Linguistic theories that Intersect with Philosophy of Language

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1. A Big-Tent Subject

Linguistics uses many methods and covers a lot of ground. For one thing, there is multiplicity of methodology; linguists can and do use highly refined experimental techniques, anthropological methododology, historical techniques, statistical methods for analyzing large datasets, and computer simulation. For another, linguists take a divide-and-conquer approach to language, dividing it into subsystems or clusters of phenomena. Each area—phonetics (sounds), phonology (sound patterns), syntax (patterns of word groupings), semantics (meaning), and pragmatics (language use)—has its own characteristic sources of evidence and bodies of theory.

Like other more or less cognitive sciences—psychology, economics, and political science, in particular—linguistics has parts that overlap hardly at all with philosophy, and parts that overlap to a considerable extent. The subfields of linguistics where the interaction with philosophy is most intense are semantics and pragmatics.

2. Semantics

Semantics is the study of linguistic meaning. At the outset, a semantic theory has to decide what meanings are. There seem to be four sorts of answers to this question.

1. Meanings could be ideas: mental or psychological items of some sort.
2. Meanings could themselves be the expressions of some language.
3. Meanings could be patterns of usage.
4. Meanings could be objects in the world—an adequate ontology, in supplying an inventory of what there is, would also supply an inventory of the meanings required by a language.

All of these approaches have their advocates, but since the 1970s, and due largely to the influence of Richard Montague (a logician) and Barbara Partee (a linguist), a combination of the third and fourth of these two ideas has come to dominate linguistic work in semantics. The field was originally called "Montague grammar," and now is called "formal semantics."

2.1. Logic and formal languages

Formal semantics, a relatively new siscipline, emerged from developments in modern logic which go back to the late nineteenth century. Particularly important was the emergence (in the first half of the twentieth century) of a conception of logic as the study of truth and inference in *formal languages.*

Through most of the twentieth century, logicians and philosophers contrasted formal with natural languages, and tended to think of the two sorts of "language" as entirely different. Formal languages are artificial creations, constructed by logicians. Their expressions (or "formulas") are characterized by relatively simple, explicit "formation rules." Most of the early examples of formal languages[1] were exercises in mathematical logic, and as such were targeted at mathematical language and reasoning.

The syntax of these languages had only to capture a relatively limited range of expressions, and was unlike the syntax of natural languages in some important ways. Where in unstilted English you might say

(1) If they aren't parallel, any two lines will intersect at a single point,

a mathematician would say something less natural, like

(2) For all lines x and y, if x and y are not parallel then x and y intersect at one and only one point.

Logicians exaggerate this unnaturalness: in a contemporary formalization this example might acquire the following format:

$$\text{(3)}\quad \forall x_1 \forall x_2 [\neg \text{Parallel}(x_1, x_2) \\ \rightarrow \exists y[\text{Line}(y) \wedge \forall z[\text{Intersect}(x_1, x_2, z) \leftrightarrow y = z]\,]\,].$$

There are several important differences between the mathematical English (2) and the formalized version (3).

First, logical notation is used instead of phrases like 'for all', and for 'and', 'if', and negation: $\forall x$ is read "for all x," $\exists x$ is read "for some x," $\neg$ is read "it is not the case that," $\wedge$ is read "and," $\rightarrow$ stands for "if ... then," and $\leftrightarrow$ stands for "if and only if." Logicians call $\forall$ and $\exists$ *quantifiers*, and $\neg$ $\wedge$, $\rightarrow$ and $\leftrightarrow$ *connectives.* We will find that the syntax and semantics of quantifiers and connectives are quite different.

Second, pronouns like 'they' in (1) are systematically replaced in (2) by *variables* like x and y. Even more variables are added in the logical formalization (3).

Third, the argument structure of an English verb phrase like 'x and y are parallel' or 'x is parallel with y'[2] is suppressed, and replaced by an expression like Parallel(x, y) in which the only indicator of the different roles of the arguments x and y is the order in which they occur.

Fourth, bracketing is used to eliminate any ambiguities having to do with *scope*—i.e., with the order in which elements are to be combined in forming complex meanings. There is no reason in principle why formal languages couldn't be ambiguous, but recall that the purpose of the earliest formal languages was to characterize correct mathematical reasoning. This can't be done with an ambiguous language. We can't say what inferences can be made from an ambiguous, unbracketed expression like $\neg\text{Line}(x) \wedge \text{Point}(y)$, which could either

[1] And expecially the language of Gottlob Frege's *Basic Laws of Arithmetic* (1848), of Bertrand Russell and Alfred North Whitehead's *Principia Mathematica*, and of David Hilbert and Paul Bernays' *The Foundations of Mathematics* (1934).

[2] In English and other natural languages, argument structure, including marking for grammatical relations like subject and direct object and prepositional phrases, is used to indicate the semantic relation in which a noun phrase stands to a governing verb or predicate.

mean "Either x is not a line or y is a point" or "Both of the following are not the case: x is a line and y is a point." With brackets in place, we can see, for instance, that $\mathrm{Point}(y)$ is not a logical consequence of $\neg[\mathrm{Line}(x) \wedge \mathrm{Point}(y)]$.

Fifth, English words that make for good style but have no particular semantic force are eliminated: the modal verb 'will' in (2) is such a vacuous word.

Sixth, the phase 'one and only one' in (2) is replaced in (3) by a rather complex (and somewhat opaque) combination of quantifiers, variables, and the identity symbol $=$. This trick works because—and you have to think this through carefully—'There is is one and only one z such that x_1 and x_2 intersect at z' is equivalent to saying 'There is a z such that for all y, x_1 and x_2 intersect at y if and only if $y = z$'. Logicians prefer this more cumbersome formalization because *parsimony* is important in logic; that is, it is important to secure whatever effects you want with minimal resources. In this case, instead of having to introduce another quantifier, 'for one and only one x', the same effect is achieved using only $\forall$, $\exists$, and $=$.

Taken together, then, there are many differences between the English formulation (1) and the conventional logical formalization (3)—and some of these differences are pretty fundamental.

2.2. The component of meaning

The earliest formal systems, as we said, were intended to capture mathematical reasoning, and did this only by providing definitions of what counts as a correct proof in these systems. The formation rules of a formal language define which expressions count as formulas. A proof is then a sequence or list of formulas that is constructed according to the rules of proof. These rules can be formulated by specifying (1) which formulas are to count as axioms and (2) which inference patterns are to count as rules of proof. An inference pattern is a pair consisting of a set of formulas (the premisses of the inference) and another formula (the conclusion). A proof is a sequence of formulas such that every step in the sequence is either an axiom or follows from previous steps by a rule of inference,

All the components of this proof definition have to do only with patterns of signs or expressions. For this reason, the notion of a proof is said to be purely *syntactic*.

But if conformity to certain syntactic rules is all there is to a proof, the element of *correctness* that is so important to the proof concept has somehow been lost. After all, it's quite easy to write down inference patterns—like "from 'If p then q' and q, infer p"—that are incorrect.

Logicians use semantic theories, which they also call *satisfaction definitions* or *model theories*, to provide this missing criterion of correctness. The idea[3] is to say that an inference is correct if it always leads from true premisses to true conclusions.

Obviously, this brings truth into the picture. Less obviously, to make the criterion useful it's also important to clarify what "always" means in the criterion. These things are accomplished by Tarski's notion of a *model*—or, equivalently, of truth or *satisfaction* in a *relational structure*.

The origins of the idea of a model go back to the graduual appreciation by mathematicians that their theories could be realized in various ways. The "lines" and "points" of geometry

[3] The logician Alfred Tarski is responsible for this idea. We'll be hearing much more about Tarski later.

could be realized by lines and points on a flat surface, or (equivalently) by certain linear equations, or (nonequivalently) by great circles and points on the surface of a sphere. How the language of geometry is realized can affect truth. In Euclidean geometry (flat surfaces), (2)—which we repeat below—is true; in Riemanian geometry (surface of a sphere), (2) is false.

(4) For all lines x and y, if x and y are not parallel then x and y intersect at one and only one point.

The general idea here is that we can *interpret* a formal language—in particular, the language of a formalized mathematical theory—using different mathematical structures.

What is a mathematical structure? Tarski's idea, which is pretty much unchanged to this day, is that it consists of a set of objects (the *domain* of the structure), and of a family of relations involving these objects. Such a structure can be defined using *set theory*—which is itself a branch of mathematics. For instance, a 2-place relation, like incidence (the relation that holds between a point and a line point when it the point lies on the line) is modeled as a set of ordered pairs of members of the domain.

Tarski went on to provide a general definition of truth-in-a-structure for formulas involving quantifiers like $\forall$ and $\exists$ and connectives like $\neg$, $\rightarrow$, and $\wedge$. This definition can then be used to characterize the correctness of inferences.[4]

Neglecting the details and ramifications of the idea, we have the following general picture: on the one hand, we have a language with an explicit syntax, and on the other hand we have a *model*—a structure involving objects that stand in certain relations. We can then use Tarski's techniques to assign values in the model to the expressions of the language.

There is no intrinsic reason why this method can't be used for linguistic purposes. Although logicians like Tarski typically were interested in formal mathematical languages, and in mathematical structures, there is no reason why, say, we couldn't formalize a language for talking about various sorts of pets and how to care for them, and relate the language to structures populated by pets and pet paraphanalia.

Now we can see why this approach to linguistic semantics—to the semantics of natural languages—conforms to the idea that meanings are objects in the world. A model represents the objects and relations that constitute the world—or, more modestly, a restricted part of the world—and semantic rules interpret the language in terms of these objects and relations.

The approach can incorporate both the idea that meanings are linguistic expressions and the—apparently conflicting—idea that they are worldly objects,by dividing the process of interpretation into two stages. In the first stage, expressions of a natural language are translated into a formalized logical language. In the second stage, the expressions of the logical language are interpreted in a model. You can think of linguists who believe in a linguistic level of *logical form* as advocating this two-stage option.

We will see that generalizing the semantics of mathematical languages to natural languages is far from straightforward, and in fact entangles us in fundamental problems with a distinctly philosophical flavor. This, in fact, is one of the main areas in which philosophy of language interacts with linguistics.

[4]For instance, an inference with one premise is *valid*, or logically correct, if for any structure serving to interpret the language of the inference, if the premise of the inference is true in the structure so is the conclusion.

3. Pragmatics

Semantics assumes a syntax for some language or other, and then interprets the syntactic structures by associating them with *semantic values* in models.

Much of *pragmatics* is motivated by the fact that linguistic expressions are used by speakers for various purposes. and that these uses, even if they are systematic and explanatory, can't be predicted merely from semantic information.

Pragmatics deals with presupposition and other sorts of backgrounded information, with linguistic context and many of its effects on the meanings of utterances, with speech acts and nondeclarative utterances, with inferred and implicated meanings of various sorts, with contrast and topicality, and with many features of multi-sentence discourse, including discourse coherence and understood connections between discourse segments.

The origins of pragmatics are philosophical rather than logical, and pragmatics is perhaps the area of linguistics that has been least successful in separating itself from philosophy. We will find, when we engage in pragmatic topics, that it is often very difficult to tell whether we are doing linguistics or philosophy. But much of the best and most exciting current work in linguistics is devoted to pragmatic issues.