

Introduction to Semantic Theory

Introducing Formal Semantics

Dr. Sarah Zobel

Class: April 13, 2016

Office hours, course materials etc.

Office: SEP, Room 0.252

Office hours: send me an email!

Materials: Handouts, slides, readings and more will be uploaded on Stud.IP

Tutor: Friederike Buch, reachable via Stud.IP

Tutorial: TBD

For the specifics on how to earn credits, consult the handout from the lab class!

Introducing Formal Semantics

The aim of formal semantics – I

What is it that you learn when you learn a language?

The aim of formal semantics – I

What is it that you learn when you learn a language?

- ▶ *lexicon*: words (and morphemes) and their pronunciations and meanings
+ some phrases with fixed meaning (e.g., idioms)
- ▶ *rules of inflection and word formation*
- ▶ *rules of syntax*: how to combine these morphemes, words, and phrases to form grammatical sentences

The aim of formal semantics – I

What is it that you learn when you learn a language?

- ▶ *lexicon*: words (and morphemes) and their pronunciations and meanings
+ some phrases with fixed meaning (e.g., idioms)
- ▶ *rules of inflection and word formation*
- ▶ *rules of syntax*: how to combine these morphemes, words, and phrases to form grammatical sentences

But: You do not learn **how to combine the newly learned word meanings** to get the meanings of the sentences you learned to construct. Nevertheless you can interpret them.

Why?

The aim of formal semantics – II

Humans possess the ability to derive the meaning of complex linguistic expressions (phrases and sentences) from the meaning of their smallest parts.

The combinatorics involved is common to all languages.

The aim of formal semantics – II

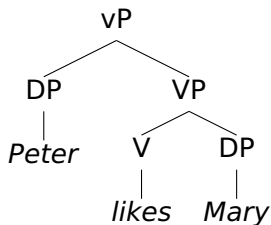
Humans possess the ability to derive the meaning of complex linguistic expressions (phrases and sentences) from the meaning of their smallest parts.

The combinatorics involved is common to all languages.

The aim of formal semantics is to **build a formal system** that **models** this fundamental ability of humans.

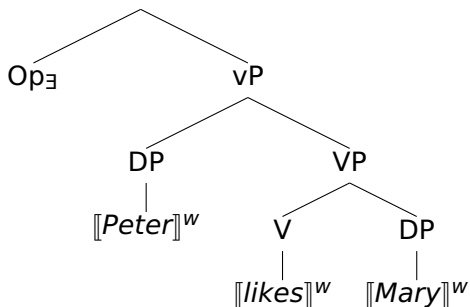
A short preview of the formal system

Based on a (reduced) syntactic structure of a sentence, we will first derive the truth-conditions of a sentence from its parts.



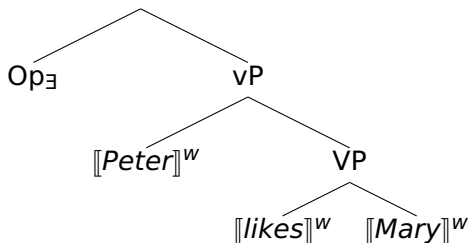
A short preview of the formal system

Step 1)



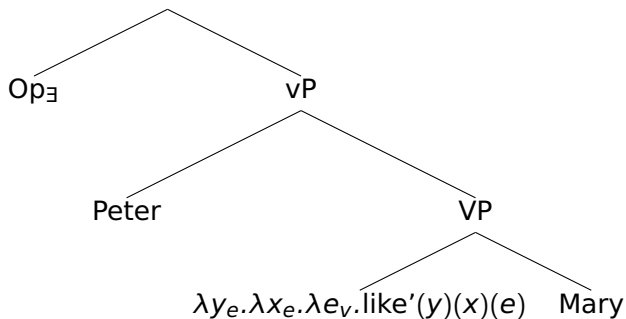
A short preview of the formal system

Step 2)



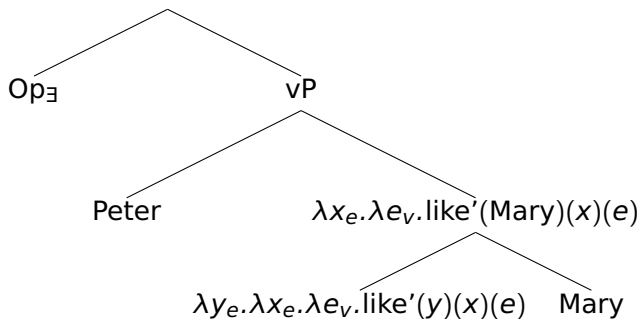
A short preview of the formal system

Step 3)



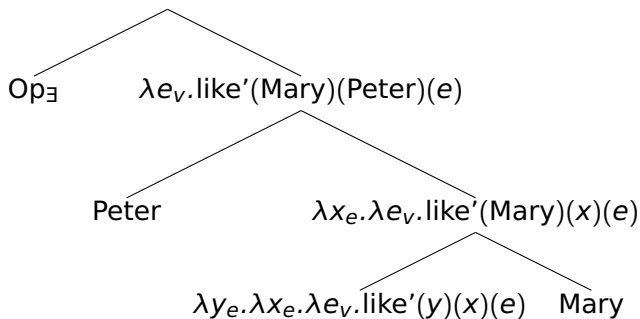
A short preview of the formal system

Step 4)



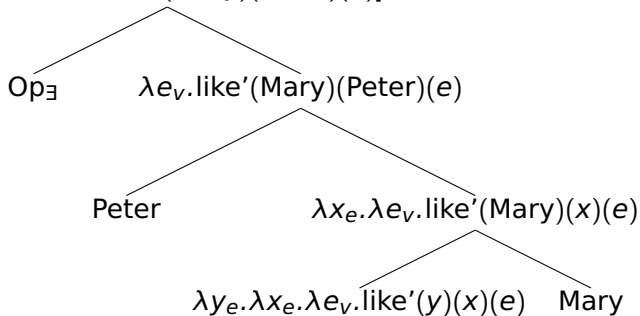
A short preview of the formal system

Step 5)



A short preview of the formal system

Step 6)

$$\exists e[e \text{ in } w \ \& \ \text{like}'(\text{Mary})(\text{Peter})(e)]$$


Why can we only aim to build **a model** that simulates the semantic ability of humans?

The unobservability of meaning

Semanticists investigate meaning. What makes this especially hard is that **meaning and how it is combined cannot be observed directly.**

What can you do if something you want to investigate cannot be observed or measured directly?

The unobservability of meaning

Semanticists investigate meaning. What makes this especially hard is that **meaning and how it is combined cannot be observed directly**.

What can you do if something you want to investigate cannot be observed or measured directly?

⇒ find something that is observable and is related to this thing in a principled manner (→ indirect evidence)

For instance: competent speakers' judgements about whether a sentence correctly describes a given state of affairs

Different kinds of meaning – I

When people use the word “meaning” (or “interpretation”) naively, they use it much more loosely to talk about other kinds of meaning than what semanticists want to model.

(1) *What is the meaning of this poem?*

Roses are red, violets are blue
I stink a lot – but so do you.

⇒ Semantic research is not concerned with hidden meanings of (quasi-)literary works.

⇒ meanings of everyday utterances

Different kinds of meaning – II

Even regarding everyday utterances we have to be careful: speakers can use one and the same sentence to communicate different things.

(2) [Context: A and B are huge fans of Big Bang Theory.]

A: Let's meet up Friday at 6pm and rewatch the entire first season of Big Bang Theory!

B: Great! I can't imagine a better way to spend the evening.

Different kinds of meaning – II

Even regarding everyday utterances we have to be careful: speakers can use one and the same sentence to communicate different things.

- (2) [Context: A and B have to prepare a presentation for their semantics seminar.]

A: Let's meet up Friday at 6pm to work on the presentation!

B: Great! I can't imagine a better way to spend the evening.

Different kinds of meaning – II

Even regarding everyday utterances we have to be careful: speakers can use one and the same sentence to communicate different things.

(2) B: *Great! I can't imagine a better way to spend the evening.*

- ▶ **BBT context:** B wants to convey the literal meaning of her utterance.
- ▶ **Presentation context:** B wants to convey the opposite of the literal meaning of her utterance (“irony”).

⇒ **Core of semantics:** investigation of **literal meaning**
Non-literal meaning (like the effect of irony) is the subject of **pragmatics**.

Different kinds of meaning – III

Certain words (conventionally) convey content that goes beyond its basic literal meaning that is connected to the speaker's attitudes/emotions or a certain stylistic register.

- (3) a. *nosy* – *inquisitive* – *curious* – *prying*
 b. *dog* – *canine* – *mutt* – *pooch*

Also consider the following German expressions:

- (4) *Pferd* – *Gaul* – *Ross*
 Toilette – *Klo* – *Abort* – *Scheißhaus*

Different kinds of meaning – III

Certain words (conventionally) convey content that goes beyond its basic literal meaning that is connected to the speaker's attitudes/emotions or a certain stylistic register.

- (3) a. *nosy – inquisitive – curious – prying*
 b. *dog – canine – mutt – pooch*

Also consider the following German expressions:

- (4) *Pferd – Gaul – Ross*
 Toilette – Klo – Abort – Scheißhaus

These meaning aspects can be subsumed under the term “**connotation**”. They have to be kept apart from the aspect of literal meaning, i.e., “**denotation**”, of these expressions.

To summarize

Semantics is (traditionally) interested in

the literal meaning of everyday utterances

and (typically) ignores aspects that can be said to be connotations of the word (even if they are conventionally associated with it).

Modelling meaning

- ▶ We want to build a formal model of natural language semantics
(= literal meanings and how they are combined).
- ▶ Meanings and how they are combined cannot be observed directly.

This means that we need to find **a suitable substitute that can play the role of basic word meanings** in the formal system.

⇒ we will find such a substitute in two steps

The combinatoric nature of meaning (Step 1)

Given the ability of humans to combine word meanings to derive sentence meanings, word meanings need to be **combinatoric in nature**. We will assume that the meanings stored in (language-specific) lexical entries need to provide “combinatoric slots” that a general combinatoric system can use to combine them.

To model the “combinatoric slots” of word meanings, we will utilize the notions of **functions and their arguments** (as studied in logic and mathematics).

The realistic view on meaning (Step 2) – I

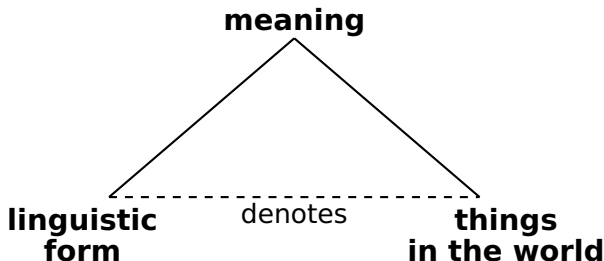
The second ingredient is [a realistic view on meaning](#):

- (5) **Realistic view:** The meaning of an expression is tightly related to those objects/entities/states of affairs in the world that the expression can be used to describe.

⇒ instead of modelling meaning of words directly, we model them via [the things in the world that they describe](#).

The realistic view on meaning (Step 2) – II

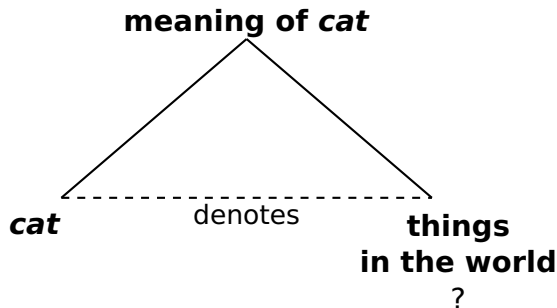
To illustrate the idea behind the realistic view on the nature of meaning: the semiotic triangle



What would the triangle look like for the word *cat*?

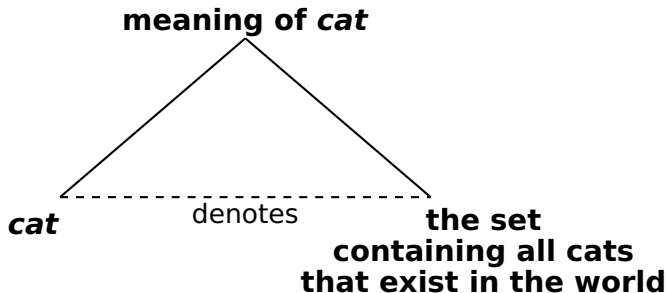
The realistic view on meaning (Step 2) – II

To illustrate the idea behind the realistic view on the nature of meaning: **the semiotic triangle**



The realistic view on meaning (Step 2) – II

To illustrate the idea behind the realistic view on the nature of meaning: **the semiotic triangle**



Two aspects of meaning – I

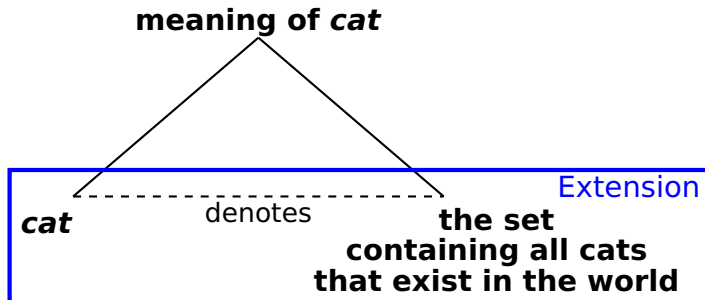
Under the realistic view, we can distinguish two aspects for the meaning of linguistic expressions:

- ▶ **Referential aspect:** enables us to refer to objects / entities / states of affairs in the world
↪ captured by the **extension**
- ▶ **Informational aspect:** deals with the information that is conveyed
↪ captured by the **intension**

The extensional system that we will build in this semester will only capture the first aspect. Anything more complicated will be the subject of seminars in semantics.

Two aspects of meaning – II

The referential aspect – captured by the extension of a linguistic expression – corresponds to the relation illustrated by the bottom of the semiotic triangle.



Other extensions

- ▶ ***tree:***
- ▶ ***Peter:***
- ▶ ***blue:***
- ▶ ***sleep:***
- ▶ ***like:***

Other extensions

- ▶ **tree:** the set containing all trees in the world
- ▶ **Peter:**
- ▶ **blue:**
- ▶ **sleep:**
- ▶ **like:**

Other extensions

- ▶ **tree:** the set containing all trees in the world
- ▶ **Peter:** Peter
- ▶ **blue:**
- ▶ **sleep:**
- ▶ **like:**

Other extensions

- ▶ **tree:** the set containing all trees in the world
- ▶ **Peter:** Peter
- ▶ **blue:** the set containing all blue things in the world
- ▶ **sleep:**
- ▶ **like:**

Other extensions

- ▶ **tree:** the set containing all trees in the world
- ▶ **Peter:** Peter
- ▶ **blue:** the set containing all blue things in the world
- ▶ **sleep:** the set containing all individuals that sleep in the world
- ▶ **like:**

Other extensions

- ▶ **tree**: the set containing all trees in the world
- ▶ **Peter**: Peter
- ▶ **blue**: the set containing all blue things in the world
- ▶ **sleep**: the set containing all individuals that sleep in the world
- ▶ **like**: the set containing all pairs of individuals in the world where the first individual in the pair likes the second individual in the pair

Connecting back. . .

to what you heard in the Intro to Linguistics about semantics:

Semantic relations between words – e.g. synonymy, antonymy, hyperonymy – correspond to how the extensions are related.

Synonymy: If two words are synonyms, their extensions are identical.

- (6) *car* – *automobile*
everything that is in the extension of *car* is also in the extension of *automobile*, and vice versa

Connecting back. . .

to what you heard in the Intro to Linguistics about semantics:

Semantic relations between words – e.g. synonymy, antonymy, hyperonymy – correspond to how the extensions are related.

Antonymy: If two words are antonyms, their extensions do not overlap. The sets are disjoint.

- (6) *big* – *small*
nothing that is in the extension of *big* is also in the extension of *small*, and vice versa

Connecting back. . .

to what you heard in the Intro to Linguistics about semantics:

Semantic relations between words – e.g. synonymy, antonymy, hyperonymy – correspond to how the extensions are related.

Hyperonymy: If a word is a hypernym of another word, its extension contains the extension of the second word.

- (6) *cat* – *animal*
everything that is in the extension of *cat* is in the extension of *animal*, but not vice versa

Overview

13.04.	Admin – Introducing formal semantics
20.04.	Structural ambiguity I
27.04.	Structural ambiguity II
04.05.	Extensions – Words, phrases, sentences
11.05.	no lecture
18.05.	Composition(ality) – Building up a sentence
25.05.	Modification
Reading Week (May 30-June 3)	
08.06.	Non-verbal predicates – Definite descriptions
15.06.	Modelling the context – Pronouns
22.06.	Quantifiers I
29.06.	Quantifiers II
06.07.	In-class exercise – Preview: Beyond extensionality
13.07.	Recapping the semester