Lexical Semantics

General Linguistics
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(Most slides: Petra Hendriks)

What is meaning?

- Language is about something
  - expressing that something = meaning
- Expressions in natural language have *meanings*

  - Word meaning
  - Phrasal meaning
  - Sentence meaning
  - Discourse meaning

Meaning = Reference?

An idea: **the meaning of a word is the same as what it refers to in the word** i.e. meaning is referential?

- Example: The word "chair" refers to objects in the real world with a certain number of legs, and which you can sit on....
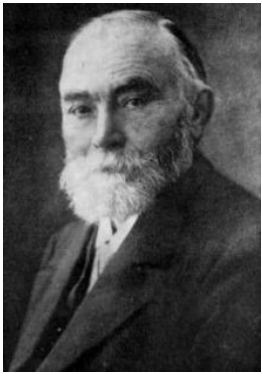- But...

Meaning as reference?

- Meaning cannot be the same thing as reference, because there are words that do not refer to anything in the real world:
  - Eenhoorn, kabouter, de huidige koning van Frankrijk…
- In addition, two expressions can refer to the same individual, yet not have the same meaning, e.g.:
  - De koningin van Nederland ≠ Beatrix

1. The morning star is the evening star.

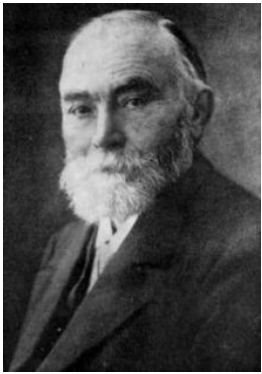2. The morning star is the morning star.

Frege's argument (1892)

1. The morning star is the evening star.
2. The morning star is the morning star.

The referent of *the morning star* and *the evening star* is in both sentences the planet Venus.

If meaning = reference, than the meaning of these two sentences would be identical.

-this certainly isn't the case!

Informational content

- Sentence 1 and 2 do not have the same informational content

- Sentence 1 is always true, and therefore it is not informative

- Sentence 2 on the other hand is a scientific discovery

- Frege's conclusion: Reference can't be all there is to meaning

Sentence meaning = truth value?

- Sentences do not refer to individuals
- Sentences describe situations that can be true or false

- Maybe the meaning of sentence is its truth value?
    - and the meaning of a compound sentence would be predicted by the truth values of the component sentences
    - (this is how meaning works in logic!)

Opaque contexts

1. Jan gelooft dat Marie zijn hoedje opgegeten heeft.

- The truth of a subordinate clause (*dat…heeft,* whether or not Marie ate Jan's hat or not) isn't relevant to the truth of the entire sentence
  - Still, some aspect of the meaning of the subordinate clause must influence the meaning of the entire sentence
  - There is a relationship that must hold between the subordinate clause and the main clause…
- Frege's conclusion: There must be more to the meaning of a sentence than its truth value

Extension and intension

Frege's solution:

Meaning is both extension and intension

- **Extension (Reference)** (German: *Bedeutung*):
  - names and nouns : their extensions are the individuals that they refer to
  - sentences: the truth value of the sentences
- **Intension (Sense)** (German: *Sinn*):
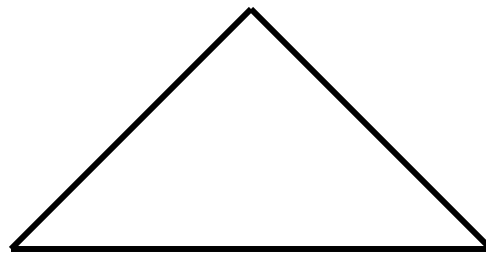 - other aspects of meaning

What are intensions?

- Mental images?
  - E.g.: *hond.*
  - Problem: There are many different kinds of dogs; further, what do you do about abstract words like *geluk*.
- Bundles of semantic features? (Katz & Fodor)
  - E.g: *vrijgezel*: +human, +adult, +male, -married.
  - Problem: for words like "game" its very difficult to find features that are relevant for all uses of the word
- Fuzzy concepts? (cf. Prototype theory)
  - E.g: robin is a better example of a bird than a pinguin

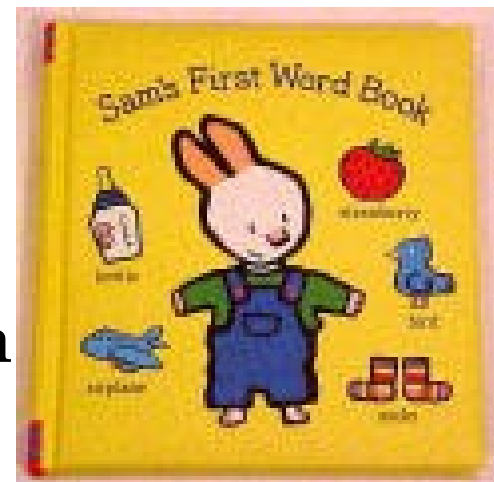# The semiotic triangle

Intension:

a number of pieces of paper,
sewn together and with a cover

Form: /buk/   Extension

The forms of words are arbitrary

The relation between the form of a word and its meaning is in general arbitrary

Shakespeare, Romeo and Juliet, Act 2, Scene 2, Juliet:

> What's in a name? that which we call a rose
> By any other name would smell as sweet;
> So Romeo would, were he not Romeo call'd,
> Retain that dear perfection which he owes
> Without that title. Romeo, doff thy name,
> And for that name which is no part of thee
> Take all myself.

Saussure

- The meaning of a **word** is determined by two things
  - how it relates to the word
  - how it relates to other words in the language

- *mouton* (Fr.) and
sheep & mutton (Eng)
mean different things

Meaning of words

- The meaning of words is studied within lexical semantics:
  - focus on the relationships between words

- Word meaning has also been studied in psycholinguistics:
  - Relations between word meaning and the corresponding mental states (concepts)

Meaning relationships between words

- Synonymy:
  - beminnen – houden van, aanschaffen - kopen
- Antonymy:
  - man – vrouw, heet – koud, aan - uit
- Homonymy:
  - bank, kop, bal
- Polysemy:
  - ronde bal, rond gezicht, ronde pijp, ronde rug, ronde stem
- Hyperonymy (taxonomic relations):
  - teckel ➜ hond ➜ zoogdier ➜ dier ➜ levend wezen

Style differences

- Many linguists believe that real synonymy is very rare

- Usually there are differences in style or usage of words that are very similar:
  - gestorven, ontslapen, van ons heengegaan, dood, de pijp uitgegaan, het hoekje omgegaan, kassiewijlen, Magere Hein tegen het lijf gelopen, etc.
  - flinke dosis - ? heftige dosis, felle ruzie - ? flinke ruzie
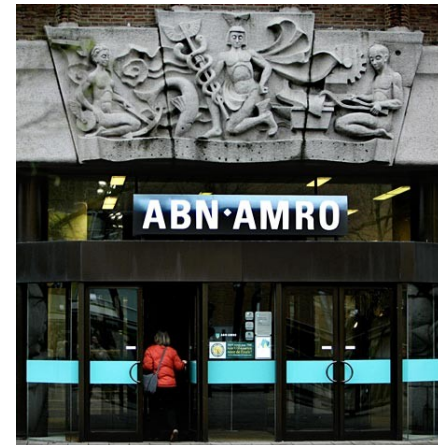
Monty Python – The Pet Shoppe

Customer: 'E's not pinin'! 'E's passed on! This parrot is no more! He has ceased to be! 'E's expired and gone to meet 'is maker! 'E's a stiff! Bereft of life, 'e rests in peace! If you hadn't nailed 'im to the perch 'e'd be pushing up the daisies! 'Is metabolic processes are now 'istory! 'E's off the twig! 'E's kicked the bucket, 'e's shuffled off 'is mortal coil, run down the curtain and joined the bleedin' choir invisibile!! THIS IS AN EX-PARROT!!

Lexical ambiguity

- common
- Word Sense Disambiguation (WSD) current research area in Natural Language Processing (NLP)
- Many applications require lexical disambiguation, e.g. search engines

Marie bezit een **bank**.

Presence of an ambiguous word:

Structural semantics

- Sentence meaning is researched within structural semantics or sentence semantics

- Structural ambiguity is also common

Ik hou van rode rozen en tulpen.

 & **OR**

 & **?**

Syntactic ambiguity

Ambiguity lies in syntactic structure:

    – Ik houd van [[rode rozen] en [tulpen]]

or

    – Ik houd van [rode [rozen en tulpen]]

Twee technici controleerden elk vliegtuig.

Semantic ambiguity

- Semantic ambiguity: isn't caused by the presence of an ambiguous word or different possible syntactic structures
- Paraphrases van de two betekenissen:
  - Er waren twee technici en die controleerden elk vliegtuig.
  - Elk vliegtuig werd door twee (niet persé dezelfde) technici gecontroleerd.
- Result of the relationship between the two quantificational expressions *twee technici* and *elk vliegtuig.*

Combinations of ambiguities

Jan zag haar vertrekken.

- Part of speech ambiguity:
  - *Haar*: genitive or object pronoun
  - *Vertrekken*: verb or noun
  - Depending on the part-of-speech there are different sentences structures associated with the same string

- Ambiguities can travel in groups: several ambiguities in the same sentence
- Ambiguity is one of the main problems in NLP
  - POS and syntactic ambiguity make parsing a challenge
  - we are only just beginning to try to disambiguate semantics

Word relationships → inferences

- Causal relations:
  - J.F.K. is vermoord → J.F.K. is dood
- Symmetric relations:
  - Marie is familie van Jan → Jan is familie van Marie
- Converse relations:
  - Marie is groter dan Jan → Jan is kleiner dan Marie
- Hypernym-Hyponym
  - Jan has two horses → Jan has at least two animals.

Meaning relations between sentences

- Paraphrase:
  - Marie ziet Jan $\leftrightarrow$ Jan wordt door Marie gezien
- Entailment (Gevolgtrekking):
  - Marie is blond en Marie is een studente $\rightarrow$ Marie is een blonde studente
- Tegenspraak (contradiction):
  - Jan is vrijgezel $-/\rightarrow$ Jan is getrouwd

What is Word Net?

- A machine-readable dictionary

- organized in the form of a lexical semantic network

  - Developed by Miller et al. at Princeton

  - Large project based on earlier ideas. Quillian et al (1968)

  - the biggest lexical resource we have, with WordNets for

  - many languages (Fully aligned English and Italian, German, Swedish, Dutch)

Words are part of **synsets**

- Synsets connected by conceptual relations
  - e.g. **chair:**
    - seat for one person
    - hypernym: furniture
    - hyponyms: folding chairs, barber ch
    - meronymy (part of): chair back, seat

How is sentence semantics studied?

- De deur staat open.

What does this sentence mean?

How is sentence semantics studied? (2)

- You can't describe the meaning of a sentence by describing it in the same language because then:
  - you aren't distinguishing between object language and meta-language
- Also not by translating on language into another:
  - You can't use one natural language as the meta-language for all other languages…
  - Every natural language is also ambiguous, so you might end up adding ambiguity in the translation

How is sentence semantics studied? (3)

- Solution: Formal languages can be used as meta-languages

- Formal languages: Propositional logic, predicate logic, etc.

- Method of working:

  Sentence ➜ Translate into formal language ➜ Interpretation via automatic-procedure from the formal language

- First step: can be very difficult

Semantic theory

A good semantic theory must:

- explain why certain meaning relationships hold between words and sentences

- be formally defined

- be able to explain how the meaning of a compound sentences or expression is built from the meaning of its component parts

Next time…

- Sentences semantics…