Stuff from last time

Intensional semantics (possible worlds semantics)

Consider a sentence like, "Necessarily, there are 9 planets"

(Hegel actually believed this.)


Pagin & Westerstahl (P&W) "Compositionality"

Ignore what P&W say about grammars. They're just showing off. We learned all we need to know from Hardegree last time.

The only grammar rule "$\alpha$" we have is the proof rule $A \rightarrow B, A \vdash B$

We do have to pay attention to what they say about semantics. Recall that when we learned semantics from Hardegree, it was designed to be compositional. But now we're going to be asking whether we should be assuming this. So we need to NOT assume, in advance, that semantics is compositional.

So let M (P&W use $\mu$) be a general variable that we use for different semantics. M is any function whose domain is a proof-tree of a syntactic expression and whose co-domain is a meaning.

Now we can define synonymy:

Expressions E1 and E2 are synonymous iff M(E1) = M(E2)

Here's how to understand the 'function' version of compositionality:

FUN(M): There is a function R such that if $M(A \rightarrow B, A \vdash B)$ is meaningful, then $M(A \rightarrow B, A \vdash B) = R(M(A), M(B))$

[Notice how our categorial semantics satisfies this definition. Any expression of syntactic type $N \rightarrow S$, for example, is going to have a functional meaning, in particular a function of semantic type $E \rightarrow T$. And any expression of syntactic type N will have syntactic type S. So there is a function R where $M(N \rightarrow S, N \vdash S) = R(M(N), M(S))$. It's $R = M(S)(M(N))$.]

And here's the substitution version:

SUB(M): Let Tree(X1) and Tree(X2) be two syntactic proof trees that differ only in that the sub-proof X1 in Tree(X1) has been replaced by the sub-proof X2 in Tree(X2). If M(X1) = M(X2), then M(Tree(X1)) = M(Tree(X2)).

Think about why our categorial semantics satisfies SUB(M)

P&W suggest ways to weaken the constraints imposed by compositionality. We could, for instance, require that the sub-proofs that are replaceable are no greater than a certain length.

If in the extreme case the length is 1 (only assumptions are replaceable, that is, only words are replaceable) we get the weakest version of compositionality.

Example: It's compatible with the extreme case that the meaning of "Bill likes Tina" in the sentence "Bill likes Tina and Fred hates George" depends upon the meaning of "George" as well as on the meanings of "Bill", "likes", and "Tina".

We could also strengthen compositionality by, say, assuming that the same meaning function R had to be used for every human language with our same derivation rules (→ elimination).

[talk about Carnap on intensional isomorphism]

Direct compositionality and semantic 'flattening' [mention Chuggo]

Constraints compositionality puts on meanings (pet fish argument)

Mental pictures (empiricism): your mental picture that you associate with 'horse' may be a brown horse. But 'horse' doesn't mean brown horse because 'purple horse' is perfectly meaningful.

Inferential roles (positivism): Suppose BROWN COW causes DANGEROUS, but neither BROWN nor COW do.

Stereotypes (contemporary cognitive psychology): stereotypical pets are furry, but stereotypical pet fish aren't. Compositionality entails that meanings aren't stereotypes.

Arguments in favor of compositionality

Learnability and Novelty:

1. The mind is finite
2. We learned/ can work out the meaning of infinitely many English sentences
3. Therefore, compositionality

Main problem: the conclusion looks like it should be 'therefore, computability'

(Here's the difference: computability requires that we be able to work out the meaning of some expression on the basis of its simple parts, its proof-tree, and some other set of fixed assumptions. Compositionality disallows the other assumptions.)

P&W also suggest that just because there are infinitely many grammatical sentences, it doesn't follow that they're meaningful before they're uttered.

Systematicity

Often formulated informally as something like "If you understand aRb then you can understand bRa".

[Discuss 'reverse compositionality' and atelic vs. telic verbs (watch vs. bake)]

"Induction on Synonymy": No different from Learnability and Novelty". If you change parts with the same meaning, you get a whole with the same meaning. But this is compatible with the computational idea that you don't get the meanings from the parts and their combination.

Convergence in interpretation:

The procedure that goes from thought to talk must be mirrored by that that goes from talk to thought.

Problem: the first isn't a function: a single thought has many expressions.

Horwich vs. pet fish

Quotation sentences

Belief sentences

Noun-noun constructions:

house boat: house that is a boat

house cat: cat that isn't allowed outdoors
house husband: husband who does a large share of domestic chores

Ambiguity

"Every critic reviewed four films."