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24.910 Topics in Linguistic Theory: Propositional Attitudes  
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## Preview of Course Topics

Course Theme: Propositional attitudes (and related topics)

Preliminaries:

### ❖ Propositions

- The kind of thing that is expressed by a declarative sentence
- The semantic type of a sentence / clause

To give some (lame) examples:

- *It's snowing (in Cambridge) (on Feb. 3, 2009)*
- $2 + 2 = 4$
- *All books have pages*

### ❖ Propositional attitudes

- Mental states that we might have towards propositions.  
For example: belief, knowledge, suspicion, discovery, desire
- Some attitude predicates: *believe, know, realize, think, discover, want ...* (and similar expressions in other languages)

### ❖ Topics to be explored in this course:

- Central theme: The semantics of attitude predicates
- Expanding the domain:
- Speech predicates (*say, ask, etc.*)  
(since these have many semantic and syntactic parallels with attitude predicates)
  - Syntax of sentence embedding  
(since speech and attitude predicates typically take sentential complements of various kinds)
  - Formal Pragmatics – Theory of conversation and common ground  
that is, the ways that shared information is updated in the course of conversations  
(since this involves many of the same formal tools as the semantics of propositional attitudes)

## Specific Topics

(The list below will have substantial overlap with – but will not be identical to – the set of topics we actually talk about.)

## Possible World Semantics for Propositional Attitudes

### ❖ Possible Worlds

- Possible world: complete history of the entire universe, specifying every detail about how everything happens.
- The actual world: the particular possible world that we are living in  
Lewis (1986, quoted in H&K):

The world we live in is a very inclusive thing. Every stick and every stone you have ever seen is part of it. And so are you and I. And so are the planet Earth, the solar system, the entire Milky Way, the remote galaxies we see through telescopes, and (if there are such things) all the bits of empty space between the stars and galaxies. There is nothing so far away from us as not to be part of our world. Anything at any distance at all is to be included. Likewise the world is inclusive in time. No long-gone ancient Romans, no long-gone pterodactyls, no long-gone primordial clouds of plasma are too far in the past, nor are the dead dark stars too far in the future, to be part of the same world. . . .

The way things are, at its most inclusive, means the way this entire world is. But things might have been different, in ever so many ways. This book of mine might have been finished on schedule. Or, had I not been such a commonsensical chap, I might be defending not only a plurality of possible worlds, but also a plurality of impossible worlds, whereof you speak truly by contradicting yourself. Or I might not have existed at all

– neither myself, nor any counterpart of me. Or there might never have been any people. Or the physical constants might have had somewhat different values, incompatible with the emergence of life. Or there might have been altogether different laws of nature; and instead of electrons and quarks, there might have been alien particles, without charge or mass or spin but with alien physical properties that nothing in this world shares. There are ever so many ways that a world might be; and one of these many ways is the way that this world is.<sup>7</sup>

- A proposition: can be construed as a set of possible worlds (intuitively, the set of worlds where that proposition is true)
- This is parallel to treating a predicate such as *red* or *smokes* as a set of individuals.

### ❖ Representing knowledge and desire states (for example):

- If we knew everything there was to know about the world (omniscient deity), we would know which possible world was the actual one.

BUT we don't, so we can only narrow down worlds to a set that are compatible with what we know – i.e., which could be the actual one for all we know.

So we can construe “what x knows” as a set of possible worlds.

- Similarly, if we had very specific desires about how the world should be (a control-freak deity?), then we could specify exactly which world we would like to be in.

BUT again our desires aren't this specific – for example, I might want to have pizza for dinner tonight, but not particularly care whether it has olives on it or not.

So we just narrow down the worlds to the set compatible with our desires (i.e., worlds which would all be perfect as far as we are concerned.)

- Again: construe “what x wants” as a set of possible worlds.

### ❖ Note about mental states and propositions

(Note that on this view a person’s entire knowledge state (belief state, desire state, etc.) is represented as the same type of thing (set of worlds) as a sentence such as *It’s snowing*.) To help make sense of this, keep in mind that:

- There is a natural mapping from sets of propositions (sets of sets of worlds) to sets of worlds.
- Given a set of sets of worlds, e.g.:  
let  $S = \{ \{w_1, w_2, w_3, w_4\}, \{w_2, w_3, w_4\}, \{w_1, w_2, w_3\} \}$   
We can take the intersection of all of the member sets to get a set of worlds:  
 $\cap S = \{w_2, w_3\}$

### ❖ Attitudes as sets of worlds

- Let  $\mathbf{Know}_x = \{w: w \text{ is compatible with what } x \text{ knows}\}$   
(the set of possible worlds compatible with what x knows, where x is an individual)

Similarly:

- $\mathbf{Believe}_x = \{w: w \text{ is compatible with what } x \text{ believes}\}$
- $\mathbf{Want}_x = \{w: w \text{ is compatible with what } x \text{ wants to be the case}\}$

### ❖ Compositional semantics of attitude reports

- $\llbracket \alpha \rrbracket =_{\text{def}}$  the semantic value (meaning) of expression  $\alpha$
- Note, for a sentence S,  $\llbracket S \rrbracket$  /a/ will be a proposition (set of worlds)

Some general rules:

- $\llbracket x \text{ knows } S \rrbracket = 1$  [true] iff  $\mathbf{know}_x \subset \llbracket S \rrbracket$   
i.e., *x knows S* is true iff every world compatible with what x knows is a world where S is true.

Similarly:

- $\llbracket x \text{ believes } S \rrbracket = 1$  iff  $\mathbf{believe}_x \subset \llbracket S \rrbracket$
- $\llbracket x \text{ wants } S \rrbracket = 1$  iff  $\mathbf{want}_x \subset \llbracket S \rrbracket$

## Presupposition & Entailments

Factive predicates:

- (1) Sue knows that it's snowing.
- (2) Sue doesn't know that it's snowing.
- (3) Sue realized that it was snowing.
- (4) Sue didn't realize that it was snowing.

All say something about Sue's mental state; but they also suggest that it is, in fact, snowing.

- (5) # Sue knows that it's snowing, but it isn't.
- (6) # Sue realized that it was snowing, but it wasn't.

First pass:

➤  $\llbracket x \text{ knows } S \rrbracket$

$$= \begin{cases} 1 & \text{if } \llbracket S \rrbracket = 1 \text{ AND } \text{know}_x \subset \llbracket S \rrbracket \\ 0 & \text{if } \llbracket S \rrbracket = 1 \text{ AND } \text{know}_x \not\subset \llbracket S \rrbracket \\ \text{undefined} & \text{if } \llbracket S \rrbracket \neq 0 \end{cases}$$

[Some of this might come from what counts as "knowledge" in the first place]

➤  $\llbracket x \text{ knows } S \rrbracket$

$$= \begin{cases} 1 & \text{if } \llbracket S \rrbracket = 1 \text{ AND } \text{know}_x \subset \llbracket S \rrbracket \\ 0 & \text{if } \llbracket S \rrbracket = 1 \text{ AND } \text{know}_x \not\subset \llbracket S \rrbracket \\ \text{undefined} & \text{if } \llbracket S \rrbracket \neq 0 \end{cases}$$

➤  $\llbracket x \text{ realized } S \text{ [at time } t_1 \text{ ]} \rrbracket$

$$= \begin{cases} 1 & \text{if } \llbracket S \rrbracket = 1 \text{ AND } \text{know}_x \not\subset \llbracket S \rrbracket \text{ before } t_1 \text{ and } \text{know}_x \subset \llbracket S \rrbracket \text{ at } t_1 \\ 0 & \text{if } \llbracket S \rrbracket = 1 \text{ AND } \text{know}_x \not\subset \llbracket S \rrbracket \text{ before } t_1 \text{ and } \text{know}_x \not\subset \llbracket S \rrbracket \text{ at } t_1 \\ \text{undefined} & \text{if } \llbracket S \rrbracket \neq 0 \text{ (or if } \text{know}_x \subset \llbracket S \rrbracket \text{ before } t_1 \end{cases}$$

## Tense under Embedding

### ❖ Two readings for embedded past tense in English:

- (7) Sue said that was happy.
  - (i) Sue said, "I'm happy" [she said at  $t_1$  that she was happy at  $t_1$ ]
  - (ii) Sue said, "I was happy" [she said at  $t_1$  that she was happy at  $t_0$ ]

Reading (i) shows "sequence of tense."

❖ **Russian embedded present**

Russian embedded tense (Schlenker 2003 citing Kondashov & Kondrashova, Kusumoto):

<p>(56)a. petja<sub>i</sub> skazal, čto on<sub>i</sub> plačet [Russian]  <i>Petja<sub>i</sub> said that he<sub>i</sub> is-crying</i>          ‘Petja said that he was crying [at the time of his utterance]’</p>
--

Extra complication: it matters what the embedding predicate is:

<p>b. petja<sub>i</sub> vstretil človeka, kotoryj plačet. [Russian]  <i>Petja met person, who is-crying</i>          ‘Petja met a person who is crying/cries.’          NOT: ‘Petja met a person who was crying [at the time of the meeting].’</p>
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❖ **“Double-access” readings (English)**

(Abusch, 1988, 1991; Ogihara, 1995)

(8) Sam found out that Mary was pregnant. (Ogihara, 1995, no. 28)

(9) Sam found out that Mary is pregnant. (Ogihara, 1995, no. 27)  
 [Mary must still be pregnant at the time of utterance]

**Logophors & Shifting Indexicals**❖ **Logophors**

(West African type) **Logophors: pronouns (typically 3<sup>rd</sup>-person) that ...**

- Only occur in embedded contexts (under speech or attitude predicates)
- Always corefer with the reported speaker / attitude holder

Example from Ewe (Clements 1975):

(1)	Kofi be yè-dzo	'Kofi said that he (Kofi) left'
	say LOG-leave	
(2)	Kofi be me-dzo	'Kofi said that I left'
(3)	Kofi be e-dzo	'Kofi said that he/she (≠Kofi) left'

❖ **Shifting Indexicals**  
**Pronouns like ‘I’ (or ‘you’) which**

- normally refer to the speaker (or hearer) of the utterance,
- when embedded, can refer to the reported speaker

Example from Amharic (Schlenker 2003):

(53)	<i>Situation:</i> John says: ‘I am a hero’ [D. Petros, p.c.]
	ḵon ḵəgna nə-ññ yil-all
	<i>John hero be.PF-ISO 3M.say-AUX.3M</i>
	‘John says that he is a hero’
	lit. “John says that I am a hero”

Q. How do we know that this isn’t just quotation?

A. From examples with indirect questions (and others?):

(54)	mīn amt’-a	īnd-al-ə-ññ	al-səmma-hu-mm
	<i>what bring.IMPER-2M</i>	<i>COMP-say.PF-3M-ISO</i>	<i>NEG-hear.PF-IS-NEG</i>
			(Leslau 1995, p. 779)
	‘I didn’t hear what he told me to bring.’		
	(lit. I didn’t hear that he said to me bring what.)		
	≠ ‘I didn’t hear him tell me “bring what!” ’		

**Self-Locating Attitudes**

Some attitudes seem to crucially involve the “self” in a way that will not be fully expressible in terms of possible worlds. (We call these *de se*.)

❖ **Amnesiac in the Library example**

The Lingens / Stanford Library example (Perry, 1977: p. 492):

An amnesiac, Rudolf Lingens, is lost in the Stanford library. He reads a number of things in the library, including a biography of himself, and a detailed account of the library in which he is lost. He believes any Fregean thought you think might help him. He still won’t know who he is, and where he is, no matter how much knowledge he piles up, until that moment when he is ready to say,  
*This place is aisle five, floor six, of Main Library, Stanford.*  
*I am Rudolf Lingens.*

The point: when he realizes “I’m in the Stanford Library,” he has come to know something that he didn’t know before, even though he already knew that Lingens was in the Stanford library.

❖ **Messy Shopper example**

(Perry, 1979: p. 3):

I once followed a trail of sugar on a supermarket floor, pushing my cart down the aisle on one side of a tall counter and back the aisle on the other, seeking the shopper with the torn sack to tell him he was making a mess. With each trip around the counter, the trail became thicker. But I seemed unable to catch up. Finally it dawned on me. I was the shopper I was trying to catch.

The point:

- he came to believe something new that he hadn't already believed: *I am making a mess*.
- It's not enough for him to have come to believe *John Perry is making a mess* (unless he also believes *I am John Perry*) → the indexicality is irreducible

[Similar examples involve a knowledgeable but lost hiker, a person attending a meeting who loses track of time]

❖ **Obligatorily de se expressions:**It seems that certain expressions are obligatorily *de se*, including:

- logophors
- shifting indexicals
- PRO (subject of infinitive clauses)

**Syntactic topics**

[Syntactic topics will be determined, and I welcome input on particular syntactic phenomena, languages, etc. you would like to look at provided it relates to sentence embedding and/or propositional attitudes]

- CP Structure
- Control and Raising

**Common Ground & Assertion**❖ **Goal of Conversation (Idealized)**

- A group of people in normal, “information-sharing” conversation are trying to get closer to having the same beliefs.

First pass (simplified version):

- Let's say that x, y, and z are in a conversation.
- Start with believe<sub>x</sub>, believe<sub>y</sub>, believe<sub>z</sub> (sets of worlds compatible with what x, y, and z believe, respectively)

- We can talk about the shared beliefs of x, y, and z as
 
$$\mathbf{believe}_x \cap \mathbf{believe}_y \cap \mathbf{believe}_z \quad [\text{let's call this } \mathbf{believe}_{x+y+z}]$$

$$= \{w: w \text{ is compatible with what } x \text{ believes, } w \text{ is compatible with what } y \text{ believes, AND } w \text{ is compatible with what } z \text{ believes}\}$$
- Suppose x says “it’s snowing” and y and z have no reason to think that x is lying or misinformed.
- Then their new shared beliefs will be become (roughly):
 
$$\mathbf{believe}_{x+y+z} \cap \llbracket \text{it's snowing} \rrbracket$$

$$= \mathbf{believe}_{x+y+z} \cap \{ w: \text{it's snowing in } w \}$$

$$= \{w: \text{it's snowing in } w \text{ and } w \text{ is compatible with the initial beliefs of } x, y, \text{ and, } z\}$$

❖ **Things are actually more complex...**

- In the above example, x, y, and z come to believe that it’s snowing, but also come to believe that they all believe that it’s snowing, and believe that they believe that they believe that it’s snowing, and so on.
- More generally, we will end up talking about not just shared beliefs but common beliefs. A group G commonly believes p iff every member of G believes...
  - that p
  - that every member of G believes that p
  - that every member of G believes that every member of p believes that p
  - ... and so on *ad infinitum*

We’ll call this the common ground.

An assertion (typical utterance of a declarative sentence) = a proposal to modify the common ground