the verb final order in (3a). This alternation of verb placement is usually treated as head movement in the GB literature.

The following sections deal with the theoretical options for dealing with these phenomena that exist within the HPSG framework. I will discuss flat vs. binary branching structures and an extension to standard HPSG that was introduced by Reape (1994): constituent order domains. Such constituent order domains allow for even more freedom and have been used to account for languages like Warlipri (Donohue & Sag 1999).

2 ID/LP format

HPSG was developed out of GPSG and Categorical Grammar. The ideas concerning linearization of daughters in a local tree were taken over from GPSG (Gazdar, Klein, Pullum & Sag (1985)). In GPSG a separation between immediate dominance and linear precedence is assumed. So, while in classical phrase structure grammar a phrase structure rule like (5) states that the NP[nom], NP[dat] and NP[acc] have to appear in exactly this order:

- (5) $S \rightarrow NP[nom], NP[dat], NP[acc], V$

This is different within GPSG and HPSG. The corresponding schemata do not express information about ordering. Instead there are separate linearization rules.

A schema like (5) licenses 24 different orders: the six permutations of the three arguments that were shown in (3) and all possible placements of the verb (to the right of NP[acc], between NP[dat] and NP[acc], between NP[nom] and NP[dat], to the left of NP[nom]). Orders like NP[nom], NP[dat], V, NP[acc] are not attested in German and hence these linearizations have to be filtered out. This is done by linearization rules, which can refer to features or to the function of a daughter in a schema. (6) shows some examples of linearization rules:

- (6) a. $X < V$
 b. $X < V[INI-]$
 c. $X < \text{Head } [INI-]$

The first rule says that all constituents have to precede a V in the local tree. The second rule says that all constituents have to precede a V that has the INITIAL value $-$. One option to analyze German would be the one that was suggested by Uszkoreit (1987) within the framework of GPSG: one could allow for two linearization variants of finite verbs. So in addition to the INI $-$ variant there could be a INI $+$ variant and this variant would be linearized initially. The LP rule in (6c) is more general than (6b) in that it does not mention the part of speech but instead refers to the function of the constituent. The rule says that a head that has the INI value $-$ has to be linearized to the right of all other elements in the local tree.

This treatment of constraint on linearization has an advantage that was already pointed out by researchers working in GPSG: it captures the generalizations regarding linearization. For instance the order of verbs and their arguments is the same in embedded sentences in German independent of the finiteness of the verb:

- (7) a. dass er dem Mann das Buch gab
 that he the man the book gave
 ‘that he gave the man the book’
 b. dass er versucht, [dem Mann das Buch zu geben]
 that he tried the man the book to give
 ‘that he tried to give the man the book’

This is also true for the relative order of dative and accusative object in (7). The constraints regarding linearization hold across rules. By factoring these constraints out, the generalizations can be captured.

3 Flat and binary branching structures

The previous section discussed LP rules and used flat phrase structure rules for illustration. The corresponding flat structures are also used in HPSG. Schema ??hows a Head-Complement schema that combines a head with all the complements selected via the COMPS list.

Schema 1 (Head-Complement Schema)

head-complement-phrase \Rightarrow

$$\left[\begin{array}{cc} \text{COMPS} & \diamond \\ \text{HEAD-DTR} & \left[\text{COMPS } \boxed{1} \right] \\ \text{NON-HEAD-DTRS} & \text{synsem2sign}(\boxed{1}) \end{array} \right]$$

synsem2sign is a relational constraint mapping *synsem* objects as they are contained in the COMPS list onto objects of type *sign* as they are contained in daughters (Pollard & Sag 1994).¹ Researchers working on English usually assume a flat structure for English but assuming binary branching structures would be possible as well, as is clear from analyses in Categorical Grammar, where binary combinatory rules are assumed (Ajdukiewicz 1935; Steedman 2000). For languages like German it is usually assumed that structures are binary branching (but see Reape (1994) and Bouma & van Noord (1998: 51)). The reason for this is that adverbs can be placed anywhere between the arguments and a straightforward analysis is to assume that adjuncts can attach to any verbal projection.

(8)

Binary branching structures with attachment of adjuncts to any verbal projection also accounts for recursion and hence the fact that arbitrarily many adjuncts can attach to a verbal projection. Of course it is possible to formulate analyses with flat structures that involve arbitrarily many adjuncts (Kasper 1994; van Noord & Bouma 1994; Bouma et al. 2001), but these analyses involve relational constraints in schemata or in lexical items. In Kasper's analysis the relational constraints walk through lists of daughters of unbounded length in order to compute the semantics. In the other two analyses adjuncts are treated as valents, which may be problematic because of scope issues. This cannot be dealt with in detail here but see Levine & Hukari (2006) and Chaves (2009) for discussion.

The following schema licenses binary branching head-complement phrases:

¹In Sign-Based Construction Grammar the objects in valence lists are of the same type as the daughters. A relational constraint would not be needed in this variant of the HPSG theory.

Schema 2 (Head-Complement Schema (binary branching))*head-complement-phrase* \Rightarrow

$$\left[\begin{array}{ll} \text{COMPS} & \boxed{1} \oplus \boxed{2} \\ \text{HEAD-DTR} & \left[\text{COMPS } \boxed{1} \oplus \langle \boxed{3} \rangle \oplus \boxed{2} \right] \\ \text{NON-HEAD-DTRS} & \langle \left[\text{SYNSEM } \boxed{3} \right] \rangle \end{array} \right]$$

\oplus (append) is a relational constraint that concatenates two lists. The COMPS list of the head daughter is split into three lists: a beginning ($\boxed{1}$), a list containing $\boxed{3}$ and a rest ($\boxed{2}$). $\boxed{3}$ is identified with the SYNSEM value of the non-head daughter. All other elements of the COMPS list of the head daughter are concatenated and the result of this concatenation ($\boxed{1} \oplus \boxed{2}$) is the COMPS list of the mother node. This schema is very general. It works for languages that allow for scrambling since it allows to take an arbitrary element out of the COMPS list of the head daughter and realize it in a local tree. The schema can also be parametrized to account for languages with fixed word order. For head final languages with fixed order $\boxed{2}$ would be the empty list and for head-initial languages with fixed order (e.g., English) $\boxed{1}$ would be the empty list.

The alternative to using relational constraints as in Schema 2 is to use sets rather than lists for the representation of valence information (Gunji 1986; Hinrichs & Nakazawa 1989; Pollard 1996; Engelkamp, Erbach & Uszkoreit 1992). The disadvantage of set-based approaches is that sets do not impose an order on their members but an order is needed for various subtheories of HPSG (see Chapter 7 on case assignment, and Chapter 20 on Binding Theory). In the approach proposed above and in Müller (2003; 2015a,b), the valence lists are ordered but the schema allows for combination with any element of the list. For valence representation and the order of elements in valence lists see Chapter 8.

maybe
cite Ackerman et al.
(2018)

4 Head movement vs. constructional approaches assuming flat structures

The Germanic languages signal the clause type by verb position. All Germanic languages with the exception of English are V2 languages: the finite verb is in second position in declarative main clauses. The same holds for questions with *wh* phrases. Yes/no questions are formed by putting the verb in initial position. English is a so-called *residual V2 language*. While declarative clauses are in base order (SVO), questions follow the pattern that is known from other Germanic languages.

(9) a.

Analyses assuming flat structures (or flat linearization domains, see Section 5) usually treat alternative orders of verbs in Germanic languages as linearization variants (Reape 1994; Kathol 2001; Müller 1995; 2003; Bjerre 2006), but this is not necessarily so as Bouma and van Noord's analysis of Dutch clauses show (Bouma & van Noord 1998: 62, 71). The alternative to verb placement as linearization is something that is similar to verb-movement in Government & Binding: a trace takes the position of the verb in its canonical position and the verb is realized in initial or second position. The following subsection deals with such approaches in more detail. Subsection 4.2 deals with a constructional approach.

4.1 Head movement approaches

Borsley (1989) showed that in addition to the analysis of auxiliary inversion in English that was suggested in GPSG (Gazdar et al. 1985) an analysis that is similar to the movement-based analysis in GB is possible in HPSG as well. The technique that is used in the analysis is basically the same that was developed by Gazdar (1981) for the treatment of nonlocal dependencies in GPSG. A trace is assumed and the information about the missing element is passed up the tree until it is bound off at an appropriate place (that is by the fronted verb). The analysis of (10) is shown in Figure 1.

(10) Did Kim get the job?

A special variant of the auxiliary selects a full clause in which an auxiliary is missing. The fact that the auxiliary is missing is represented as the value of DSL. The value of DSL is a *synsem* object, that is something that contains syntactic and semantic information ([2] in Figure 1). DSL is a head feature and hence available everywhere along a projection path (see Chapter 1 for the Head Feature Principle).

The trace for head movement is rather simple:

$$(11) \left[\begin{array}{cc} \text{word} & \\ \text{PHON} & \diamond \\ \text{SYNSEM|LOC} & [1] \left[\text{CAT|HEAD|DSL} [1] \right] \end{array} \right]$$

It states that there is an empty element that has the local requirements that correspond to its DSL value. For cases of verb movement it says: I am a verb that is missing itself. The fronted auxiliary is licensed by a lexical rule that maps a non-fronted auxiliary onto one that selects a complete clause from which the input auxiliary is missing.

check reference to Chapter 1.

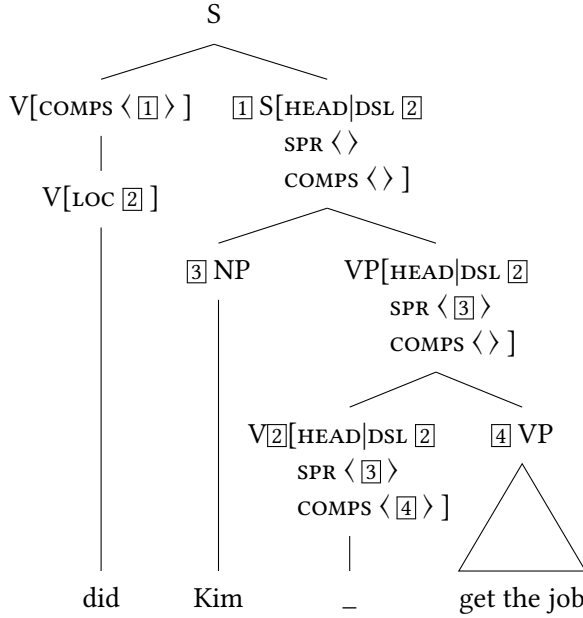


Figure 1: Analysis of English auxiliary constructions as head-movement following (Borsley 1989)

Such head-movement analyses are assumed by most researchers working on German (Kiss & Wesche 1991: Section 4.7; Oliva 1992; Netter 1992; Kiss 1993; Frank 1994; Kiss 1995; Feldhaus 1997, Meurers 2000; Müller 2005a; Müller 2017) and also by (Bouma & van Noord 1998: 62, 71) in their work on Dutch, by Müller & Ørsnes (2015) in their grammar of Danish and by Müller (2018) for Germanic in general.

4.2 Constructional approaches

The alternative to head-movement-based approaches is a flat analysis with an alternative serialization of the verb. This was already discussed with respect to German, but I want to discuss English auxiliary constructions here, since the figured prominently in linguistic discussions. This tree is licensed by a schema combining a head with its subject (1) and its VP complement (2) in one go. As is common in HPSG since 1995 (Sag 1997) phrasal schemata are organized in type hierarchies and the general schema for auxiliary initial constructions has the type *aux-initial-cxt*. (Fillmore 1999) and Sag & Chaves (2018) argue that there are various usages of auxiliary-initial constructions and assign the respective usages

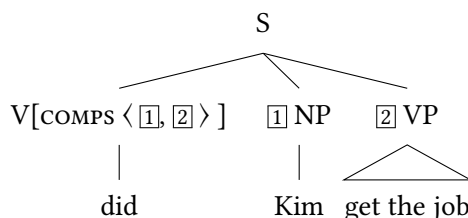


Figure 2: Analysis of English auxiliary constructions according to (Sag & Chaves 2018)

to subconstructions of the general auxiliary-initial construction. Technically this amounts to stating subtypes of *aux-initial-cxt*. For example, Sag & Chaves (2018) posit a subtype *polar-int-cl* for polar interrogatives like (12a) and another subtype *auxinitial-excl-cl* for exclamatives like (12b).

- (12) a. Are they crazy?
b. Are they crazy!

Chomsky (2010) compared the various clause types used in HPSG with the – according to him – much simpler Merge-based analysis in Minimalism. Minimalism assumes just one very general schema for combination (External Merge is basically equivalent to our Schema 2 above, see Müller (2013)), so this rule for combining linguistic objects is very simple, but this does not help in any way when considering the facts: there are at least three different meanings associated with auxiliary initial clauses and these have to be captured somewhere in a grammar. One way is to state them in a type hierarchy as is done in some HPSG analyses and in SBCG, another way is to use implicational constraints that assign meaning with respect to actual configurations (see Section 4.3) and a third way is to do everything lexically. The only option for Minimalism is the lexical one. This means that Minimalism has to either assume as many lexical items for auxiliaries as there are types in HPSG or to assume empty heads that contribute the meaning that is contributed by the phrasal schemata in HPSG (Borsley 2006; Borsley & Müller 2018). The latter proposal is generally assumed in Cartographic approaches (Rizzi 1997). Since there is a fixed configuration of functional projections that contribute semantics, one could term these Rizzi-style analyses *Crypto-Constructional*.

4.3 Mixed approaches

The situation with respect to clause types is similar in German. Verb first sentences can be yes/no questions, imperatives, conditional clauses, and declarative sentences with topic drop.

- (13) a. Kommt Peter?
 b. Komm!
 c. Kommt Peter, komme ich nicht.
 d. Kommt. (Was ist mit Peter?)

Verb second sentences can be questions, declarative sentences, or imperatives.

- (14) a. Peter kommt.
 b. Jetzt komm!
 c. Wer kommt?

While one could try and capture this situation by assuming surface order-related clause types, such approaches are rarely assumed (but see Kathol (2001) and Wetta (2011). See Section ??n why such approaches are doomed to failure). Rather researchers assumed binary branching head-complement structures together with verb movement (I assumed linearization domains (see Section 5) for ten years and then switched to the head-movement approach (Müller 2005a,b; 2017)).

As was explained above, the head movement approaches are based on lexical rules or unary projections. These license new linguistic objects that could contribute the respective semantics. As Borsley (2006) pointed out, this would mean that one needs seven versions of fronted verbs to handle the seven cases in (13) and (14), which would correspond to the seven phrasal types that would have to be stipulated in phrasal approaches. But there is a way out of this: one can assume one lexical item with underspecified semantics. HPSG makes it possible to use implicational constraints referring to a structure in which an item occurs. Depending on the context the semantics contributed by a specific item can be further specified. Figure 3 shows the construction-based and the lexical rule-based analysis for comparison. In the construction-based analysis the daughters contribute x and y as semantic values and the whole construction adds the construction meaning f . In the lexical rule- or unary projection-based analysis, the lexical rule/unary projection adds the f and the output of the rule is combined compositionally with the other daughter. Now, implicational constraints can be used to determine the exact contribution of the lexical item (Müller 2016). This is shown with the example of a question in Figure 4. The implication says: when the

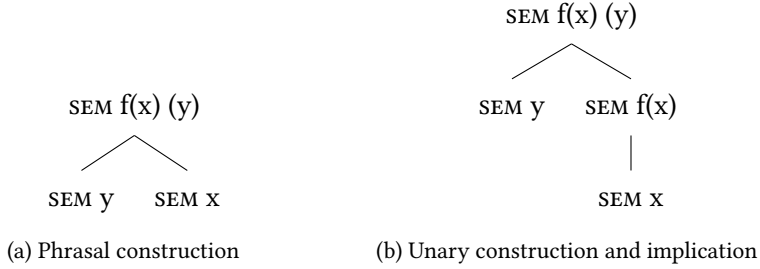


Figure 3: Construction-based, phrasal approach and approach with implicational constraint

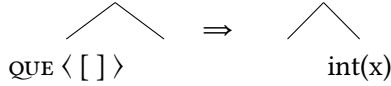


Figure 4: Implication for interrogative sentences

configuration has the form that there is a question pronoun in the left daughter, the output of the lexical rule gets question semantics. Since HPSG represents all linguistic information in the same AVM, such implicational constraints can refer to intonation as well.

Note that in Constructional HPSG as layed out by Sag (1997) implicational constraints can refer to the structure of a complete utterance. Hence items with a complex internal structure can be seen as contributing a certain meaning. This is ruled out by design in Sign-Based Construction Grammar, where linguistic objects of type *phrase* do not have daughters.

5 Constituent order domains

There is an interesting extension to standard HPSG that opens up possibilities for analyses that are quite different from what is done otherwise in theoretical linguistics: Mike Reape (1991; 1992; 1994) working on German suggested formal tools that allow for the modeling of discontinuous constituents. His original motivation was to account for scrambling of arguments in verbal complexes but this analysis was superseded by Hinrichs and Nakazawa's analysis (Hinrichs & Nakazawa 1989; 1994) since purely linearization-based approaches are unable to account for the so-called remote passive (**Kathol**). Nevertheless, his work was

taken up by Andreas Kathol and me and was used for analyzing German (Kathol & Pollard 1995; Kathol 2000; Müller 1995; 1996; 2004). Finally, there were reasons for dropping analysis assuming discontinuous constituents (**MuellerGS1**; Müller 2005b) but constituent order domains still play a major role in analyzing ellipsis and coordination.

5.1 A special representational layer for constituent order

Reape (1994); Kathol (2001); Müller (2004)

The technique that is used to model discontinuous constituents in frameworks like HPSG goes back to Mike Reape's work on German (1991; 1992; 1994). Reape uses a list called `DOMAIN` to represent the daughters of a sign in the order in which they appear at the surface of an utterance. (15) shows an example in which the `DOM` value of a headed-phrase is computed from the `DOM` value of the head and the list of non-head daughters.

$$(15) \text{ headed-phrase} \Rightarrow \left[\begin{array}{ll} \text{HEAD-DTR} | \text{DOM} & \boxed{1} \\ \text{NON-HEAD-DTRS} & \boxed{2} \\ \text{DOM} & \boxed{1} \circ \boxed{2} \end{array} \right]$$

The symbol ' \circ ' stands for the *shuffle* relation. *shuffle* relates three lists A, B and C iff C contains all elements from A and B and the order of the elements in A and the order of the elements of B is preserved in C. (16) shows the combination of two sets with two elements each:

$$(16) \quad \langle a, b \rangle \circ \langle c, d \rangle = \langle a, b, c, d \rangle \vee \\ \langle a, c, b, d \rangle \vee \\ \langle a, c, d, b \rangle \vee \\ \langle c, a, b, d \rangle \vee \\ \langle c, a, d, b \rangle \vee \\ \langle c, d, a, b \rangle$$

The result is a disjunction of six lists. *a* is ordered before *b* and *c* before *d* in all of these lists, since this is also the case in the two lists $\langle a, b \rangle$ and $\langle c, d \rangle$ that have been combined. But apart from this, *b* can be placed before, between or after *c* and *d*. Every word comes with a domain value that is a list that contains the word itself:

(17) Domain contribution of single words, here *gibt* 'gives':

$$\boxed{1} \begin{bmatrix} \text{PHON} & \langle \text{gibt} \rangle \\ \text{SYNSEM} & \dots \\ \text{DOM} & \langle \boxed{1} \rangle \end{bmatrix}$$

The description in (17) may seem strange at first glance, since it is cyclic, but it can be understood as a statement saying that *gibt* contributes itself to the items that occur in linearization domains.

The constraint in (18) is responsible for the determination of the PHON values of phrases:

$$(18) \text{ phrase} \Rightarrow \begin{bmatrix} \text{PHON} & \boxed{1} \oplus \dots \oplus \boxed{n} \\ \text{DOM} & \langle \begin{bmatrix} \text{sign} \\ \text{PHON} & \boxed{1} \end{bmatrix}, \dots, \begin{bmatrix} \text{sign} \\ \text{PHON} & \boxed{n} \end{bmatrix} \rangle \end{bmatrix}$$

It states that the PHON value of a sign is the concatenation of the PHON values of its DOMAIN elements. Since the order of the DOMAIN elements corresponds to their surface order, this is the obvious way to determine the PHON value of the whole linguistic object.

Figure 5 shows how this machinery can be used to license binary branching structures with discontinuous constituents. Words or word sequences that are

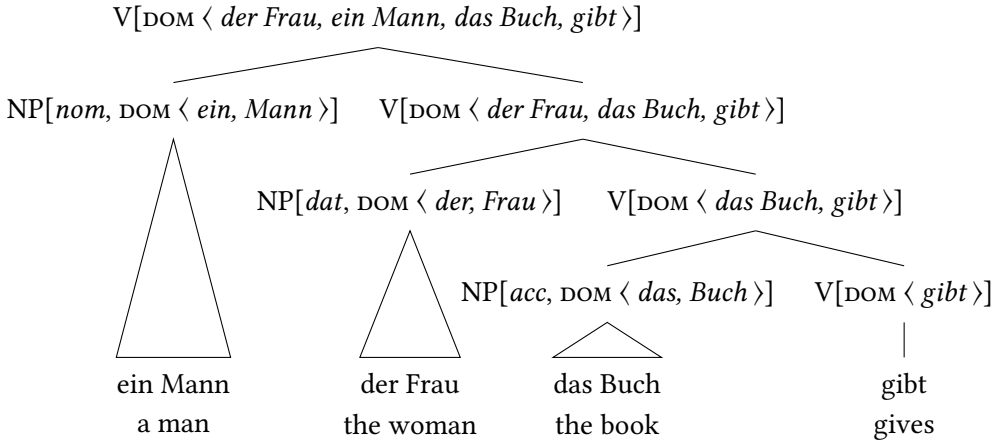


Figure 5: Analysis of *dass der Frau ein Mann das Buch gibt* ‘that a man gives the woman the book’ with binary branching structures and discontinuous constituents

separated by commas stand for separate domain objects, that is, $\langle \text{das, Buch} \rangle$

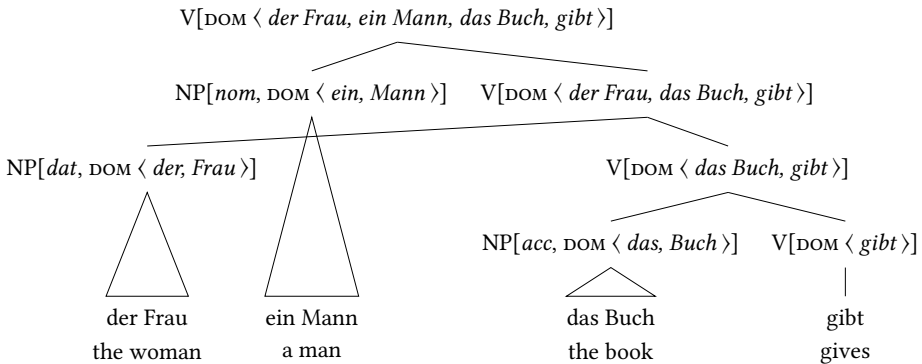


Figure 6: Analysis of *dass der Frau ein Mann das Buch gibt* 'that a man gives the woman the book' with binary branching structures and discontinuous constituents showing the discontinuity

contains the two objects *das* and *Buch* and $\langle \text{das Buch, gibt} \rangle$ contains the two objects *das Buch* and *gibt*. The important point to note here is that the arguments are combined with the head in the order accusative, dative, nominative, although the elements in the constituent order domain are realized in the order dative, nominative, accusative rather than nominative, dative, accusative, as one would expect. This is possible since the formulation of the computation of the DOM value using the shuffle operator allows for discontinuous constituents. The node for *der Frau das Buch gibt* 'the woman the book gives' is discontinuous: *ein Mann* 'a man' is inserted into the domain between *der Frau* 'the woman' and *das Buch* 'the book'. This is more obvious in Figure 6, which has a serialization of NPs that corresponds to their order.

Free constituent order languages Donohue & Sag (1999)

5.2 Partial compaction (extraposition)

5.3 Problems with order domains

5.3.1 Partial fronting

Partial verb phrase fronting requires partial constituents.

(Kathol 2001; Müller 2017)

5.3.2 Surface order and clause types

5.4 Other usages of constituent order domains

reference to Chapter 16 on coordination and Chapter 19 on ellipsis.

comparison with Dependency Grammar (Chapter 35)

6 Free constituent order languages without order domains

Bender (2008)

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Chapter 10

Clitics

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Abbreviations

Acknowledgements

Chapter 11

Complex predicates

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Chapter 12

Control and raising

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Chapter 13

Unbounded dependencies

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Chapter 14

Relative clauses

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Chapter 15

Island phenomena and related matters

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Chapter 16

Coordination

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Chapter 17

Idioms

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Manfred Sailer

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Chapter 18

Negation

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Chapter 19

Ellipsis

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Chapter 20

Binding

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Part III

Other levels of description

Chapter 21

Phonology

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1 Introduction: PHONOLOGY in the HPSG sign

The PHONOLOGY attribute in (Pollard & Sag 1987) and (Pollard & Sag 1994):

- rudimentary PHON value
- basic Phonology Principle constrained by Linear Precedence rules: corresponds to simple terminal spell-out of the phrase structure tree
- “Phonology-Free Syntax” (Miller et al. 1997): PHON information inaccessible for selection via SYNSEM

There has been relatively little work within HPSG on phonological representation and the analysis of phonological phenomena. Most references to the PHON attribute use it simply as a lexical identifier, or they are dealing with phenomena at the phonology-syntax interface (e.g. constituent order, ellipsis). For such applications, the actual content of the PHON value is unimportant. These topics are covered in other chapters.

2 Phonological representations in HPSG

Proposals for the detailed content of PHON values:

- encoding of phonological constituents (Bird & Klein 1994; Klein 2000; Höhle 1999)



- syllable structure Tseng (2008)
- metrical phonology (Klein 2000; Bonami & Delais-Roussarie 2006)

3 Phonological analysis in HPSG

- principles of constraint-based phonology vs derivational phonology (Bird & Klein 1994): compositionality, monotonicity
- compositional construction of prosodic structure in parallel with phrase structure (Klein 2000)

But HPSG is formally compatible with many approaches, and there is as yet no emerging consensus among practitioners.

- Finite state phonology (Bird 1992; 1995)
- need for abstract underlying forms (Skwarski 2009); phonologically empty categories
- OT in HPSG (Orgun 1996)

4 Specific phenomena and case studies

- shape conditions (Asudeh & Klein 2002)
- French (Tseng 2003; Bonami et al. 2004)
- phonological idioms [already covered in Manfred's chapter]
- ...

Abbreviations

Acknowledgements

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Chapter 22

Morphology

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Berthold Crysmann

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Abbreviations

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Chapter 23

Semantics

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Chapter 24

Information structure

Kordula de Kuthy

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Acknowledgements



Chapter 25

Pragmatics and dialogue semantics

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Part IV

Other areas of linguistics

Chapter 26

Diachronic syntax

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Ulrike Demske

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Chapter 27

Acquisition

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Jonathan Ginzburg

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Chapter 28

Processing

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Chapter 29

Computational linguistics and Language Engineering

Emily Bender

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Guy Emerson

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1 Introduction

2 Infrastructure

- Relevant properties of HPSG that facilitate all of this
 - Stable formalism
 - Differentiating formalism from theory
 - Interest in core as well as periphery
 - Type hierarchy (maintainability)
- Tractability / practical considerations
 - Turing-completeness in theory
 - Efficiency in practice
 - Difference of perspective compared to CCG, TAG
 - Parse ranking



- History: PAGE, VerbMobil, ??
- Current platforms:
 - LKB/ACE/PET/Agree
 - Trale
 - Other

3 Development of HPSG resources

- CoreGram
- DELPH-IN consortium
 - ERG
 - Other large-ish grammars
 - Grammar Matrix
- Systems inspired by HPSG:
 - Alpino
 - Enju
 - RASP

4 Deployment of HPSG resources

- Language documentation/linguistic hypothesis testing
 - CoreGram
 - Grammar Matrix
 - AGGREGATION
- DELPH-IN:
 - DELPH-IN Applications: Things we do using DELPH-IN grammars directly
 - Derived resources: Redwoods-style treebanks
 - Training data for Deep Learning
- Alpino

– ??

- Other?

5 Lessons for Linguistics

- Ambiguity
- Long-tail phenomena (raising and control?)
- Scaling up (thematic roles)
- CLIMB methodology

6 Summary

Abbreviations

Acknowledgements

Chapter 30

Sign languages

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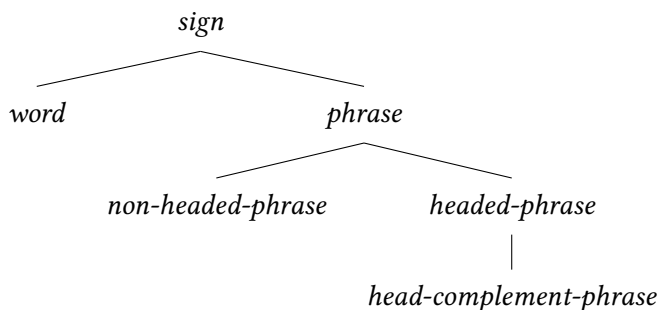
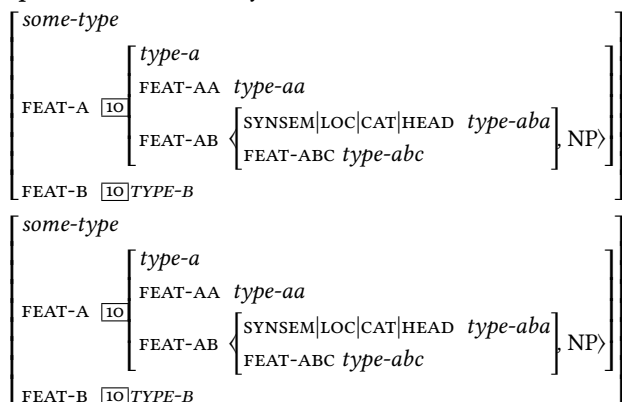


Figure 1: Type hierarchy for *sign*

Abbreviations

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Chapter 31

Gesture

Andy Lücking

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Andy Lücking

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Acknowledgements

Part V

The broader picture

Chapter 32

HPSG and Minimalism

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Put abstract here with \abstract.

1 Introduction

The Minimalist framework, which was first outlined by Chomsky in the early 1990s (Chomsky 1993; 1995b), still seems to be the dominant approach to syntax. It is important, therefore, to consider how HPSG compares with this framework. The issues are clouded by the rhetoric that surrounds the framework. At one time ‘virtual conceptual necessity’ was said to be its guiding principle. A little later, it was said to be concerned with the “perfection of language”, with ‘how closely human language approaches an optimal solution to design conditions that the system must meet to be usable at all’ Chomsky (2002: 58). Much of this rhetoric seems designed to suggest that Minimalism is quite different from other approaches and should not be assessed in the same way. In the words of Postal (2003: 19), it looks like ‘an attempt to provide certain views with a sort of privileged status, with the goal of placing them at least rhetorically beyond the demands of serious argument or evidence’. However, the two frameworks have enough in common to allow meaningful comparisons.

Both frameworks seek to provide an account of what is and is not possible both in specific languages and in language in general. Moreover, both are concerned not just with local relations such as that between a head and its complement or complements but also with non-local relations such as those in the following:



- (1) The student knows the answer.
- (2) It seems to be raining,
- (3) Which student do you think knows the answer?

In (1), *the student* is subject of *thinks* and is responsible for the fact that *thinks* is a third person singular form, but they are not sisters if *knows* and *the answer* form a VP. In (2) the subject is *it* because the complement of *be* is *raining*, but *it* and *raining* are obviously not sisters. Finally, in (3), *which student* is understood as the subject of *thinks* and is responsible for the fact that it is third person singular, but again the two elements are structurally quite far apart. Both frameworks provide analyses for these and other central syntactic phenomena, and it is quite reasonable to compare them and ask which is the more satisfactory.¹

Although HPSG and Minimalism have enough in common to permit comparisons, there are obviously many differences. Some are more important than others, and some relate to the basic approach and outlook, while others concern the nature of grammatical systems and syntactic structures. In this chapter we will explore the full range of differences.

The chapter is organized as follows. In Section 2, we look at differences of approach between the two frameworks. Then in Section 3, we consider the quite different views of grammar that the two frameworks espouse, and in Section 4, we look at the very different syntactic structures which result. Finally, in Section 5.2, we will look at a further issue which deserves some attention.

2 Differences of approach and outlook

As many of the chapters in this volume have emphasized, HPSG is a framework which places considerable emphasis on detailed formal analyses of the kind that one might expect within generative grammar. Thus, it is not uncommon to find lengthy appendices setting out formal analyses. See, for example, Sag's (1997) paper on English relative clauses and especially Ginzburg & Sag (2000), which has a 50 page appendix. One consequence of this, discussed in Chapter ??, is that HPSG has had considerable influence in computational linguistics.

In Minimalism things are very different. Detailed formal analyses are virtually non-existent. There appear to be no appendices like those in Sag (1997) and Ginzburg & Sag (2000). In fact the importance of formalization has long been

¹As noted below, comparison is complicated somewhat by the fact that Minimalists typically provides only sketches of analyses in which various details are left quite vague.

downplayed in Chomskyan work. Thus, in a 1980 conversation, Chomsky remarked that ‘I do not see any point in formalizing for the sake of formalizing’ (see Huybregts & Riemsdijk 1982: 73), and this view seems fairly standard within Minimalism. Chomsky and Lasnik (1995: 28) attempt to justify the absence of detailed analyses when they suggest that providing a rule system from which some set of phenomena can be derived is not ‘a real result’ since ‘it is often possible to devise one that will more or less work’. Instead, they say, ‘the task is now to show how the phenomena ... can be deduced from the invariant principles of UG with parameters set in one of the permissible ways’. In other words, providing detailed analyses is a job for unambitious drudges, and real linguists pursue a more ambitious agenda. Postal (2004: 5) comments that what we see here is ‘the fantastic and unsupported notion that descriptive success is not really that hard and so not of much importance’. He points out that if this were true, one would expect successful descriptions to be abundant within transformational frameworks. However, he suggests that ‘the actual descriptions in these frameworks so far are not only not successful but so bad as to hardly merit being taken seriously’. Postal does much to justify this assessment with detailed discussions of Chomskyan work on strong crossover phenomena and passives in Chapters 9 and 8 of his book.

Chomsky
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There has also been a strong tendency to focus on just a subset of the facts in whatever domain is being investigated. As Culicover & Jackendoff (2005: 535) note, ‘much of the fine detail of traditional constructions has ceased to garner attention’. This tendency has sometimes been buttressed by a distinction between core grammar, which is supposedly a fairly straightforward reflection of the language faculty, and a periphery of marked constructions, which are of no great importance and which can reasonably be ignored. However, as Culicover (1999) and others have argued, there is no evidence for a clear cut distinction between core and periphery. It follows that a satisfactory approach to grammar needs to account both for such core phenomena as *wh*-interrogatives, relative clauses, and passives but also with more peripheral phenomena such as the following:

- (4) a. It’s amazing the people you see here.
- b. The more I read, the more I understand.
- c. Chris lied his way into the meeting.

These exemplify the nominal extraposition construction (Michaelis & Lambrecht 1996), the comparative correlative construction (Borsley 2011), and the *X’s Way* construction (Sag 2012). As has been emphasized in other chapters, the HPSG system of types and constraints is able to accommodate broad linguistic general-

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RF

izations and highly idiosyncratic facts and everything in between.

The general absence in Minimalism of detailed formal analyses is quite important. It means that Minimalists may not be fully aware of the complexity of the structures they are committed to and allows them to sidestep the question whether it is really justified. It also allows them to avoid the question of whether the very simple conception of grammar that they favour is really satisfactory. Finally, it may be that they are unaware of how many phenomena remain unaccounted for. These are all important matters.

The general absence of detailed formal analyses has also led to Minimalism having little impact on computational linguistics. There has been some work that has sought to implement Minimalist ideas, but Minimalism has not had anything like the productive relation with computational work that HPSG has enjoyed.

There are, then, issues about the quantity of data that is considered in Minimalist work. There are also issues about its quality. Research in HPSG is typically quite careful about data and often makes use of corpus and experimental data. Research in Minimalism is often rather less careful. In a review of a collection of Minimalist papers, Bender (2002: 434) comments that: 'In these papers, the data appears to be collected in an off-hand, unsystematic way, with unconfirmed questionable judgments often used at crucial points in the argumentation'. She goes on to suggest that the framework encourages 'lack of concern for the data, above and beyond what is unfortunately already the norm in formal syntax, because the connection between analysis and data is allowed to be remote.' Similar things could be said about a variety of Minimalist work. Consider, for example, Aoun & Li (2003), who argue for quite different analyses of *that*-relatives and *wh*-relatives on the basis of the following (supposed) contrasts, which appear to represent nothing more than their own judgements:

- (5) a. The headway that Mel made was impressive.
b. ?? The headway which Mel made was impressive.
- (6) a. We admired the picture of himself that John painted in art class
b. * We admired the picture of himself which John painted in art class
- (7) a. The picture of himself that John painted in art class is impressive.
b. *? The picture of himself which John painted in art class is impressive.

None of the native speakers we have consulted find significant contrasts here which could support different analyses.

There are also differences in the kind of arguments that the two frameworks find acceptable. It is common within Minimalism to assume that some phenomenon

which cannot be readily observed in some languages must be part of their grammatical system because it is clearly present in other languages. Notable examples would be case or agreement. This stems from the longstanding Chomskyan assumption that language is the realization of a complex innate language faculty. From this perspective, there is much in any grammatical system that is a reflection of the language faculty and not in any simple way of the observable phenomena of the language in question. If some phenomenon plays an important role in many languages it is viewed as a reflection of the language faculty, and hence it must be a feature of all grammatical systems even those in which it is hard to see any evidence for it. This line of argument would be reasonable if a complex innate language faculty was an established fact, but it isn't, and since Hauser, Chomsky & Fitch (2002), it seems to have been rejected within Minimalism. It follows that ideas about an innate language faculty should not be used to guide research on individual languages. Rather, as Müller (2015: 25) puts it, 'grammars should be motivated on a language-specific basis.' Does this mean that other languages are irrelevant when one investigating a specific language? Clearly not. As Müller also puts it, 'In situations where more than one analysis would be compatible with a given dataset for language X, the evidence from language Y with similar constructs is most welcome and can be used as evidence in favor of one of the two analyses for language X.' (2015: 43) In practice, any linguist working on a new language will use apparently similar phenomena in other languages as a starting point. It is important, however, to recognize that apparently similar phenomena may turn out on careful investigation to be significantly different.²

Radford's
PP analysis?
AgrO?
Anything
else?

3 Different views of grammar

We turn now to more substantive differences between HPSG and Minimalism, differences in their conceptions of grammar, especially syntax, and differences in their views of syntactic structure. As we will see, these differences are related. In this section we consider the former, and in the next we will look at the latter.

As has been emphasized throughout this volume, HPSG assumes a declarative or constraint-based view of grammar. It also assumes that the grammar involves a complex systems of types and constraints. Finally, it assumes that syntactic analyses complemented by separate semantic and morphological analyses. In each of these areas, Minimalism is different. It assumes a procedural view of

²Equally, of course, apparently rather different phenomena may turn out on careful investigation to be quite similar. For further discussion of HPSG and comparative syntax, see Borsley (forthcoming).

grammar. It assumes that grammar involves just a few general operations. Finally, it assumes that semantics and morphology are simple reflections of syntax. We comment on each of these matters in the following paragraphs.

Whereas HPSG is a declarative or constraint-based approach, Minimalism seems to be firmly committed to a procedural approach. Chomsky (1995b: 219) remarks that: ‘We take L [a particular language] to be a generative procedure that constructs pairs (π, λ) that are interpreted at the articulatory-perceptual (A-P) and conceptual-intentional (C-I) interfaces, respectively, as “instructions” to the performance systems’. Various arguments have been presented within HPSG for a declarative view, but no argument seems to be offered within Minimalism for a procedural view. Obviously, speakers and hearers do construct representations and must have procedures that enable them to do so, but this is a matter of performance, and there is no reason to think that the knowledge that is used in performance has a procedural character. Rather, the fact that it is used in both production and comprehension suggests that it should be neutral between the two and hence declarative. For further discussion of the issues, see e.g. Pullum & Scholz (2001), Postal (2003) and Sag & Wasow (2011; 2015).

The declarative-procedural contrast is an important one, but the contrast between the complex systems of types and constraints that are assumed within HPSG and the few general operations that form a Minimalist grammar is arguably more important.³ Much work in Minimalism has three main operations Merge, Agree, and Move or Internal Merge. Merge combines two expressions, either words or phrases, to form a larger expression with the same label as one of the expressions (Chomsky 1995b: 244). Its operation can be presented as follows:

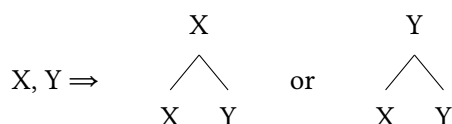


Figure 1: insert caption

In the case of English, the first alternative is represented by situations where a lexical head combines with a complement while the second is represented by situations where a specifier combines with a phrasal head.

³A procedural approach doesn't necessarily involve a very simple grammatical system. The Standard Theory of transformational grammar (Chomsky 1965) is procedural but has many different rules, both phrase structure rules and transformations.

Bob:
Maybe
we should
say more
here.

Agree, as one might suppose, offers an approach to various kinds of agreement phenomena. It involves a probe, which is a feature or features of some kind on head, and a goal, which the head c-commands. At least normally, the probe is an uninterpretable feature or features with no value and the goal has a matching interpretable feature or features with appropriate values. Agree values the uninterpretable feature or features and they are ultimately deleted, commonly after they have triggered some morphological effect. Agree can be represented as follows (where the ‘*u*’ prefix identifies a feature as uninterpretable.):⁴

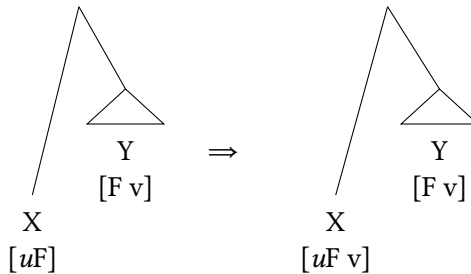


Figure 2: insert caption

Unsurprisingly subject-verb agreement is one manifestation of Agree, where X is a T(ense) and Y is a nominal phase, for Minimalism a DP, inside the complement of T. Here, and elsewhere, Agree is a non-local relation involving elements which are not sisters. This contrasts with the situation in HPSG, in which subject-verb agreement is a consequence of a relation between the subject and its VP sister and a relation between the VP and the V that heads it.

Finally, Move or Internal Merge is an operation which makes a copy of a constituent of some expression and merges it with the expression. The original element that is copied normally undergoes deletion. The process can be presented as follows:

This covers both the A'-movement process assumed for unbounded dependency constructions such as *wh*-interrogatives and the A-movement process assumed for raising sentences and passives. A question arises about so-called head-movement where a head moves to a higher head position. This appears to mean that it must be possible for the copy to be merged with the head of the expression that contains it. However, this is incompatible with the widely assumed extension con-

add refer-
ences

⁴On standard assumptions, the goal also has some uninterpretable feature, which renders it ‘active’, i. e. capable of undergoing Agree. This is ultimately deleted, possibly after they have triggered some morphological effect.

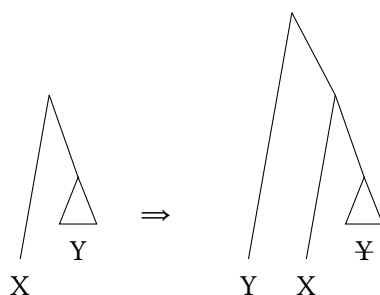


Figure 3: insert caption

dition, which requires Merge to produce a larger structure. One response is the idea espoused in Chomsky (1995a: 368; 2001: 37) that head-movement takes place not in the syntax but in the PF component, which maps syntactic representations to phonetic representations. It seems that its status is currently rather unclear.

The three operations just outlined interact with lexical items to provide syntactic analyses. It follows that the properties of constructions must largely derive from the lexical items that they contain. Hence, the properties of lexical items are absolutely central to Minimalism. Oddly, the obvious implication – that the lexicon should be a major focus of research – seems to be ignored. As Newmeyer (2005: 95, fn. 9) comments:

‘...in no framework ever proposed by Chomsky has the lexicon been as important as it is in the MP [Minimalist Program]. Yet in no framework proposed by Chomsky have the properties of the lexicon been as poorly investigated.’

Sometimes it is difficult to derive the properties of constructions from the properties of visible lexical elements. But there is a simple solution: postulate an invisible element. The result is a large set of invisible functional heads. As we will see in the next section, these heads do the work in Minimalism that is done by phrase types and the constraints on them in HPSG.

Although Minimalism is a procedural approach and HPSG a declarative approach, there are some similarities between Minimalism and early HPSG, the approach presented in Pollard & Sag (1987; 1994). In much the same way as Minimalism has just a few general mechanisms, early HPSG had just a few general phrase types. Research in HPSG in the 1990s led to the conclusion that this is too simple and that a more complex system of phrase types is needed to accommodate the full complexity of natural language syntax. Nothing like this happened

within Minimalism, almost certainly because there was little attempt within this approach to deal with the full complexity of natural language syntax. As noted above, the approach has rarely been applied in detailed formal analyses. It looks too simple and it appears problematic in various ways. It is also a major source of the complexity that is characteristic of Minimalist syntactic structures, as we will see in the next section.

The Minimalist machinery has various implications for syntactic structure which we will explore in the next section. Here we will just highlight two points. First, the fact that Merge combines two expressions entails that syntactic structures are confined to binary branching and excludes various analyses that have been assumed within HPSG and other frameworks. Second, the assumption that expressions produced by Merge have the same label as one of the expressions that they consist of is essentially the assumption that all complex expressions are headed. For HPSG, as for many other approaches, there are headed expressions and non-headed expressions, e.g., coordinate structures. We will discuss both of these matters in the next section.

As emphasized above, a further important feature of Minimalism is the view that semantics and morphology are simple reflections of syntax. The idea that semantics is a simple reflection of syntax goes back to the early years of transformational grammar. One aspect of this idea was formalized as the Uniform Theta Assignment Hypothesis (UTAH) by citet[46]Baker88a.

(8) **Uniform Theta Assignment Hypothesis**

Identical thematic relationships between items are represented by identical structural relationships between those items at the level of D-structure.

Minimalism abandoned the notion of D-structure, but within Minimalism the Hypothesis can be reformulated as follows:

(9) **Uniform Theta Assignment Hypothesis (revised)**

Identical thematic relationships between items are represented by identical structural relationships between those items when introduced into the structure.

We will look at some of the implications of this in the next section.

The idea that morphology is a simple reflections of syntax is also important. As we will discuss in the next section, it leads to abstract underlying structures and complex derivations and to functional heads corresponding to various suffixes. Again, we will say more about this in the next section.

4 Different views of syntactic structure

The very different views of grammar that are assumed in Minimalism and HPSG naturally lead to very different views of syntactic structure. The syntactic structures of Minimalism are both very complex and very simple. This sounds paradoxical but it isn't. They are very complex in that they involve much more structure than those assumed in HPSG and other approaches. But they are very simple in that they have just a single ingredient – they consist entirely of local trees in which there is a head and a single non-head. From the standpoint of HPSG, they are both too complex and too simple. We will consider the complexity in 4.1 and then turn to the simplicity in 4.2.

4.1 The complexity of Minimalist structures

For HPSG, as the chapters in this volume have illustrated, linguistic expressions have a single relatively simple constituent structure with a minimum of phonologically empty elements.⁵ For Minimalism, they have a complex structure containing a variety of empty elements and with various constituents occupying more than one position in the course of the derivation. Thus the structures assumed within Minimalism are not at all minimalist. But this complexity is a more or less inevitable consequence of the Minimalist view of grammar outlined above.

There are a variety of sources of complexity, and some predate Minimalism.⁶ This is true especially of the idea that semantics and morphology are simple reflections of syntax. For the syntax-semantics relation, UTAH, which we introduced above, is particularly important. It leads to a variety of abstract representations and movement processes. Consider, for example, the following:

- (10) a. Who did Lee see?
b. Lee saw who

Who bears the same thematic relation to the verb *see* in (10a) as in (10b). Assuming UTAH, it follows that *who* in (10a) should be introduced in the object position which it occupies in (10b) and then be moved to its superficial position. Consider next the following:

⁵The relatively simple structures of HPSG are not an automatic consequence of its declarative nature. Postal's Metagraph Grammar framework (formerly known Arc Pair Grammar) is a declarative framework with structures that are similar in complexity to those of Minimalism (see Postal 2010).

⁶For interesting discussion of the historical development of the ideas that characterize Minimalism, see Culicover & Jackendoff (2005: Chapters 2 and 3).

- (11) a. Lee was seen by Kim.
b. Kim saw Lee.

Here, *Lee* bears the same thematic relation to the verb *see* in (11a) as in (11b). Hence, it follows that *Lee* in (11a) should be introduced in the object position which it occupies in (11b) and then be moved to its superficial subject position. Finally, consider these examples:

- (12) a. Lee seems to be ill.
b. It seems that Lee is ill.

Here, *Lee* bears the same thematic relation to *ill* in (12a) as in (12b). Thus, it follows that *Lee* in (12a) should be introduced in the same position as *Lee* in (12a). The standard Minimalist approach assumes that *Lee* in both examples originates in a position adjacent to *ill* and is moved a short distance in (12a) but a longer distance in (12a).

These analyses are more or less inevitable if one accepts UTAH. But how sound is UTAH? Work in HPSG shows that it is quite possible to capture both the syntactic and the semantic properties of these sentence types without the assumption that the crucial constituents occupy more than one position. Thus, there is no reason to accept UTAH.

The idea that semantics is a simple reflection of syntax has led to other kinds of complexity. For example, it has led to revival of the idea once characteristic of Generative Semantics that lexical items may derive from complex expressions which in some sense represent their meanings. Thus, Hale & Keyser (1993) argue that (4a) derives from a structure like that of (4b).

- (13) a. Kim shelved the books.
b. Kim put the books on the shelf.

One problem with this proposal is that *shelve X* means more than just *put X on the shelf*. Thus, (14a) is not equivalent to (14b).

- (14) a. Kim put his elbow on the shelf.
b. Kim shelved his elbow.

Moreover, denominal verbs can have many different interpretations.

- (15) a. Kim saddled the horse.
(Kim put the saddle on the horse.)
b. Lee chaired the meeting.
(Lee was the chairperson of the meeting.)

- c. Sandy skinned the rabbit.
(Sandy removed the skin from the rabbit.)
- d. Kim pictured the scene.
(Kim constructed a mental picture of the scene.)
- e. They stoned the criminal.
(They threw stones at the criminal.)
- f. He fathered three children.
(He was the biological father of three children.)
- g. He mothers his students.
(He treats his students the way a mother would.)

Denominal verbs need to be associated with the correct meanings, but there is no reason to think that syntax has a role in this.⁷

The idea that morphology is a simple reflection of syntax also leads to syntactic complexity. The fact that verbs in English and many other languages are marked for tense leads to the assumption that there is a T(ense) head at the heart of clause structure. Similarly the fact that nouns in English and other languages are marked for number leads to the assumption that there is a Num(ber) head at the heart of noun phrase structure. These elements are not solely motivated by morphology. The assumption that verbs move to T and nouns to Num in some languages but not others provides a way of accounting for cross-linguistic word order differences. However, assumptions about morphology are an important part of the motivation.

Another source of complexity which also predates Minimalism is the assumption that all structures are binary branching. As Culicover & Jackendoff (2005: 112–116) note, this idea goes back to the 1980s. It entails that there can be no structures of the form in figure 4. Rather all structure must take the form in figure 5 or figure 6.

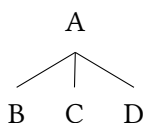


Figure 4: insert caption

⁷See Culicover & Jackendoff (2005: 53–56) for further discussion.

Bob: Probably there should be some reference to HPSG work on morphology.

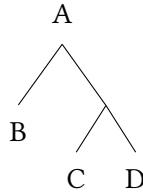


Figure 5: insert caption



Figure 6: insert caption

As Culicover and Jackendoff discuss, the arguments for the binary branching restriction have never been very persuasive. Moreover, it is incompatible with various analyses which have been widely accepted in HPSG and other frameworks. We will return to this topic in 4.2.

As noted in section 3, the simplicity of the Minimalist grammatical system means the properties of constructions must largely derive from the lexical items that they contain. Hence, the properties of lexical items are absolutely central to Minimalism and often this means the properties of phonologically empty items, especially empty functional heads. Thus, a large set of such elements is a central feature of Minimalism. These elements do much the same work as phrase types and the associated constraints in HPSG.

The contrast between the two frameworks can be illustrated with unbounded dependency constructions. Detailed HPSG analyses of various unbounded dependency constructions are set out in Sag (1997; 2010) and Ginzburg & Sag (2000), involving a complex system of phrase types. For Minimalism, unbounded dependency constructions are headed by a phonologically empty complementizer (C) and have either an overt filler constituent or an invisible filler (an empty operator) in their specifier position. Essentially, then, they have the following structure:

All the properties of the construction must stem from the properties of the C that heads it.

An important unbounded dependency construction is relative clauses. In En-

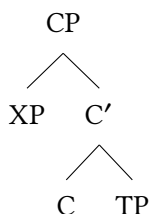


Figure 7: insert caption

glish there are *wh*-relatives and non-*wh*-relatives and finite and non-finite relatives. *Wh*-relatives are illustrated by the following:

- (16) a. someone [who you can rely on]
 b. someone [on whom you can rely]
- (17) a. * someone [who to rely on]
 b. someone [on whom to rely]

These show that whereas finite *wh*-relatives allow either an NP or a PP as the filler, non-finite *wh*-relatives only allow a PP. In the HPSG analysis of Sag (1997), the facts are a consequence of constraints on two phrase types. A constraint on the type *fin-wh-fill-rel-cl* allows the first daughter to be an NP or a PP while a constraint on *inf-wh-fill-rel-cl* requires the first daughter to be a PP. For Minimalism, the facts must be attributed to the properties of the complementizer. There must be a complementizer which takes a finite TP complement and allows either an NP or a PP as its specifier and another complementizer which takes a non-finite TP complement (with an unexpressed subject) and only allows a PP as its specifier.

Non-*wh*-relatives require further phrase types within HPSG and further complementizers in Minimalism. However, rather than consider this, we will look at another unbounded dependency construction: *wh*-interrogatives. The basic data that needs to be accounted for is illustrated by the following:

- (18) a. Who knows?
 b. I wonder [who knows].
 c. Who did Kim talk to?
 d. I wonder [who Kim talked to].
 e. I wonder [who to talk to].

Like *wh*-relatives, *wh*-interrogatives can be finite and non-finite. When they are finite their form depends on whether the *wh*-phrase is subject of the highest verb or something else. When it is subject of the highest verb, it is followed by what looks like a VP although it may be a clause with a gap in subject position. When the *wh*-phrase is something else, the following clause shows auxiliary-initial order if it is a main clause and subject-initial order if it is not. Non-finite *wh*-interrogatives are a simple matter, especially as the filler does not have to be restricted in the way that it does in non-finite *wh*-relatives. Ginzburg & Sag (2000) present an analysis which has two types for finite *wh*-interrogatives, one for subject-*wh*-interrogatives such as those in (18a) and (18b), and another for non-subject-*wh*-interrogatives such as those in (18c) and (18d). The latter is subject to a constraint requiring it to have the same value for the features IC (INDEPENDENT-CLAUSE) and INV (INVERTED). Main clauses are [IC +] and auxiliary-initial clauses are [INV +]. Hence the constraint ensures that a non-subject-*wh*-interrogative shows auxiliary-initial order just in case it is a main clause.

How can the facts be handled within Minimalism? As noted above, Minimalism analyses auxiliary-initial order as a result of movement of the auxiliary to C. It is triggered by some feature of C. Thus C must have this feature just in case (18a) it heads a main clause and (18b) the *wh*-phrase in its specifier position is not the subject of the highest verb. There are no doubt various ways in which this might be achieved, but the key point is the properties of a phonologically empty complementizer are crucial.

Borsley (2006b; 2017) discusses Minimalist analyses of relative clauses and *wh*-interrogatives and suggests that at least eight complementizers are necessary. One is optionally realized as *that*, and another is obligatorily realized as *for*. The other six are always phonologically empty. But it has been clear since Ross (1967) and Chomsky (1977) that relative clauses and *wh*-interrogatives are not the only unbounded dependency constructions. Here are some others:

- (19) a. What a fool he is! (Wh-exclamative clause)
 b. The bagels, I like. (Topicalized clause)
 c. Kim is more intelligent [than Lee is]. (Comparative-clause)
 d. Kim is hard [to talk to]. (Tough-complement-clause)
 e. Lee is too important [to talk to]. (Too-complement-clause)
 f. [The more people I met], [the happier I became]. (The-clauses)

small
caps? –
RF

small
caps? –
RF

Bob: We could probably say more here, e.g. referring to Pesetsky and Torrego's account of the contrast between subject and non-subject-*wh*-interrogatives, but I'm not sure if it is worth it.

Each of these constructions will require at least one empty complementizer. Thus, a comprehensive account of unbounded dependency constructions will require a large number of such elements. But a large set of complementizers makes no distinction between properties shared by some or all elements and properties restricted to a single element. There are a variety of shared properties. Many of the complementizers will take a finite complement, many others will take a non-finite complement, and some will take both. There will also be complementizers which take the same set of specifiers. Most will not attract an auxiliary, but some will, not only the complementizer in an example like (18c) but also the complementizers in the following, where the auxiliary is in bold:

- (20) a. Only in Colchester *could* such a thing happen.
 b. Kim is in Colchester, and so *is* Lee.
 c. Such *is* life.
 d. The more Bill smokes, the more *does* Susan hate him.

Thus, there are generalizations to be captured here. The obvious way to capture them is with the approach developed in the 1980s in HPSG work on the hierarchical lexicon, i.e. a detailed classification of complementizers which allows properties to be associated not just with individual complementizers but also with classes of complementizers. With this it should be possible for Minimalism not just to get the facts right but to capture the full set of generalizations. In many ways such an analysis would be mimicking the HPSG approach with its hierarchy of phrase types.⁸ But in the present context the main point is that the Minimalist approach to unbounded dependency constructions which leads to considerable complexity.

Thus, a variety of features of Minimalism lead to structures that are much more complex than those of HPSG. HPSG shows that this complexity is unnecessary given a somewhat richer conception of grammar.

4.2 The simplicity of Minimalist structures

As we emphasized above, while minimalist structures are very complex, they are also simple in the sense that they have just a single ingredient, local trees consisting a head and a single non-head. To most outsiders this looks too simple.

We look first at binary branching. As we noted above, the assumption that all branching is binary is incompatible with various analyses which have been widely accepted in HPSG and other frameworks. For example, it means that the

⁸For a fuller discussion of the issues see Borsley (2006b; 2017)

bracketed VP in (21), which contains two complements, cannot have the ternary branching structure in figure 8.

(21) Kim gave a book to Lee.

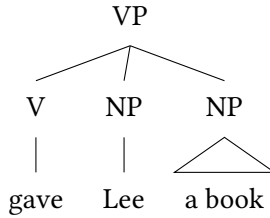


Figure 8: insert caption

Instead it has been assumed since Larson (1988) that it has something like the following structure:

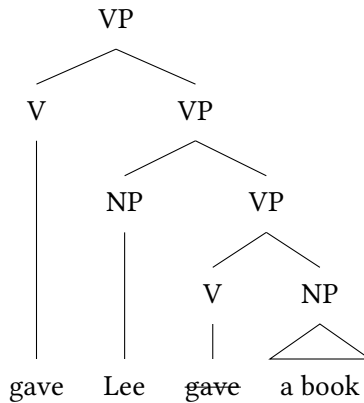


Figure 9: insert caption

It is assumed that the verb originates in the lower VP and is moved into the higher VP.⁹ The main argument for such an analysis appears to involve anaphora, especially contrasts like the following:

- (22) a. John showed Mary herself in the picture.
 b. *John showed herself Mary in the picture.

⁹The higher V position to which the verb moves is commonly labelled *v* ('little *v*') and the higher phrase *vP*.

The first complement can be the antecedent of a reflexive which is the second complement, but the reverse is not possible. If constraints on anaphora refer to constituent structure, the contrast suggests that the second NP should be lower in the structure than the first NP. But, as discussed in Chapter ??, it is assumed in HPSG that constraints on anaphora refer not to constituent structure but to ARG-ST lists. On this view, anaphora can provide no argument for the complex structure in (24).

The fact that Merge combines two expressions also means that the auxiliary-initial clause in (23) cannot have a flat structure with both subjects and complement(s) as sisters of the verb, as in (10).

(23) Will Kim be here?

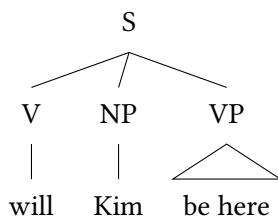


Figure 10: insert caption

It is standardly assumed that it has a structure of the following form:

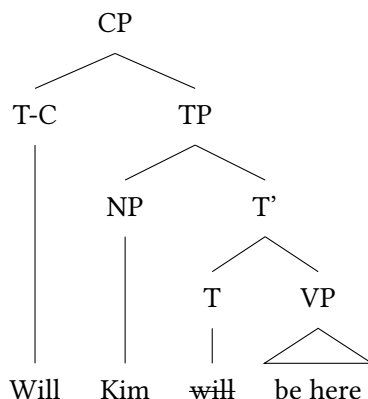


Figure 11: insert caption

Will is analysed as a T(ense) element which moves to the C(omplementizer)

which
chapter
– RF

Bob: We
should
probably
note
that some
HPSG
work, e.g.
yours in-
volves a
different
binary
branching
structure.

position. An analysis like this is essentially the only possibility within Minimalism.

It is not just English auxiliary-initial clauses that cannot have a ternary branching analysis within Minimalism but verb-initial clauses in any language. A notable example is Welsh, which has verb-initial order in all types of finite clause. Here are some relevant examples:¹⁰

- (24) a. *Mi/Fe gerddith Emrys i 'r dre.*
 PRT walk.FUT.3SG Emrys to the town
 ‘Emrys will walk to the town.’
 b. *Dywedodd Megan [cerddith Emrys i 'r dre].*
 say.PAST.3SG Megan walk.FUT.3SG Emrys to the town
 ‘Megan said Emrys will walk to the town.’

A variety of transformational work, including work in Minimalism, has argued for an analysis like (23) for Welsh finite clauses (see e.g., Jones & Thomas 1977, Sproat 1985, Sadler 1988, Rouveret 1994, and Roberts 2005). But Borsley (2006a) argues that there is no theory-neutral evidence for a structure of this kind. Hence, at least for Welsh, it seems that a simpler flat structure like (22) is preferable.¹¹

We turn now to the idea that all structures are headed. For HPSG, and many other approaches, there are headed structures and non-headed structure. Probably the most important example of the latter are coordinate structures such as those in (25) (see Sag 2003 for an HPSG analysis).

- (25) [Kim and Lee] [sang and danced].

Much work in Minimalism assumes that coordinate structures are headed by the conjunction. This suggests that both coordinate structures in (25) are conjunction phrases. If they are phrases of the same kind, one would expect them to be interchangeable, but of course they are not.¹²

- (26) * [Sang and danced] [Kim and Lee].

It is fairly clear that conjunctions cannot be ordinary heads. One might suggest that they are heads which have the properties of their specifier and complement, and are thus nominal if they are nominal, verbal if they are verbal, etc. This would

¹⁰Positive main clause verbs are optionally preceded by a particle (*mi* or *fe*). We have included this in (24a) but not in (24b). When it appears it triggers so-called soft mutation. Hence (24a) has *gerddith* rather than the basic form *cerddith*, which is seen in (24b).

¹¹Borsley (2016) argues for a similar flat structure for the Caucasian ergative SOV language Archi.

¹²For a more detailed critique of this approach see Borsley (2005).

Bob: I assume you favour a structure rather like (30) for German. I suppose we need to make it clear that (29) seems right for some verb-initial clauses, not all.

Bob: Insert NPN-construction here

make them a unique type of a head with a unique relation to their specifier and complement. A problem for this approach is coordinate structures in which the conjuncts belong to different categories, e.g., the following:

- (27) a. Hobbs is [a linguist and proud of it].
b. Hobbs is [angry and in pain].

Such examples have led to HPSG analyses in which coordinate structures have whatever properties are common to the two conjuncts (Sag 2003). Within Minimalism, one might try to mimic such analyses by proposing that conjunctions have whatever properties are common to their specifier and complement. But a problem arises with an example like (12), where the conjuncts are not words but phrases.

- (28) Kim [criticized and insulted] his boss.

To accommodate such examples, conjunctions would have to acquire not only part of speech information from the conjuncts but also selectional information. They would be heads which combine with a specifier and a complement to form an expression which, like a typical head, combines with a specifier and a complement. This would be a very strange situation.¹³ Perhaps recognizing the weaknesses of the ConjP analysis, Chomsky (2013) sketches a different approach to coordinate structures, in which the first conjunct is the head. This approach has a problem with a simple example like (36).

- (29) [Kim and Lee] were late.

Since the first conjunct *Kim* is singular, Chomsky's approach will identify the coordinate structure as singular and one would expect the singular form *was* and not the plural form *were*. Further problems arise with the following examples:

- (30) a. [You and he] know yourselves well.
b. [You and I] know ourselves well.

In both examples the first conjunct is the second person, and in (30a), the form of the reflexive suggests that the coordinate structure is too. However, in (30b), the form of the reflexive suggests that the coordinate structure is first person. Clearly, this is because the second conjunct is first person. It is clear, then, that the properties of a coordinate structure reflects both conjuncts in a way that

¹³There have been attempts to argue that conjuncts are always phrases (Kayne 1994, Bruening 2018). But this position seems untenable (Abeillé 2006, Müller 2018).

makes them very different from ordinary headed structures. This suggests rather strongly that the idea that all structures are headed is untenable.

Finally, we want to consider the Move/Internal Merge approach to unbounded and other non-local dependencies. It is important to emphasize that this mechanism is involved not only in unbounded dependency constructions but also in passives, unaccusatives, and raising sentences, such as the examples in (31).

- (31) a. Kim has been hit.
 b. Kim has disappeared.
 c. Kim seems to be clever.

The two types of construction have rather different. For example, whereas the gaps in unbounded dependency constructions are positions in which overt NPs can appear, this is not true of the supposed gap positions.

- (32) a. * It has been hit Kim.
 b. * It has disappeared Kim.
 c. * It seems Kim to be clever.

This is a complication if they involve the same mechanism, but is unsurprising if they involve different mechanisms, as in HPSG and most other frameworks.

The Move/Internal Merge approach seems quite plausible for typical examples of an unbounded dependency, but issues arise with less typical examples. Within this approach one expects to see a constituent in the tree and a matching gap somewhere inside its sister. This is what we commonly find, but there are unbounded dependency constructions in which there is a gap but no visible higher constituent matching it. Consider e.g., the following:

- (33) a. the book [Kim bought _]
 b. Lee is too important [for you to talk to _].
 c. Lee is important enough [for you to talk to _].
 d. Kim is easy [for anyone to talk to _].

Within Minimalist assumptions, it is more or less necessary to assume that such examples contain an invisible filler (a so-called empty operator). Unless there is some independent evidence for such invisible fillers, they are little more than an ad hoc device to maintain the Move/Internal Merge approach. Within the HPSG SLASH-based approach to unbounded dependencies, there is no assumption that there should always be a filler at the top of an unbounded dependency. Hence, the examples in (33) are completely unproblematic.

nice underlines needed – RF

There are also unbounded dependency constructions which seem to have not a gap but a resumptive pronoun (RPs). Among many languages that are relevant here is Welsh, which has RPs in both *wh*-interrogatives and relative clauses, as the following illustrate:

- (34) a. Pa ddyn werthodd Ieuan y ceffyl iddo fo?
 which man sell.PAST.3SG Ieuan the horse to.3SGM he
 ‘Which man did Ieuan sell the horse to?’
 b. y dyn werthodd Ieuan y ceffyl iddo fo
 the man sell.PAST.3SG Ieuan the horse to he
 ‘the man that Ieuan sold the horse to’

Willis (2011) and Borsley (2010; 2013) present evidence that Welsh RPs involve the same mechanism as gaps. Within Minimalism, this means that they must involve Move/Internal Merge. But one expects to see a gap where Move/Internal Merge has applied. One Minimalist response suggests that instead of being deleted, the copy left behind by Move/Internal Merge is somehow turned into a pronoun (see McCloskey 2006). Another approach exploits the complexity of Minimalist structures and proposes that there is a gap in the structure somewhere near the RP. See Willis (2011), Aoun et al. (2001), and Boeckx (2003). For detailed objections to both approaches, see Borsley (2013: section 3). Within the SLASH-based approach of HPSG, there is no reason to think that there will always be a gap at the bottom of a dependency, and it is not difficult to accommodate RPs. See Borsley (2013) and Crysmann (2012; 2016) for slightly different approaches.¹⁴

Thus, there are variety of phenomena which suggest that the Minimalist view of constituent structure is too simple. The restriction to binary branching, the assumption that all structures are headed, and Move/Internal Merge all seem problematic. It looks, then, as if the Minimalist view is both too complex and too simple.

¹⁴ Also relevant here are examples with more than one gap such as the following:

- (35) a. Who does Kim like _ and Lee hate _?
 b. Which book did you criticize _ without reading _?

There have been various attempts to accommodate such examples within the Move/Internal Merge approach, but it is not clear that any of them is satisfactory. In contrast such examples are expect within the SLASH-based approach Levine & Sag (2003).

Bob:
 Could
 obviously
 say more
 here, but
 maybe
 it's not
 necessary.

5 Psycholinguistic issues

Although they differ in a variety of ways, HPSG and Minimalism agree that grammatical theory is concerned with linguistic knowledge. They focus first and foremost on the question: what form does linguistic knowledge take? But there are other questions that arise here, notably the following:

- How is linguistic knowledge put to use?
- How is linguistic knowledge acquired?

Both questions are central concerns for psycholinguistics. Thus, in considering the answers that HPSG and Minimalism can give we are considering their relevance to psycholinguistics. Chomskyan approaches, including Minimalism, have focused mainly on the second question and have paid little attention to the first. HPSG has had more to say about the first and has shown less interest in the second. Clearly an adequate grammatical theory should be able to give satisfactory answers to both questions. In this section we will look briefly at the relation of the two theories to processing and then consider more fully their relation to acquisition.

5.1 Processing

We noted in section 3 that whereas HPSG is a declarative or constraint-based approach to grammar, Minimalism has a procedural view of grammar. This contrast means that HPSG is much more suitable than Minimalism for incorporation into an account of the processes that are involved in linguistic performance.

The most obvious fact about linguistic performance is that it involves both production and comprehension. As noted in section 3, this suggests that the knowledge that is used in production and comprehension should have a declarative character as in HPSG and not a procedural character as in Minimalism.

A second important feature of linguistic performance is that it involves different kinds of information utilized in any order that is necessary. Sag & Wasow (2011) illustrate with the following examples:

- (36) a. The sheep that was sleeping in the pen stood up.
 b. The sheep in the pen had been sleeping and were about to wake up.

In (36a), morphological information determines the number of sheep before non-linguistic information determines that pen means ‘fenced enclosure’ and not

‘writing implement’. In (36b), on the other hand, non-linguistic information determines that *pen* means ‘fenced enclosure’ before morphological information determines the number of sheep. This is unproblematic for an approach like HPSG in which linguistic and non-linguistic knowledge takes the form of constraints which are not ordered in any way. It is quite unclear how the facts can be accommodated within Minimalism given that linguistic knowledge with its procedural form is quite different from non-linguistic knowledge.

Other features of HPSG also make it attractive from a processing point of view. Firstly, there is the fact emphasized earlier that linguistic expressions have a single relatively simple constituent structure with a minimum of phonologically empty elements. Secondly there is the fact that all constraints are purely local and never affect anything larger than a local tree consisting of an expression and its daughters. Both these properties make processing easier than it would otherwise be. Minimalism has neither property and hence again seems less satisfactory than HPSG in this area.

5.2 Acquisition

Acquisition has long been a central concern for Chomskyans and it has long been argued that acquisition is made possible by the existence of a complex innate language faculty. Since the early 1980s the dominant view has been that the language faculty consists of a set of principles responsible for the properties which they share and a set of parameters responsible for the ways in which they may differ. On this view acquiring a grammatical system is a matter of parameter-setting. Proponents of HPSG have always been sceptical about these ideas (see e.g., the remarks about parameters in Pollard & Sag (1994: 31) and have favoured accounts with ‘an extremely minimal initial ontology of abstract linguistic elements and relations’ (Green 2011: 378). Thus, the two frameworks appear to be very different in this area. It is not clear, however, that this is really the case.

The idea that acquiring a grammatical system is a matter of parameter-setting is only as plausible as the idea of a language faculty with a set of parameters. It seems fair to say that this idea has not been as successful as was hoped when it was first introduced in the early 1980s. Outsiders have always been sceptical, but they have been joined in recent times by researchers sympathetic to many Chomskyan ideas. Thus, Newmeyer (2005: 75) writes as follows:

[...] empirical reality, as I see it, dictates that the hopeful vision of UG as providing a small number of principles each admitting of a small number

of parameter settings is simply not workable. The variation that one finds among grammars is far too complex for such a vision to be realized.

At least some Minimalists have come to similar conclusions. Thus, Boeckx (2011: 206) suggests that:

some of the most deeply-embedded tenets of the Principles-and-Parameters approach, and in particular the idea of Parameter, have outlived their usefulness. (Boeckx 2011: 206)

Much the same view is expressed in Hornstein (2009: 164–168).

A major reason for scepticism about parameters is that estimates of how many there are seem to have steadily increased. Fodor (2003) considers that there might be just twenty parameters, so that acquiring a grammatical system is a matter of answering twenty questions. Newmeyer (2005: 44) remarks that ‘I have never seen any estimate of the number of binary-valued parameters needed to capture all of the possibilities of core grammar that exceeded a few dozen’. However, Roberts & Holmberg (2005) comment that ‘[n]early all estimates of the number of parameters in the literature judge the correct figure to be in the region of 50–100’. Clearly, a hundred is a lot more than twenty. This is worrying. As Newmeyer (2006: 6) observes, ‘it is an ABC of scientific investigation that if a theory is on the right track, then its overall complexity decreases with time as more and more problematic data fall within its scope. Just the opposite has happened with parametric theory. Year after year more new parameters are proposed, with no compensatory decrease in the number of previously proposed ones. Just the opposite has happened with parametric theory. Year after year more new parameters are proposed, with no compensatory decrease in the number of previously proposed ones’.

The growing scepticism appears to tie in with the proposal by Hauser, Chomsky & Fitch (2002: 1573) that ‘FLN [the “Narrow Language Faculty”] comprises only the core computational mechanisms of recursion as they appear in narrow syntax and the mappings to the interfaces’. On this view there seems to be no place for parameters within FLN. This conclusion is also suggested by Chomsky’s remarks (2005) that ‘There is no longer a conceptual barrier to the hope that the UG [Universal Grammar] might be reduced to a much simpler form’ (p. 8) and that ‘we need no longer assume that the means of generation of structured expressions are highly articulated and specific to language’ (p. 9). It’s hard to see how such remarks are compatible with the assumption that UG includes 50–100 parameters. But if parameters are not part of UG, it is not at all clear what their status might be.

page

Fodor (1998: 346–347) assumes that there are 20 to 30 parameters, Gibson & Wexler (1994: 408) mention the number 40, Baker (2003: 349) talks of 10 to 20 and Roberts & Holmberg (2005: 541) of 50 to 100.

It looks, then, as Chomskyans are gradually abandoning the idea of parameters. But if it is abandoned, grammar acquisition is not a matter of parameter-setting. Hence, it is not clear that Chomskyans can invoke any mechanisms that are not available to HPSG.

This might suggest that HPSG and Minimalism are essentially in the same boat where acquisition is concerned. However, this is not the case given the very different nature of grammatical systems in the two frameworks. The complex and abstract structures that are the hallmark of Minimalism and earlier Chomskyan frameworks pose major problems for acquisition. It is this that has led to the assumption that acquisition must be assisted by a complex language faculty. In contrast, HPSG structures are quite closely related to the observable data and so pose less of a problem for acquisition and hence create less need for some innate apparatus. Thus, HPSG probably has an advantage over Minimalism in this area too.

There is one further issue that we should discuss here. It appears to be quite widely assumed that one advantage that Minimalism has over alternatives like HPSG is that it is more ‘restrictive’, in other words that it makes more claims about what is and is not possible in language. It is true that HPSG makes few claims about what is and is not possible in language. It is also true that it is good other things being equal for a theory to make such claims. It looks then as if there might be an argument for Minimalism here. It is not clear, however, that this is really the case.

Minimalism would be a restrictive theory making interesting claims about language assumed a relatively small number of parameters. However, it seems that the idea that there is just small number of parameters seems to have been abandoned, and at least some minimalists have abandoned the idea of parameters altogether. If there is either a large number of parameters or no parameters at all, Minimalism is not restrictive in the way that it once was. However, it does still embody some restrictions on grammatical systems. The assumption that syntactic structures are confined to binary branching is an important restriction, as is the assumption that expressions produced by Merge have the same label as one of the expressions that they consist of. But we have argued that both assumptions are quite dubious. It also seems to be assumed that case and agreement are features of all grammatical systems. This would be another important restriction, but this also seems dubious given that many languages show no clear evidence for one or both of these features. It looks to us, then, as if the restrictiveness of Minimalism is largely a matter of imposing certain dubious restrictions on grammatical systems.

These remarks should not be understood as a suggestion that vary without limit, as Joossuggested. No doubt there are language universals and variation is limited. However, most HPSG linguists would think that we don't have enough detailed formal analyses of enough phenomena in enough languages to have any firm conclusions about these matters. If this is right, a restrictive theory if not a realistic expectation at the present time.

provide
refer-
ence

Abbreviations

Acknowledgements

6 To do

Tom Wasow: Mention Generative Semantics.

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Dear Bob and Stefan

very good outline, although a bit on the defensive side (I would be more offensive, but it's me...)

- a historical part is missing: HPSG and minimalism both come from generative transformational grammar it would be good for the (young) reader to know when they set apart and why

- Main point : is HPSG generative ? Ivan was insisting that HPSG is truer than Minimalism to the Syntactic structures program of a formal explicit model of language

you may mention Pullum and Schulz's distinction between generative enumerative syntax and model theoretic syntax

- ø HPSG more compatible with infinite lexicon and gradient grammaticality

- sections 2 and 3

Underspecification is what distinguishes HPSG : may allow several word order without positing one derived from the other, different scope etc

HPSG compatible with autonomous morphology (ref chapter) not minimalism : distributed morphology

- section 4 syntax:

you may mention the different view on features: from the little I know of minimalism, they only have binary features (like structuralists) which have to be « checked » (for me it's pathetically informal, but you may have a more subtle view)

Binary branching is also not plausible for coordination (ref chapter),

Very different view on islands : no innate syntactic constraints but discourse infelicity and processing difficulties (ref Island chapter)

section 5 - you should enlarge the scope and title of section 5 or add a section on psychological plausibility: minimalism supposes an innate UG, not HPSG,

HPSG is more compatible with views as that language acquisition uses more general categorising mechanisms (ref acquisition chapter)

HPSG more compatible with incremental one stage models of human parsing (using all available information at each word, not processing syntactic structure than semantics) (ref performance compatible paper by Sag and Wasow 2011) it's strange that there are HPSG people in true lg processing conferences (Cuny, Am-lap) but (almost) no minimalists

the chomskyan rhetorics about biolinguistics should be torn to pieces > best
anne

Chapter 33

HPSG and Categorical Grammar

Yusuke Kubota

University of Tsukuba

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Yusuke Kubota

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Abbreviations

Acknowledgements

Chapter 34

HPSG and Lexical Functional Grammar

Doug Arnold

University of Essex

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Doug Arnold

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Abbreviations

Acknowledgements

Chapter 35

HPSG and Dependency Grammar

Dick Hudson

London

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1 Two centuries of syntactic theory

In the early 19th century, European grammar was still dominated by the Latin grammar of Priscian which focused on individual words, their morphosyntactic properties and their relations (controlled especially by government and agreement); grammars and grammatical theory were mainly focused on school pedagogy, where the dominant model was the parsing of individual words. But these ideas, and especially government, defined ‘dependency’ relations holding most words together. The exception was the relation between the verb and its subject, which was still described in terms of the dominant classical logic based on the subject-predicate split. Putting these two traditions together, grammarians produced a mixed theory of sentence structure and a number of diagramming systems to represent such structures – most famously, the diagramming system invented in the USA by Reed & Kellogg (1877) (and still taught in the 21st century in some American schools). This is also the theory that Bloomfield brought back to the USA from Germany, and which he developed into Immediate Constituent analysis (which later turned into phrase-structure analysis); as in the earlier theory, the subject and predicate were equal, in contrast with other ‘endocentric’ constructions. Bloomfield combined this mixed theory with Wundt’s theory of cognition, with the sentence as the ‘whole’ which defines its parts (and the word no longer in prime position), which allowed a consistent geometry, but phrase-structure trees did not appear till the middle of the 20th century. Meanwhile, however, both Humboldt and Grimm had suggested that the verb was



the sole head of the sentence, with the subject as one of its dependents, and by the 1860s and 1870s, grammarians in Hungary, Russia and Germany (apparently working independently) were arguing for this view, half a century before it was formalised by Tesnière and named ‘dependency analysis’. The first ‘stemma’ diagram appeared (in Hungary) in 1873. Another 19th-century reaction against classical logic was the logical tradition started (in Germany) by Frege, who may have learned to draw stemmas at school; this tradition gave rise (in Poland) to categorial grammar, which some (including Chomsky) see as a version of dependency analysis. One outcome of this history was the present-day geographical split between American phrase structure (PS) and European dependency structure (DS). Variations on the dependency theme Unsurprisingly, therefore, dependency theory has had more impact on Europeans than on Americans. The general idea of word-word dependencies was built into a number of different theoretical packages which combined it with other ideas, notably multiple levels (the Russian Mel’cuk) and information structure (the Czechs Sgall and Hajicová). However, dependency structure has also been popular internationally in natural-language processing (represented perhaps most notably by the Stanford Parser). ‘Plain-vanilla’ versions of DS and PS are very similar and are weakly equivalent, but as with phrase structure, such theories need to be supplemented, giving rise to theories in which structures are much richer. One such theory is Word Grammar (WG), which is probably closer to HPSG than any of the other DS theories. In WG, a word is allowed to depend on more than one other word (like re-entrance in HPSG) and dependencies are combined with extra mechanisms for coordination and for word order. This theory will be the main point of comparison with HPSG in the rest of the chapter.

2 Signs, constructions and levels

The contrast between PS and DS is orthogonal to choices about the number of levels (syntax, morphology, etc) and how they are related, but of course these choices are essential for any theoretical package. As in PS theories, different DS theories assume different answers, but Word Grammar takes a rather conservative position in which syntax is distinct both from morphology and from semantics. This view is hard to reconcile with the claim that language consists of ‘constructions’ or ‘signs’, both of which assume a direct link between ‘form’ and ‘meaning’. In this view, units of phonological ‘form’ are only indirectly linked to units of meaning. Approaches which evoke ‘signs’ or ‘constructions’ can also be challenged for their conservative assumptions about plain-vanilla surface PS.

Arguably, DS is a better basis for capturing the fine detail of idiosyncratic constructions since these always involve individual lexical items linked by dependencies, and typically focus on just one dependent of a given lexeme rather than on entire multi-dependent phrases. Networks WG takes the whole of language (not just the lexicon) to be a gigantic network, which is a step further than HPSG (where PS rules are outside the network); the network is also not assumed to be a DAG because mutual dependency is allowed. One of the characteristics of network analyses is the central role of relation types (i.e. HPSG attributes). According to WG, but not HPSG, these types form a typed hierarchy which parallels the typed hierarchy of non-relational ‘entities’ such as words, phonemes and so on; and in both hierarchies, properties are inherited by (a special formalisation of) default inheritance. One of the consequences of this treatment of relations is that, just like entities, they can freely be created and learned as required, so there is no need to assume a universal hard-wired reservoir of relations. This is particularly helpful in DS, where dependencies are typed but different languages require different classifications and distinctions. Word order Another similarity between WG and HPSG is in the treatment of word order. In both theories, dominance (i.e. daughterhood in HPSG and dependency in WG) is separated from linear precedence. In WG, a word’s position is treated as one of the word’s property’s linked to a second property (‘landmark’), the word from which it takes its position; the word’s landmark is normally the word on which it depends, but exceptions are allowed in cases such as extraction and pied piping. The landmark relation allows a treatment of pied piping which avoids the feature-percolation of HPSG.

3 Words, nodes and semantic phrases

The final topic is the Achille’s heel of DS: the completely flat structures where a word has two or more dependents. This is problematic in DS (but not, of course, in HPSG) in examples such as typical French house, meaning ‘typical for a French house’, because there is no syntactic node that could carry the meaning ‘French house’. Current WG provides a solution which moves WG in the direction of PS by distinguishing types from tokens, and then distinguishing ‘sub-tokens’ of tokens. In this analysis, the token house is distinct not only from the type HOUSE, but also from the sub-token house’ which is modified by the dependent French, which in turn is distinct from house’’ modified by typical. Sub-tokens are very similar in function to the phrases of HPSG but arguably not quite equivalent.

Abbreviations

Acknowledgements

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Chapter 36

HPSG and Construction Grammar

Stefan Müller

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1 What is Construction Grammar?

Goldberg (1996; 2006); Michaelis (2012)

- form-meaning pairs
- language acquisition without (much) UG
- no empty elements

Historical aspects:

- non-locality (Fillmore et al. 1988)
- type inheritance Kay & Fillmore (1999); Sag (1997)

2 HPSG as a Construction Grammar

- form-meaning pairs
- type hierarchies
- surface oriented



3 Valence vs. phrasal patterns

Goldberg (1996; 2006); Goldberg & Jackendoff (2004)
Müller (2006); Müller & Wechsler (2014); Müller (2018)

4 Phrasal patterns

Why more than just binary branching abstract schemata are needed:

- Jackendoff (2008): NPN construction
- Jacobs (2008)
- Müller (2016: Section 21.10.1)

Specialized constructions for special cases, e.g., Sag (2010).

Acknowledgements

I thank Bob Borsley, Rui Chaves, and Jean-Pierre Koenig for comments on the outline for this chapter and for discussion in general.

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