Introduction to Semantic Theory
Structural Ambiguity I

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Connecting back to the previous lecture

The **central points** of the previous lecture:

- Humans have the ability to derive the meaning of sentences from the meanings of the words contained in them (→ combinatoric nature of meaning).
- The aim of formal semantics is to model this ability with the help of formal means taken from math and logic.
- As a formal substitute notion for meaning (which is unobservable), the notion of "the extension of a word" is used.
Aim for today

The aim for today: to investigate the combinatoric nature of meaning by looking at ambiguous sentences

⇒ They provide a window into what guides the composition of meaning.
⇒ We will show: syntactic structure guides meaning composition

(This lecture follows Sternefeld & Zimmermann 2013, Chapter 3)
Types of ambiguities – I

The following sentence has **two readings**, i.e., two ways in which it can be interpreted:

(1) *Peter and Mary met at a bus stop next to the bank.*

What are the two readings of (1) and how do they arise?
The following sentence has two readings, i.e., two ways in which it can be interpreted:

(1)  *Peter and Mary met at a bus stop next to the bank.*

What are the two readings of (1) and how do they arise?

The two readings arise from a *lexical ambiguity* of the word *bank*: the financial institution vs. the river bank.
Some first ambiguous sentences

Types of ambiguities – II

Example (2) is also ambiguous.

(2)  *John told the girl that Bill liked the story.*

What are the two readings of (2)?
Some first ambiguous sentences

Types of ambiguities – II

Example (2) is also ambiguous.

(2)    *John told the girl that Bill liked the story.*

What are the two readings of (2)?

▶ John told a girl, namely the one that Bill liked, the story.
▶ John told the girl something, namely that Bill liked the story.
Some first ambiguous sentences

Types of ambiguities – II

Example (2) is also ambiguous.

(2) John told the girl that Bill liked the story.

What are the two readings of (2)?

- John told a girl, namely the one that Bill liked, the story.
- John told the girl something, namely that Bill liked the story.

Do these readings arise because of a lexical ambiguity?
Types of ambiguities – III

Example (2) illustrates a structural ambiguity.

(3) John told [VP [DP the girl [CP that Bill liked ]] the story]
(4) John told [VP [DP the girl] [CP that Bill liked the story]]

⇒ The two readings arise because of two possible syntactic structures that can be assigned to the string of words.
Types of ambiguities – IV

First reading:

```
FinP
  └── Fin'
      └── vP
          └── v'
              └── VP
                  └── V'
                      └── CP
                          └── that Bill liked the story
                  └── V
                      └── the girl
                          └── told-v
                              └── <John>
                                  └── Fin
                                      └── [PAST] John
                                          └── Fin
                                              └── FinP
                                                  └── John
                                                      └── that Bill liked the story
```

Intro
Elementary examples
Scope and syntactic domains
Summary

Some first ambiguous sentences
Some first ambiguous sentences

Types of ambiguities – IV

Second reading:

FinP

John

Fin’

Fin

[PAST] <John>

told-v

vP

v’

V’

VP

DP

the

girl

that Bill liked

NP

CP

V

V’

DP

the story

<told>
Spotting ambiguities

At first glance, most ambiguous sentences will appear unambiguous because context and world knowledge makes one of the possible readings pragmatically more plausible.

Spotting ambiguities requires practice!
Spotting ambiguities

At first glance, most ambiguous sentences will appear unambiguous because context and world knowledge makes on of the possible readings pragmatically more plausible.

Spotting ambiguities requires practice!

What needs to be trained?

- **Semantic intuitions:** considering which contexts the sentence can appear in and whether there is a change of meaning
- **Syntactic intuitions:** getting a feeling for how different phrases can be combined
Paraphrasing

Once an ambiguity is spotted: the available readings need to be made precise. One way to do this is to give **paraphrases** of the readings.

Paraphrases of readings need to be unambiguous and must capture only one of the readings!

To judge whether a paraphrase captures the intended reading and whether two paraphrases capture distinct readings:

(5) **The most certain principle**

If a sentence $S_1$ is true and another sentence $S_2$ is false **in the same circumstances** then $S_1$ and $S_2$ differ in meaning.
Another example – I

Example (6) is two-way ambiguous.

(6) *Peter put the block in the box on the table.*

What are the two readings of (6) and how do they arise?
Another example – I

Example (6) is two-way ambiguous.

(6) *Peter put the block in the box on the table.*

What are the two readings of (6) and how do they arise?

The sentence in (6) is again an example of a structural ambiguity:

(7) *Peter put* [VP [DP the block [PP in the box ]] [PP on the table ]]

(8) *Peter put* [VP [DP the block] [PP in [DP the box [PP on the table ]]]]
Another example – II

First reading:

FinP

Peter

Fin’

Fin [PAST] <Peter>

vP

v’

put-v

VP

DP

the

NP

block

PP

in the box

V’

V

PP

<put>

on the table

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Another example – III

Second reading:

\[
\begin{array}{c}
\text{FinP} \\
\downarrow \\
\text{Peter} \\
\downarrow \\
\text{Fin'} \\
\downarrow \\
\text{Fin} [\text{PAST}] \\
\downarrow \\
\langle \text{Peter} \rangle \\
\downarrow \\
\text{vP} \\
\downarrow \\
\text{v'} \\
\downarrow \\
\text{VP} \\
\downarrow \\
\text{V'} \\
\downarrow \\
\text{DP} \\
\downarrow \\
\text{the block} \\
\downarrow \\
\langle \text{put} \rangle \\
\downarrow \\
\text{in the box [PP on the table]}
\end{array}
\]
Another type of ambiguity?

Can the ambiguity illustrated in (9) be categorized into one of the classes we already know?

(9)  *John aß den Brokkoli. Er war nass.*
Another type of ambiguity?

Can the ambiguity illustrated in (9) be categorized into one of the classes we already know?

(9) John aß den Brokkoli. Er war nass.

The ambiguity of the second sentence arises from the different possible interpretations of *er*. However, we do *not* want to assume that *er* is lexically ambiguous!

Why?
Referential ambiguities

The example in (9) is a referential ambiguity. It arises because the referent of *er* is fixed in the context as either John or the broccoli.

Similar example in English (according to one synt. analysis):

(10) *John ate the broccoli wet.*
Referential ambiguities

The example in (9) is a referential ambiguity. It arises because the referent of \( er \) is fixed in the context as either John or the broccoli.

Similar example in English (according to one synt. analysis):

(10)  \[ \text{John ate the broccoli wet.} \]

Also in this case, world knowledge and plausibility sometimes excludes one of the readings:

(11)  a. \[ \text{John ate the broccoli raw.} \]
     b. \[ \text{John ate the broccoli naked.} \]
Interim summary

We have seen three types of ambiguities:

▶ lexical ambiguities
▶ structural ambiguities
▶ referential ambiguities

Note: A sentence can be multiply ambiguous because lexical, structural, referential, and other types of ambiguities can occur together!

(12)  
Paul took Peter to a party at one of his friends.  
Peter told the girl that he liked a story about a bank.
The notion of scope – I

For words with functional meaning, there is an important semantic notion – scope. The scope of a word determines which other expressions’ interpretations are in some sense dependent on the meaning contributed by that word.

If two (or more) expressions with functional meaning co-occur in a sentence, their scopes usually interact. Consider (13).

(13) The doctor didn’t leave because he was angry.

Which two readings does (13) have? Which two functional expressions can you identify that could interact?
The notion of scope – II

The two readings of example (13) arise from the interaction of negation (*not*) and the CP introduced by the causal subordinator *because*:

- The doctor did not leave, and the reason for not leaving was because he was angry. (*because CP < not*)
- The doctor left, but his reason for leaving was not because he was angry. (*not < because CP*)
The notion of scope – II

The two readings of example (13) arise from the interaction of negation (not) and the CP introduced by the causal subordinator because:

- The doctor did not leave, and the reason for not leaving was because he was angry. \((because\ CP < not)\)
  \((because < not): not\ is\ interpreted\ in\ the\ scope\ of\ the\ CP\ introduced\ by\ because.\ That\ is,\ the\ clause\ introduced\ by\ because\ gives\ a\ reason\ for\ why\ something\ did\ not\ happen.\)

- The doctor left, but his reason for leaving was not because he was angry. \((not < because\ CP)\)

\(\Rightarrow\) (13) is an example for a scope ambiguity.
The notion of scope – II

The two readings of example (13) arise from the interaction of negation (not) and the CP introduced by the causal subordinator because:

- The doctor did not leave, and the reason for not leaving was because he was angry. \( (\text{because CP} < \text{not}) \)
- The doctor left, but his reason for leaving was not because he was angry. \( (\text{not} < \text{because CP}) \)

\( \text{(not} < \text{because}) \): because and its CP are interpreted in the scope of not. That is, not negates that the clause introduced by because gives a reason for why something happened.

\( \Rightarrow \) (13) is an example for a scope ambiguity.
The notion of scope – III

Syntactically, the readings arising from the two scope orderings also correspond to two different structures.

First Reading:

```
FinP
  FinP
    FinP
      DP
        The doctor
      Fin
        [PAST] did
      Fin'
        NegP
          not
        vP
          leave-v <the doctor>
  Fin'
    NegP
      not
    vP
      leave-v <the doctor>
  CP
    because he was angry
```
The notion of scope – III

Syntactically, the readings arising from the two scope orderings also correspond to two different structures.

Second Reading:

```
FinP  
<table>
<thead>
<tr>
<th></th>
<th>FinP</th>
<th>Fin'</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The doctor</td>
<td>Fin</td>
<td>NegP</td>
</tr>
<tr>
<td>[PAST] did</td>
<td>not</td>
<td>vP</td>
</tr>
</tbody>
</table>
<leave-v | leave-v | because he was angry
<the doctor> | <the doctor> |
VP | VP |
CP |

<leave> | <the doctor>
<the doctor> | because he was angry
```
The Scope–C-command principle

The discussion of how the two readings of example (13) arise suggests a connection between what the scope of a word with functional meaning is and how this is represented in the syntactic structure.

(14) The Scope–C-command principle
If an expression X has scope over an expression Y, then syntactically, X c-commands Y.

(15) C-command
A constituent X c-commands a constituent Y if the node immediately dominating X also dominates Y.
Another example – I

The following phrase shows a hybrid between a scope ambiguity and a structural ambiguity.

(16) the girl and the boy in the park

Which two readings does (16) have? Which two (functional) expressions can you identify that could interact?

Note: Given the scope–c-command principle, scope ambiguities reduce to a special case of structural ambiguities.
Another example – II

The two readings arise from which expressions are coordinated by the conjunction *and* and the syntactic attachment site of the PP headed by *in*. 

```
\[
\begin{array}{c}
&\text{DP} & \text{DP} \\
&\text{\&'} & \text{\&'} \\
&\text{the girl} & \text{the girl} \\
&\text{\&} & \text{\&} \\
&\text{DP} & \text{DP} \\
&\text{and the boy} & \text{and the} \\
\end{array}
\]

\[
\begin{array}{c}
&\text{PP} & \text{DP} \\
&\text{in the park} & \text{in the park} \\
&\text{\&P} & \text{\&P} \\
&\text{DP} & \text{DP} \\
&\text{the girl} & \text{the girl} \\
&\text{\&'} & \text{\&'} \\
\end{array}
\]

\[
\begin{array}{c}
&\text{NP} & \text{PP} \\
&\text{boy in the park} & \\
&\text{N} & \\
\end{array}
\]
```
Summary

There are (at least) four types of ambiguities:

- lexical ambiguities
- structural ambiguities
- referential ambiguities
- scope ambiguities (→ reduces to a structural ambiguity)

The core underlying assumption regarding the relation between syntactic structure and interpretation:

To each syntactic structure with disambiguated word senses corresponds exactly one interpretation (but not vice versa!)

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