Local Semantics in Head-Driven Phrase Structure Grammar

Manfred Sailer
SFB 441, Universität Tübingen
mf@sfs.uni-tuebingen.de

April 5, 2004

1 Introduction

1.1 Local Phenomena

What are local phenomena?

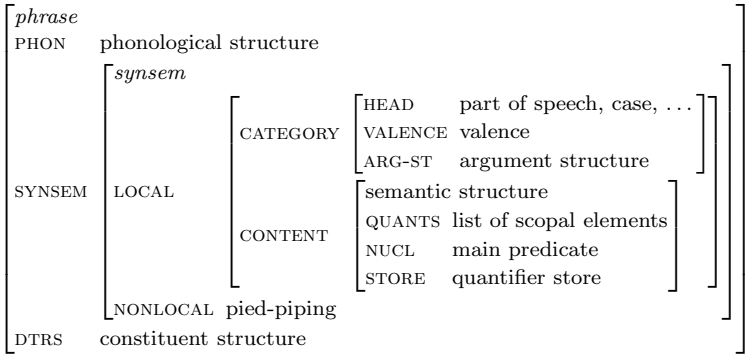
- Syntax: determined within one phrase:
  subcategorization (categorial selection), case assignment, in some theories: binding.
- Semantics:
  selection (selectional restrictions), thematic role assignment
- Syntax-Semantics interface:
  linking, argument structure alternations
- General characterization:
  - determined by lexical properties
  - concern the direct relation between a head and its dependents

Non-local phenomena

- Syntax:
  extraction/ unbounded dependencies, pied-piping, scrambling?
- Semantics:
  scope interaction (quantifiers, modifiers, negation, ...)
- General characterization
  - largely independent of idiosyncratic head-dependent relations
  - concern structural rather than lexical properties

1.2 Locality in HPSG

(1) Architecture of a linguistic sign according to Pollard and Sag (1994) (Pollard and Yoo, 1998):



- Only *synsem* objects occur on the argument structure and on the valence lists.
- A selector cannot determine the phonological properties or the syntactic structure of the selected element.
- But: all of the semantics is there!

Why HPSG?

- rigidly formalized framework.
- analysis for local and non-local semantic phenomena available.
- the modular structure of a linguistic sign makes the discussed distinctions especially transparent.

2 Local Semantics

Argument: for an account of local semantic phenomena:

- argument structure, semantic hierarchies, ... are relevant.
- but no reference needs to be made to operator or quantifier scope.

2.1 Linking

Linking: the mapping between semantic roles and syntactic complements

(2) a. Pat moved the car.

b.
$$\begin{bmatrix} \textit{word} \\ \textsc{phon} \ \langle \textit{moved} \rangle \\ \textsc{syns} \ \begin{bmatrix} \textsc{loc} \ \begin{bmatrix} \textsc{cat} \ \begin{bmatrix} \textsc{head} \ \ \textit{verb} \\ \textsc{arg-st} \ \langle \boxed{1} \left[\textsc{loc cont index} \ \boxed{1'}\right], \boxed{2} \left[\textsc{loc cont index} \ \boxed{2'}\right] \rangle \\ \textsc{val} \ \begin{bmatrix} \textsc{subj} \ \langle \boxed{1} \rangle \\ \textsc{comps} \ \langle \boxed{2} \rangle \end{bmatrix} \end{bmatrix} \\ \textsc{cont} \ \begin{bmatrix} \textsc{nucl} \ \begin{bmatrix} \textit{move-rel} \\ \textsc{causer} \ \ \boxed{1'} \\ \textsc{causally-affected} \ \boxed{2'} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(3) Linking, we claim, consists of a classification of words constraining the relations that can exist between (the type of) semantic content of verbs and (the type of) their subcategorization structure. [...] Crucially, the linking constraints that map from semantic attribute to the subject and object reference both the semantic attributes and the list of syntactic dependents or ARG-ST list. (Davis and Koenig, 2000)

(4) Linking constraint (à la Koenig and Davis (2003)):

$$\begin{bmatrix} \textsc{syns loc} \ \begin{bmatrix} \textsc{cat} \ \left[\textsc{arg-st} \ \langle \text{NP}, \ldots \rangle\right] \\ \textsc{cont} \ \left[\textsc{nucleus} \ \textit{cause-rel}\right] \end{bmatrix} \end{bmatrix} \Rightarrow \begin{bmatrix} \textsc{syns loc} \ \begin{bmatrix} \textsc{cat} \ \left[\textsc{arg-st} \ \langle \left[\textsc{loc cont index} \ \boxed{1}\right], \ldots \rangle\right] \\ \textsc{cont} \ \left[\textsc{nucleus} \ \left[\textsc{causer} \ \boxed{1}\right]\right] \end{bmatrix} \end{bmatrix}$$

(where *move-rel* is a subsort of *cause-rel*)

Linking theory predicts the lack of a verb *hypdraw* such that the following two sentences have the same meaning:

(5) a. John drew a picture.

b. *A picture hypdrew John.

Locality

- The linking properties of a verb do not depend on semantic operators such as the quantificational nature of the complements or tense operators.
- Linking constraints à la Koenig and Davis (2003) are not constrained in this way:

(6) Hypothetical linking constraint:

if the first argument contains a universal quantifier, then ...

$$\begin{bmatrix} \textsc{syns loc} \ \begin{bmatrix} \textsc{cat} \ \left[\textsc{arg-st} \ \langle \left[\textsc{loc cont store} \ \langle \left[\textit{forall}\right] \rangle\right], \ldots \rangle\right] \\ \textsc{cont} \ \left[\textsc{nucleus} \ \textit{cause-rel}\right] \end{bmatrix} \end{bmatrix} \Rightarrow \quad \ldots$$

- An adequate architecture of grammar should forbid the formulation of this kind of linking constraints.

2.2 Semantic Restrictions

2.2.1 Sortal Restrictions

- Krifka (2003) assumes a semantic ontology which contains: kinds, groups, individuals and numbers.
- These are encoded as semantic types.
- Determiners and predicates impose type requirements on their semantic arguments:

  (7) * Dodo is extinct.
  dodo: individual
  be extinct: requires a kind

- Sensitivity to certain quantifiers?

  (8) a. The dodo is extinct.
  b. * Every dodo is extinct.

  (9) Wenn noch vor zehn Jahren jede Art des Positivismus als ausgestorben . . . galt,
  'While 10 years ago every kind of positivism was still considered . . . extinct, . . . '

- Shifting rules between the domains, similar to Partee (1987) ("kind-of" operator "$^{\cup}$"):

  (10) a. This house has been every color
  b. $\forall x[\mathsf{color}'(x) \rightarrow {}^{\cup}x(h)]$
  (For each x: if x is a color, then this house has been x)

- Binding versus coreference:

  (11) a. At the meeting, Martians presented themselves as almost extinct.
  b. At the meeting, Martians claimed to be almost extinct.

  (12) a. Das Institut steht in der Wilhelmstraße.
  'The institute is situated at Wilhelmstraße.'
  (institution → thing (location of), object)
  b. Das Institut trifft sich zum Mittagessen.
  'The institute meets for lunch.'
  (institution → person, plural (associated with)
  c. [Das Institut]$_i$ steht in der Wilhelmstraße. *Es$_i$ trifft sich regelmäßig zum Mittagessen.
  'The institute is situated at Wilhelmstraße. It regularly meets for lunch.'
  d. Hans kauft [einen Löwen]$_i$, weil *er$_i$/ [dieses Tier]$_i$ vom Aussterben bedroht ist.
  'Hans is buying a lion, because *it/ this animal is in danger of extinction.'

Locality

- Lexical semantic properties of the words play a role, but not their quantificational or scopal behavior.
- There is interaction with binding.
- The shifting rules are independent of the quantificational nature of a noun.

2.2.2 Selectional Restrictions

(13) a. Hans plückte einen Löwenzahn.
Hans picked a dandelion

b. ?? Hans plückte ein Buch aus dem Regal.
Hans picked a book from the shelve

(14) Binnen de GG wordt een zin waarin selectie-restricties worden geschonden echter niet opgevat als ongrammaticaal: in dergelijke zinnen wordt niet een strukturele regel geschonden, maar hebben we te maken met een schending van eisen die we kennen op grond van onze kennis van de buitentalige werkelijkheid. Voor dit soort kennis hoeft geen verklaring te worden gegeven in de grammatica. (Bennis and Hoekstra, 1989, p. 23)

Within generative grammar a sentence in which selectional restrictions are violated is not considered ungrammatical: in such a sentence no structural rule is violated, instead we are dealing with a violation of constraints which we know by our knowledge of the non-linguistic reality. For this kind of knowledge, no explanation needs to be given within the grammar.

Repairing contexts:

- negation and modals:

(15) a. ?? Tom ate a keyboard.
b. Tom cannot eat a keyboard. (Androutsopoulos and Dale, 2000)

- meta-linguistic comments:

(16) a. it is nonsense to speak of (there is no activity as) elapsing a book
b. elapsing a book is not an activity that can be performed
c. one cannot elapse a book (Chomsky, 1965, p. 158)

Independent of quantifiers or other semantic operators:

(17) Hans hat zwei/ alle Pusteblumen geplückt/ pflücken wollen.
Hans has two/ all dandelions picked/ pick want
'Hans picked/ wanted to pick two/ all dandelions.'

Note: Selectional restrictions differ from sortal restrictions (see Lang (1994)):

- Selectional restrictions are more fine-grained.
- The distinction between sortal and selectional restrictions can be a solution to the two levels of semantic features in Chomsky (1965).
- Selectional restrictions interact with binding to a lesser degree than sortal restr.:

(18) Hans pflückte das Buch und las es gleich darauf.
'Hans picked the book(*thing*) and read it(*thing*) immediately.'

Locality

- The effect of quantifiers, negation or modal operators is not part of the idiosyncratic semantic restrictions of a verb.
- Within the architecture in (1) such restrictions could be formulated:

(19) Part of a hypothetical lexical entry:

A word which requires its first argument to contain a universal quantifier

$$\left[\textsc{syns loc}\ \left[\textsc{cat}\ \left[\textsc{arg-st}\ \left\langle\left[\textsc{loc cont store}\ \langle[\mathit{forall}]\rangle\right], \ldots\right\rangle\right]\right]\right]$$

3 Lexical Resource Semantics

General remarks:

- LRS uses techniques of *underspecified semantics* (Reyle, 1993; Bos, 1996), but the logical form of a sentence is a single, disambiguated expression of the semantic representation language (Sailer, 2003).
- Previous LRS publications discuss scope ambiguity (Richter and Sailer, 2001a; Bouma, 2003), negative concord (Richter and Sailer, 2001b), multiple wh-interrogatives in German (Richter and Sailer, 2001a), and multiple past tense marking in Afrikaans (Sailer, 2004).
- Richter and Sailer (2004) provides an introduction to LRS.

(20) The architecture of semantics:

$$\left[\begin{array}{ll}
\textit{phrase} & \\
\textsc{phon} & \text{phonological structure} \\
\textsc{synsem} & \left[\begin{array}{ll}
\textit{synsem} & \\
\textsc{local} & \left[\begin{array}{ll}
\textsc{category} & \left[\begin{array}{ll} \textsc{head} & \text{part of speech, case, } \ldots \\ \textsc{valence} & \text{valence} \\ \textsc{arg-st} & \text{argument structure} \end{array}\right] \\
\textsc{content} & \left[\begin{array}{ll} \textbf{local semantic structure} & \\ \textsc{index} & \left[\begin{array}{ll} \textsc{phi} & \phi\text{-features} \\ \textsc{var} & \text{logical variable} \end{array}\right] \\ \textsc{main} & \text{semantic constant} \end{array}\right]
\end{array}\right] \\
\textsc{nonlocal} & \text{pied-piping}
\end{array}\right] \\
\textsc{logical-form} & \left[\textbf{logical expressions associated with the sign}\right] \\
\textsc{dtrs} & \text{constituent structure}
\end{array}\right]$$

3.1 Nonlocal Semantics

(21) a. The value of LOGICAL-FORM:

$$\left[\begin{array}{ll}
\textsc{external-content} & \text{at utterances: the overall logical form} \\
\textsc{internal-content} & \text{the scopally lowest expression of the sign} \\
\textsc{parts} & \text{all expressions contributed by a sign}
\end{array}\right]$$

b. The LF values:

everyone

$$\left[\begin{array}{ll}
\textsc{ex-cont} & \forall x[\alpha \rightarrow \beta] \\
\textsc{in-cont} & \mathsf{human}'(x) \\
\textsc{parts} & \langle \forall x[\alpha \rightarrow \beta], \alpha \rightarrow \beta, \mathsf{hum}'(x) \rangle
\end{array}\right]$$

and $\mathsf{hum}'(x) \lhd \alpha$

loves

$$\left[\begin{array}{ll}
\textsc{ex-cont} & \gamma \\
\textsc{in-cont} & \mathsf{love}'(e, x, y) \\
\textsc{parts} & \langle \mathsf{love}'(e, x, y) \rangle
\end{array}\right]$$

something

$$\left[\begin{array}{ll}
\textsc{ex-cont} & \exists y[\delta \wedge \epsilon] \\
\textsc{in-cont} & \mathsf{object}'(y) \\
\textsc{parts} & \langle \exists y[\delta \wedge \epsilon], \delta \wedge \epsilon, \mathsf{obj}'(y) \rangle
\end{array}\right]$$

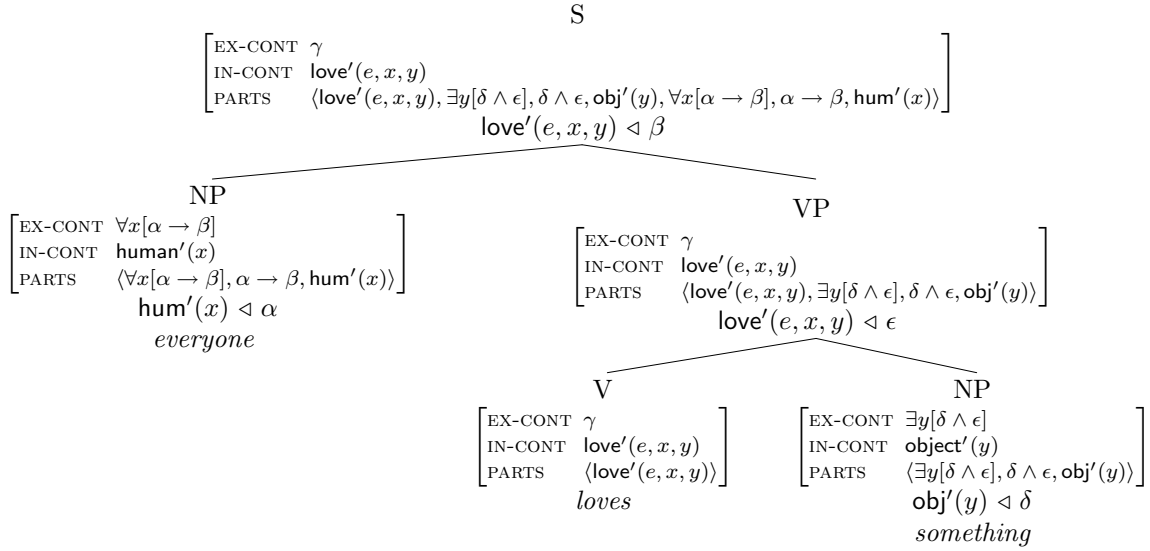
and $\mathsf{obj}'(y) \lhd \delta$

(22) SEMANTICS PRINCIPLE:

- The values of EX-CONT and IN-CONT are identical on the mother and the head.
- The PARTS value of the mother is the union of the PARTS values of the daughters.
- Structure-dependent constraints:
  - If the nonhead is a quantified NP complement of the head, then the head's IN-CONT is a subexpression of the nonhead's nuclear scope.
  - ...

(23) a. Everyone loves something.

b.



c. Readings:

- ∀∃-reading: $\forall x[\mathsf{hum}'(x) \rightarrow \exists y[\mathsf{obj}'(y) \wedge \mathsf{love}'(e,x,y)]]$
- ∃∀-reading: $\exists y[\mathsf{obj}'(y) \wedge \forall x[\mathsf{hum}'(x) \rightarrow \mathsf{love}'(e,x,y)]]$

3.2 Local Semantics

(24) a. Outline of the lexical entry of *everyone*:

$$\left[\begin{array}{ll}
\textsc{phon} & \langle \textit{everyone} \rangle \\
\textsc{syns} & \left[\textsc{loc} \left[\begin{array}{ll} \textsc{cat} & \left[\begin{array}{ll} \textsc{head} & \textit{noun} \\ \textsc{arg-st} & \langle\rangle \end{array}\right] \\ \textsc{cont} & \left[\begin{array}{ll} \textsc{index} & \left[\textsc{phi} \left[\begin{array}{ll} \textsc{num} & \textit{sg} \\ \textsc{pers} & \textit{3rd} \end{array}\right] \right. \\ & \left. \textsc{var}\ x \right] \\ \textsc{main} & \mathsf{human}' \end{array}\right] \end{array}\right]\right] \\
\textsc{lf} & \left[\begin{array}{ll} \textsc{ex-cont} & \forall x[\alpha \rightarrow \beta] \\ \textsc{in-cont} & \mathsf{human}'(x) \\ \textsc{parts} & \langle \forall x[\alpha \rightarrow \beta], \alpha \rightarrow \beta, \mathsf{hum}'(x) \rangle \end{array}\right]
\end{array}\right]$$

and $\mathsf{human}'(x) \lhd \alpha$

b. Outline of the lexical entry of *loves*:

$$\left[\begin{array}{ll}
\textsc{phon} & \langle \textit{loves} \rangle \\
\textsc{syns} & \left[\textsc{loc} \left[\begin{array}{ll} \textsc{cat} & \left[\begin{array}{ll} \textsc{head} & \textit{verb} \\ \textsc{arg-st} & \left\langle \left[\textsc{loc} \left[\begin{array}{ll} \textsc{cat} & \left[\textsc{head}\ \textit{noun}\right] \\ \textsc{cont} & \left[\textsc{index}\ \textsc{var}\ x\right] \end{array}\right]\right], \left[\textsc{loc} \left[\begin{array}{ll} \textsc{cat} & \left[\textsc{head}\ \textit{noun}\right] \\ \textsc{cont} & \left[\textsc{index}\ \textsc{var}\ y\right] \end{array}\right]\right] \right\rangle \end{array}\right] \\ \textsc{cont} & \left[\begin{array}{ll} \textsc{index} & \left[\textsc{var}\ e\right] \\ \textsc{main} & \mathsf{love}' \end{array}\right] \end{array}\right]\right] \\
\textsc{lf} & \left[\begin{array}{ll} \textsc{ex-cont} & \gamma \\ \textsc{in-cont} & \mathsf{love}'(e,x,y) \\ \textsc{parts} & \langle \mathsf{love}'(e,x,y) \rangle \end{array}\right]
\end{array}\right]$$

- Quantifiers and other operators are no longer part of the *synsem* structure, i.e., of what can be selected for.
- The main semantic relation of a word is part of *synsem* (the MAIN value). Thus, it is available for linking.
- Sortal restrictions can be expressed by the semantic type of the head.
- Selectional restrictions can be expressed with reference to a hierarchy of semantic relations.

3.2.1 Hierarchy of semantic constants

- The MAIN value is a semantic constant.
- Semanitc constants are encoded as linguistic sorts (Sailer, 2003).
- Hierarchies useful for linking constraints:
  move-rel is a subsort of *cause-rel* is a subsort of *constant*.
- Hierarchies useful for selectional restrictions (WordNets)

3.2.2 Complement INDEX versus argument type

- The INDEX value of a noun is its referential variable.
- This need not appear directly in the verb's argument slot.

(25) a. Mary likes the green car.
$\mathsf{like}'(e, m, \iota x[\mathsf{car}'(x) \& \mathsf{green}'(x)])$
(where $\iota x_\tau[\phi]$ denotes an individual a of type τ such that $[\![\lambda x.\phi]\!](a) = 1$ if there is exactly one such individual, otherwise the denotation is undefined.)

b. Mary likes every green car.
$\forall x[[\mathsf{car}'(x) \& \mathsf{green}'(x)] \rightarrow \mathsf{like}'(e, m, x)]$

c. local semantics of *the/every car*:

$$\begin{bmatrix} \text{INDEX} & \begin{bmatrix} \text{PHI} & \begin{bmatrix} \text{NUM} & sg \\ \text{GEN} & neutr \\ \text{PERS} & 3rd \end{bmatrix} \\ \text{VAR} & x \end{bmatrix} \\ \text{MAIN} & \mathsf{car}'_{et} \end{bmatrix}$$

- Propositional Relative Clauses:

(26) a. German: *mit jdm. auf (dem) Duzfuß stehen* (*be on informal terms with s.o.*)

b. Eine beliebte Variante ist das Bruderschafts-Dropping, bei dem man geschickt Vornamen wie Thomas, Viktor, Ioan, Otti etc. einflicht, um den anderen den Duzfuß ahnen zu lassen, [$_{RelS}$auf dem man mit den Spitzenkräften steht].
'A popular variant is the "friendship-dropping" throuh which one drops first names such as Thomas, Viktor, ... in order to make the other one suspect that one is on informal terms with the top executives.' (from the IDS corpora, Mannheim)

c. ... um den anderen ahnen zu lassen, [$_{ComplS}$ dass man mit den Spitzenkräften auf dem Duzfuß steht].

(27) a. *jemandem den Garaus machen* (*to kill someone*)

b. Einzig Vera Kutters ... Negativfoto der Wiener Secession bleibt als Hinweis auf den Garaus, den die Nazis der in ihren Augen "entarteten Kunst" machten.
'Only Vera Kutter's picture of the Vienna Secession remains as an indication of the fact that the Nazis destroyed what to their eyes was "degenerated art"' (http://www.taz.de/pt/2001/11/30/a0123.nf/text)

c. Die Globalisierung machte dem Kleinbetrieb den Garaus.
$\lambda w.\exists e'[\mathsf{make}'(w.e', \mathsf{G}, \mathsf{K}, \iota x[\mathsf{garaus}'(w, x)])]$

d. INDEX VAR value of *Garaus*: x
argument of make': $\iota x[\mathsf{garaus}'(w, x)]$

- The INDEX VAR value of a complement need not be a semantic argument of the head itself!
- Back to the Martians:

(28) At the meeting, Martians$_i$ presented themselves$_i$ as almost extinct.

- Binding = identity of INDEX values.
- i.e. also identity of INDEX VAR values.
- But: *present* takes an individual (or group) and *be-extinct* a kind as semantic arguments.

(29) a. INDEX VAR value of *Martians*: x

b. Group of Martians: $\exists g[g = \lambda x.\mathsf{martian}'(x) \& \ldots]$

c. Kind of Martians: $\exists k[k = \lambda x.\mathsf{martian}'(x) \& \ldots]$

3.2.3 MAIN versus INTERNAL-CONTENT

(30) Eine Schraube fehlt.
a screw is missing

$\textsf{be-missing}'(\hat{}\lambda P.\exists x[\textsf{screw}'(x) \wedge \check{} P(x)])$

(31) Outline of the lexical entry of *fehlen* (*be missing*):

$$\left[\begin{array}{ll}
\textsc{phon} & \langle \textit{fehlen} \rangle \\
\textsc{syns} & \left[\textsc{loc} \left[\begin{array}{ll}
\textsc{cat} & \left[\textsc{head} \;\; \textit{verb} \;\; \textsc{arg-st} \left\langle \left[\textsc{loc} \left[\begin{array}{ll} \textsc{cat} & \left[\textsc{head} \;\; \textit{noun}\right] \\ \textsc{cont} & \left[\textsc{index var} \;\; x\right]\end{array}\right]\right]\right\rangle\right] \\
\textsc{cont} & \left[\begin{array}{ll} \textsc{index} & \left[\textsc{var} \;\; e\right] \\ \textsc{main} & \textsf{be-missing}'\end{array}\right]
\end{array}\right]\right] \\
\textsc{lf} & \left[\begin{array}{ll}
\textsc{ex-cont} & \gamma \\
\textsc{in-cont} & \check{} P(x) \\
\textsc{parts} & \langle \textsf{be-missing}'(e, \hat{}\lambda P.\delta),\ \hat{}\lambda P.\delta,\ \check{} P(x), P(x) \rangle
\end{array}\right]
\end{array}\right]$$

and $\check{} P(x) \lhd \delta$

- Data with intensional verbs could not be handled by the quantifier mechanism of Pollard and Sag (1994) and constituted the main motivation for integrating STORE into the *synsem* structure (Pollard and Yoo, 1998; Przepiórkowski, 1998).
- The distinction between the INTERNAL-CONTENT and the MAIN value in LRS solves this problem.
- Analogous data with other opaque verbs:

  (32) A unicorn seems to be approaching.

- Verbal complexes ("content raising"):

  (33) a. dass Peter ein Buch [kaufen will]
  that Peter a book buy want
  b. $\textsf{want}'(p, \lambda@.\exists x[\textsf{book}'(x)\&\textsf{buy}'(p, x)])$
  c. $\exists x[\textsf{book}'(x)\&\textsf{want}'(p, \lambda@, \textsf{buy}'(p, x))]$

  (34) CONTENT RAISER PRINCIPLE:

  In every head-complement structure: If the head-daughter subcategorizes for some complements of the non-head daughter, then the IN-CONT values of the head and the nonhead are identical.

$$\mathbf{A}\,\boxed{1}\left(\begin{array}{l}
\left[\begin{array}{ll} \textsc{h-dtr} & \left[\textsc{syns loc cat subcat} \left\langle \ldots \right\rangle \oplus \boxed{1} \oplus \left\langle \ldots \right\rangle\right] \\ \textsc{n-dtr} & \left[\textsc{syns loc cat subcat} \;\; \boxed{1} \;\; \textit{nelist}\right]\end{array}\right] \\
\Rightarrow \mathbf{E}\,\boxed{2}\left(\left[\begin{array}{ll} \textsc{lf} & \left[\textsc{incont} \;\; \boxed{2}\right] \\ \textsc{n-dtr} & \left[\textsc{lf} \;\; \left[\textsc{incont} \;\; \boxed{2}\right]\right]\end{array}\right)
\end{array}\right)$$

- Effect of the CONTENT RAISER PRINCIPLE:

  MAIN value of the clause: $\textsf{want}'$
  IN-CONT value of the clause: $\textsf{buy}'$(p,x)
  Scoping constraint: $\exists x[\textsf{book}'(x) \wedge \alpha]$, $\textsf{buy}'(p, x) \lhd \alpha$.
  $\Rightarrow$ 2 readings!

3.2.4 Less constrained than intended?

- A verb could enforce narrow scope for its arguments, if we use the EX-CONT value.

  (35) Hypothetical lexical entry:

$$\left[\begin{array}{l}
\textsc{syns loc cat arg-st} \left\langle \ldots \left[\textsc{loc cont index var} \;\; x\right] \ldots \right\rangle \\
\textsc{lf} \left[\textsc{ex-cont} \;\; \ldots \exists x[\ldots] \ldots\right]
\end{array}\right]$$

- Normally complements can outscope the EX-CONT:

(36) a. Inverse scopings:
[A representative from every city] was present.
$\forall y[\mathsf{cite}'(y)\&\exists x[\mathsf{representativ}'(x)\&\mathsf{from}'(x,y)\&\mathsf{be\text{-}present}'(x)]]$

b. *De re*-readings:
Peter believed [that someone from Spain had called]
$\exists x[\mathsf{from\text{-}Spain}'(x)\&\mathsf{believe}'(p,\lambda@.\mathsf{call}'(x))]$

c. Verbal complexes:

Maria will ein Buch kaufen.
Maria wants a book buy

$\exists x[\mathsf{book}'(x)\&\mathsf{want}'(m,\lambda@.\mathsf{buy}'(m,x))]$

4 Apparent Counterexample: Negative Concord

4.1 de Swart and Sag (2002)

(37) Lexical Quantifier Retrieval:

$$\begin{bmatrix} \textit{word} \\ \text{SYNS LOC CAT HEAD } \textit{verb} \end{bmatrix} \Rightarrow \begin{bmatrix} \text{SYNS LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{ARG-ST} & \left\langle \left[\text{LOC CONT STORE } \Sigma_1\right], \ldots, \left[\text{LOC CONT STORE } \Sigma_n\right] \right\rangle \end{bmatrix} \\ \text{CONT} & \left[\text{QUANTS } \mathtt{retrieve}(\Sigma_1 \cup \ldots \cup \Sigma_n)\right] \end{bmatrix} \end{bmatrix}$$

(where $\mathtt{retrieve}(X)$ is a series of quantifiers such that each quantifier in X either appears in $\mathtt{retrieve}(X)$ or forms a resumptive quantifier with some other quantifier of X)

(38) a. Personne n'aime personne.
nobody NM love nobody

b. No one is such that they love no one.

$$\begin{bmatrix} \text{PHON } \langle \textit{n'aime} \rangle \\ \text{SYNS LOC} \begin{bmatrix} \text{CAT ARG-ST} \left\langle \left[\text{LOC CONT STORE } \langle NO_x \rangle\right], \left[\text{LOC CONT STORE } \langle NO_y \rangle\right] \right\rangle \\ \text{CONT} \begin{bmatrix} \text{QUANTS} & \langle NO_x, NO_y \rangle \\ \text{NUCL} & \textit{Love}(x,y) \\ \text{STORE} & \langle\rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

c. No one loves anyone.

$$\begin{bmatrix} \text{PHON } \langle \textit{n'aime} \rangle \\ \text{SYNS LOC} \begin{bmatrix} \text{CAT ARG-ST} \left\langle \left[\text{LOC CONT STORE } \langle NO_x \rangle\right], \left[\text{LOC CONT STORE } \langle NO_y \rangle\right] \right\rangle \\ \text{CONT} \begin{bmatrix} \text{QUANTS} & \langle NO_{x,y} \rangle \\ \text{NUCL} & \textit{Love}(x,y) \\ \text{STORE} & \langle\rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

4.2 Negative concord in LRS

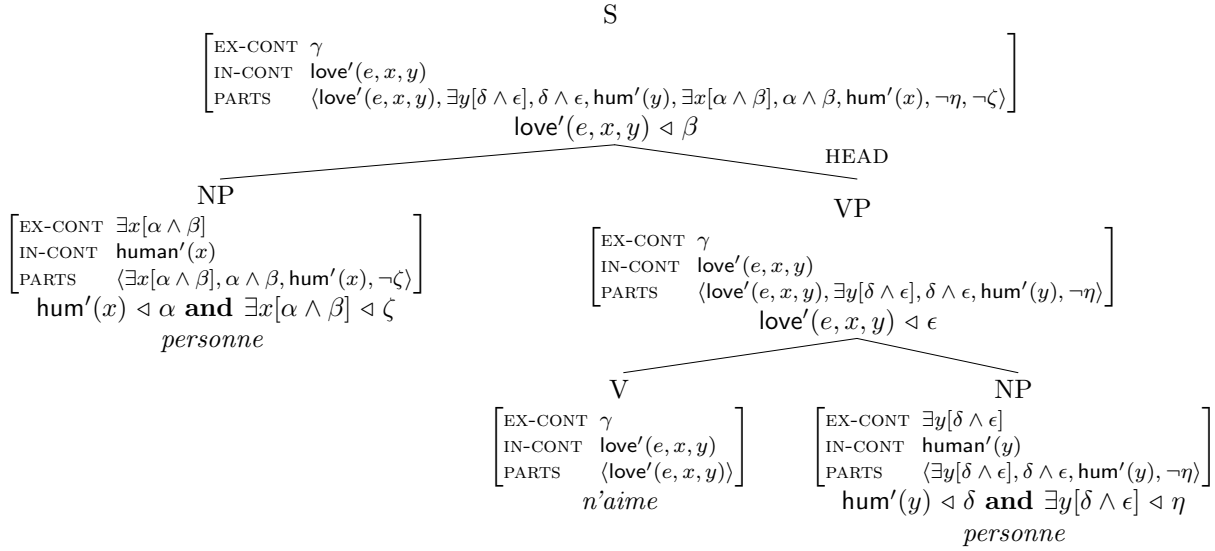
(39) Outline of the lexical entry of *personne* (*no one*):

$$\begin{bmatrix} \text{PHON } \langle \textit{personne} \rangle \\ \text{SYNS} \begin{bmatrix} \text{LOC} \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{noun} \\ \text{ARG-ST} & \langle\rangle \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{INDEX} & \begin{bmatrix} \text{PHI} & \begin{bmatrix} \text{NUM} & \textit{sg} \\ \text{PERS} & \textit{3rd} \end{bmatrix} \\ \text{VAR} & x \end{bmatrix} \\ \text{MAIN} & \mathsf{human}' \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{LF} \begin{bmatrix} \text{EX-CONT} & \exists x[\alpha \wedge \beta] \\ \text{IN-CONT} & \mathsf{human}'(x) \\ \text{PARTS} & \langle \exists x[\alpha \wedge \beta], \alpha \wedge \beta, \mathsf{human}'(x), \neg\zeta \rangle \end{bmatrix} \end{bmatrix}$$

and $\mathsf{human}'(x) \lhd \alpha$
and $\exists x[\alpha \wedge \beta] \lhd \zeta$

(40) a. Personne n'aime personne.

b.



c. Readings:

- Double negation ($\eta \neq \zeta$): $\neg\exists x[\mathsf{hum}'(x) \wedge \neg\exists y[\mathsf{hum}'(y) \wedge \mathsf{love}'(e,x,y)]]$
- Negative Concord ($\eta = \zeta$): $\neg\exists x[\mathsf{hum}'(x) \wedge \exists y[\mathsf{hum}'(y) \wedge \mathsf{love}'(e,x,y)]]$

General remarks:

- We exploit identities to derive semantic concord.
- Identities are the major analytic tool of HPSG.
- Analogous accounts are given for Polish negative concord (Richter and Sailer, 2001b), for multiple wh-questions in German (Richter and Sailer, 2001a), and for past tense concord in Afrikaans (Sailer, 2004).

5 Conclusion

- The inclusion of STORE and QUANTS in *synsem* in Pollard and Sag (1994), Pollard and Yoo (1998) and de Swart and Sag (2002) is motivated technically.
- Techniques of semantic underspecification allow for a more modular architecture of semantics.
- This leads to a cleaner devision between local and non-local semantic phenomena,
- and thus to a more constrained theory of selection and linking.

References

Androutsopoulos, Ion and Dale, Robert (2000). Selectional Restrictions in HPSG. In *Proceedings of COLING 2000*, Saarbrücken, pp. 15–20.

Bennis, Hans and Hoekstra, Teun (1989). *Generatieve Grammatica*. Dordrecht: Foris.

Bos, Johan (1996). Predicate Logic Unplugged. In P. Dekker and M. Stokhof (Eds.), *Proceedings of the Tenth Amsterdam Colloquium*, pp. 133–143. ILLC/Department of Philosophy, University of Amsterdam.

Bouma, Gosse (2003). Verb Clusters and the Scope of Adjuncts in Dutch. In P. A. M. Seuren and G. Kempen (Eds.), *Verb Constructions in German and Dutch*. Amsterdam and Philadelphia: John Benjamins.

Chomsky, Noam (1965). *Aspects of the Theory of Syntax*. Cambridge: MIT Press.

Davis, Anthony and Koenig, Jean-Pierre (2000). Linking as constraints on word classes in a hierarchical lexicon. *Language 76*, 56–91.

Swart, Henriëtte de and Sag, Ivan A. (2002). Negation and Negative concord in French. *Linguistics and Philosophy 25*, 373–417.

Dölling, Johannes (1994). Sortale Selektionsbeschränkungen und systematische Bedeutungsvariationen. In M. Schwarz (Ed.), *Kognitive Semantik/ Cognitive Semantics. Ergebnisse, Probleme, Perspektiven*, pp. 41–59. Tübingen: Narr.

Koenig, Jean-Pierre and Davis, Anthony (2003). Semantically Transparent Linking in HPSG. In S. Müller (Ed.), *Proceedings of the HPSG-2003 Conference, Michigan State University, East Lansing*, pp. 222–235. Stanford: CSLI Publications.

Krifka, Manfred (2003). Bare NPs: Kind-referring, Indefinites, Both, or Neither? In *Proceedings of SALT 13, 2003*. to appear.

Lang, Ewald (1994). Semantische vs. konzeptuelle Struktur: Unterscheidung und Überschneidung. In M. Schwarz (Ed.), *Kognitive Semantik/ Cognitive Semantics. Ergebnisse, Probleme, Perspektiven*, pp. 25–40. Tübingen: Narr.

Partee, Barbara (1987). Noun Phrase Interpretation and Type-shifting Principles. In J. Groendijk, D. de Jongh, and M. Stokhof (Eds.), *Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers*, pp. 115–144. Foris, Dordrecht.

Pollard, Carl and Sag, Ivan A. (1994). *Head-Driven Phrase Structure Grammar*. Chicago and London: University of Chicago Press.

Pollard, Carl J. and Yoo, Eun Jung (1998). A Unified Theory of Scope for Quantifiers and *wh*-Phrases. *Journal of Linguistics 34*, 415–445.

Przepiórkowski, Adam (1998). 'A Unified Theory of Scope' Revisited. In *Proceedings of the FHCG-98, 14–16 August 1998, Saarbrücken*, pp. 185–195.

Reyle, Uwe (1993). Dealing with Ambiguities by Underspecification: Construction, Representation and Deduction. *Journal of Semantics 10*(2), 123–179.

Richter, Frank and Sailer, Manfred (2001a). On the Left Periphery of German finite Sentences. In W. D. Meurers and T. Kiss (Eds.), *Constraint-Based Approaches to Germanic Syntax*, pp. 257–300. Stanford: CSLI Publications.

Richter, Frank and Sailer, Manfred (2001b). Polish Negation and Lexical Resource Semantics. In G.-J. Kruijff, L. S. Moss, and R. T. Oehrle (Eds.), *Proceedings FG-MOL 2001*, Number 53 in Electronic Notes in Theoretical Computer Science. Elsevier Science.

Richter, Frank and Sailer, Manfred (2004). Basic Concepts of Lexical Resource Semantics. to appear in the series of the Kurt Gödel Society, Vienna.

Sailer, Manfred (2003). Combinatorial Semantics and Idiomatic Expressions in Head-Driven Phrase Structure Grammar. Phil. Dissertation (2000). Arbeitspapiere des SFB 340. 161, Eberhard-Karls-Universität Tübingen.

Sailer, Manfred (2004). Past Tense Marking in Afrikaans. In *Proceedings of Sinn und Bedeutung 8*. to appear.