Handout for Week 8: Semantics I

Philosophy of Language.
Metavocabularies of Reason:
Pragmatics, Semantics, and Logic
https://sites.pitt.edu/~rbrandom/Courses

1. Recap: The place of logical vocabularies among metavocabularies of reason.
   a) Logical vocabularies are *vocabularies*. That is, a lexicon (set of sentences), plus reason relations defined on sets of those sentences.
   b) They are *meta*vocabularies. That is, their reason relations are determined by features of another vocabulary, the *base* vocabulary of that metavocabulary.
   c) They are *rational* metavocabularies. That is, their reason relations are determined by the *reason relations* of their base vocabularies.
   d) Logical Metavocabularies are a *conservative extension* of their base vocabularies, both w/res to their lexicon and w/res to their reason relations.
   e) Logical Metavocabularies are **LX** for their base vocabularies. That is, they are *elaborated* (L) from and *explicative* (X) of the reason relations of its base vocabularies.
   f) Logical vocabularies should aim to be *universal* and *comprehensive*. That is, they should be LX for *every* vocabulary. And in each logical extension of a base vocabulary, they should explicitate the reason relations of the whole extended vocabulary, as well as the base.

2. The defining task of *semantic* metavocabularies is to determine the reason relations of base vocabularies. Formal semantic theories of the *meanings* expressed by declarative sentences ("claimables") appeal to a *structured universe* of items from which to draw *semantic interpretants* assigned to those sentences, in order to specify the *functional roles* those sentences play in *reason relations* of implication and incompatibility among sentences (claimables).

3. Sketch of the expressive progress of mathematical forms of semantic metavocabularies:
Note that all the semantic metavocabularies surveyed below are themselves extensional.
Each more expressively powerful semantic metavocabulary in this progression can treat all those before it as special cases.

   a) Two-valued (Bipolar) Semantic Metavocabulary for Classical Logic (1920s):
      - *Universe* of *semantic interpretants* is the set of two ˢtruth-valuesˢ {True, False}.
      - *Implication* is truth preservation from premises to conclusion.

- Two sets of sentences X,Y are *incompatible* (inconsistent) iff for some sentence A, set X implies A is assigned one semantic interpretant and the other set Y implies that same sentence A is assigned the other semantic interpretant (X |= A and Y |= ¬A).

Variant: 3-valued, and in general, multivalued matrix semantics.
(Revival of this variant in last decade: K3, LP, ST, TS. More on this development later in the course.)

b) Model-Theoretic Semantic Metavocabularies for *Extensional* Base Vocabularies (Tarski, Carnap, 1940s-1950s):

- The *universe* of semantic interpretants is a set of ˢmodelsˢ.
- Each sentence A is assigned a set v(A) ⊆ MODELS as its *semantic interpretant*.
- *Implication* is by set-inclusion: Γ|=A iff all the models of all the elements of Γ (the intersection of their model-sets) are models of A. $\cap v(G_i \in \Gamma) \subseteq v(A)$.
- *Incompatibility* is not having a common model.
  X and Y are incompatible iff $v(X) \cap v(Y) = \varnothing$.
  Slogan "A model is proof of consistency."

Note that having semantic interpretants be sets (it doesn't matter that they are sets of ˢmodelsˢ) and defining reason relations by set inclusion and intersection enforces their structural *closure*: monotonicity and transitivity.

c) Possible Worlds Semantic Metavocabularies for *Intensional* Base Vocabularies:

First wave of modal revolution: **Modal logic** (Kripke, 1960s):

- *Universe* of semantic interpretants is a collections of ˢpossible worldsˢ.
- Each sentence A is assigned a *set of possible worlds* as its *semantic interpretant*.
- *Implication* and *incompatibility* are determined just as for model-theoretic semantics. (So a *closure* structure is still imposed on the reason relations.)
- Vocabulary is divided into two classes: *extensional* (treated model-theoretically), and *intensional*, which depends on further structure of the universe of semantic interpretants, beyond what the model-theoretic metavocabulary admits.
- That *further structure* on the set of possible worlds (subsets of which are semantic interpretants) is an ˢaccessibilityˢ function, assigning each possible world a neighborhood of possible worlds that are its relatives. The algebraic structure of this function (reflexive, symmetric, transitive) is important.
- Kripke (age 16) interprets the additional connectives of modal logic by looking beyond the semantic interpretants of a given sentence, to those in the neighborhoods of those semantic interpretants.
- The semantic interpretant of □A, necessarily A, is just the set of semantic interpretants that are in the neighborhoods of *all* the semantic interpretants of A.

- The semantic interpretant of ◊A, possibly A, is just the set of semantic interpretants that are in the neighborhood of *any* semantic interpretant of A. One can then compute the incoherent sets and implications involving not only ordinary claims, but also *modal* claims, just looking at those sets of semantic interpretants and keeping track of set-theoretic inclusions among them.

Second wave of modal revolution: **Intensional semantics**
(Montague, Lewis, Kaplan, Stalnaker…, 1970s-80s):
Generalizes Kripke's idea by assigning to sentences as their *semantic interpretants* **functions** from ˢindicesˢ to sets of possible worlds. Examples of such indices are possible worlds, speakers, times and places. (This allows assigning different semantic interpretants (sets of possible worlds) to different *tokenings* of the same sentence *type*.)
Kripkean accessibility functions are just one kind of indexing by possible worlds.
For *extensional* sentences, the semantic interpretants are *constant* functions: the set of possible worlds that is their semantic interpretant does not vary across indices.
Intensional sentences have as their semantic interpretants functions that assign *different* sets of possible worlds as values, depending on the index to which the function is applied. Subjunctive conditionals are a paradigm.
Implication now requires that the set of possible worlds common to all the premises be a subset of the set of possible worlds assigned to the conclusion at *all* index values.
Incompatibility requires the disjointness of the two sets of possible worlds for every index value.

Third wave of modal revolution: **Metaphysics as metasemantics**.
(Kripke again, 1970s-present). One can think of analytic metaphysics as concerned with the nature and structure of the universe on which semantic interpretants are defined.

d) Truthmaker Bipolar Semantic Metavocabularies for *Hyperintensional* Base Vocabularies (Fine, 2017-present):

- The *universe* from which semantic interpretants are drawn is a set of ˢ*states*ˢ, with a further *mereological* (rather than set-theoretic) structure on it, defined by a ˢ*fusion*ˢ function that assigns to each pair (or set) of states a further state: the *whole* of which they are *parts*.
- A further bit of structure is that the states are partitioned into *possible* states and *impossible* states. An important point of contrast (contributing to the hyperintensional expressive power of the truthmaker semantic metavocabulary) is that, unlike possible worlds semantics, there are not just many different *possible* states, but also many different *im*possible states.

Possible worlds then show up as the special case of mereologically *maximal* possible states: fusing any non-part with them yields an *im*possible state.

- *Semantic interpretants* of sentences are then *ordered pairs* of sets of states: the set of the sentence's *truth-makers* or *verifiers* and the set of its *false-makers* or *falsifiers* (bipolarity).

As we will see, there are different alternatives available in this setting for defining reason relations. Among those Fine finds most natural are:

- *Implication*: Γ implies A iff all the truth-makers of everything in Γ (the intersection of the truthmaker-sets of all the premises) are truth-makers of A.
- *Incompatibility*: sets of sentences X and Y are incompatible iff the intersection of the truthmaker-sets of all the elements of $X \cup Y$ is empty.

These have paired, non-equivalent definitions appealing only to false-makers, and, as we shall see, variants that appeal to both.