

# 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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Anne Abeillé

Robert D. Borsley

Jean-Pierre Koenig

Stefan Müller



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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 cursus<sup>1</sup> sapien pulvinar. Sed consequat, magna<sup>2</sup>. 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

## Acknowledgements

## References

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

<sup>1</sup>eros condimentum mi consectetur, ac consectetur

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



Meier, Jane. 2017. *Language universals and linguistic typology*. Oxford: Basil Blackwell.



## Chapter 2

# The evolution of HPSG

Dan Flickinger

Stanford University

Tom Wasow

Stanford University

Carl Pollard

Ohio State Universtiy

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or remove it there

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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

Goethe-Universität Frankfurt

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## 1 Introduction

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*Frank Richter*

ut turpis cursus rhoncus. Donec sed convallis justo. Sed sed massa pharetra ex  
aliquet eleifend. finality

## **Abbreviations**

## **Acknowledgements**

## Chapter 4

# The nature and role of the lexicon in HPSG

Jean-Pierre Koenig

University at Buffalo

Anthony Davis

Buffalo?

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## **Abbreviations**

## **Acknowledgements**



## Chapter 5

# Understudied languages

Doug Ball

Aron Broadwell

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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**

## **Part II**

# **Syntactic phenomena**



## Chapter 6

# Agreement

Steve Wechsler

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*Steve Wechsler*

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## **Abbreviations**

## **Acknowledgements**

# Chapter 7

## Case

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*Adam Przepiórkowski*

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aliquet eleifend. finality

## **Abbreviations**

## **Acknowledgements**



## Chapter 8

# Argument structure and linking

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Steve Wechsler

University of Texas at Austin

Anthony Davis

Buffalo?

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## 1 Introduction

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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**

## Chapter 9

# Constituent order

Stefan Müller

Humboldt-Universität zu Berlin

### 1 Introduction

### 2 ID/LP format

Gazdar et al. (1985)

### 3 Flat and binary branching structures

ARG-ST (Chapter 8) as the underlying representation and determinant of basic order

### 4 Head movement

Welsh and German DOUBLE SLASH:

Borsley (1989); Müller (2017)

English Aux-System

Sag (2018)

### 5 Constituent order domains

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

reference to Chapter 12 on coordination and Chapter 19 on ellipsis.



Stefan Müller. 2018. Constituent order. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 23–24. Berlin: Language Science Press.  
DOI:??

## 6 Free constituent order languages without order domains

Bender (2008)

### Abbreviations

### Acknowledgements

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- Sag, Ivan A. 2018. *Lessons from the English auxiliary system*. Ms. Stanford University.

## Chapter 10

# Clitics

Anne Abeillé

Université Paris Diderot

Gerald Penn

University of Toronto

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## **Abbreviations**

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## Chapter 11

# Complex predicates

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Pollet Samvelian

Université Sorbonne Nouvelle

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## **Abbreviations**

## **Acknowledgements**



## Chapter 12

# Coordination

Anne Abeillé

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Rui Chaves

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## **Abbreviations**

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## Chapter 13

# Unbounded dependencies

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## **Abbreviations**

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## Chapter 14

# Island phenomena and related matters

Rui Chaves

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## **Abbreviations**

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## Chapter 15

# Idioms

Manfred Sailer

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## **Abbreviations**

## **Acknowledgements**



## Chapter 16

# Relative clauses

Doug Arnold

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Danièle Godard

Université Paris Diderot

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## **Abbreviations**

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## Chapter 17

# Control and raising

Anne Abeillé

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## **Abbreviations**

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## Chapter 18

# Negation

Jong-Bok Kim

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## **Abbreviations**

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## Chapter 19

# Ellipsis

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## **Abbreviations**

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## Chapter 20

# Binding

Tibor Kiss

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## **Abbreviations**

## **Acknowledgements**

## **Part III**

# **Other levels of description**



## Chapter 21

# Morphology

Berthold Crysmann

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## **Abbreviations**

## **Acknowledgements**

## Chapter 22

# Semantics

Jean-Pierre Koenig

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## **Abbreviations**

## **Acknowledgements**



## Chapter 23

# Pragmatics and dialogue semantics

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Robin Cooper

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Andy Lücking, Jonathan Ginzburg & Robin Cooper. 2018. Pragmatics and dialogue semantics. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 53–54. Berlin: Language Science Press. DOI:??

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## **Abbreviations**

## **Acknowledgements**

## **Part IV**

# **Other areas of linguistics**



## Chapter 24

# Diachronic syntax

Ulrike Demske

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*Ulrike Demske*

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## **Abbreviations**

## **Acknowledgements**

## Chapter 25

# Acquisition

Jonathan Ginzburg

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*Jonathan Ginzburg*

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## **Abbreviations**

## **Acknowledgements**



## Chapter 26

# Processing

Tom Wasow

Stanford University

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*Tom Wasow*

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## **Abbreviations**

## **Acknowledgements**

## Chapter 27

# Computational linguistics and Language Engineering

Emily Bender

University of Washington

Put abstract here with \abstract.

## 1 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)
- History: PAGE, VerbMobil, ??
- Current platforms:
  - LKB/ACE/PET/Agree
  - Trale
  - Other

## 2 Development of HPSG resources

- CoreGram
- DELPH-IN consortium



Emily Bender. 2018. Computational linguistics and Language Engineering. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 63–64. Berlin: Language Science Press. DOI:??

- ERG
  - Other large-ish grammars
  - Grammar Matrix
- Alpino

### **3 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
- Alpino
  - ??
- Other?

## **Abbreviations**

## **Acknowledgements**

## Chapter 28

# Sign languages

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## **Abbreviations**

## **Acknowledgements**

## Chapter 29

# Gesture

Andy Lücking

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*Andy Lücking*

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## **Abbreviations**

## **Acknowledgements**



## **Part V**

# **The broader picture**



## Chapter 30

# HPSG and Minimalism

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### 1 Introduction

The Minimalist framework, which was first outlined by Chomsky in the early 1990s (Chomsky 1993; 1995), 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.<sup>1</sup>

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, 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

<sup>1</sup>As 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 and van 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.

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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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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 and 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 et al. (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.<sup>2</sup>

### 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

---

<sup>2</sup>Equally, 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 (1995: 219) remarks that: ‘We take L [a particular language] to be a generative procedure that constructs pairs  $(\pi, \lambda)$  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.<sup>3</sup> 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 1995: 244). Its operation can be presented as follows:

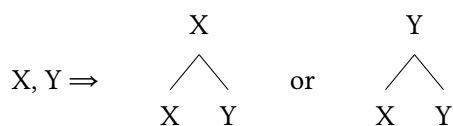


Figure 1: insert caption

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.

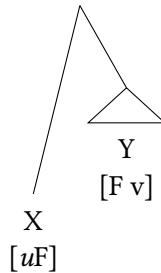
Agree, as one might suppose, offers an approach to various kinds of agreement

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<sup>3</sup>A 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.



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.):<sup>4</sup>



## 4 Different views of syntactic structure

## 5 Restrictiveness

## Abbreviations

## Acknowledgements

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<sup>4</sup>On 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.

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## Chapter 31

# HPSG and Categorical Grammar

Yusuke Kubota

University of Tsukuba

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*Yusuke Kubota*

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## **Abbreviations**

## **Acknowledgements**

## Chapter 32

# HPSG and Lexical Functional Grammar

Doug Arnold

University of Essex

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## 1 Introduction

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*Doug Arnold*

ut turpis cursus rhoncus. Donec sed convallis justo. Sed sed massa pharetra ex  
aliquet eleifend. finality

## **Abbreviations**

## **Acknowledgements**



## Chapter 33

# 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 34

# HPSG and Construction Grammar

Stefan Müller

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### 1 What is Construction Grammar?

Michaelis (2012)

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

### 2 HPSG as a Construction Grammar

- form-meaning pairs
- type hierarchies
- surface oriented

### 3 Valence vs. phrasal patterns

Müller (2006); Müller & Wechsler (2014); Müller (2018)



## 4 Phrasal patterns

### Acknowledgements

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