An introduction to Head-Driven Phrase Structure Grammar and remarks on its position in the theoretical landscape

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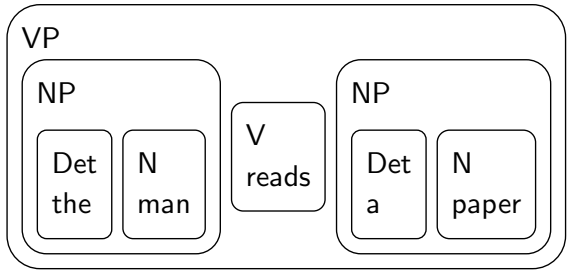
Head-Driven Phrase Structure Grammar (Background)

- developed in the 80s as a successor of GPSG (influences from CG, GB, CxG)
- main publications Pollard and Sag, 1987, 1994, many contributions since then
  - syntactic theory
  - language typology
  - computational linguistics, grammar development
    (German, Englisch, French, Norwegian, Japanese, Spanish, Persian, Maltese, Danish, Polish, Mandarin Chinese, ...)
- Phonology, morphology, syntax, semantics, and pragmatics (information structure) are covered.
- since 1993 yearly conferences:
  conference volumes are published by CSLI online publications
- Web pages:
  http://hpsg.stanford.edu/ and
  http://hpsg.fu-berlin.de/HPSG-Bib/ (Literature)

Course Page and Material

- Web page with the slides and handouts of the lectures:
  http://hpsg.fu-berlin.de/~stefan/Lehre/stuts2012.html
- The analyses are implemented.
  A CD rom image which contains the grammar development software and example grammars for German, Chinese, and Maltese can be downloaded from http://hpsg.fu-berlin.de/Software/Grammix/.
- Further reading:
  - Overview article in English: Müller, To appear
  - Introduction to HPSG in German: Müller, 2008
  - Introduction to several frameworks and comparison: Müller, 2010a

Labeled Boxes



Those who moved to a new flat will agree that it makes sense to label boxes.

We have information about the most important element in each box.

Boxes May Be Replaced by Boxes with the Same Label

- The content of the box do not matter:

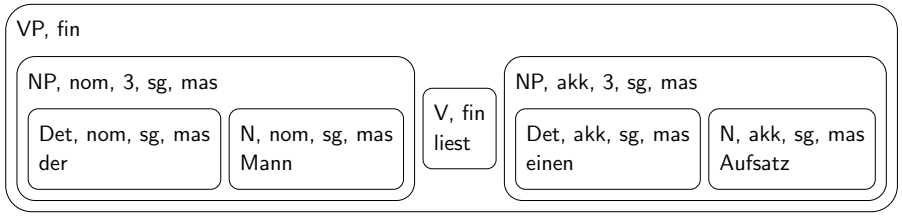
  (1) a. he
  b. the man
  c. the man from Stuttgart
  d. the man from Stuttgart that we know

  Important: the words and phrases in (1) are nominal and complete: NP
  We can exchange them for each other in bigger boxes that contain an NP.
- This does not work for all NPs:

  (2) a. The man read a paper.
  b. * The men reads a paper.
  c. * Him reads a paper.

- Certain properties are important for the distribution of phrases.

Boxes with Detailed Labels



All features that are relevant for the distribution of a phrase are projected.

These features are called **head features**.

Basic Assumptions

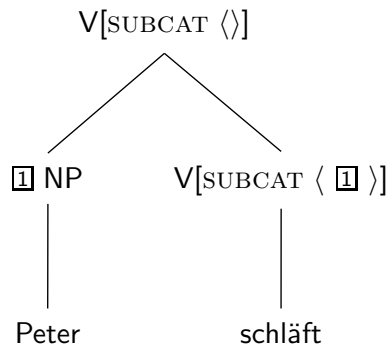
- lexicalized (head-driven)
- sign-based (Saussure, 1916)
- typed feature structures (lexical items, phrases, principles)
- multiple inheritance
- monostratal theory
  - Phonology
  - Syntax
  - Semantics

$$\begin{bmatrix} \textsc{phon} & \langle\ \textit{Grammatik}\ \rangle \\ \textsc{synsem|loc} & \begin{bmatrix} \textsc{cat} & \begin{bmatrix} \textsc{head} & \begin{bmatrix} \textsc{case}\ \boxed{1} \\ \textit{noun} \end{bmatrix} \\ \textsc{subcat} & \langle \textsc{det}[\textsc{case}\ \boxed{1}] \rangle \\ \textit{cat} \end{bmatrix} \\ \textsc{cont}\ \ldots & \begin{bmatrix} \textsc{inst}\ X \\ \textit{grammatik} \end{bmatrix} \\ \textit{loc} \end{bmatrix} \\ \textit{word} \end{bmatrix}$$

Valence and Grammar Rules

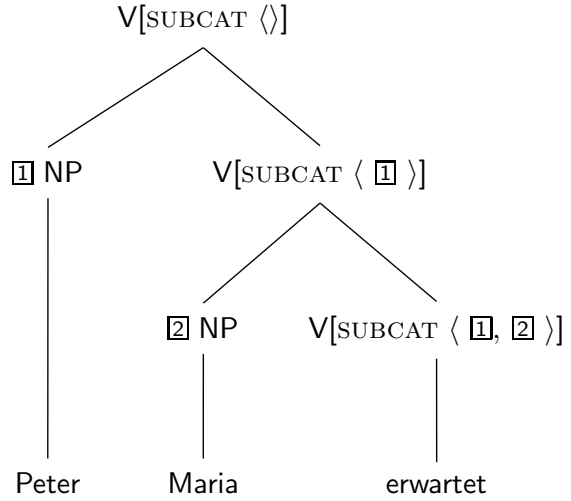
- Arguments are represented as complex categories
  in the lexical representation of the head (as in Categorial Grammar)
- Verb — SUBCAT
  schlafen ('sleep') — ⟨ NP ⟩
  lieben ('love') — ⟨ NP, NP ⟩
  sprechen ('talk') — ⟨ NP, PP[*über*] ⟩
  geben ('give') — ⟨ NP, NP, NP ⟩
  dienen ('serve') — ⟨ NP, NP, PP[*mit*] ⟩

Example Structure with Valency Information (I)



V[SUBCAT ⟨ ⟩] corresponds to a complete phrase (VP or S)

Example Structure with Valency Information (II)



Valence and Grammar Rules

- specific rules for head-argument combinations:
  V[SUBCAT A] → B V[SUBCAT A ⊕ ⟨ B ⟩]
- ⊕ is a relation that combines two lists:
  ⟨ *a*, *b* ⟩ = ⟨ *a* ⟩ ⊕ ⟨ *b* ⟩ oder
  ⟨⟩ ⊕ ⟨ *a*, *b* ⟩ oder
  ⟨ *a*, *b* ⟩ ⊕ ⟨⟩
- generalized, abstract schema (H = head):
  H[SUBCAT A] → H[SUBCAT A ⊕ ⟨ B ⟩] B

Representation of Valence Information in Feature Descriptions

gibt (finite form):

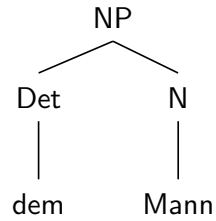
$$\begin{bmatrix} \text{PHON} & \langle\, \textit{gibt} \,\rangle \\ \text{PART-OF-SPEECH} & \textit{verb} \\ \text{SUBCAT} & \left\langle \text{NP}[\textit{nom}],\ \text{NP}[\textit{acc}],\ \text{NP}[\textit{dat}] \right\rangle \end{bmatrix}$$

NP[*nom*], NP[*acc*] and NP[*dat*] are abbreviations of complex feature descriptions.

Representation of Grammar Rules (I)

- Feature descriptions are the description inventory for
  - morphological rules
  - lexical entries and lexical rules
  - syntactic rules
- Separation of immediate dominance (ID) and linear precedence (LP)
- Dominance is encoded in DTR features (head daughter and non-head daughters)
- precedence is implicit in PHON

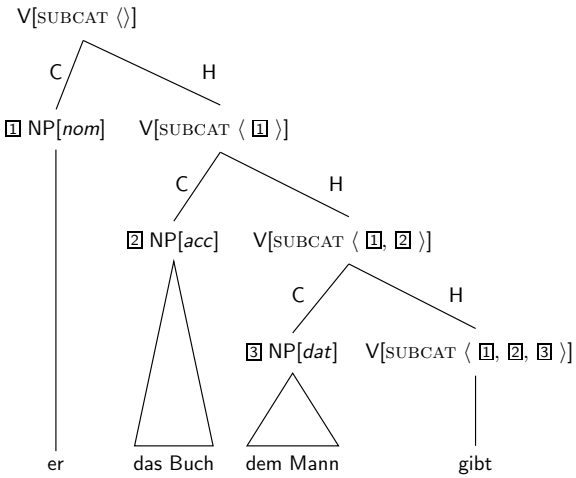
Partial Structure in Feature Representation



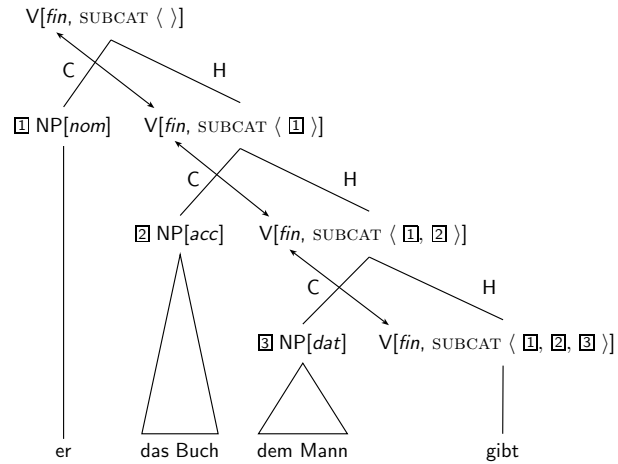
$$\begin{bmatrix} \text{PHON} & \langle\, \textit{dem Mann} \,\rangle \\ \text{HEAD-DTR} & \left[\text{PHON} \langle\, \textit{Mann} \,\rangle\right] \\ \text{NON-HEAD-DTRS} & \left\langle \left[\text{PHON} \langle\, \textit{dem} \,\rangle\right] \right\rangle \end{bmatrix}$$

- There is exactly one head daughter (HEAD-DTR).
  The head daughter contains the head.
  Structure with the daughters *the* and *picture of Mary* → *picture of Mary* is the head daughter, since *picture* is the head.
- There can be more than one non-head daughter
  (if we assume flat structures or binary branching structures without head).

An Example



Projection of Head Features



The head is the finite verb.

Feature Representation: the HEAD Value

- possible feature geometry:
  $$\begin{bmatrix} \text{PHON} & \textit{list of phonemes} \\ \text{P-O-S} & \textit{p-o-s} \\ \text{VFORM} & \textit{vform} \\ \text{SUBCAT} & \textit{list} \end{bmatrix}$$
- more structure, grouping of information that is projected:
  $$\begin{bmatrix} \text{PHON} & \textit{list of phonemes} \\ \text{HEAD} & \begin{bmatrix} \text{P-O-S} & \textit{p-o-s} \\ \text{VFORM} & \textit{vform} \end{bmatrix} \\ \text{SUBCAT} & \textit{list} \end{bmatrix}$$

Different Heads Project Different Features

- VFORM makes sense for verbs only
- prenominal adjectives and nouns project case (in German)
- possible structure: a structure with all features:
  $$\begin{bmatrix} \text{P-O-S} & \textit{p-o-s} \\ \text{VFORM} & \textit{vform} \\ \text{CASE} & \textit{case} \end{bmatrix}$$
  CASE would not have a value for verbs, VFORM would not have a value for nouns.
- Better: different types of feature structures
  - the description for verbs:
    $$\begin{bmatrix} \text{VFORM} & \textit{vform} \\ \textit{verb} \end{bmatrix}$$
  - for nouns
    $$\begin{bmatrix} \text{CASE} & \textit{case} \\ \textit{noun} \end{bmatrix}$$

A Lexical Item with Head Features

- A lexical item consists of:
  gibt ('gives'):
  $$\begin{bmatrix} \text{PHON} & \langle\ \textit{gibt}\ \rangle \\ \text{HEAD} & \begin{bmatrix} \text{VFORM} & \textit{fin} \\ \textit{verb} \end{bmatrix} \\ \text{SUBCAT} & \left\langle \text{NP}[\textit{nom}],\ \text{NP}[\textit{acc}],\ \text{NP}[\textit{dat}] \right\rangle \end{bmatrix}$$
  - phonological information
  - head information (part of speech, verb form, ...)
  - valence information: a list of feature descriptions

Head Feature Principle

- In a headed structure the head features of the mother are token identical with the head features of the head daughter.

  $$\textit{headed-structure} \rightarrow \begin{bmatrix} \text{HEAD}\ \boxed{1} \\ \text{HEAD-DTR}|\text{HEAD}\ \boxed{1} \end{bmatrix}$$

- *head-argument-structure* is a subtype of *headed-structure*
  → restrictions hold for this type as well
- *head-argument-structure* inherits properties from *headed-structure*.

Integration of Semantics

- sign-based: Syntax and semantics are represented in the same structure (see also Jackendoff, 2011)
- possibel data structure (CONT = CONTENT):

$$\begin{bmatrix} \text{PHON} & \textit{list of phoneme strings} \\ \text{HEAD} & \textit{head} \\ \text{SUBCAT} & \textit{list} \\ \text{CONT} & \textit{cont} \end{bmatrix}$$

Separate Representation of Syntactic and Semantic Information

- grouping of information, division in syntactic and semantic information (CAT = CATEGORY)

$$\begin{bmatrix} \text{PHON} & \textit{list of phoneme strings} \\ \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{head} \\ \text{SUBCAT} & \textit{list} \\ & \textit{cat} \end{bmatrix} \\ \text{CONT} & \textit{cont} \end{bmatrix}$$

- → possible to share syntactic information only
- symmetric coordination: the CAT value is identical:

(3) a. [the man and the woman]
b. He [knows and loves] this record.

German Clause Structure

- Example German: V2 + SOV + free ordering of arguments in the so-called *Mittelfeld*
  Deutsch ist eine V/2-Sprache mit Verbendstellung und freier Wortfolge (Haftka, 1996)
- almost free order of arguments in the Mittelfeld:

(4) a. weil der Mann der Frau das Buch gibt
since the man the woman the book gives
'since the man gives the woman the book'
b. weil der Mann das Buch der Frau gibt
c. weil das Buch der Mann der Frau gibt
d. weil das Buch der Frau der Mann gibt
e. weil der Frau der Mann das Buch gibt
f. weil der Frau das Buch der Mann gibt

Adjuncts in the Mittelfeld

- Apart from arguments adjuncts can appear in the Mittelfeld.
- These can be placed anywhere:

(5) a. weil morgen der Mann das Buch der Frau gibt
since tomorrow the man the book the woman gives
b. weil der Mann morgen das Buch der Frau gibt
c. weil der Mann das Buch morgen der Frau gibt
d. weil der Mann das Buch der Frau morgen gibt

Scopal Adjuncts

- Scopal adjuncts cannot be reordered without a change in meaning:

(6) a. weil er absichtlich nicht lacht
since he deliberately not laughs
'since he does not laugh deliberately'

b. weil er nicht absichtlich lacht
since he not deliberately laughs
'since he does deliberately not laugh'

Proposals

- Various proposals, for a discussion see Müller, 2004, 2005
- totally flat structures: verbs and arguments are in the same local tree. (Uszkoreit, 1987; Pollard, 1996)
  - Question: What about adjuncts? Semantics? (Kasper, 1994)
  - What about apparently multiple frontings? (Müller, 2003)

Binary Branching Structures

- Sentences like (7) are no problem:

(7) weil [der Mann [das Buch [der Frau gibt]]]

- The integration of adjuncts is straight-forward:

(8) a. weil [morgen [der Mann [das Buch [der Frau gibt]]]]
b. weil [der Mann [morgen [das Buch [der Frau gibt]]]]
c. weil [der Mann [das Buch [morgen [der Frau gibt]]]]
d. weil [der Mann [das Buch [der Frau [morgen gibt]]]]

- The meaning difference in (9) follows from the difference in embedding.

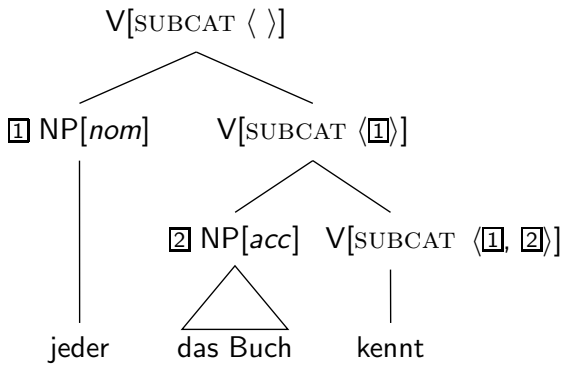
(9) a. weil er [absichtlich [nicht lacht]]
b. weil er [nicht [absichtlich lacht]]

Reordering and Binary Branching

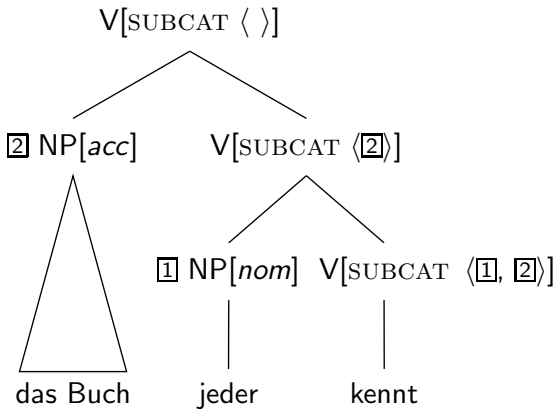
- Analyses with binary branching:
  - Analysis 1: Verb takes the arguments in the order they are represented in the valence list → we need several lexical items to cover all possible orders (Uszkoreit, 1986; Jacobs, 1986)
  - Analysis 2: Verb takes an arbitrary element from the valence list.
    This proposal can be found in HPSG (Gunji, 1986; Müller, 2008), Categorial Grammar (Hoffman, 1995; Steedman and Baldridge, 2006) and in GB/Minimalism (Fanselow, 2001)

Example: Normal Order

(10) a. weil jeder das Buch kennt
b. weil das Buch jeder kennt

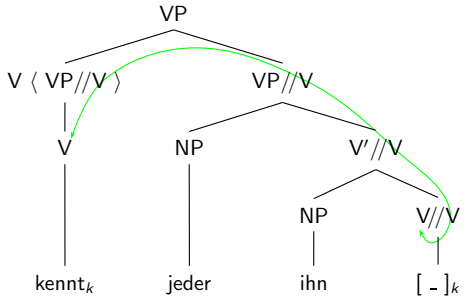


Example: Reordering



The difference is the binding off of elements in SUBCAT

Verb Position: "Movement"



- A trace takes the position of the verb in the cannonical SOV order.
- A special form of the verb is placed in initial position.
  This special verb selects a projection of the trace.
- This special verb is licensed by a unary rule.
- Connection between verb and trace via percolation of information.

The LOCAL feature

- Syntactic information (valence, part of speech, inflexion) and semantic information is shared
- This information, which is relevant locally,
  is grouped under LOCAL.
  gibt:

$$\begin{bmatrix} \text{PHON} & \langle\ \textit{gibt}\ \rangle \\ \text{LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{VFORM} & \textit{fin} \\ & \textit{verb} \end{bmatrix} \\ \text{SUBCAT} & \left\langle \text{NP}[\textit{nom}],\ \text{NP}[\textit{acc}],\ \text{NP}[\textit{dat}] \right\rangle \end{bmatrix} \\ \text{CONT} & \ldots \end{bmatrix} \end{bmatrix}$$

Fronting (V2) as Nonlocal Dependency

- V2 just an alternative linearization?
  Nunberg, Sag and Wasow (1994) (for the fronting of idiom parts)
  Kathol (1995, Chapter 6.3) for simple frontings
- does not cover all cases:

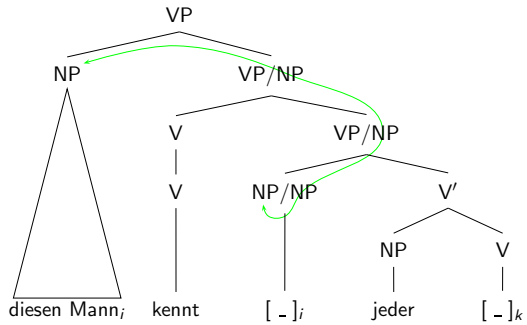
(11) a. [Um zwei Millionen Mark]$_i$ soll er versucht haben,
[eine Versicherung _$_i$ zu betrügen].[1]

b. „Wer$_i$, glaubt er, daß er _$_i$ ist?“ erregte sich ein Politiker vom Nil.[2]

c. Wen$_i$ glaubst du, daß ich _$_i$ gesehen habe.[3]

[1] taz, 04.05.2001, p. 20.
[2] Spiegel, 8/1999, p. 18.
[3] Scherpenisse, 1986, p. 84.

Constituent Movement



- As in the example of head movement: Trace at “canonical” position
- percolation of information in the tree
- constituent movement is not local, verb movement is two different features for modelling (SLASH vs. DSL)

The NONLOCAL Feature

- NONLOC contains features that are relevant for nonlocal dependencies (V2, relative clauses, interrogatives, extraposition).
- description for *kennt jeder* (‘knows everybody’):
  sentence with missing accusative object:

$$\begin{bmatrix} \text{LOC} \mid \text{CAT} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{VFORM} & \textit{fin} \\ & \textit{verb} \end{bmatrix} \\ \text{SUBCAT} & \langle\rangle \end{bmatrix} \\ \text{NONLOC}|\ldots|\text{SLASH} & \left\langle \text{NP}[\textit{acc}] \right\rangle \end{bmatrix}$$

- These properties can be selected (LOC and NONLOC).
  No selection of daughters.
  New feature SYNSEM that includes LOC and NONLOC but excludes HEAD-DTR etc.

Categorial Grammar

- Categorial Grammar is the ancestor of many theories of relevance today (Ajdukiewicz, 1935; Steedman, 2000).
  - Binary branching functor argument structures.
    (some HPSG grammars use flat structures)
  - Argument composition for predicate complexes (Geach, 1970).
- CG has problems with relative clauses and pied piping (Pollard, 1988).
- Solution: Explicit passing around of features related to relative pronouns → HPSG.
- Additional rules are needed in CG,
  some are already there (topicalization).
- It does not make sense for all structures to assume a head (functor).
  See for instance Constructionist work by Jackendoff (2008) and Jacobs (2008).

LFG's f-structure and HPSG's projected Argument Structure

- Wambaya: The traditional NP can be realized discontinuously. Adjectives and nouns agree in case.
- Nordlinger (1998) suggested LFG analysis in which constituents refer to the f-structure for the enforcement of agreement.
- Bender (2008): This can be modeled in HPSG if a non-cancellation approach to valence is assumed.
- Non-cancellation was first suggested in GB: Higginbotham (1985, p. 560).
- Introduced and motivated for HPSG: Meurers, 1999, Przepiórkowski, 1999, Müller, 2008, Chapter 17.4

Minimalism

- Minimalist Program: There is only Move and Merge.
- The Head Complement Schema of HPSG is Merge.
- The Filler Head Schema of HPSG is Move. (see Müller, Submitted)
- So, is everything the same?

Minimalism vs. Constraint-Based Theories

- Yes and no. Look at the trees! HPSG is minimalist in terms of tree structure.
- Empty elements are avoided. (They have to be justifyable on a language particular basis)
- HPSG is model theoretic, declarative, constraint-based.
- Minimalism is generative-enumerative and derivational rather than representational. (Pullum and Scholz, 2001)

Mixing up Levels (some variants)

- MGG is syntax centered: A strong syntactic component and then interface modules PF and LF.
- As a result a lot of semantic or information structure phenomena are now treated in syntax with invisible functional projections:
  - SpeakerP, HearerP (Poletto, 2000, p. 31)
  - TopP, ForceP, OuterTopP (Rizzi, 1997; Grewendorf, 2002, 2009; Wiklund et al., 2007)
  - Quality, Size, Shape, Color, Nationality (Cinque, 1994, p. 96, 99)
- Other stuff that does not correspond to traditional, part of speech-based categories:
  - SubjP, ObjP, TraP (Transitive Phrase), IntraP (Intransitive Phrase) (Karimi-Doostan, 2005)

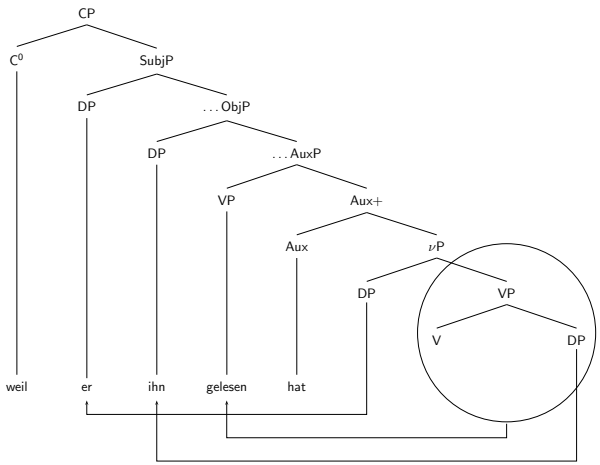
Core and the Rest

- Most work in GB/Minimalism is on the so-called Core, that is, the regular and common parts of language.
- Other areas exist and the ultimate value of a theory depends on its capability to cover both core and periphery.

Evidence from a single language and UG

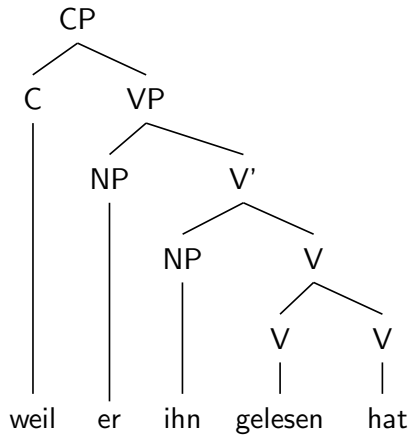
- What does it mean for other languages that a rule/morpheme is present in one particular language?
- Possible answer:
  If we have a certain structure in language X, it must be present in all languages.
- Example:
  - Basque: Tree positions for object agreement (AgrO, AgrIO)
  - Japanese: Tree position for topic marker
- German and Dutch neither have object agreement nor topic morphemes.
- Conclusion:
  If such inferences regarding properties of particular languages, one has to assume (very specific!) innate linguistic knowledge.

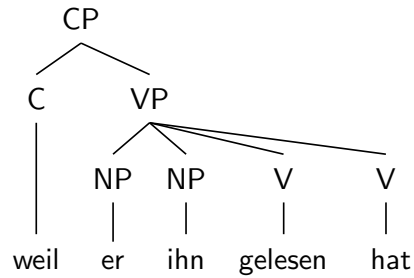
German is English/Romance (SVO, Laenzlinger following Kayne)



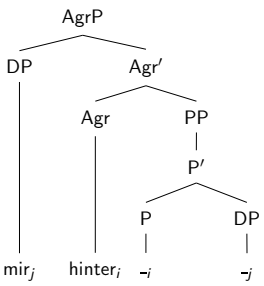
- All languages are SVO underlyingly.
- The object is moved out of the VP.
- The subject is fronted.
- The empty VP is fronted.
- There are further empty heads (Cinque, 1999).
- Innateness has to be assumed.

German is German (GB Variants, CG, LFG, HPSG, ...)



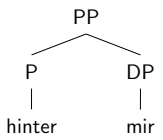


English, German, ... are Hungarian



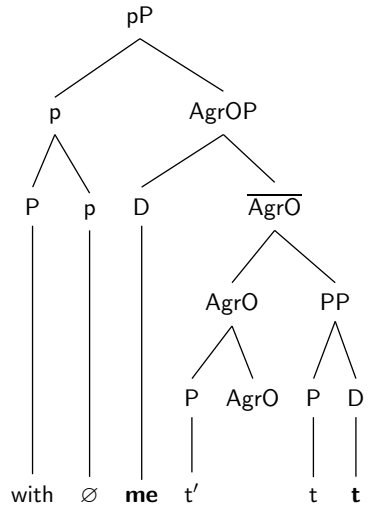
- Hornstein, Nunes and Grohmann (2005, p. 124): agreement head for the checking of case features
- Preposition is moved there.
- DP is put into the specifier position of this head.
- Evidence for this: Agreement in Hungarian postpositional phrases
- English is like Hungarian, but the movement is invisible.

German is German, ... Hungarian is Hungarian



- A PP is a P together with an NP (or DP).
- No movement instead of two movements.
- Structure has five nodes less.
- Truly minimal!
- Question: What constitutes an explanation? Where and how is complexity of language represented?

The Swiss Cheese



- from another text book: Radford (1997, p. 452)
- Sternefeld (2006, p. 549–550) calls this a Swiss Cheese analysis, but there are more holes (5) than cheese (2).

Sociological Differences

- The way arguments work (sometimes) differs dramatically. (See Culicover and Jackendoff, 2005 on uniformity)
- Avoid empty elements! This should be a strategy for every linguistic theory (Occam's Razor)!

Minimalism and Psycholinguistic Plausibility

- Derivations are psycholinguistically implausible.
  Derivational Theory of Complexity (DTC) falsified in the 70s (Fodor, Bever and Garrett, 1974, p. 320–328).
- See Wittenberg et al. (To appear) on the plausibility of recent head-movement analyses.
- See Sag and Wasow (2011); Jackendoff (2011) on psycholinguistically plausible theories and Labelle, 2007 for a brief note on Phases.
- Processing is incremental and takes all levels (phonology, syntax, semantics, world knowledge) into account (Tanenhaus et al., 1996).
- Realistic theories have to be:
  - surface-oriented
  - constraint-based
- See Pulvermüller (2003) on how this could be implemented in the brain.

Construction Grammar

- CxG (Goldberg, 1995, 2006; Tomasello, 2003) is sign-based (as is HPSG)
- There is continued discussion about the issue whether constructions should be lexical or phrasal: Müller, 2006, two special issues of journals, . . . , Müller and Wechsler, 2012
- Most authors in HPSG assume lexical constructions, whereas most CxG authors assume phrasal ones.
- Goldberg (2013):
  Lexical rules understood as templates are compatible with her views.
- This view of lexical rules is adopted in HPSG (Meurers, 2001).
- HPSG (Sag, 1997) can be seen as a formalized variant of CxG.

Summary

- We successfully (?) covered everything that is normally covered in one semester.
- Features, values and identity
- HPSG structures are complex since certain features are shared simultaneously.
  Nowadays most theories assume features but often they are not grouped.
- What you get:
  - Increased Precision
  - Framework for Integration
  - Declarative, Constraint Satisfaction System
  - Grammars that Scale Up
  - Grammars that Can be Implemented
  - Psycholinguistic Plausibility
- HPSG 2013 is in Berlin, ESSLLI 2013 features some HPSG courses.

Poverty of the Stimulus and U-DOP

- U-DOP learns from examples that do not contain examples with auxiliary inversion and relative clauses (Bod, 2009).
  Once one learned the correct trees for (12) one can also assign the correct structure to sentences with auxiliary inversion (p. 778):

(12) a. The man who is eating is hungry.
b. Is the boy hungry?

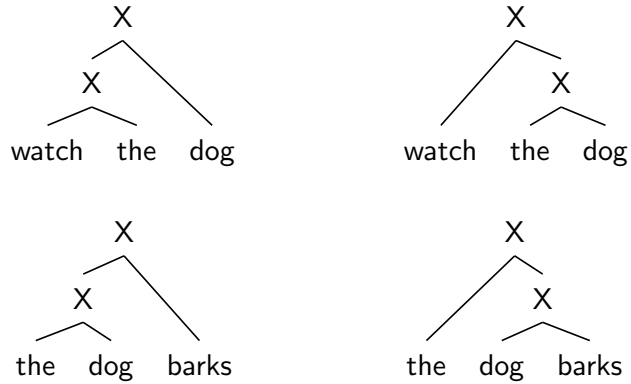
To acquire (12) for example the sentences in (13) are sufficient:

(13) a. The man who is eating mumbled.
b. The man is hungry.
c. The man mumbled.
d. The boy is eating.

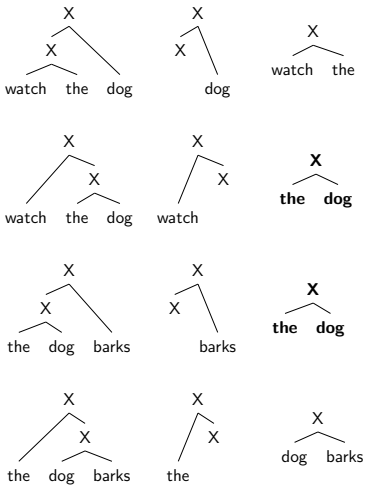
Poverty of the Stimulus and U-DOP – II

- Procedure:
  1. Compute all possible (binary branching) trees (without category symbols) for a set of given sentences.
  2. Compute all subtrees of these trees.
  3. Compute the best tree for a given sentence.
- The acquired grammars make the same mistakes as children!

Possible binary branching structures for *Watch the dog* and *The dog barks*

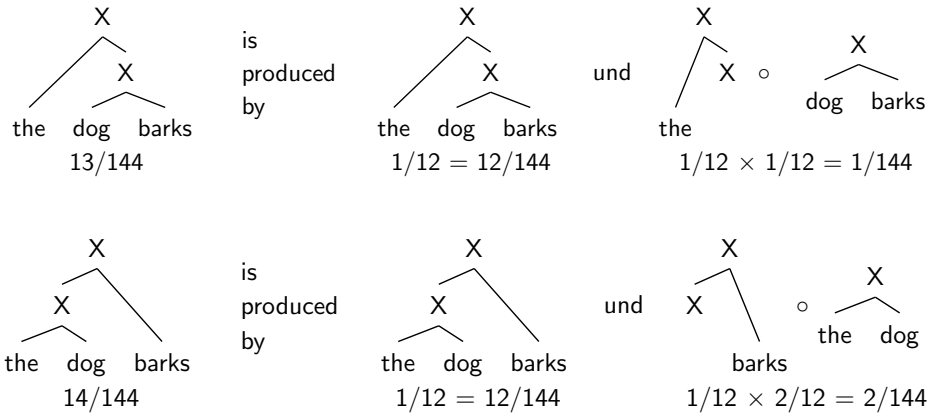


Subtrees



- Jeder Baum hat eine Wahrscheinlichkeit von 1/12.
- *the dog* kommt zweimal vor! Wahrscheinlichkeit = 2/12.

Analysis with Subtrees and Probabilities



Ajdukiewicz, Kasimir. 1935. Die syntaktische Konnexität. *Studia Philosophica* 1, 1–27.

Bender, Emily M. 2008. Radical Non-Configurationality without Shuffle Operators: An Analysis of Wambaya. In Stefan Müller (ed.), *Proceedings of the 15th International Conference on Head-Driven Phrase Structure Grammar*, pages 6–24, Stanford, CA: CSLI Publications. http://cslipublications.stanford.edu/HPSG/9/, 31.10.2008.

Bierwisch, Manfred. 1963. *Grammatik des deutschen Verbs*. studia grammatica, No. 2, Berlin: Akademie Verlag.

Bildhauer, Felix. 2008. *Representing Information Structure in an HPSG Grammar of Spanish*. Dissertation, Universität Bremen.

Bod, Rens. 2009. From Exemplar to Grammar: Integrating Analogy and Probability in Language Learning. *Cognitive Science* 33(4), 752–793. http://staff.science.uva.nl/~rens/analogy.pdf, 15.07.2008.

Bouma, Gosse and van Noord, Gertjan. 1998. Word Order Constraints on Verb Clusters in German and Dutch. In Erhard W. Hinrichs, Andreas Kathol and Tsuneko Nakazawa (eds.), *Complex Predicates in Nonderivational Syntax*, Syntax and Semantics, No. 30, pages 43–72, San Diego: Academic Press. http://www.let.rug.nl/~vannoord/papers/, 31.05.2010.

Chomsky, Noam. 1981. *Lectures on Government and Binding*. Dordrecht: Foris Publications.

Chomsky, Noam. 1993. A Minimalist Program for Linguistic Theory. In Kenneth Hale and Samuel Jay Keyser (eds.), *The View from Building 20: Essays in Linguistics in Honor of Sylvain Bromberger*, Current Studies in Linguistics, No. 24, pages 1–52, Cambridge, MA/London: MIT Press.

Cinque, Guglielmo. 1994. On the Evidence for Partial N Movement in the Romance DP. In Guglielmo Cinque, Jan Koster, Jean-Yves Pollock, Luigi Rizzi and RaffaellaZanuttini (eds.), *Paths Towards Universal Grammar. Studies in Honor of Richard S. Kayne*, pages 85–110, Washington, D.,C.: Georgetown University Press.

Cinque, Guglielmo. 1999. *Adverbs and Functional Heads. A Cross-Linguistic Perspective*. New York, Oxford: Oxford University Press.

Culicover, Peter W. and Jackendoff, Ray S. 2005. *Simpler Syntax*. Oxford: Oxford University Press.

den Besten, Hans. 1983. On the Interaction of Root Transformations and Lexical Deletive Rules. In Werner Abraham (ed.), *On the Formal Syntax of the Westgermania: Papers from the 3rd Groningen GrammarTalks, Groningen, January 1981*, Linguistik Aktuell/Linguistics Today, No. 3, pages 47–131, Amsterdam and Philadelphia: John Benjamins Publishing Co. http://www.dbnl.org/tekst/best005inte01_01/, 11.10.2012.

Fanselow, Gisbert. 2001. Features, θ-Roles, and Free Constituent Order. *Linguistic Inquiry* 32(3), 405–437.

Fanselow, Gisbert. 2002. Against Remnant VP-Movement. In Artemis Alexiadou, Elena Anagnostopoulou, Sjef Barbiers and Hans-MartinGärtner (eds.), *Dimensions of Movement. From Features to Remnants*, Linguistik Aktuell/Linguistics Today, No. 48, pages 91–127, Amsterdam and Philadelphia: John Benjamins Publishing Co.

Fillmore, Charles J., Kay, Paul and O'Connor, Mary Catherine. 1988. Regularity and Idiomaticity in Grammatical Constructions: The Case of *LetAlone*. *Language* 64(3), 501–538.

Fodor, Jerry A., Bever, Thomas G. and Garrett, Merrill F. 1974. *The Psychology of Language. An Introduction to Psycholinguistics and Generative Grammar*. New York: McGraw-Hill Book Co.

Gazdar, Gerald, Klein, Ewan, Pullum, Geoffrey K. and Sag, Ivan A. 1985. *Generalized Phrase Structure Grammar*. Cambridge, MA: Harvard University Press.

Geach, Peter Thomas. 1970. A Program for Syntax. *Synthese* 22, 3–17.

Goldberg, Adele E. 1995. *Constructions. A Construction Grammar Approach to Argument Structure*. Cognitive Theory of Language and Culture, Chicago/London: The University of Chicago Press.

Goldberg, Adele E. 2006. *Constructions at Work. The Nature of Generalization in Language*. Oxford Linguistics, Oxford, New York: Oxford University Press.

Goldberg, Adele E. 2013. Explanation and Constructions. *Mind and Language* .

Goldberg, Adele E. To appear. Argument Structure Constructions vs. Lexical Rules or Derivational Verb Templates. *Mind and Language* .

Grewendorf, Günther. 2002. *Minimalistische Syntax*. UTB für Wissenschaft: Uni-Taschenbücher, No. 2313, Tübingen, Basel: A. Francke Verlag GmbH.

Grewendorf, Güther. 2009. The Left Clausal Periphery. Clitic Left Dislocation in Italian and Left Dislocation in German. In Benjamin Shear, Philippa Cook, Werner Frey and Claudia Maienborn (eds.), *Dislocated Elements in Discourse. Syntactic, Semantic, and Pragmatic Perspectives*, Routledge Studies in Germanic Linguistics, pages 49–94, New York: Routledge.

Gunji, Takao. 1986. Subcategorization and Word Order. In William J. Poser (ed.), *Papers from the Second International Workshop on Japanese Syntax*, pages 1–21, Stanford, CA: CSLI Publications.

Haftka, Brigitta. 1996. Deutsch ist eine V/2-Sprache mit Verbendstellung und freier Wortfolge. In Ewald Lang and Gisela Zifonun (eds.), *Deutsch – typologisch*, Institut für deutsche Sprache, Jahrbuch 1995, pages 121–141, Berlin/New York, NY: Walter de Gruyter.

Haider, Hubert. 2000. OV is More Basic than VO. In Peter Svenonius (ed.), *The Derivation of VO and OV*, pages 45–67, Amsterdam: John Benjamins Publishing Co.

Higginbotham, James. 1985. On Semantics. *Linguistic Inquiry* 16(4), 547–593.

Hoffman, Beryl Ann. 1995. *The Computational Analysis of the Syntax and Interpretation of "Free" Word Order in Turkish*. Ph. D.thesis, University of Pennsylvania.

Hornstein, Norbert, Nunes, Jairo and Grohmann, Kleantes K. 2005. *Understanding Minimalism*. Cambridge Textbooks in Linguistics, Cambridge, UK: Cambridge University Press.

Jackendoff, Ray S. 2008. Construction after Construction and Its Theoretical Challenges. *Language* 84(1), 8–28.

Jackendoff, Ray S. 2011. What is the human language faculty? Two views. *Language* 87(3), 586–624.

Jacobs, Joachim. 1986. The Syntax of Focus and Adverbials in German. In Werner Abraham and S. de Meij (eds.), *Topic, Focus, and Configurationality. Papers from the 6th Groningen Grammar Talks,Groningen, 1984*, Linguistik Aktuell/Linguistics Today, No. 4, pages 103–127, Amsterdam and Philadelphia: John Benjamins Publishing Co.

Jacobs, Joachim. 1991. Bewegung als Valenztransfer. SFB 282: Theorie des Lexikons 1, Heinrich Heine Uni/BUGH, Düsseldorf/Wuppertal.

Jacobs, Joachim. 2008. Wozu Konstruktionen? *Linguistische Berichte* 213, 3–44.

Jacobs, Joachim. 2009. Valenzbindung oder Konstruktionsbindung? Eine Grundfrage der Grammatiktheorie. *Zeitschrift für Germanistische Linguistik* 37(3), 490–513.

Karimi-Doostan, Gholamhossein. 2005. Light Verbs and Structural Case. *Lingua* 115(12), 1737–1756.

Kasper, Robert T. 1994. Adjuncts in the Mittelfeld. In John Nerbonne, Klaus Netter and Carl J. Pollard (eds.), *German in Head-Driven Phrase Structure Grammar*, CSLI Lecture Notes, No. 46, pages 39–70, Stanford, CA: CSLI Publications.

Kathol, Andreas. 1995. *Linearization-Based German Syntax*. Ph. D.thesis, Ohio State University.

Kayne, Richard S. 1994. *The Antisymmetry of Syntax*. Linguistic Inquiry Monographs, No. 25, Cambridge, MA: MIT Press.

Koster, Jan. 1975. Dutch as an SOV Language. *Linguistic Analysis* 1(2), 111–136.

Labelle, Marie. 2007. Biolinguistics, the Minimalist Program, and Psycholinguistic Reality. *Snippets* 14. http://www.ledonline.it/snippets/, 18.02.2010.

Laenzlinger, Christoph. 2004. A Feature-Based Theory of Adverb Syntax. In Jennifer R. Austin, Stefan Engelberg and Gisa Rauh (eds.), *Adverbials: The Interplay Between Meaning, Context, and Syntactic Structure*, Linguistik Aktuell/Linguistics Today, No. 70, pages 205–252, Amsterdam: John Benjamins Publishing Co.

Meinunger, André. 2000. *Syntactic Aspects of Topic and Comment*. Linguistik Aktuell/Linguistics Today, No. 38, Amsterdam and Philadelphia: John Benjamins Publishing Co.

Meurers, Walt Detmar. 1999. Raising Spirits (and Assigning Them Case). *Groninger Arbeiten zur Germanistischen Linguistik (GAGL)* 43, 173–226. http://www.sfs.uni-tuebingen.de/~dm/papers/gagl99.html, 18.04.2000.

Meurers, Walt Detmar. 2001. On Expressing Lexical Generalizations in HPSG. *Nordic Journal of Linguistics* 24(2), 161–217. http://www.sfs.uni-tuebingen.de/~dm/papers/lexical-generalizations.html, 30.11.2006.

Morrill, Glyn. 1995. Discontinuity in Categorial Grammar. *Linguistics and Philosophy* 18(2), 175–219.

Müller, Stefan. 1999. *Deutsche Syntax deklarativ. Head-Driven Phrase Structure Grammar für das Deutsche*. Linguistische Arbeiten, No. 394, Tübingen: Max Niemeyer Verlag. http://hpsg.fu-berlin.de/~stefan/Pub/hpsg.html, 21.11.2012.

Müller, Stefan. 2002. *Complex Predicates: Verbal Complexes, Resultative Constructions, and Particle Verbs in German*. Studies in Constraint-Based Lexicalism, No. 13, Stanford, CA: CSLI Publications. http://hpsg.fu-berlin.de/~stefan/Pub/complex.html, 21.11.2012.

Müller, Stefan. 2003. Mehrfache Vorfeldbesetzung. *Deutsche Sprache* 31(1), 29–62. http://hpsg.fu-berlin.de/~stefan/Pub/mehr-vf-ds.html, 21.11.2012.

Müller, Stefan. 2004. Continuous or Discontinuous Constituents? A Comparison between Syntactic Analyses for Constituent Order and Their Processing Systems. *Research on Language and Computation, Special Issue on Linguistic Theory and Grammar Implementation* 2(2), 209–257. http://hpsg.fu-berlin.de/~stefan/Pub/discont.html, 21.11.2012.

Müller, Stefan. 2005. Zur Analyse der deutschen Satzstruktur. *Linguistische Berichte* 201, 3–39. http://hpsg.fu-berlin.de/~stefan/Pub/satz-lb.html, 21.11.2012.

Müller, Stefan. 2006. Phrasal or Lexical Constructions? *Language* 82(4), 850–883. http://hpsg.fu-berlin.de/~stefan/Pub/phrasal.html, 21.11.2012.

Müller, Stefan. 2008. *Head-Driven Phrase Structure Grammar: Eine Einführung*. Stauffenburg Einführungen, No. 17, Tübingen: Stauffenburg Verlag, second edition. http://hpsg.fu-berlin.de/~stefan/Pub/hpsg-lehrbuch.html, 21.11.2012.

Müller, Stefan. 2009. A Head-Driven Phrase Structure Grammar for Maltese. In Bernard Comrie, Ray Fabri, Beth Hume, Manwel Mifsud, Thomas Stolz and Martine Vanhove (eds.), *Introducing Maltese Linguistics. Papers from the 1st International Conference on Maltese Linguistics (Bremen/Germany, 18–20 October, 2007)*, Studies in Language Companion Series, No. 113, pages 83–112, Amsterdam and Philadelphia: John Benjamins Publishing Co. http://hpsg.fu-berlin.de/~stefan/Pub/maltese-sketch.html, 21.11.2012.

Müller, Stefan. 2010a. *Grammatiktheorie*. Stauffenburg Einführungen, No. 20, Tübingen: Stauffenburg Verlag. http://hpsg.fu-berlin.de/~stefan/Pub/grammatiktheorie.html, 21.11.2012.

Müller, Stefan. 2010b. Persian Complex Predicates and the Limits of Inheritance-Based Analyses. *Journal of Linguistics* 46(3), 601–655. http://hpsg.fu-berlin.de/~stefan/Pub/persian-cp.html, 21.11.2012.

Müller, Stefan. Submitted. Unifying Everything. Ms, Freie

Universität Berlin. http://hpsg.fu-berlin.de/~stefan/Pub/unifying.html, 21.11.2012.

Müller, Stefan. To appear. Head-Driven Phrase Structure Grammar. In Artemis Alexiadou and Tibor Kiss (eds.), *Syntax – Ein internationales Handbuch zeitgenössischer Forschung*, Handbücher zur Sprach- und Kommunikationswissenschaft, Berlin/New York, NY: Walter de Gruyter Verlag, second edition. http://hpsg.fu-berlin.de/~stefan/Pub/hpsg-hsk.html, 21.11.2012.

Müller, Stefan and Lipenkova, Janna. 2009. Serial Verb Constructions in Chinese: An HPSG Account. In Stefan Müller (ed.), *Proceedings of the 16th International Conference on Head-Driven Phrase Structure Grammar, University of Göttingen, Germany*, pages 234–254, Stanford, CA: CSLI Publications. http://hpsg.fu-berlin.de/~stefan/Pub/chinese-svc.html, 21.11.2012.

Müller, Stefan and Wechsler, Stephen Mark. 2012. Lexical Approaches to Argument Structure. Ms. http://hpsg.fu-berlin.de/~stefan/Pub/arg-st.html, 21.11.2012.

Newmeyer, Frederick J. 2005. *Possible and Probable Languages: A Generative Perspective on Linguistic Typology*. Oxford: Oxford University Press.

Nordlinger, Rachel. 1998. *Constructive Case: Evidence from Australia*. Dissertations in Linguistics, Stanford, CA: CSLI Publications.

Nunberg, Geoffrey, Sag, Ivan A. and Wasow, Thomas. 1994. Idioms. *Language* 70(3), 491–538.

Ørsnes, Bjarne. 2009. Preposed Negation in Danish. In Stefan Müller (ed.), *Proceedings of the 16th International Conference on Head-Driven Phrase Structure Grammar, University of Göttingen, Germany*, pages 255–275, Stanford, CA: CSLI Publications.

Phillips, Colin. 2003. Linear Order and Constituency. *Linguistic Inquiry* 34(1), 37–90.

Poletto, Cecilia. 2000. *The Higher Functional Field: Evidence from Northern Italian Dialects*. Oxford: Oxford University Press.

Pollard, Carl J. 1988. Categorial Grammar and Phrase Structure Grammar: An Excursion on theSyntax-Semantics Frontier. In Richard Oehrle, Emmon Bach and Deirdre Wheeler (eds.), *Categorial Grammars and Natural Language Structures*, pages 391–415, Dordrecht/Boston/London: D. Reidel Publishing Company.

Pollard, Carl J. 1996. On Head Non-Movement. In Harry Bunt and Arthur van Horck (eds.), *Discontinuous Constituency*, Natural Language Processing, No. 6, pages 279–305, Berlin/New York, NY: Mouton de Gruyter, veröffentlichte Version eines Ms. von 1990.

Pollard, Carl J. and Sag, Ivan A. 1987. *Information-Based Syntax and Semantics*. CSLI Lecture Notes, No. 13, Stanford, CA: CSLI Publications.

Pollard, Carl J. and Sag, Ivan A. 1994. *Head-Driven Phrase Structure Grammar*. Studies in Contemporary Linguistics, Chicago, IL/London: The University of Chicago Press.

Przepiórkowski, Adam. 1999. On Case Assignment and "Adjuncts as Complements". In Gert Webelhuth, Jean-Pierre Koenig and Andreas Kathol (eds.), *Lexical and Constructional Aspects of Linguistic Explanation*, Studies in Constraint-Based Lexicalism, No. 1, pages 231–245, Stanford, CA: CSLI Publications.

Pullum, Geoffrey K. and Scholz, Barbara C. 2001. On the Distinction between Generative-Enumerative and Model-Theoretic Syntactic Frameworks. In Philippe de Groote, Glyn Morrill and Christian Retor (eds.), *Logical Aspects of Computational Linguistics: 4th International Conference*, Lecture Notes in Computer Science, No. 2099, pages 17–43, Berlin: Springer Verlag.

Pulvermüller, Friedemann. 2003. *The Neuroscience of Language: On Brain Circuits of Words and Serial Order*. Cambridge, UK: Cambridge University Press.

Radford, Andrew. 1997. *Syntactic Theory and the Structure of English: a Minimalist Approach*. Cambridge Textbooks in Linguistics, Cambridge, UK: Cambridge University Press.

Reis, Marga. 1974. Syntaktische Hauptsatzprivilegien und das Problem der deutschen Wortstellung. *Zeitschrift für Germanistische Linguistik* 2(3), 299–327.

Rizzi, Luigi. 1997. The Fine Structure of the Left Periphery. In Liliane Haegeman (ed.), *Elements of Grammar*, pages 281–337, Dordrecht: Kluwer Academic Publishers.

Sag, Ivan A. 1997. English Relative Clause Constructions. *Journal of Linguistics* 33(2), 431–484. http://lingo.stanford.edu/sag/papers/rel-pap.pdf, 30.05.2004.

Sag, Ivan A. and Wasow, Thomas. 2011. Performance-Compatible Competence Grammar. In Robert Borsley and Kersti Börjars (eds.), *Non-Transformational Syntax*, pages 359–377, Oxford, UK/Cambridge, MA: Blackwell Publishing Ltd.

Saussure, Ferdinand de. 1916. *Grundfragen der allgemeinen Sprachwissenschaft*. Berlin: Walter de Gruyter & Co, 2nd edition 1967.

Scherpenisse, Wim. 1986. *The Connection Between Base Structure and Linearization Restrictions in Germanand Dutch*. Europäische Hochschulschriften, Reihe XXI, Linguistik, No. 47, Frankfurt/M.: Peter Lang.

Steedman, Mark J. 1997. *Surface Structure and Interpretation*. Linguistic Inquiry Monographs, No. 30, Cambridge, MA/London, England: MIT Press.

Steedman, Mark J. 2000. *The Syntactic Process*. Language, Speech, and Communication, Cambridge, MA/London, England: MIT Press.

Steedman, Mark J. and Baldridge, Jason. 2006. Combinatory Categorial Grammar. In Keith Brown (ed.), *Encyclopedia of Language and Linguistics*, pages 610–621, Oxford: Elsevier, second edition.

Sternefeld, Wolfgang. 2006. *Syntax: eine morphologisch motivierte Beschreibung des Deutschen*. Stauffenburg Linguistik, No. 31, Tübingen: Stauffenburg Verlag.

Sternefeld, Wolfgang and Richter, Frank. 2012. Wo stehen wir in der Grammatiktheorie? — Bemerkungen anläßlich eines Buchs von Stefan Müller. *Zeitschrift für Sprachwissenschaft* 31(2), 263–291.

Tanenhaus, Michael K., Spivey-Knowlton, Michael J., Eberhard, Kathleen M. and Sedivy, Julie C. 1996. Using Eye Movements to Study Spoken Language Comprehension: Evidence for Visually Mediated Incremental Interpretation. In Toshio Inui and James L. McClelland (eds.), *Information Integration in Perception and Communication*, Attention and Performance, No. XVI, pages 457–478, Cambridge, MA: MIT Press.

Thiersch, Craig L. 1978. *Topics in German Syntax*. Dissertation, M.I.T.

Tomasello, Michael. 2003. *Constructing a Language: A Usage-Based Theory of Language Acquisition*. Cambridge, MA: Harvard University Press.

Uszkoreit, Hans. 1986. Linear Precedence in Discontinuous Constituents: Complex Fronting in German. Report No. CSLI-86-47, Center for the Study of Language and Information, Stanford, CA.

Uszkoreit, Hans. 1987. *Word Order and Constituent Structure in German*. CSLI Lecture Notes, No. 8, Stanford, CA: CSLI Publications.

von Stechow, Arnim. 1996. The Different Readings of *wieder* "again": A Structural Account. *Journal of Semantics* 13(2), 87–138.

Welke, Klaus. 2009. Konstruktionsvererbung, Valenzvererbung und die Reichweite von Konstruktionen. *Zeitschrift für Germanistische Linguistik* 37(3), 514–543.

Wiklund, Anna-Lena, Hrafnbjargarson, Gunnar Hrafn, Bentzen, Kristine and Hróarsdóttir, Thorbjörg. 2007. Rethinking Scandinavian Verb Movement. *Journal of Comparative Germanic Linguistics* 10(3), 203–233.

Wittenberg, Eva, Jackendoff, Ray, Kuperberg, Gina, Paczynski, Martin, Snedeker, Jesse and Wiese, Heike. To appear. The Processing and Representation of Light Verb Constructions. In Asaf Bachrach, Isabelle Roy and Linnaea Stockall (eds.), *Structuring the Argument*, Amsterdam and Philadelphia: John Benjamins Publishing Co.