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0 Introduction

Modern semantics and pragmatics emerged from the work of philosophers and philosophically inclined mathematicians: Gottlob Frege, Bertrand Russell, Alfred Tarski, J. L. Austin, Peter Strawson, Willard van Orman Quine, Donald Davidson, Richard Montague, Paul Grice, and others. Many of the central ideas that now can be found in introductory textbooks of semantics and pragmatics were shaped in debates where language was seen merely as a way to make philosophical points about logic, epistemology, ontology, or ethics. Many of the participants in these debates would be puzzled to find themselves counted among the founding figures of branches of linguistics. For many of them, a systematic theoretical enterprise seeking to interpret the expressions of natural languages and to understand the conversational effects of uttering those expressions in a context would be unthinkable or even wrongheaded. Our survey of three crucial debates will give a sense of how philosophers and logicians – sometimes unwittingly – paved the road to scientific semantics and pragmatics.

0.1 Quine versus Carnap on Intensionality

Rudolf Carnap and Willard V. O. Quine were among the leading philosophers of the twentieth century. Carnap (who lived 1891–1970) was for a time a student of Frege's in Jena. He was influential in German and Austrian philosophy after the First World War, but moved to the US before the Second World War, teaching at Chicago University and then at UCLA. Quine (who lived 1908–2000), although he traveled widely, taught at Harvard for his entire career.

Both were logicians as well as philosophers, but their interests in logic were quite different. Quine contributed – in ways that now seem somewhat idiosyncratic – to logic and its systematic use in formalizing set theory and mathematics. Carnap sought to extend logical techniques that had been used to formalize mathematics to other domains, and especially to the physical sciences.

Both Carnap and Quine began with a syntactic approach to logic and language ("syntactic" in the logical sense, i.e. proof-theoretic), with works such as Carnap (1937) and Quine (1958). Carnap embraced Tarski's model-theoretic approach to semantics and sought to use it in his philosophical

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projects. Carnap (1956), for instance, is an extended and systematic attempt to apply these techniques to what he called "intensional" constructions.

Quine, on the other hand, although he was certainly aware of Tarski's ideas, avoided Tarski's semantic techniques in his logical work and rejected attempts to extend them to modal and psychological (that is, to intensional) languages. He regarded intensionality as problematic, and viewed semantic theories of intensionality with deep suspicion. As we will see, the debate between Quine and Carnap over intensionality is, in fact, only an aspect of a deeper difference of opinion concerning the nature of semantics.

The phenomenon of intensionality,[1] and its opposite, extensionality, have to do with the substitution of equals for equals. Carnap characterizes these notions in the following series of definitions:[2]

(i) A sentence ϕ is equivalent to a sentence ψ if and only if ϕ and ψ are either both true or both false. More generally, an expression η is equivalent to an expression η' if and only if η and η' have the same semantic value. In particular, if η and η' are referring expressions, they are equivalent if they refer to the same thing.

(ii) A syntactic constituent η in an environment ϕ is interchangeable with a phrase η' of the same syntactic type if and only if ϕ is equivalent to ϕ', where ϕ' is the result of replacing the constituent η in ϕ with η'.

(iii) The sentence ϕ is *extensional* with respect to a certain occurrence of the expression η in ϕ if and only if the occurrence is interchangeable with any expression equivalent to η.

(iv) Finally, the sentence ϕ is *intensional* with respect to an occurrence of the expression η in ϕ if and only if ϕ is not extensional with respect to this occurrence.

From the definition, you can see that intensionality is a semantic notion: it has to do with truth and reference. And it refers to a specific position in a sentence at which some component phrase occurs. To introduce some commonly used terminology, the component phrase occurs in the context of a sentence, and in this context it may or may not be intensional.

Borrowing linguistic notation for phrase structure, the structure of a noun phrase (an NP) occurring somewhere in an arbitrary sentence is this.

(0.1.1) $[X\,[\,Y\,]_{\mathrm{NP}}\,Z]_{\mathrm{S}}$.

In this diagram, X, Y, and Z represent stretches of syntactic material, and $[X \ldots Z]_{\mathrm{S}}$ is the context where the noun phrase Y appears.

[1] Intens̲ionality is easily confused with intent̲ionality. The latter notion was introduced by the philosopher and psychologist Franz Brentano and has to do with the "aboutness" of mental states. Although verbs having to do with mental states are in fact typically intensional, the two notions are different. Their relationship will be discussed in Chapter 5.

[2] The definitions are adapted from Carnap (1956: 14, 47–48). Notation has been modernized, and the definitions have been paraphrased to some extent, also to modernize them.

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Where [Y'] is another noun phrase,

(0.1.2) $[X\,[\,Y'\,]_{NP}\,Z]_S$

will be the result of replacing Y with Y' in this context. It is this replacement we need to consider in testing for intensionality.

Let's confine ourselves to the case where the component phrase is either a name or a "definite description" – a definite noun phrase involving 'the'. (For philosophers, these are the paradigmatic cases.) And we'll assume that in our model, such phrases take *individuals* as values – these are elements of the model's domain.

Substituting equals for equals is a pretty fundamental principle of reasoning. If we are given two equations, such as

(0.1.3) $x = y - 4$
(0.1.4) $y = 2 \cdot x$

we automatically begin by substituting '$2 \cdot x$' for 'y' in (0.1.3), obtaining

(0.1.5) $x = (2 \cdot x) - 4$

and proceed, concluding that $x = 4$. This sort of reasoning is ubiquitous in mathematics and is so natural that we use it unthinkingly. Such reasoning is also commonplace in nonmathematical cases like (0.1.6–8):

(0.1.6) Jane is shorter than the tallest person in the room.
(0.1.7) Molly is the tallest person in the room.
(0.1.8) So Jane is shorter than Molly.

This means that any case of intensionality is also a violation of a plausible and fundamental principle of reasoning. But intensionality is not at all unusual, as the following two examples show.

(0.1.9) Jane might have been shorter than the tallest girl in the room.
(0.1.10) Jane (in fact) is the tallest girl in the room.
(0.1.11) ? So Jane might have been shorter than Jane.

(0.1.12) Fred suspects that Jane is the tallest girl in the room.
(0.1.13) Molly is the tallest girl in the room.
(0.1.14) ? So Fred suspects that Jane is Molly.

These examples illustrate two typical sorts of contexts that can precipitate intensionality: 'might' is a *modal verb*, and 'suspect' is a *psychological* one.

Sometimes we find ourselves taking anomalies for granted, without ever recognizing them as problematic. And sometimes difficulties that at first seem artificial and even superficial can turn out to be enormously challenging. The intensionality phenomenon is like this. We're familiar with examples like (0.1.9–11) and (0.1.12–14), and yet we happily use the rule of substitution

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of equals for equals, without noticing the incongruity. The difficulty only arises when we begin to think systematically about the semantics of languages that can have expressions like ‘might’ and ‘suspect’. In fact, intensionality is the central problem of Frege (1892) and has haunted philosophy of language since then. But it hardly seems to have been taken seriously before the late nineteenth century.

The resulting quandary for semantic theory can be summed up like this. On the one hand, we have a plausible and fundamental principle of reasoning that moreover seems to be well motivated. If a sentence involves a referring expression, then it makes a claim about whatever thing that expression refers to. But then the truth of the sentence shouldn’t depend on how we refer to this thing: that is, the sentence should be extensional. On the other hand, modals and psychological verbs provide straightforward examples of intensional contexts.

There are two responses to the problem of intensionality: (1) treat it as a challenge, as something that needs to be overcome by developing an improved semantic theory; (2) take it to indicate that the project of developing a semantics for any language capable of talking about modal or psychological matters is fundamentally misguided in some way. The first response is Carnap’s; the second is Quine’s.

As you might expect (especially if you knew how prolific and systematic a philosopher Carnap was), Carnap’s reaction takes the form of an extended, articulated study of the semantics of intensionality: Carnap (1956), as well as shorter articles on related topics. Partly in response to Quine’s criticism, Carnap also published methodological studies defending semantics as a legitimate area of inquiry. Quine too was a prolific writer, but his project is negative, and to make his point he doesn’t have to produce an extended theory. So his contributions tend to be shorter, more targeted criticisms, although he did produce one extended work in the philosophy of language: Quine (1960).

There is no need here to go into the details of Carnap’s solution to the problem of intensionality because it was the first systematic exercise in what is now known as possible worlds semantics. It is essentially the same as Richard Montague’s solution, which is now the more or less standard approach to formal semantics in linguistics. We will return to this topic in Chapters 4 and 5.

From 1947 to the late 1970s, Quine produced a number of objections to the very idea of intensional semantics. The earliest of these revolve around *modal logic* – the logic of terms like ‘must’, ‘may’, and ‘should’. The later objections are more general, and have to do with ontological and methodological considerations

To appreciate the background of Quine’s earliest concerns, it is important to understand the use–mention distinction, the separation of object language from metalanguage, and the formalization of logical syntax.

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In the twentieth century, formal logic evolved into the study of mathematical language and mathematical reasoning. Since logic is a branch of mathematics, logic itself must be among the subjects that logic can study. This reflective twist turned out to be crucial for some of the most important results in the field. Kurt Gödel's proof in Gödel (1931) that no consistent axiomatizable system of arithmetic could prove its own consistency and Alfred Tarski's proof in Tarski (1936) that no interpreted formal language can provide a definition of its true formulas both depend on the ability of logic to formalize itself. Part of Gödel's proof consists, for instance, in systematically showing how a formalized system of arithmetic can talk about its own formulas and proofs.

A logician dealing with a system of this sort is, of course, using language to talk about language. To introduce a technical term, the logician is using a *metalanguage* to theorize about an *object* language. The metalanguage will use expressions to name the formulas of the object language. But often these expressions will look a lot like the expressions they are supposed to name. It is easy to get confused about this sort of thing: to write '2 + 2=4', for instance, when what is meant is 'The formula '2 + 2 = 4' is provable'. But the former is *using* the formula to assert that the sum of 2 with itself is 4. The latter is *mentioning* the formula, saying that there is a proof of it in some axiomatic system.

As we said, it is easy to confuse use and mention. Such confusions are invited by the fact that, if quotation belongs to spoken language at all, it is almost always covert. And in written language, quotation marks serve many purposes, only one of which is to name the expression between the quotation marks. It is probably best to think of this use as a technical regimentation of everyday language, similar to the other regimentations that are found in mathematical language. We ourselves will use single quotes for use–mention, with a few exceptions. We will omit quotes in displayed examples, and – because quotes within quotes can be hard to parse, when we quote a sentence that itself involves quotation, we will use "corner quotes" for the outermost quotation, thus: ⌜the sentence 'Snow is white' is true⌝.

In the 1930s many logicians came to believe that the work of earlier thinkers had been flawed by carelessness about use and mention. Some philosophers even believed that use/mention confusions were a pervasive source of error in philosophical thinking. And Quine and other prominent contemporary logicians were somewhat obsessive about the use–mention distinction and the employment of various devices, and especially of quotation, to distinguish the two explicitly.

Some of Quine's earliest criticisms of modal logic seem to arise from the thought that it involves confusion of use and mention. If, for instance, the proper "analysis" of a modal claim like (0.1.15) is (0.1.16) – that is, if (0.1.16) is the correct explication of (0.1.15) – then modal statements contain covert quotation.

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(0.1.15) 2 + 2 is necessarily equal to 4.
(0.1.16) The sentence '2 + 2 = 4' is provable from the axioms of arithmetic.

If so, then a logician who ignores the hidden quotation marks may be guilty of confusion. This suspicion is compounded by the fact that early work in modal logic, such as Lewis (1918), is indeed confused in just this way.

Quine correctly recognized that quotation creates environments that are logically peculiar and need special treatment. Certainly, covert quotation can produce intensional contexts. The following example is from Quine (1980):[3]

(0.1.17) Giorgione was so-called on account of his size.

(0.1.18) Giorgione was Barbarelli.

(0.1.19) ? Barbarelli was so-called on account of his size.

Quotation has many semantic oddities. In particular, it is opaque to quantification: (0.1.20) says that 2 has a square root, but (0.1.21) fails to claim the existence of anything, because putting quotation marks around '$x^2 = 2$' creates the name of an expression, in which 'x' is mentioned, not used. Compare (0.1.21), for instance, with $\exists x$['*six*' contains 'x'], which Quine (1980: 150) calls "a grotesque example."

(0.1.20) $\exists x\,[x^2 = 2]$.
(0.1.21) $\exists x$ ['$x^2 = 2$' is an equation].

Quine is careful to avoid saying that modal and other intensional constructions involve implicit quotation. Earlier, in the first edition of Carnap (1956), Carnap had proposed a quotational analysis of belief sentences, according to which belief is a relation between a person and a sentence. Alonzo Church criticized such analyses in Church (1950); Carnap accepted this criticism and modified his account. Quine was aware of this exchange and cites Church's paper in Quine (1980). Nevertheless, he believes that the analogy between quotation and intensionality is suggestive and in particular that "quantifying in" to an intensional context – binding a variable in an intensional context with a quantifier – is semantically problematic.

Quine asks what an example like (0.1.22) can mean.

(0.1.22) $\exists x$ [Necessarily, $x > 7$].

It seems to be saying that there is some number that necessarily is greater than 7. You might think that (0.1.22) is true, because 9, for instance, is a number, and because – as a matter of mathematical necessity – 9 is necessarily greater than 7. But, Quine (writing before the demotion of Pluto) asks what this number is. It can't be 9, because 9 is the number of the planets, and the number of the planets is *not* necessarily greater than 7. (Linguists may suspect

[3] The background for this example is that 'Giorgione' means, roughly, "Big George," and was a nickname for the painter Giorgio Barbarelli.

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that there is a scope ambiguity in Quine's example: the adverb 'necessarily' may take wide or narrow scope with respect to negation. Quine frames his argument without seeming to notice the ambiguity. In this connection, see Stalnaker and Thomason [1968].)

Quine's point seems to be that quantification is *quantification over objects* and that an object is what it is and has the properties it does independently of how it is named. As a way of emphasizing this point, Quine uses the term 'referential opacity' instead of Carnap's 'intensional'.

It is possible to invent a formal system and yet to be confused about its semantics. Sometimes, perhaps, the confusion can be so acute that there is no sensible way to provide an interpretation of the formalism. In his early criticisms of intensionality, Quine seems to be saying that logical systems that combine modalities or other intensional operators with quantification and that allow formulas like $\exists x\phi$, where ϕ contains occurrences of x in intensional contexts, suffer from this sort of confusion.

Natural languages also allow this sort of "quantifying-in." (For instance, consider the following example, from a Manitoba Department of Corrections webpage: 'Anyone believed to be under the influence of alcohol or drugs will not be permitted to visit'.) If these criticisms are right, it would follow that taking language of this kind seriously and attempting to provide a semantic account of it is misguided. Doubts about quantifying-in can lead to skepticism about the viability of natural language semantics.

Over the years, Quine changed the focus of his criticisms, no longer insinuating that quantifying-in leads to semantic incoherence but claiming only that it leads to theories that are philosophically unacceptable. One line of argument, based on "semantic indeterminacy" – the underdetermination of semantic theories by linguistic evidence – is discussed in Chapter 3.

Another is ontological. Throughout his career, Quine had a preference for ontological parsimony, the idea that theories that postulate fewer kinds of things are preferable. This preference seems to have been motivated by a liking for *philosophical nominalism*, the position that denies the existence of "universals" and, more generally, of "abstract entities" or that at least (and this is Quine's position) treats these things with suspicion and seeks to minimize them.

Universals are what nominalized predicates purport to denote. Goodness, beauty, and triangularity are universals. Debates over the philosophical status of universals go back to ancient times. The category of *abstract entities* is somewhat vague, but includes sets, numbers, species, mathematical points, and other "nonconcrete" things that don't seem to be located in space or time.

Quine recognized, correctly, that a semantic theory of natural language would have to *reify* (to treat as existing) a host of things that philosophers with nominalist inclinations would find unacceptable. Anyone would find the question 'How many inhabitants of Ohio are there?' sensible, even if it might

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be difficult to answer exactly. But Quine thinks that if a theory were to admit *possible* objects (and this, it seems, is what a semantic theory of modal logic with quantifiers would have to do), it would have to treat questions like 'How many possible inhabitants of Ohio are there?' as legitimate.

In fact, it is far from obvious that accepting the legitimacy of quantifying into modal contexts entails accepting the existence of merely possible entities. 'There are at least three people who might be inhabitants of Ohio' quantifies over flesh and blood actual people, saying that at least three of them might live in Ohio. (Contrast this with 'Ohio might have at least three inhabitants', which does not quantify over actual people.) But Quine is correct in claiming that it is exceedingly hard to design a modal semantics that eschews ontological commitment to nonactual objects.

Rudolf Carnap and Alonzo Church opposed Quine's criticisms of semantics, taking the position that it is a science. Their point is that, like any science, semantics is entitled to make whatever assumptions are appropriate for its own needs, and that philosophical criticisms of these assumptions are beside the point. See Carnap (1950); Church (1951b).

Quine was a lifelong advocate of *naturalism* – of the view that science provides our best way of understanding things. If, as he seems to believe, scientific inquiry provides firmer ground than philosophical considerations, it is peculiar to find him rejecting semantics for philosophical reasons. Quine, then, seems to be treating semantics more like a philosophical than a scientific enterprise. As long as semantics is part of philosophy, Quine is merely indulging in the usual philosophical business of criticizing philosophical positions.

In fact, during much of the twentieth century, semantics was mainly a philosophical pursuit. But now it has become part of linguistics. With some justice, linguists are likely to feel indignant at philosophers who wish to tell them which parts of their subject are legitimate. Quine himself doesn't have much help to offer here; he seems to have little to say about what qualifies an area of inquiry as a science. But he might respond that it is up to linguists, if they wish to do semantics, to put it on a sound enough footing so that they will not find themselves committed to philosophical claims that philosophers can legitimately criticize.

On both sides in this debate, we can find points that are worth taking seriously. Certainly, Carnap and Church were right that a dedicated, scientific approach to semantics, based on ideas from logic, would be rewarding. Quine was right that such theorizing would make problematic assumptions. But in this respect, semantics doesn't seem to be unusual; the foundations of *any* science are philosophically problematic. In general, you would hope for a productive conversation between philosophers and scientists, in which on the one hand the philosophers respect the work of the scientists, and on the other hand the scientists can accept philosophical questions about foundations as legitimate and even interesting.

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0.2 Russell versus Strawson on Referring

Bertrand Russell (who lived 1872–1970) was one of the most prolific and influential English-speaking philosophers in the first half of the twentieth century. With Alfred North Whitehead, he produced Whitehead and Russell (1925–1927), which develops a system of logic designed to avoid the logical paradoxes, and seeks to complete Frege's project of developing the mathematics of continuity from logical principles. (Volume I of the first edition of this work was published in 1910.)

Russell (1905), the landmark article with which we are concerned here, belongs to Russell's logical period. However, it was primarily intended as a contribution to philosophy, communicating an insight that, Russell felt, deflated the excesses of nineteenth-century German idealism. The paper was enormously influential, and precipitated a tradition – more or less successful – of "philosophical analysis."

Peter Strawson (who lived 1919–2006) belonged to a younger generation and was associated with a different style of philosophy becoming popular at Oxford – a style that tended to deprecate formal logic but was intensely interested in language. When he opted to tangle with Russell on his home ground in Strawson (1950), Strawson was making a bold and perhaps risky choice, but his paper, too, turned out to be quite influential.

Russell was concerned with what he called "denoting phrases." This term is not much used any more, either by philosophers or linguists. Russell doesn't define it, and what he intended has to be reconstructed from the examples he provides. These include, among other things, phrases headed by the indefinite article 'a' such as 'a man', and definite phrases like 'the present king of England' and 'Charles II's father'. Philosophers have coined the term "definite description" for NPs headed by 'the', possessive NPs, and perhaps some other definite NPs – but excluding proper names. Although the range of constructions that count as definite descriptions is somewhat vague, the term is still in general use in philosophy.

Surprisingly, Russell has nothing to say about proper names in Russell (1905), though he does turn to them in a later work, Russell (1918–1919: 524ff). Since there he extends his analysis of definite descriptions to include proper names, we should also think of these as denoting phrases. Russell contrasts denoting phrases with what in Russell (1918–1919: 201) he called "logically proper names." These may not be found in natural languages but according to Russell would occur in a logically perfect language.

Russell's insight can be put this way in more modern terms: in a language with variables and the universal quantifier – a language that supplies sentences of the form $\forall x\,\phi$ – we can define or "analyze" a wide variety of nominal constructions that superficially don't seem to be universal at all but rather appear to refer. He coined the term "denoting phrase" for the phrases that he thought could be analyzed in this way.

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Indefinites can be defined in terms of the universal quantifier and negation. (0.2.23), for instance, is equivalent to (0.2.24); to work this out, notice that if I caught a fish, then it's false that everything I caught is *not* a fish. Conversely, if not everything I caught is not a fish, I caught a fish. Russell is appealing here to the logical equivalence (0.2.25).

(0.2.23) I caught a fish.

(0.2.24) It is not the case that everything I caught is not a fish.

(0.2.25) $\exists x\phi \leftrightarrow \neg\forall x\neg\phi$.

The main point of the paper, though, and what it is remembered for, is the idea that, using quantifiers, variables, and identity it's possible to analyze many definite constructions. Russell illustrates this with (0.2.26) and (0.2.27).

(0.2.26) The present King of France is bald.
(0.2.27) The father of Charles II was executed.

The analysis depends on the fact that *uniqueness* can be characterized using identity and the universal quantifier. To say, for instance, that Charles II had a unique father involves two things: (i) that Charles II had a father, and (ii) that he had no more than one father. But (ii) amounts to this: for all x and y, if x is a father of Charles II and y is a father of Charles II, then $x = y$. The indefinite 'a' in (ii) is inessential: at the risk of sounding archaic, Russell makes this clear by substituting 'begat' for 'is a father of'. Notice that (i) is an indefinite, which can in turn be analyzed using the universal quantifier. And (ii) involves only variables, the universal quantifier, and identity.

Putting these ideas together, we arrive at (0.2.28) as the analysis of 'Charles II had a unique father':

(0.2.28) (i) For some x, x begat Charles II, and (ii) for all y and z,
if y and z begat Charles II, then $y = z$.

Part (i) of the analysis ensures that there is at least one begetter of Charles II, while part (ii) ensures that there is no more than one.

If now we want an analysis of (0.2.27), we merely have to add to (0.2.28) a clause saying that x was executed:

(0.2.29) (i) For some x, x begat Charles II, and (ii) for all y and z,
if y and z begat Charles II, then $y = z$ and (iii) x was executed.

The logical version of (0.2.30) clarifies the structure of the entire analysis.

(0.2.30)
$$\begin{aligned}&\exists x[\mathrm{Begat}(x, c)\wedge\\ &\quad\forall y\forall z[[\mathrm{Begat}(y, c) \wedge [\mathrm{Begat}(z, c)] \rightarrow y{=}z]\wedge\\ &\quad\mathrm{Executed}(x)].\end{aligned}$$

Similarly, Russell's famous example about the king of France produces the following analysis and logical formalization.

(0.2.31) (i) For some x, x is a king of France, and (ii) for all y and z,
if y and z are kings of France, then $y = z$ and (iii) x is bald.

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