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## Mind Association

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Theories of Nature and the Nature of Theories

Author(s): Paul A. Roth

Reviewed work(s):

Source: *Mind*, New Series, Vol. 89, No. 355 (Jul., 1980), pp. 431-438

Published by: [Oxford University Press](#) on behalf of the [Mind Association](#)

Stable URL: <http://www.jstor.org/stable/2253535>

Accessed: 19/05/2012 11:07

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## Theories of Nature and the Nature of Theories\*

PAUL A. ROTH

Quine acknowledges that he uses the term 'theory' in two distinct ways; one use he terms 'technical',<sup>1</sup> the other I shall call the extended use of 'theory'. The technical sense, stemming from Tarski's use of 'theory', characterizes a set of sentences as a theory iff 'it consists of some subset S of sentences together with all the further sentences that are logically implied by S and do not exceed the vocabulary of S'.<sup>2</sup> This technical sense is part of what is intended when Quine speaks of theories in the natural sciences. No actual scientific theory may, perhaps, be fully regimented in precisely this sense of 'theory'; the point is that the technical sense of 'theory' represents the Quinean ideal for the natural sciences. However, Quine uses the term 'theory' in an extended, epistemological sense when he speaks of all the sentences of a natural language which enjoy community-wide acceptance, i.e., where 'theory' means 'the generally accepted cultural lore'. He holds that 'such contexts are insensitive to a distinction between language and theory' (*WsOs*, p. 310). In this sense of 'theory', *our* theory of the world is loosely identified with some subset of sentences of English. This looser sense of 'theory' represents Quine's most characteristic employment of the term. 'In *Word and Object* and related writings my use of the term "theory" is not technical. For these purposes a man's theory on a given subject may be conceived, nearly enough, as the class of all those sentences . . . that he believes to be true' (*WsOs*, p. 309). What escapes Quine's notice, however, is that his latter, looser use is ambiguous in an important respect.

The extended sense of 'theory' is ambiguous with respect to whether Quine's statements *about* theories are to be held true only *within* some *specific* scientific framework or held true come what may in current scientific theory. For example, Quine, maintains that 'a sentence S is meaningless except relative to its own theory'<sup>3</sup> and that 'we can never do better than occupy the standpoint of some theory or other, the best we can muster at the time' (*WO*, p. 22). Here Quine is clearly talking *about* theories; indeed, he is offering a general pronouncement to the

\* I wish to thank my colleagues Lawrence Davis, Robert Gordon, Daniel Lehocky, David Phillips and Stephanie Ross for their help with earlier drafts of this paper.

1 W. V. O. Quine, 'Replies' in *Words and Objections*, D. Davidson and J. Hintikka (eds.) (Dordrecht: Reidel, 1969), p. 309. Hereafter cited as *WsOs*.

2 *Ibid.*, p. 309. See also Quine's remarks in 'On Empirically Equivalent Systems of the World', *Erkenntnis*, ix (1975), p. 318.

3 W. V. O. Quine, *Word and Object* (Cambridge, Mass.: MIT Press, 1960), p. 24. Hereafter cited as *WO*.

effect that *all* attribution of truth and meaningfulness to sentences is theory-relative. The claim makes no explicit appeal to received scientific doctrine. Yet, Quine insists, 'epistemology, or something like it, simply falls into place as a chapter of psychology and hence of natural science'.<sup>1</sup> But this seems to suggest that the previous statements *about* theories, if they are to belong to epistemology 'or something like it', must be treated as hypotheses *within* empirical psychology.

The aforementioned ambiguity is symptomatic, I suggest, of the presence of *two distinct epistemological theses* in Quine's writings. The problem is that Quine conflates the basis for his *a priori* characterization of the nature of theoretical knowledge with his programmatic proposal which identifies epistemology with empirical psychology. The two distinct epistemological views which need to be explicitly distinguished in Quine are, then, his Duhemian/holistic view of language and, his notion of a 'naturalized' theory of knowledge.

These two epistemological positions are importantly different because one—the Duhemian view—serves as a *premise* in Quine's arguments for his most characteristic epistemological doctrines, e.g., the indeterminacy of translation and the underdetermination of theories (*OR*, p. 82). His other thesis—the proposal that epistemology be viewed as a portion of empirical psychology—has the status of only a visionary project; indeed, Quine maintains the programmatic view as a consequence of the Duhemian thesis. The programmatic proposal plays no role in supporting Quine's central pronouncements on the nature of knowledge. The problem in interpreting and making consistent some of Quine's claims becomes the problem of deciding, for a given case where Quine remarks on the nature of theoretical knowledge, which of his two epistemological positions is intended by his use of 'theoretical'.

The failure to notice the distinction in epistemological kind hidden by Quine's use of 'theory' explains the conflicting analyses of Quine's notion of logical truth offered by Barry Stroud and Michael Dummett.<sup>2</sup> According to Quine, first-order predicate logic not only is the canonical idiom of natural science, but also is part, along with all of mathematics, of our total theory of nature.<sup>3</sup> In this regard, logical laws are viewed as firmly embedded portions of current physical theory which are, given the extended notion of 'theory', subject to possible revision. However, Stroud suggests, logical laws do have some special status within Quine's epistemology. Stroud sees as significant Quine's remark that at least one aspect of our current system of logic—the definition of the truth-

1 W. V. O. Quine, *Ontological Relativity and Other Essays* (New York: Columbia University Press, 1969), p. 82. Hereafter cited as *OR*.

2 Barry Stroud, 'Conventionalism and the Indeterminacy of Translation', *Words and Objections*, pp. 82-96. A view similar to Stroud's is found in an article by C. F. Presley, 'Quine, Willard Van Orman', in *Encyclopedia of Philosophy*. Dummett's position is given in his book, *Frege: Philosophy of Language* (New York: Harper and Row, 1974). See especially pp. 584-627.

3 W. V. O. Quine, *Philosophy of Logic* (Englewood Cliffs: Prentice-Hall, 1970), pp. 98-101.

functional connectives—'lends itself directly to radical translation' (*WO*, p. 57). Stroud interprets this as implying that Quine distinguishes in kind between (at least some) portions of logic and all other non-observational sentences, viz., the latter, but not the former, are subject to the indeterminacy of translation of theoretical sentences. Unlike Stroud, Dummett maintains that Quine observes no such distinction in epistemological kind; indeed, he believes that Quine's scruples preclude any such distinction. However, Dummett also thinks that the absence of such distinctions has unfortunate consequences for Quine's philosophy of language. Specifically, it prevents Quine from offering any specific analysis of language.

I show that both Stroud and Dummett are mistaken, and, more generally, that their respective mistakes are a result of a failure to perceive the relevant epistemological stance which Quine adopts for the problems they discuss. When the two epistemological positions, which Quine consistently conflates, are distinguished, it can be seen that Quine has not, as Stroud believes, held logic aloof from the problems posed by the indeterminacy of translation of theoretical sentences; nonetheless, it can be seen why Dummett is incorrect in maintaining that Quine's holism precludes his talking meaningfully about language. I begin by sharpening the distinction in epistemological views in question. I then look at the specific criticisms proffered by Stroud and Dummett.

One of Quine's distinct epistemological theses emphasizes his holistic conception of theories; this is his Duhemian Thesis (DT).

(DT) Theoretical sentences have their meaning and their evidence not as single sentences but only as larger blocks of theory.

The DT is a theory *about* theories; it implies that *any* theoretical sentence is known to be true or false only relative to some containing theory.<sup>1</sup> In particular, Quine holds the DT to be true both of natural languages and natural sciences; DT is an epistemological precept, but it is *not* formulated within some one scientific theory. This last point is critical in as much as Quine's second type of epistemological thesis maintains that work on the nature of human knowledge is to be carried out *within* a specific natural scientific framework. This is Quine's Epistemology Naturalized Thesis (ENT).

(ENT). To be an epistemologist is to be an empirical psychologist, scientifically investigating man's acquisition of science. Epistemology, as such, is contained within natural science, as a chapter of psychology.<sup>2</sup>

The ENT envisages epistemological inquiry as preceding from within science; epistemological truths, in this case, are true relative to the

1 I delineate the crucial role which DT plays in Quine's argument for the indeterminacy of translation of theoretical sentences in 'Paradox and Indeterminacy', *Journal of Philosophy* (July 1978), pp. 347-367.

2 W. V. O. Quine, *Roots of Reference* (La Salle, I.: Open Court Press, 1973), pp. 2-3. Hereafter cited *RR*.

particular theory to which they belong (and all properly scientific theories, Quine believes, finally fall under the aegis of physics).

However, Quine makes it clear that his statements *about* theories are *not* justified by appeal to natural science. Quine consistently distinguishes between the 'old epistemology' (*Aufbau*like projects) and his 'new epistemology'—the envisaged absorption of the study of human knowledge by empirical psychology (*OR*, pp. 83 ff.; *RR*, pp. 3–4), which indicates that the relevant remarks *about* the nature of theories are made from a perspective which is not just part of the 'new epistemology'. In short, since Quine's arguments with regard to the *a priori* limits to theoretical knowledge are what are to convince us to accept the new epistemological project, the relevant arguments cannot assume the prior acceptance of that epistemological stance. Quine applies what I earlier termed the extended notion of 'theory' indistritinately to both statements *about* the general nature of knowledge and statements made *within* a particular scientific view; that is, he calls *all* such statements theoretical. The philosophically significant point, however, is that the 'theoretical' statements, in each case, are predicated on different types of assumption, are different with respect to their consequences, and are revised in light of different considerations.

It is a consequence of DT that all sentences of any theory are, in principle, open to revision; hence, it seems that all epistemological precepts must be open to revision. But DT is just one such epistemological precept, thus DT is open to revision. Yet if DT is revisable in just the way any other epistemological precept is, i.e., if it is only a statement true *within* one particular theory, then there is no apparent reason to accept it as true *a priori* of theories. Moreover, Quine cannot maintain that DT is true independent of any theory, for DT states that sentences have their significance only as part of some larger theory. The problem, in other words, is as follows. If we draw the basis for DT too narrowly, i.e., make it a precept of a particular naturalized epistemology, what DT asserts *about* theories in general should have the status of an empirical hypothesis; but we have already seen that Quine does not view it as such. Yet if DT is not part of a naturalized epistemology, how can it be, consistent with Quine's remarks, an epistemological precept at all?

The foregoing argument shows that the reasons for granting DT cannot be reasons adduced from *within* a naturalized epistemology. The DT is to apply both to theories in the extended sense of the term (and so to pre-scientific, natural language discourse) *and* to theories in a narrower sense, i.e., to scientific theories which 'refine' our more casual idiom for speaking about the world. The ENT envisages epistemology, by hypothesis, as contained in some particular theory.

DT is presented as an *a priori* limit to knowledge; it delimits the most general nature of human knowledge. The naturalized epistemologist, on the other hand, is attempting to explain how we know as much as we do. Quine's claim that sentences are, one and all, revisable, his continued use of the web metaphor when speaking of theories in both the extended and technical senses, would be trivialized by making DT a truth of

scientific theory. *DT* is of epistemological moment only if we separate it from Quine's pragmatic and programmatic vision of epistemology. It is not my purpose here to defend *DT*, or even to say what the arguments for it might be. My concern, rather, is to indicate the need to distinguish the *DT* and *ENT* in order to make perspicuous the fundamental significance of Quine's Duhemian views to his epistemology.

Given *DT*, one accepts that it is only within theories in the extended sense that judgements of the truth and falsity of sentences can be made; given *ENT*, one chooses the accepted scientific canons as determinative of one's method of investigation. However, the consequences of the *DT* are not truths of science, and the truths of some one theory have no philosophical status, i.e., no claim to being *a priori* truths about theories *per se*. Stroud's belief that Quine gives special epistemological status to the translatability of logical connectives is a result of just such a confusion between particular scientific truths and what Quine holds to be true of theories.

Stroud's suggestion that Quine has undergone a change of heart regarding the revisability of logical truths is quashed by Quine in his subsequent remarks on Stroud's paper (*WsOs*, pp. 316–319). Indeterminacy, Quine insists, extends to the enterprise of translating truth-functions (*WOsOs*, p. 317). Nonetheless, he acknowledges that 'preserve logical truth' is no casual canon of translation. Any violation, Quine points out, is 'absurd under our semantic criteria' (*WO*, p. 58). That is, Quine believes both that absurdity results if this canon of translation—'preserve logical truth'—is violated and that logical laws are not inviolable.<sup>1</sup> Yet, Stroud insists, if the only imaginable alternative to our present scheme of translation on this point is, *ex hypothesi*, absurd, then what sense is to be made of the alleged possibility of an alternative translation?<sup>2</sup>

The answer to this question requires that one distinguish between the 'rigidity of logic in translation and the question of the immunity of logic to revision' (*WsOs*, p. 317). Stroud complains that translation avoids absurdity only if the native's idiolect conforms to the canons of logic as we understand them. This is true, but the canonical restraint is pragmatic, and *not* based on reasons external to the theory. In developing a manual of translation, we have no more to go on than the overt behaviour—oral and otherwise—of the native. The behavioural factors provide what determinants there are of the significance of the native's utterances; such is the thesis of the indeterminacy of translation. Insofar as adherence to the canons of logic help supply the means of constructing a theory in which to cast the linguistic facts at our disposal, these canons are to be valued. Yet our canons of translation are subject

1 *Words and Objections*, p. 317. See also 'Philosophical Progress in Language Theory', in Kiefer (ed.), *Contemporary Philosophical Thought* (Albany: State University of New York Press, 1970).

2 Quine, in fact, subscribes to the very sort of 'conventionalism' which Stroud seeks to defend him from. So while Stroud does not consider that his question is directed to Quine, in fact it does bear on Quine's position.

to revision; these canons are not secured by any argument concerning the conditions for any possible translation. In order to give any methodological canon pride of epistemological place—to show that it could not be otherwise—would require such arguments. Stroud confuses the rigidity of the semantics for defining logical connectives with epistemological distinctiveness.

The truths of logic and mathematics are, Quine insists, part of science, and so not to be distinguished from other portions of our theory about man's natural environment. This is not meant to suggest, of course, that all the sentences of received theory are equally likely candidates for revision. In order to understand in what sense logical laws are open to revision, it is helpful to look at the constraints which govern changes in the ontology of a theory. The considerations which underlie Quine's adherence to the canon 'preserve logical truth' are basically those which he musters in defence of the received scientific notion of reality. Ontological revision can proceed bit by bit from within the language/theory we inherit; however, we cannot discard our current lore of physical objects all at once, for then we would lose whatever sense the word 'reality' has for us. We cannot draw a distinction between what is and what is not without preserving, at least initially, part of the current basis for drawing such a distinction.<sup>1</sup>

Quine's point seems unobjectionable. We have certain (linguistic) resources for distinguishing between genuine objects and fictional ones, and if we attempt to abandon these very resources, all at once, we abandon, in effect, the distinction in question. We must husband these resources and take a piecemeal approach to changes in our account of reality. And what is true of ontological discourse is true, also, of our discourse concerning logical truth. However, in the case of logical laws, there is an important twist. For our logical laws are so interconnected that it is difficult to effect isolated revisions. 'Dropping a logical law means a devastatingly widespread unfixing of truth values of contexts of the particles concerned, leaving no fixity to rely on in using those particles' (*WO*, p. 60). There is a sense, in other words, in which any revision in logical laws 'unfixes' the whole system, or might threaten to do so.

Stroud, in other words, confuses the constraints imposed by the ENT on the epistemologist with the constraints governing any possible theory. This is a mistake; the determinacy which current theory dictates with regard to translating logical connectives cannot be extended to cover all possible theories. Ironically, Dummett appreciates this point, i.e., that logic falls within the ENT, and so is, in principle, open to revision. However, he insists that this inclusion generates a serious problem for Quine's epistemology. Specifically, Quine has constructed a philosophy of language within which we are prevented from talking about language.

Dummett notes that, for Quine, it is a mistake to regard individual theoretical sentences as significant taken in isolation from their theories.

1 W. V. O. Quine, *Ways of Paradox* (New York: Random House, 1966), p. 216. See also *OR*, p. 54.

Rather, if we are to talk of their meaning at all, we must do so against the background of other statements of that theory which we accept as meaningful. But exactly how are we to explicate this relation? What is needed, Dummett suggests, is 'some way of understanding in what the inferential connections between sentences consist'.<sup>2</sup> But any statement about the inferential connections is itself part of the theory which we are, *ex hypothesi*, trying to explain. So now the statement about the inferential connections between sentences consist'.<sup>1</sup> But any statement if these inference rules are subject to revision, as Quine maintains, then we must be able to specify them. But how is specification possible? That is, any statements adduced for the purpose are, if meaningful and true, part of a theory; but it is precisely the relation among sentences in our theory which we wanted to clarify. Quine's view of theoretical sentences is that they are all of a kind; but in order to talk about the rules of a system—even if only to say such rules are revisable—requires that we do distinguish sentences in kind, e.g., as belonging to the system of sentences one is talking about or as part of the language used talking about some set of sentences.

Quine's thesis involves, however, that the principles governing deductive connections themselves form part of the total theory which, as a whole, confronts experience. . . . But, in that case there is nothing for the inferential links between sentences to consist in. They cannot be replaced by superinferential links, compelling us, if we accept certain logical principles, to accept also the consequences under those principles of other sentences we accept: for any such superlogical laws could in turn be formulated and considered as sentences no more immune to revision than any other (*ibid.*, p. 596).

Quine, in broadening his notion of a theory to include all of logic has, Dummett claims, effectively eliminated the resources necessary for making statements about theories.

The problem arises only because Dummett refuses to distinguish DT from ENT. However, the naturalized epistemologist is free, *within* current physical theory, to distinguish between, e.g., the rules of inference and the object language sentences to which those rules apply (or, for that matter, to distinguish between observational sentences and theoretical ones). To acknowledge that these meta-logical rules are themselves part of a theory is not to vitiate the distinctions, for given ENT, it is precisely such constraints which the epistemologist has chosen to accept. Dummett's complaint has force, in other words, only if some 'point of cosmic exile', a standpoint independent of, and firmer than, current scientific theory is required. In denying, by DT, that the epistemologist can construct such a first philosophy, Quine has reconceived the epistemological project. The project for Quine is one of defending 'science from within, against its self doubts' (*RR*, p. 3); however, 'in confronting this challenge, the epistemologist may make free use of all scientific theory' (*RR*, p. 2). The problems for a Quinean epistemologist

1 Dummett, *ibid.*, p. 596.

(as for others) are *about* science, but for a Quinean, the answers to these problems, and to questions concerning how human beings develop their theories in the broadest sense of that term, are questions to be answered from *within* science. Given DT, we *cannot* distinguish in kind between sentences, but given ENT, we can. Quine believes that ENT represents the best philosophic strategy in light of DT. Dummett confuses the former thesis with the latter, and so arrives at the mistaken conclusion that Quine's philosophy of language leaves us with a featureless collection of sentences and no way to talk about them.

I have argued that both Stroud and Dummett confuse what Quine says about the consequences of doing epistemology *within* science with what Quine maintains with regard to the *a priori* nature of theoretical knowledge. The confusion is understandable, given that Quine simply overlooks this distinction. Attending to this distinction, it becomes clear that specific psychological theories concerning how people can know what they do are formulated *within* current science, in accord with the programme suggested by ENT, and such theories are open to revision. The claim that all human knowledge has an irremediably theoretical character is made on the basis of DT. DT is, of course, possibly false; the point is that its truth or falsity is not tied to current scientific theory, and so DT remains unaffected by particular revisions in science.

Quine consistently develops, and, with equal consistency, fails to distinguish, two basic lines of argument in his epistemological writings. The first line is that which maintains that his Duhemian view obviates the very possibility of extra-theoretic knowledge, since truth and falsity are determined, given DT, by the standards of one or another theory. The DT constitutes his 'theory of theorizing', his prolegomena to a naturalized epistemology. It too is subject to revision, of course, but the Duhem premise is not a precept of some particular theory in science. DT applies at the level where the terms 'language' and 'theory' are interchangeable. Quine's second line of argument is intra-theoretic, and proceeds from his views on the revisability of natural scientific theories, and the consequences which this type of revision has on our attempt at scientific self-understanding. The problem here is to determine what falls within the scope of epistemology understood as a chapter of our (more or less) formal theory about the world. Here the primary focus is on the use and acquisition of language, and how language comes to have its important social qualities.

Quine consistently entangles these two lines of thought. However, when the strands of argument are held separate, it can be seen, for the issue considered above, that the asserted revisability of logical laws leads back to Quine's meta-theoretical concerns; the Duhem premise does *not* mandate the inviolability of logical laws. However, there are effective constraints imposed on any revision of such laws, although these, in turn, are grounded on intra-theoretic considerations.



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Erratum: Theories of Nature and the Nature of Theories

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Reviewed work(s):

Source: *Mind*, New Series, Vol. 90, No. 358 (Apr., 1981), p. 320

Published by: [Oxford University Press](#) on behalf of the [Mind Association](#)

Stable URL: <http://www.jstor.org/stable/2253355>

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#### Erratum

In the paper 'Theories of Nature and the Nature of Theories' by Paul A. Roth in the number of *Mind* for July 1980, p. 437, lines 8-9 should read:

'inferential links between sentences needs to be explained; in particular, if these inference rules are subject to revision, as Quine. . .'

and the footnote indication in line 5 should read '1'.