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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Contents

Preface

Acknowledgments

Part I

Introduction

Chapter 1

Basic properties and elements

Bob Borsley
University of Essex

Anne Abeillé
Université Paris Diderot

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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'

Bob Borsley & Anne Abeillé. 2018. Basic properties and elements. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 3–5. Berlin: Language Science Press. DOI:??

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 [1] sapien pulvinar. Sed consequat, magna[2]. 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.

[1] eros condimentum mi consectetur, ac consectetur

[2] 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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Change the abstract in chapters/02.tex Quisque ullamcorper placerat ipsum. Cras nibh. Morbi vel justo vitae lacus tincidunt ultrices. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. In hac habitasse platea dictumst. Integer tempus convallis augue. Etiam facilisis. Nunc elementum fermentum wisi. Aenean placerat. Ut imperdiet, enim sed gravida sollicitudin, felis odio placerat quam, ac pulvinar elit purus eget enim. Nunc vitae tortor. Proin tempus nibh sit amet nisl. Vivamus quis tortor vitae risus porta vehicula.

1 Introduction

Spanish (Chomsky 1957)

Abbreviations

COP	copula	NEG	negation
FV	final vowel	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. 2018. Formal Background. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 9–10. Berlin: Language Science Press.
DOI:??

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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Jean-Pierre Koenig & Anthony Davis. 2018. The nature and role of the lexicon in HPSG. in Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 11–12. Berlin: Language Science Press. DOI:??

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Abbreviations

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Chapter 5

Understudied languages

Doug Ball

Aron Broadwell

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Doug Ball & Aron Broadwell. 2018. Understudied languages. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 13–14. Berlin: Language Science Press. DOI:??

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Abbreviations

Acknowledgements

Part II

Syntactic phenomena

Chapter 6

Agreement

Steve Wechsler
University of Texas at Austin

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Steve Wechsler. 2018. Agreement. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 17–18. Berlin: Language Science Press. DOI:??

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Abbreviations

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Chapter 7

Case

Adam Przepiórkowsk
Polish Academy of Sciences

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

Abbreviations

Acknowledgements

Chapter 8

Argument structure and linking

Jean-Pierre Koenig
University at Buffalo

Steve Wechsler
University of Texas at Austin

Anthony Davis
Buffalo?

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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:??

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Abbreviations

Acknowledgements

Chapter 9

Constituent order

Stefan Müller
Humboldt-Universität zu Berlin

1 Introduction

2 ID/LP format

Gazdar, Klein, Pullum & Sag (1985)

3 Flat and binary branching structures

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

valence features as sets (Gunji 1986; Hinrichs & Nakazawa 1989; Pollard 1996; Engelkamp, Erbach & Uszkoreit 1992)

need for an extra list for Binding

Ackerman et al. (2013)

valence features as lists + append (Müller 2015)

4 Head movement vs. constructional approaches assuming flat structures

4.1 Head movement approaches

Welsh (Borsley 1989) and German DOUBLE SLASH (Kiss & Wesche 1991: Section 4.7; Oliva 1992; Netter 1992; Kiss 1993; Frank 1994; Kiss 1995; Feldhaus 1997, Meurers

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*, 23–26. Berlin: Language Science Press. DOI:??

2000; Müller 2005; Müller 2017)

4.2 Constructional approaches

English Aux-System (Fillmore 1999; Sag 2018)

5 Constituent order domains

5.1 A special representational layer for constituent order

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

5.2 Problems with order domains

Partial verb phrase fronting requires partial constituents.
(Kathol 2001; Müller 2017)

5.3 Other usages of constiuent order domains

reference to Chapter 12 on coordination and Chapter 19 on ellipsis.
comparison with Dependency Grammar (Chapter 35

6 Free constituent order languages without order domains

Bender (2008)

Abbreviations

Acknowledgements

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Chapter 10

Clitics

Anne Abeillé
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Gerald Penn
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Anne Abeillé & Gerald Penn. 2018. Clitics. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 27–28. Berlin: Language Science Press. DOI:??

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Abbreviations

Acknowledgements

Chapter 11

Complex predicates

Danièle Godard
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Université Sorbonne Nouvelle

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Danièle Godard & Pollet Samvelian. 2018. Complex predicates. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 29–30. Berlin: Language Science Press. DOI:??

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Abbreviations

Acknowledgements

Chapter 12

Coordination

Anne Abeillé
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Rui Chaves
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Chapter 13

Unbounded dependencies

Berthold Crysmann
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Bob Borsley
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Chapter 14

Island phenomena and related matters

Rui Chaves
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Chapter 15

Idioms

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Chapter 16

Relative clauses

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Doug Arnold & Danièle Godard. 2018. Relative clauses. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 39–40. Berlin: Language Science Press. DOI:??

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Chapter 17

Control and raising

Anne Abeillé
Université Paris Diderot

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Chapter 18

Negation

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Abbreviations

Acknowledgements

Chapter 19

Ellipsis

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Chapter 20

Binding

Tibor Kiss
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Acknowledgements

Part III

Other levels of description

Chapter 21

Phonology

Jesse Tseng
Université Paris Diderot

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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)

Jesse Tseng. 2018. Phonology. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 51–54. Berlin: Language Science Press. DOI:??

- 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. 2018. Morphology. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 55–56. Berlin: Language Science Press. DOI:??

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Abbreviations

Acknowledgements

Chapter 23

Semantics

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Abbreviations

Acknowledgements

Chapter 24

Information structure

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Chapter 25

Pragmatics and dialogue semantics

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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*, 61–62. Berlin: Language Science Press. DOI:??

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Abbreviations

Acknowledgements

Part IV

Other areas of linguistics

Chapter 26

Diachronic syntax

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Acknowledgements

Chapter 27

Acquisition

Jonathan Ginzburg
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Chapter 28

Processing

Tom Wasow
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Tom Wasow. 2018. Processing. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 69–70. Berlin: Language Science Press. DOI:??

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Abbreviations

Acknowledgements

Chapter 29

Computational linguistics and Language Engineering

Emily Bender
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Guy Emerson
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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

Emily Bender & Guy Emerson. 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*, 71–72. Berlin: Language Science Press. DOI:??

2 Development of HPSG resources

- CoreGram
- DELPH-IN consortium
  - 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 30

Sign languages

Markus Steinbach
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Anke Holler
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Markus Steinbach & Anke Holler. 2018. Sign languages. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 73–74. Berlin: Language Science Press. DOI:??

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Abbreviations

Acknowledgements

Chapter 31

Gesture

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Abbreviations

Acknowledgements

Part V

The broader picture

Chapter 32

HPSG and Minimalism

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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 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:

Bob Borsley & Stefan Müller. 2018. HPSG and Minimalism. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 79–105. Berlin: Language Science Press. DOI:??

(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, 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.

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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

[1] 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:

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(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]

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

[2]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 (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 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:

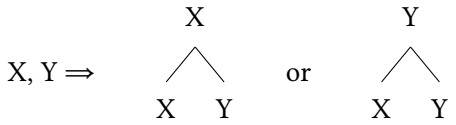

Figure 1: insert caption

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.

[3] 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.

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]

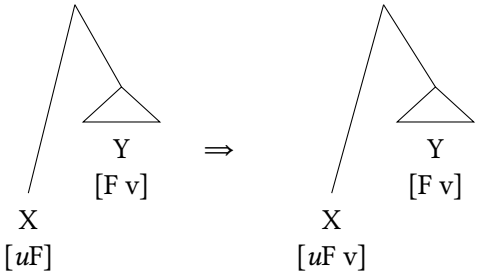

Figure 2: insert caption

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-

[4]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.

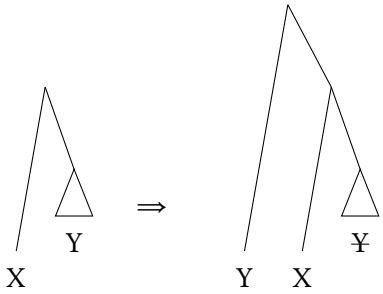

Figure 3: insert caption

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 is 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.

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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:

[5] The 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).

[6] For 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.

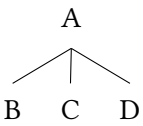
(15) a. Kim saddled the horse.
(Kim put the saddle on the horse.)
b. Lee chaired the meeting.
(Lee was the chairperson of the meeting.)

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.



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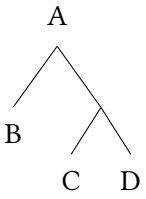
[7]See Culicover & Jackendoff (2005: 53–56) for further discussion.



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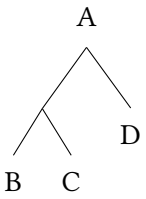

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As Culicover and Jackendoff discuss, the arguments for the binary branching restriction have never been very persuasive. Moreover, it is incompatible with various analyses which have been widely accepted in HPSG and other frameworks. We will return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

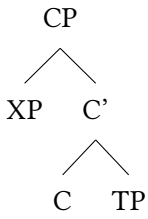

Figure 7: insert caption

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.

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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.

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Borsley (2006) (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:

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(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)

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 compementizer 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

[8]For a fuller discussion of the issues see Borsley (2006) (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.

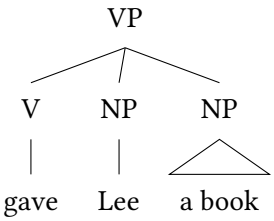

Figure 8: insert caption

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

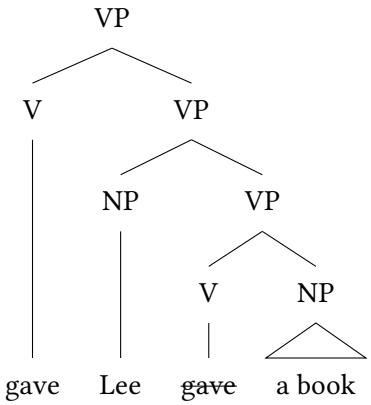

Figure 9: insert caption

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.

[9] The 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).

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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?

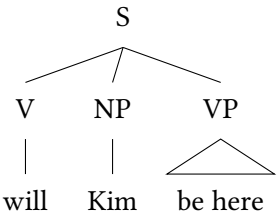

Figure 10: insert caption

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

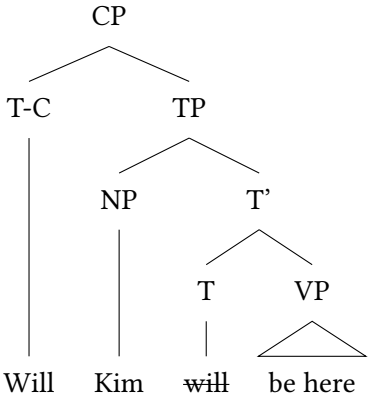

Figure 11: insert caption

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

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 and 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 2003for 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

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[10] Positive 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).
[11] Borsley (2016) argues for a similar flat structure for the Caucasian ergative SOV language Archi.
[12] For a more detailed critique of this approach see Borsley (2005).

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].

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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

[13] There 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 _].

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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.

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'

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Willis (2011)and Borsley (2013),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 (to appear),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).

5 Restrictiveness

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'. It seems to us that there is not much basis for this view, but the issues merit some attention.

Since the early 1980s Chomskyans have taken the view that the range of possibilities in grammatical systems is defined by a set of innate parameters. This could be seen as a restrictive view. However, it seems fair to say that this idea not been as successful as was hoped when it was first introduced in the early 1980s. Over the years estimates of how many there are seem to have steadily increased. Fodor (2001)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 and Holmberg (2006)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'. He concludes (2005: 75) as follows:

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> '…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.'

In recent times some Minimalists have come to a similar view. Thus, Boeckx (2011)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.' It is not really clear what Chomsky's view of parameters is, but there appears to be no place for them in the version of Minimalism presented in Hauser, Chomsky and Fitch (2002), in which the narrow language faculty is just 'recursion'.

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If the idea of a set of innate parameters has been abandoned, then Minimalism is not restrictive in the way that it once was. However, rejecting the idea of innate

parameters is not the same as saying that anything goes, and Minimalism certainly imposes 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 dubious restrictions on grammatical systems.

What about HPSG? In proposing that grammars take a certain form HPSG is restrictive in a sense. However, it could be said that HPSG imposes few restrictions on the content of grammars. Probably most proponents of HPSG would think that this is a reasonable. No doubt there are language universals and languages do not vary without limit, as Joos suggested. But 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.

Abbreviations

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Chapter 33

HPSG and Categorial Grammar

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1 Introduction

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Yusuke Kubota. 2018. HPSG and Categorial Grammar. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 107–108. Berlin: Language Science Press. DOI:??

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Abbreviations

Acknowledgements

Chapter 34

HPSG and Lexical Functional Grammar

Doug Arnold
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1 Introduction

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Doug Arnold. 2018. HPSG and Lexical Functional Grammar. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 109–110. Berlin: Language Science Press. DOI:??

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Abbreviations

Acknowledgements

Chapter 35

HPSG and Dependency Grammar

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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

Dick Hudson. 2018. HPSG and Dependency Grammar. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 111–114. Berlin: Language Science Press. DOI:??

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 Tesniere 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 Hajicova). 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

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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)

Stefan Müller. 2018. HPSG and Construction Grammar. In Anne Abeillé, Robert D. Borsley, Jean-Pierre Koenig & Stefan Müller (eds.), *The one and only handbook of Head-Driven Phrase Structure Grammar*, 115–116. Berlin: Language Science Press. DOI:??

4 Phrasal patterns

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