

Introduction to Semantics

Lecture 1: Linguistic Meaning

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1 What this course is about

This course is a (very quick) introduction to **semantics**.

The approach we will adopt is variously called for historical and sociological reasons.

- formal semantics
- truth-conditional semantics
- model-theoretic semantics
- Montagovian semantics (after Richard Montague)

Strictly speaking, these names do not refer to the exact same thing (e.g., not all formal semantic theories are model-theoretic, not all are about truth-conditions, etc.).

What unifies the field is the idea that meaning in natural language can be investigated using tools and concepts developed for studying meaning in logical/mathematical languages (cf. Richard Montague's 1975 article entitled 'English as a formal language').

Perhaps **formal semantics** is the most neutral term.

It should be emphasized that most (if not all) of the achievements of formal semantics so far are about the **syntax/morphology-semantics interface**. As such it is of relevance to syntacticians and morphologists.

There are other approaches to semantics (e.g., Cognitive Semantics, Frame Semantics). Generative Semantics is also often distinguished from formal semantics for historical reason.

1.1 Semantics vs. pragmatics

Certain aspects of (what is traditionally considered to be) **pragmatics** also fall into this area, e.g.

- Implicature

- Presupposition
- Indexicality
- Anaphora

Roughly, semantics is the study of meaning conventionally encoded in linguistic expressions (words and phrases) and pragmatics is the study of meaning that arises when such expressions are put in use (we will see some concrete examples later).

But there is no theory-neutral way of defining what belongs in semantics and what belongs in pragmatics.

It would be handy to have an umbrella term that encompasses both semantics and pragmatics, but there is no established one (as far as I know).

- Sometimes ‘formal semantics/pragmatics’ is used.
- In my regular course at UCL I call it ‘the study of meaning’ but besides it being uncool, we would ideally like something like ‘meaning-ology’ so that we could also have an adjectival version of the term.

1.2 A short history of formal semantics and its place in Theoretical Linguistics today

For most of the 20th century, formal semantics/pragmatics was not part of the core areas of Linguistics at many schools. In particular, the North American linguistic tradition eschewed explicit analysis of meaning.

Against this scholarly backdrop, formal semantics arose from works in (analytic) philosophy and logic. Consequently, there have always been major players in formal semantics/pragmatics who have had academic training as philosophers and/or have offices in the department of philosophy. Although there certainly are cultural differences between philosophers and linguists, when it comes to research in semantics/pragmatics, there is, and should not be, any substantial difference between what we do.

As mentioned above, a lot of research in formal semantics is about the syntax/semantics interface. As such, a formal semantic theory is usually simultaneously about syntax-morphology and semantics.

In the early days of formal semantics, there was a tension with syntacticians working in the Chomskyan tradition of linguistics, including Noam Chomsky himself, which is partly due to their adherence to the strict autonomy of syntax (while Richard Montague, who pioneered formal semantics for natural language adopted Categorical Grammar), and partly to the vestige of the pre-Chomskyan tradition of regarding meaning as too subjective for scientific investigation. However, thanks to people like Barbara H. Partee and her students, the formal semantic tradition has been shown to be compatible with the Chomskyan school of syntax (in addition to other syntactic frameworks). Today, a number of scholars conduct research in both syntax and semantics.

Formal semantics/pragmatics is now taught as part of the core linguistic education in graduate programs, as well as some undergraduate programs, throughout the world. Since the beginning of the present century, researchers have been putting a lot of effort into finding ways of investigating theoretical questions about formal semantics/pragmatics using experimental methods developed in psychology and cognitive science, as well as cross-linguistic data, some of which are gathered through methods of fieldwork linguistics.

Barbara H. Partee has written some excellent overviews of the discipline from a historical point of view such as the following (she also has written about specific scholars).

- Barbara H. Partee (2011) Formal semantics: origins, issues, early impact. In Barbara H. Partee, Michael Glanzberg & Jurgis Škilters (eds.), *Formal Semantics and Pragmatics: Discourse, Context, and Models. The Baltic Yearbook of Cognition, Logic, and Communication*, vol. 6. Manhattan, KS: New Prairie Press.
- Barbara H. Partee (2013) **On the history of the question of whether natural language is “illogical”**. In James McElvenny (ed.), *History and Philosophy of the Language Sciences*.
- Barbara H. Partee (2014) A brief history of the syntax-semantics interface in Western Formal Linguistics. *Semantics-Syntax Interface*, 1(1): 1–21.
- Barbara H. Partee (2016) Formal semantics. In Maria Aloni & Paul Dekker (eds.), *The Cambridge Handbook of Formal Semantics*, Chapter 1, pp. 3–32. Cambridge University Press.

1.3 Schedule

One of the major early achievements of this semantic tradition is the model-theoretic account of **quantification**.

We will try to lay out the theoretical foundation in the first two lectures and from Lecture 3, discuss how to analyze the meanings of quantifiers like *every*, *some*, and *no*.

Day 1 Linguistic Meaning

Day 2 Compositionality and Model Theory

Day 3 Generalized Quantifier Theory I

Day 4 Generalized Quantifier Theory II

Day 5 Quantifier Scope

1.4 What to do after this course

What you learn here has been extended to analyze various other linguistic phenomena. Just to name some areas:

- | | |
|-------------------------------|---|
| • Connectives | • Degree expressions (comparatives, superlatives, etc.) |
| • Pronouns | • Evidentials |
| • Tense | • Interrogatives |
| • Aspect | • Imperatives |
| • Modals and attitude reports | • Focus |
| • Mass/count and plurality | • Discourse particles |

Naturally you can't learn much in a week or two. If you find formal semantics/pragmatics interesting, I personally recommend the following two textbooks as the next steps.

- Irene Heim & Angelika Kratzer (1998) *Semantics in Generative Grammar*. Blackwell.

- L. T. F. Gamut (1991) *Logic, language, and meaning*. University of Chicago Press.

Heim & Kratzer is an absolute classic. It's a bit old by now, but I think it's still worth reading. I also recommend Gamut, which is even older but teaches you Propositional Logic and Predicate Logic in some detail. Having solid knowledge of logic will be an advantage in doing semantics/pragmatics, and formal linguistics more generally. For this purpose, I recommend the following textbook as well.

- Babara Partee, Alice ter Meulen & Robert E. Wall (1990) *Mathematical Methods in Linguistics*. Kluwer.

There are a number of other introductory textbooks in formal semantics, for example:

- Henriëtte de Swart (1998) *Introduction to natural language semantics*. CSLI.
- Thomas Ede Zimmermann & Wolfgang Sternefeld (2013) *Introduction to semantics: An essential guide to the composition of meaning*. De Gruyter Mouton.
- Pauline Jacobson (2014) *Compositional semantics: an introduction to the syntax/semantics*. Oxford University Press.
- Yoad Winter (2018) *Elements of formal semantics*. Edinburgh University Press.
- Daniel Altshuler, Terence Parsons & Roger Schwarzschild (2019) *A course in semantics*. MIT Press.
- Elizabeth Coppock & Lucas Champollion (2025, ms.) *Invitation to formal semantics*.

After a couple of these textbooks, you can go on to read about more specific topics. For this purpose, it is useful to check out intermediate-level textbooks like the following and (recent) survey articles published in online journals like *Language and Linguistic Compass*, *Annual Review of Linguistics*, *Stanford Encyclopedia of Philosophy* and handbooks like *The Cambridge Handbook of Formal Semantics* and *The Handbook of Contemporary Semantic Theory*.

- Kai von Fintel & Irene Heim (1997–2023, ms.) *Intensional semantics*.
- Fred Landman (2000) *Events and Plurality*. Kluwer.
- Daniel Büring (2005) *Binding Theory*. Cambridge University Press.
- Anna Szabolcsi (2010) *Quantification*. Cambridge University Press.
- Marcin Morzycki (2015) *Modification*. Cambridge University Press.
- Daniel Büring (2016) *Intonation and Meaning*. Oxford University Press.
- Veneeta Dayal (2016) *Questions*. Oxford University Press.
- Rothstein (2017) *Semantics for counting and measuring*. Cambridge University Press.
- Philippe Schlenker (2022) *What it all means: semantics for (almost) everything*. MIT Press.

These books and articles provide summaries of relevant literature and key references. Recent dissertations with good overviews are often useful as well.

2 Semantic/pragmatic intuitions

Syntax, morphology, and phonology study **grammaticality** (alt.: well-formedness), and take grammaticality intuitions as primary data.

Strictly speaking, the primary data is **acceptability**, and theorists need to sift out observations that do not concern grammaticality from the data so as to focus on grammaticality.

Theories of syntax, morphology, and phonology are essentially about which *forms* are in the language and which are not. They answer this question by hypothesizing about grammatical principles and mechanisms.

Semantics and pragmatics are about meaning, rather than form, and correspondingly, the primary data for semantics/pragmatics is about intuitions about meaning, rather than grammaticality intuitions. There are several distinct types of semantic/pragmatic intuitions.

- Truth-conditional intuitions
- Referential intuitions
- Felicity intuitions

Theoretical questions are, however, essentially parallel to syntax, morphology, and phonology: What principles and mechanisms are responsible for these intuitions?

2.1 Truth-conditional intuitions

If you are presented with a (grammatical) declarative sentence in your language together with sufficient information about what is going on in a (real or hypothetical) scenario, you can (normally) tell if the sentence is true or false with respect to that scenario.

For example, take the English sentence in (1).

- (1) Exactly two Hungarian cities have populations of over 1 million.

Let us consider some scenarios:

- If you are given the actual populations of Hungarian cities, this sentence is judged to be false, as Budapest is the only Hungarian city that has a population over 1 million (as of 2026).
- Suppose, hypothetically, that the population of Budapest is 1.7 million and that of Debrecen is 12 million, while all the other Hungarian cities have less than 1 million inhabitants. With respect to this scenario, the sentence is true.
- Similarly, relative to another hypothetical scenario where the facts about the world geography and population are as in reality except that London belongs to Hungary, the sentence is judged to be true again.
- With respect to a hypothetical scenario where all Hungarian cities have less than 50,000 inhabitants, the sentence is judged to be false.
- Similarly, with respect to a scenario where Budapest, Debrecen, and Pécs (and no other Hungarian cities) have populations over 1 million, the sentence is false.

2.2 Referential intuitions

For *referential expressions* like proper names, definite and demonstrative noun phrases, pronouns, etc., speakers have referential intuitions, which are intuitions about what they (can) refer to in a give scenario.

2.3 Felicity intuitions

Speakers also have intuitions about *felicity*. There are arguably different types of felicity.

- **Presupposition failure**

(2) The king of France is on vacation right now.

(3) She's returning to Moscow next summer.

- Infelicity regarding social aspects of language use (e.g., mis-using markers of politeness/intimacy or gender, inappropriate uses of slurs and taboo words, etc.).
- Infelicity due to conversational irrelevance (e.g., not answering a question posed, saying something that is clearly false or something that is already known to be true).

Theoretically it is considered that different pragmatics principles are responsible for different types of infelicity, but in analyzing specific examples, it is often not self-evident which instances of infelicity are to be treated on a par with which other instances.

In this introductory course, we will only discuss presupposition failure in Day 4.

3 Truth-conditions

In order to account for the truth-conditional intuitions we have for (declarative) sentences, we assume that they are each associated with some **truth-conditional meaning**. The truth-conditional meaning of a sentence will remain very abstract, and the only way we can represent it is by paraphrasing its truth-conditions in some language, which could be a natural language like English or an artificial language. We will come back to this point immediately below, but for now, you can think of the truth-conditional meaning of a sentence as a black-box that tells you if the sentence is true or false when you give it a concrete scenario. In other words, the truth-conditional meaning can be understood in terms of in which scenarios the sentence is true and in which scenarios the sentence is false.

Let us consider a concrete example:

(4) Exactly two Hungarian cities have populations of over 1 million.

Its truth-conditional meaning can be characterized by stating what needs to be the case in order for the sentence to be true and what needs to be the case in order for the sentence to be false, as in (5).

(5) The sentence "Exactly two Hungarian cities have populations of over 1 million" is true with respect to scenarios where there are two Hungarian cities with populations

over 1 million, and there is no other Hungarian city that has a population of over 1 million, and is false in all other scenarios.

We call such statements **truth-conditions**.

(5) is a rather wordy representation. We could more compactly state the same thing as in (6).

(6) “Exactly two Hungarian cities have populations of over 1 million” is true if exactly two Hungarian cities have populations of over 1 million and false if more than two Hungarian cities have populations of over 1 million or fewer than two Hungarian cities have populations of over 1 million.

or more succinctly:

(7) “Exactly two Hungarian cities have populations of over 1 million” is true if exactly two Hungarian cities have populations of over 1 million and false otherwise.

It’s common to use ‘if and only if’ to shorten this further.

(8) “Exactly two Hungarian cities have populations of over 1 million” is true if and only if exactly two Hungarian cities have populations of over 1 million.

Because the phrase ‘if and only if’ is very often used in semantics (as well as in logic and mathematics), it has a standard abbreviation, ‘iff’.

(9) “Exactly two Hungarian cities have populations of over 1 million” is true iff exactly two Hungarian cities have populations of over 1 million.

All the above ways of stating truth-conditions in (5)–(9) are equivalent, but practically you only see (9) in published papers.

3.1 More on ‘iff’

‘Iff’ is always flanked by two statements. “ ϕ iff ψ ” means the truth of ϕ is a necessary and sufficient condition for the truth of ψ , which is to say, that they hold in the exact same set of situations. For this reason, ‘iff’ is often used in stating definitions.

If the truth of ϕ is a necessary condition for the truth of ψ , we say “ ϕ if ψ ”. This means something weaker than “ ϕ iff ψ ”: if ψ is true, ϕ is bound to be true, but it doesn’t say whether or not the converse also holds (although it also doesn’t say it doesn’t hold).

If the truth of ϕ is a sufficient condition for the truth of ψ , we say “ ϕ only if ψ ”. This means that if ϕ is true, ψ is bound to be true, but is open to the other direction of implication.

Evidently, whenever “ ϕ if ψ ” is the case, “ ψ only if ϕ ” is the case, and vice versa.

3.2 Object language and metalanguage

Descriptions of truth-conditions like (9) are not very impressive. In fact it is easy to come up with similar analyses for other example sentences:

- (10)
- a. “There are pandas in Budapest” is true iff there are pandas in Budapest.
 - b. “Chomsky has published 12 books” is true iff Chomsky has published 12 books.
 - c. “No textbook in semantics cites textbooks in syntax” is true iff no textbook in semantics cites textbooks in syntax.

This suggests that generally, we can say:

- (11) For any sentence “S”, “S” is true iff S.

It is important to notice that this is not a trivial statement. We can state a generalization like (11) because we are using one and the same language, English, both as **object language**, which is the language we are analyzing, and as **metalanguage**, which is the language in which we state our analysis.

The metalanguage needs not be identical to the object language, and in such a case, there obviously won't be a generalization like (11). For instance, if the object language is Hungarian, we might say something like (12), which is clearly non-trivial.

- (12) “Három férfi fut” is true iff three men are running.

Throughout this course, English will keep playing the double role of object language and metalanguage. This is just for practical convenience, and not for any theoretical reason. And it should be kept in mind that (11) crucially relies on our ability to understand the righthand side of ‘iff’. It turns out, furthermore, that there are sentences whose meanings are not entirely clear, and such sentences should not be used in stating an analysis (unless you make clear what you mean by them).

3.3 Tautologies and contradictions

Some sentences have ‘trivial’ truth-conditions. For instance, the sentences in (13) are always true and never false.

- (13)
- a. There is a river or there is not a river.
 - b. Nothing is different from itself.

Such sentences that are always true are called **tautologies**.

There are also sentences that are always false, which are called **contradictions**.

- (14)
- a. Fewer than five cats are asleep and more than 10 cats are asleep.
 - b. Nothing is self-identical.

3.4 Entailment and (in)consistency

We have so far characterized the truth-conditional meaning of a sentence in terms of what needs to be the case for it to be true and what needs to be the case for it to be false. We can also think of it in terms of *relations* with other sentences.

Take two (declarative) sentences and call them ϕ and ψ . We say:

- ϕ **entails** ψ iff whenever ϕ is true, ψ has to be true.

For instance, (15a) entails (15b), but (15b) does not entail (15a).

- (15) a. There is a pink panda next to an expensive car.
 b. There is a car.

Note also that every (declarative) sentence entails itself.

We also say “ ϕ implies ψ ”, “ ψ follows from ϕ ”, etc.

- If ϕ entails ψ but ψ doesn’t entail ϕ , we say “ ϕ asymmetrically entails ψ ”, “ ϕ is **stronger** than ψ ”, or “ ψ is weaker than ϕ ”.
- ϕ is **consistent with** ψ iff ϕ and ψ can be simultaneously true (i.e., there is at least one scenario in which both ϕ and ψ are true).
- ϕ **contradicts** ψ iff ϕ and ψ cannot be simultaneously true (i.e., there no scenario in which both ϕ and ψ are true). We also say “ ϕ is inconsistent with ψ ”, “ ϕ and ψ are inconsistent with each other”, “ ϕ and ψ are mutually inconsistent”.

Once we know the truth-conditions of ϕ and ψ , we can determine whether these relations hold between them or not.

4 Model-theoretic approach to linguistic meaning

The standard approach to formal semantics/pragmatics is **model-theoretic**. I should stress that it is not the only approach in this area, but it is arguably the standard and you should be aware of it.

Model theory was first developed for logic, and in the 1960s and 70s, Richard Montague demonstrated that the approach is applicable to natural languages like English, which put an end to the debate as to whether or not natural language semantics is amenable to formal analyses like the semantics of logical languages.

What is nice about model theory is that we can understand linguistic meaning, which is abstract and nebulous in nature, in terms of concrete things. We saw an example of this above: We understood the truth-conditional meanings of declarative sentences in terms of concrete scenarios where they are true or false.

Model theory represents those aspects of such concrete scenarios that matter for linguistic meaning in formal/mathematical terms, and the formal/mathematical counterparts of scenarios are called **models**.