

Sentence Semantics Tutorial

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Compositionality: The meaning of a complex expression is a function of the meanings of its (immediate) constituents and how they are put together.

=> Sentences are not (all) idioms.

=> Semantics must take syntax seriously and conversely, interpretability may choose between syntactic alternatives.

=> A complex expression cannot be more context dependent than its constituents; *It is cold in here* 'Please close the window' is not a matter of compositional semantics.

Rule-by-rule interpretation, bottom-up (Montague Grammar or the Minimalist Program):

If α and β are expressions, interpreted as α' and β' , resp., and they are assembled (merged) using syntactic operation O , then $\alpha\beta$ is interpreted as $O'(\alpha')(\beta')$, where O' is the semantic operation corresponding to O .



For a top-down implementation, see Heim—Kratzer (1998).

Research in sentence semantics proceeds by studying some important entailments of sentences, rather than by trying to specify all aspects of their meanings in one swoop.

p entails q iff it cannot be that p is true and q is false.

Quince is a blonde carpenter entails Quince is blonde, Quince is a carpenter (*blonde* is an extensional, intersective adjective)

Quince is a terrible carpenter entails that Quince is a carpenter but not that Quince is terrible (*terrible* is an intensional, subsective adjective)

Quince is an alleged carpenter entails neither that Quince is a carpenter nor that Quince is alleged (*alleged* is a purely intensional adjective)

Assertion: an entailment that is cancelled by the (full, external) negation of the sentence. But sentences/utterances convey more than what they directly assert:

Presupposition: an entailment that is not cancelled by negation; its fulfilment is necessary for the sentence to be either true or false; an assumption that the speaker believes to be part of the common ground

The present king of France is bald presupposes: there is a present king of France
I regret that Tom lives in London presupposes: Tom lives in London
I agree that the Earth is flat presupposes: someone has claimed that...

Implicatures: arise from the Gricean conversational maxims (Relevance, Quantity, Quality)

John saw two cars: the grammar interprets it with 'at least two cars'. The hearer will strengthen this to an 'exactly' interpretation if the precise number is relevant and the speaker can be assumed to be fully informed and truthful. Implicature: 'not more'.

The recognition of Gricean implicatures plays an important role in formulating interpretations that are suitable for a compositional grammar.

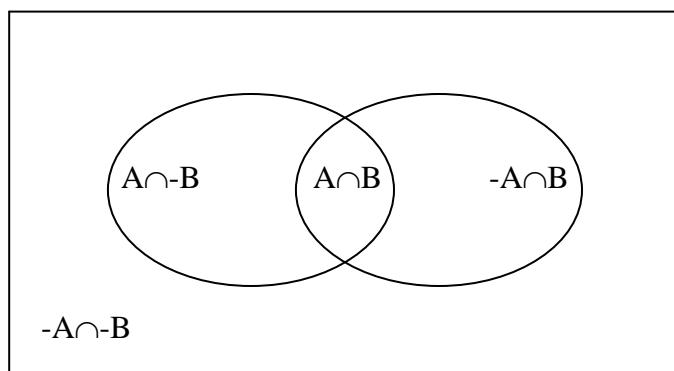
The interpretation of subsentential expressions:

John saw two cars in first order predicate logic:

$\exists x \exists y [x \neq y \wedge \text{car}'(x) \wedge \text{car}'(y) \wedge \text{saw}'(x)(\text{john}') \wedge \text{saw}'(y)(\text{john}')]$

The parts of this formula do not match up with the syntactic constituents.

Generalized quantifier theory: Determiners denote relations between sets of individuals

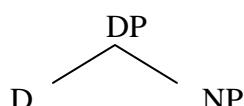


A = car' (restriction)
B = John saw' (scope)

three'(A)(B) is true iff the intersection of A and B has at least three elements

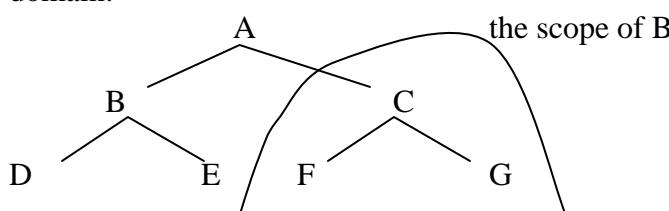
every'(A)(B) is true iff A is a subset of B

Do natural language determiners denote arbitrary relations between sets? No. It turns out that they are all **restricted** in the sense that in order to determine the truth of $\text{Det}(A)(B)$, we can "shrink" the universe to A: areas $-A \cap B$ and $-A \cap -B$ can be ignored.



The semantic fact that the set A plays the role of Det's restriction matches up nicely with syntactic constituency (A is the denotation of NP, D's sister).

The **scope** of an operator is that segment of the sentence in which it can induce a referential dependency in other items. In grammatical terms, the scope of an operator is its c-command domain:



Interpretive relations dependent on scope, e.g.:

Pronoun binding: *Every boy thought that his teacher left.*

**That every boy left upset his teacher.*

Negative polarity item licensing: *No one thinks that you have ever been here*
 **That no one knows him has ever occurred to me.*

Referential variation: *Every boy thought that some planet or other was uninhabitable.*
 **That every planet was uninhabitable surprised some boy or other.*

Scope is not an unanalyzable primitive, nor uniform for all quantifiers:

Existential scope is potentially unbounded, **distributive scope** is clause bounded:

Some man or other imagined that every violinist was left-handed.
 'some man imagined a world with all left-handed violinists'
 'the set of real violinists are such that some man imagined that every one of them was left-handed'
 *'for every real violinist there is a man who imagined that s/he was left-handed'

If three relatives of mine die, I inherit a house.
 'if there are three relatives who die, I inherit a house'
 'there are three relatives such that if they all die, I inherit a house'
 * 'there are three relatives such that for each, if he/she dies, I inherit a house'

Inverse scope, goes against linear order/surface c-command: **Distributives** (*every man, each man, etc.*) easily scope inversely over **counting quantifiers** (*few men, two or more men, more men than women, etc.*), but not vice versa:

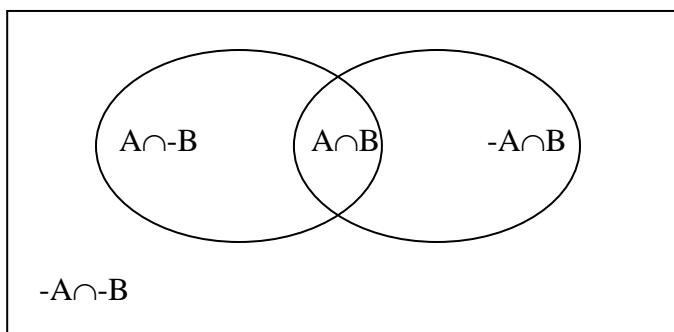
<i>Few men have read every book.</i>	few>every, every>few
<i>Every man has read few books.</i>	every>few, *few>every

Whether inverse scope is due to Logical Form (LF) movement, or to surface structures that are more complex than meets the eye, or to purely semantic devices such as choice functions is hotly debated.

Parallels between the domains of **individuals and situations/events/cases**:

Adverbs of quantification denote relations between sets of cases:

Always/rarely, if John is hungry, he is grumpy.



$A = (\text{if John is hungry})$,
 $B = \text{John is grumpy}$

$\text{always}'(A)(B)$ is true iff
 A is a subset of B

$\text{rarely}'(A)(B)$ is true iff
 $|A \cap -B| >> |A \cap B|$

A prime number is rarely even can mean 'Few primes are even' – how come?

Usually, if a man sneezes, he covers his face – possible multiplicity of cases of sneezing

Usually, if a man is French, he prefers wine – no multiplicity of cases of being French

Further ways to recover the restriction of the adverb (the set A) in the absence of an if-clause:

I regret that I forgot the keys. presupposes: I forgot the keys.

I rarely regret forgetting the keys.

‘Rarely when I forget the keys do I regret forgetting the keys’

I agree that the Earth is flat. presupposes: Someone claimed that...

I always agree that the Earth is flat.

‘Always when someone claims that the Earth is flat, I agree that the E. is f.’

I badmouth MARY to Bill. presupposes: I badmouth someone to Bill.

I usually badmouth MARY to Bill.

‘Usually when I badmouth someone to Bill, I badmouth Mary to Bill’

References:

(i) This tutorial is directly based on:

Semantics. In Fromkin, ed., Linguistics: An Introduction to Linguistic Theory. Blackwell, 2000. [Compositionality; Scope; Cross-categorial Parallelisms; Acquisition of Meaning; by Stabler, Szabolcsi, and Hyams]

(ii) Recommended further readings:

Bach, Emmon et al. eds., 1995. Quantification in Natural Languages. Kluwer.

Bach, Emmon, 1989. Informal Lectures on Formal Semantics. SUNY Press.

Carlson, Greg et al. eds., 199?, The Generic Book.

Heim, Irene and Angelika Kratzer, 1998. Semantics in Generative Grammar. MIT Press.

Kayne, Richard, 1998. Overt vs. covert movement. Syntax 1.

Lappin, Shalom, ed. 1996. Handbook of Contemporary Semantic Theory, Blackwell.

Reinhart, Tanya, 1997. Quantifier scope: the division of labor between QR and choice functions. Linguistics and Philosophy.

Szabolcsi, Anna, ed. 1997. Ways of Scope Taking. Kluwer.