The Conceptual Foundations of Truth-Conditional Semantics [1]

1. The Big Questions

(1) **Semantics** The study of *meaning* in natural language.

- But, what does it really *mean* to study 'meaning'?
- Well, considering the opening passage to Stephen Pinker's *The Language Instinct*

> "As you are reading these words, you are taking part in one of the wonders of the natural world. For you and I belong to a species with a remarkable ability: *we can shape events in each other's brains with exquisite precision*…
> …Simply by making noises with our mouths, we can reliably cause precise new combinations of ideas to arise in each other's minds. The ability comes so naturally that we are apt to forget what a miracle it is. Asking you only to surrender your imagination to my words… I can make you think some very specific thoughts…"

(2) **Uncontroversial Idea:** Language is a system for encoding (and expressing) thought

(3) **Immediate Follow-Up Question:** *How*, exactly, does language encode thought?

- Classic 'productivity arguments' show us that it cannot be a system like the one in (4)
  - There are an *infinite* number of meaningful expressions in a human language
  - So, a list like the one in (4) would have to be *infinite.*
  - But, our brains / minds are *finite.*

(4) **The Simplest System (Which Language is Not)**

A stipulated (memorized) list of symbols paired with their meaning:

"bell"	⇔	🔔
"happy"	⇔	☺
"death"	⇔	☠
…		

So, if it's not a list like in (4), what kind of system is it?...

(5) **Common Way for Linguists to Frame the Question**
What does one have to know in order to understand the sentences of a language?

To get a handle on this question, consider the sentence in (6)…

[1] These notes are based on material in Larson (1995: 361-368), Partee (1995: 311-316), Chierchia & McConnell-Ginet (2000: 1-33), and Heim & Kratzer (1998: 1-3).

(6) **Sentence of St'át'imcets (Lillooet; Salish, British Columbia)**

Kelkálenas tits'í7a na sqaxa7lhkálha.

To figure out what this sentence means, what do you have to know?

a. The meaning of the words (duh).

b. The structure of the sentence (what's modifying what, etc.)

c. Often Overlooked Ingredient (Usually Implicit in Second Language Instruction):
A set of rules for deriving the meaning of the sentence from (6a) and (6b).

(7) **Fundamental Conclusion about Natural Language Semantics**

The semantic competence of a native speakers of a language L must comprise:

a. A finite number of primitive meaningful units (lexical items, idioms)

b. A finite number of *rules* for deriving the meaning of a complex expression from:
(i) The meanings of the component expressions, *and*
(ii) The syntactic structure of the complex expression.

(8) **The Principle of Compositionality (see Partee 1995)**

The meaning of a complex expression (in natural language) can be effectively computed from (i) **the meaning of its component expressions**, and (ii) **their 'mode of combination'** (i.e., syntax of complex expression)

(9) **Another Path to the Conclusions in (7) and (8)**
The meaning of a complex expression in natural language depends upon both:

a. The meaning of its component expressions
After all, if you change the words in a sentence, you change its meaning:

The dog bit the man. VERSUS *The dog bit the cat.*

b. The syntactic structure of the expression
After all, if you change the syntactic structure, you also change the meaning.

The dog bit the man. VERSUS *The man bit the dog.*

*So, part of what's in our brains is a system **of rules** for deriving the meanings of complex expressions…*

(10) **Burning Question:**
What are these semantic rules that our brains use for computing meanings?

(11) **Unfortunate (or Fortunate) Fact:**
Our knowledge of these rules is 'tacit' (unconscious), and so we cannot simply introspect them.

- Rather, to answer the question in (10), we have to do science; we have to **frame and test hypotheses!**

(12) **The Over-Arching Research Question (for Semanticists)**

What is the system of rules that our cognitive systems employ to compute the meanings of complex expressions (in a way consistent with the Principle of Compositionality (8))

(13) **Some Related, More Specific Research Questions**

a. How does a human being acquire this system? How much is already specified by the biology of the organism? (semantic acquisition)

b. How does this system vary across languages? Do languages differ in how they compute meanings, and if so, in what ways? (semantic typology)

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2. The Meaning of 'Meaning'

(14) **An Immediate Problem for Our Project**

What is a 'meaning'?

- To answer the question in (12), we want to develop some hypotheses about what the system is like, and then test them…

- So, we'll want to design a hypothetical formal system that will manipulate primitive '**meanings**' to derive the '**meanings**' of more complex sentences.

- But, *how do we formally represent the '**meaning**' of a sentence or its component phrases?*

- What is the '**meaning**' of "Barack" and the '**meaning**' of "smokes" such that 'combining them together' gives us the '**meaning**' of "Barack smokes"?

Over-Arching Problem:

- The word 'meaning' is a vague, pre-theoretic term from every-day discourse.
  (like 'alive', 'hot', 'rock', 'heavy')

- Thus, it may not be an appropriate term for a precise, scientific study of human language.
  (*e.g.* biology doesn't actually employ terms like 'alive' or 'dead' or 'life-form')
  (*e.g.* physics doesn't actually employ terms like 'hot', 'heavy', 'fast', *etc.*)

(15) **New, Preliminary Objective**
Let's replace our pre-theoretic concept of 'meaning' with some more precise terminology, which will:

(i) Divide up 'meaning' into more properly identifiable (and manageable) subparts.

(ii) Thereby allow us to work towards a formal system that manipulates 'meanings'…

… so how can we better pin down the phenomena/properties that we are interested in, those that are typically, loosely categorized under the general umbrella of 'meaning'?...

(16) '**Meaning' is as 'Meaning' Does**
"In order to say what a meaning is, we may first ask what a meaning *does*, and then find something that does that" (David Lewis; "General Semantics")

- What (exactly) do we *know* when we *know* 'the meaning' of a sentence?

a. Social Appropriateness of the Statement:
What social contexts the statement is appropriate in.

"That's wonderful." vs. "That kicks ass!"

b. 'Emotional Content' of the Statement:
What the statement reveals about the emotional state of the speaker.

"I disagree with Dave's judgment." vs. "Dave is a damn fool!"

c. ***The Informational Content of the Statement***
What information about the world the sentence 'conveys'.

Rightly or wrongly, (c) has received by-far-and-away the greatest attention over the centuries
It will also be the aspect of meaning that we will be concerned with in this course. Thus, let's try to develop our concept of the 'information' that is 'conveyed' by a sentence…

2.1 The Different Ways that Information Can Be 'Conveyed'

When we examine this notion of a sentence 'conveying information', we find that it is not so simple either:

There seem to be different *ways* that information can be 'conveyed' by a sentence.

(17) **Example Dialog**

Person 1: How did Dave's physical go?
Person 2: Well, he's stopped smoking.

Person 2's utterance 'conveys' all the following information:

- Dave has stopped smoking.
- Dave *has been smoking*.
- Dave's physical did not go well. (Dave received bad news at his physical.)

Each of these different bits of information is 'conveyed' in a different way by the utterance.

(18) **Assertion**
The information that *Dave has stopped smoking* is **asserted** by the utterance / speaker

- Sentence S **asserts that** *p* = S is true if and only if *p*

Test: "Dave stopped smoking" is true if and only if Dave stopped smoking.

(19) **Presupposition**
The information that *Dave has been smoking* is **presupposed** by the utterance / speaker

- Sentence S **presupposes** *p* = S is true *or false* only if *p*

Test: "Dave stopped smoking" can only be true if Dave has been smoking.
"Dave **didn't** stop smoking" can only be true if Dave has been smoking.

(20) **Implicature**
The info that *D's physical didn't go well* is an **implicature** of the utterance / speaker

- *p* is **an implicature** of S = *p* is 'conveyed' by S, but 'not *p*' is consistent with S

Test: "Dave stopped smoking, but he did fine on his physical" is logically consistent.

The Main Point:

The information 'conveyed' by a sentence / utterance can be divided into (at least):

(a) The information *asserted* by the sentence / utterance

(b) The information *presupposed* by the sentence / utterance

(c) The *implicatures* of the sentence / utterance.

Consequently, if we want to understand the overall system by which complex sentences can 'convey' information, we will need to understand each of the following:

(i) How the *assertions* of a sentence are derived from the 'meanings' of its parts.

(ii) How the *presuppositions* of a sentence are derived from the 'meanings' of its parts.

(iii) How the *implicatures* of a sentence are derived (in part) from the 'meanings' of its parts.

Ultimately, a formal semantic theory will need to do all of (i) – (iii).

However, we also need to start *somewhere*, and so (in this class) we will start with (i)…
(*… though we will also touch a bit on presuppositions and implicature later on…*)

(21) **Our Goal (Restated)**

Develop a theory of the rule system that derives the *assertions* of a complex (declarative) sentence from (i) the 'meanings' of its component expressions, and (ii) its syntactic structure

Side-Note: What about *non*-declarative sentences, like questions and imperatives?
They seem to also be meaningful, but they don't seem to 'assert' anything!...

Suspend your disbelief!

If you go on in semantics, you will find that a treatment of interrogatives and imperatives can be built using the formal tools we initially develop for the treatment of declaratives…

2.2 The Importance of 'Truth Conditions' to a Theory of Meaning

To build towards our (restated) goal in (21), let's introduce a new bit of terminology.

(22) **Truth Conditions**

The 'truth conditions' of a sentence S are the conditions under which S is true.

Canonical Truth-Conditional Statement: **'S is true if and only if *p*'**

Some Consequences:

a. The 'truth conditions' of S are another name for the 'assertions' of S
b. Thus, our goal in (21) can again be restated to the following:

(23) **Our Goal (Restated Again)**

Develop a theory of the rule system that derives the *truth conditions* of a sentence from (i) the 'meanings' of its component parts, and (ii) its syntactic structure.

A Quick Review of How We Got Here:

a. We want to know how the 'meaning' of a sentence is computed from the 'meanings' of its parts (and how they are syntactically combined)

b. This requires us to make more precise what we mean by 'meaning'.

c. This leads us to the notion of *the information that a sentence conveys*

d. This requires us to make more precise what we mean by 'conveying information'

e. This leads us to the notion of *the information 'asserted' by a sentence*.

f. This notion can be recast as *the truth conditions of a sentence*.

g. Thus, we want to know how the *truth conditions* of a sentence can be derived from the 'meanings' of its component parts…

An Important Reminder:
As we've seen, 'truth-conditions' aren't all there is to the general phenomenon of 'meaning'.
At some point, we will have to come back to the other phenomena in (16), (19) and (20)….

Our restated goal in (23) carries a certain assumption regarding the nature of our 'language faculty', which it is worth pausing to reflect on:

(24) **The 'Psychological Reality' of Truth-Conditions**

Our goal in (23) assumes that *part of our cognitive capacity as speakers of a language is a system that derives* ***truth conditions****.*

This isn't so far fetched a claim… consider the following (plausible) characterization of the information computed during a typical conversation…

(25) **A Model of Information Computed During Sentence Comprehension**

a. Speaker's Utterance: "The house is on fire."

b. Listener's Computations:

(i) *Syntax*: The string "The house is on fire" has the following structure:
[[the house][is[on[fire]]]]

(ii) *Semantics:* [[the house][is[on[fire]]]] is true *iff* the house is on fire

(iii) *Pragmatics:*
- The speaker is an honest guy, so he believes what he says...

- The speaker is smart, so what he believes is true...

- So "[[the house][is[on[fire]]]]" must be true…

- So, **given its truth conditions,** the house must be on fire…

- …**OH MY GOD THE HOUSE IS ON FIRE!!!!...**

Observation:
In the model of human communication in (25), a central step in comprehension is the computation of the truth-conditions of the speaker's utterance:

- If a listener has reason to believe that a speaker's utterance is *true* (*e.g.* because the speaker is honest and knowledgeable)….

- …then knowing the **truth conditions** of a sentence allows the listener to thereby deduce *facts about the world!*

CONCLUSION:

To the extent to which (25) is an accurate characterization of the kind of information our systems compute when we 'understand' an utterance, ***then part of what our language systems 'do' during sentence comprehension is compute truth-conditions***

(26) **Brief Terminological Aside: 'Object Language' and 'Metalanguage'**

a. The Object Language:
The language we are *describing* (not using).

We want our theory to associate sentences of the *object* language with their truth conditions.

b. The Metalanguage:
The language we are *using* to characterize the truth conditions of the sentences of our *object language*.

We want our theory to associate sentences of the object language with their truth conditions, *as characterized in the metalanguage*.

The object language and metalanguage can both be *the same language*….

c. "The house is on fire" is T (true) *iff* the house is on fire.
Object language: English *Metalanguage: English*

…or, they can be two different languages:

d. "Het huis brandt" is T (true) *iff* the house is on fire.
Object language: Dutch *Metalanguage: English*

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(27) **Where We Go From Here**

- Following our re-stated goal in (23), we want to develop a formal system that will derive the Truth-Conditions of complex sentences from the 'meanings' (in some sense) of their component parts…

- However, in order to build such a formal system, we are first going to have to learn some formalisms…

- So in the next section of class, we will take a break from our linguistic discussion, and learn a bit about the mathematics of *sets* and *functions*….