

ARTICLE

STRUCTURE AND GENESIS IN SCIENTIFIC THEORY: HUSSERL, BACHELARD, DERRIDA

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I

Just recently some analytic philosophers – notably Michael Dummett – have begun to question the received idea (handed down by the logical positivists) that there exists an unbridgeable gulf between Anglo-American philosophy after Frege and ‘Continental’ thinking in the line of descent from Husserl.¹ That idea gained currency very largely on account of the belief that Husserl and his followers had remained in thrall to a subject-centred (‘psychologistic’) theory of meaning, logic, and truth, and had thus failed to register the signal advance represented by Frege’s and Russell’s work on the logical foundations of mathematics. My main purpose here is to challenge both this understanding of Husserl and – what often goes along with it – the dismissal of other ‘Continental’ developments, among them the epistemo-critical approach of Gaston Bachelard in philosophy of science and Derrida’s early (Husserl-inspired) essays on the structure and genesis of philosophic concepts.

This aspect of Derrida’s work has yet to be appreciated by Anglo-American commentators – Dummett among them – who are themselves in process of gradually revising the standard ‘analytic’ versus ‘continental’ tale of post-Kantian developments. I seek to correct that particular omission and also to encourage a wider reassessment of those alternative resources for philosophy of science provided by thinkers in the mainland-European tradition. For it is only on a narrow (historically and geographically distorted) view that we can treat the predominant interests and concerns of Anglo-American philosophy as belonging to a world quite apart from those that have typically animated work in the French and German contexts of debate. Indeed, it may be argued that analytic philosophy of science has taken a number of wrong turns as a consequence of its becoming so far out of touch with developments elsewhere.

¹ See especially Michael Dummett, *The Origins of Analytic Philosophy* (London, Duckworth, 1993); also Dummett, *The Seas of Language* (Oxford, Clarendon Press, 1993).

Dummett remains more than half-way convinced that Husserl's was itself a wrong turn, even though he concedes – as against Ryle and other early detractors – that the project of transcendental phenomenology cannot be viewed as merely a species of naïve 'psychologism'.² What is taken as read in Dummett's Fregean account is: (1) the objectivity of logical thought; (2) the close relation between logical issues and issues of meaning and truth; (3) the priority of logico-semantic considerations over arguments in epistemology or theory of knowledge; and (4) – following directly from this – the demise of 'foundationalist' epistemologies in whatever shape or form.³ Other thinkers have arrived at a similar conclusion via different routes of thought. These include a whole range of externalist (or reliabilist) approaches that forswear the traditional epistemic appeal to a privileged first-person viewpoint, and which look instead to the kinds of criteria, or the sorts of confirmatory warrant, that can just as well be applied by an observer suitably placed to monitor the process of knowledge-acquisition.⁴ Then again, there is Karl Popper's idea of 'epistemology without the knowing subject', an approach adopted mainly on account of the problems with any theory of knowledge (whether rationalist or empiricist) that banks on the notion of first-person privileged epistemic access.⁵ Moreover, there is that whole chapter of developments in post-Fregean symbolic logic and philosophy of mathematics which has led many thinkers (Quine among them) to abandon any notion of discovering a priori grounds for the analysis of truth, or validity, conditions.⁶ What it amounts to, in effect, is a reversal of Kant's 'Copernican revolution' in philosophy, one that locates those truth-conditions outside the knowing subject or beyond the realm of judgements supposedly self-evident to reason through forms of jointly intuitive-conceptual grasp.

II

This seems to me an appropriate context for understanding what Jacques Derrida is about in his deconstructive reading of various texts in the

² See the various essays and reviews brought together in Gilbert Ryle, *Collected Papers*, Vol. 1 (London, Hutchinson, 1971).

³ See also Dummett, *Truth and Other Enigmas* (London, Duckworth, 1978).

⁴ See for instance Alvin Goldman *Epistemology and Cognition* (Cambridge, Mass., Harvard University Press, 1986) and *Empirical Knowledge* (Berkeley & Los Angeles, University of California Press, 1988).

⁵ Karl Popper, *Objective Knowledge* (Oxford, Clarendon Press, 1972); *Realism and the Aim of Science* (London, Hutchinson, 1983); *The Myth of the Framework: in defence of science and rationality*, in M. A. Notturmo (ed.) (London, Routledge, 1994).

⁶ See especially W. V. Quine, 'Two Dogmas of Empiricism', in *From a Logical Point of View*, 2nd ed. (Cambridge, Mass., Harvard University Press, 1961), pp. 20–44.

Western mainstream 'logocentric' tradition.⁷ Moreover, as I shall argue, Derrida's early work on Husserl is directed toward precisely those problems with the phenomenological appeal to self-present, punctual, conscious awareness that concern analytically-minded commentators like Dummett.⁸ Thus when Derrida examines the conflicting claims of phenomenology and structuralism he takes the latter to extend far beyond that relatively localized movement of thought which had its origins in Saussure's project of structural linguistics, and which at this time – the early 1960s – was being vigorously canvassed in other fields such as anthropology, historiography, the social sciences, and literary criticism.⁹ Certainly this structuralist movement of thought was one very striking manifestation of the desire for methodological rigour, the drive toward system and method, which had characterized the human sciences during various stages of their history from Aristotle down. But there was also a sense in which structuralism continued the central, indeed the defining project of Western philosophy since its ancient Greek inception, that is, the quest for adequate concepts or categories whereby to order the inchoate flux of experience, intuitions, or meanings.

It is in this sense, Derrida writes, that a certain structuralism may be seen as 'philosophy's most spontaneous gesture', one that emerges whenever it is a question – as with thinkers from Descartes to Kant and Husserl – of attaining such knowledge through a process of rigorous (transcendental) argument from the conditions of possibility for human thought and experience in general.¹⁰ Yet this project always encounters its limit in that which eludes or exceeds the grasp of any theory aimed toward a 'structural' account – a wholly adequate conceptualization – of whatever is given at the level of intuitive or pre-reflective understanding. In other words, there will always come a point at which this approach proves inadequate to explain how it is that thought can reach beyond those existent structures of knowledge or signification, thereby creating new expressive possibilities or, as it

⁷ See for instance Jacques Derrida, *Of Grammatology*, trans. G. C. Spivak (Baltimore, Johns Hopkins University Press, 1975); *Writing and Difference*, trans. Alan Bass (London, Routledge & Kegan Paul, 1978); *Dissemination*, trans. Barbara Johnson (London, Athlone Press, 1981); *Margins of Philosophy*, trans. Alan Bass (Chicago, University of Chicago Press, 1982).

⁸ Derrida, 'Force and Signification' and '"Genesis and Structure" and Phenomenology', in *Writing and Difference* (op. cit.) pp. 3–30 and 154–68; also 'Speech and Phenomena' and *Other Essays on Husserl's Theory of Signs*, trans. David B. Allison (Evanston, Ill., Northwestern University Press, 1973); *Edmund Husserl's 'Origin of Geometry': an introduction*, trans. John P. Leavey (Pittsburgh, Pa., Duquesne University Press, 1978); *Le problème de la genèse dans la philosophie de Husserl* (Paris, Presses Universitaires de France, 1990).

⁹ For a representative sampling, see Michael Lane (ed.) *Structuralism: a reader* (London, Allen Lane, 1969); Richard Macksey and Eugenio Donato (eds.) *The Structuralist Controversy: the languages of criticism and the sciences of man* (Baltimore, Johns Hopkins University Press, 1972); David Robey (ed.) *Structuralism: an introduction* (Oxford, Clarendon Press, 1973); Terence Hawkes, *Structuralism and Semiotics* (London, Methuen, 1977).

¹⁰ Derrida, '"Genesis and Structure" and Phenomenology' (op. cit.) p. 159.

might be, entire new fields of scientific thought. Phenomenology appears better equipped to cope with this problem since it takes account of precisely that crucial non-coincidence between structure and meaning, form and content, conceptual understanding and lived experience, or again (in linguistic-semiotic terms) between merely 'indicative' and genuinely 'expressive' signs. Yet in so doing – as Derrida shows – it cannot escape the philosophical imperative which requires a more rigorous conceptualization of the latter term in each of these counterpoised pairs.¹¹ Such was indeed Husserl's chief aim: to provide a transcendental (as opposed to a merely formal) grounding or justification for all those interlinked modalities of human thought, knowledge, experience, and judgement that would otherwise fall apart into the separate realms of objectified (positivist) science on the one hand and subjective 'lifeworld' on the other.¹² Only thus, he believed, could philosophy regain its lost vocation of providing a reflective and critical account of the various episodes in its own prehistory that had brought this situation about.

In order for Husserl's project to succeed it would have to pursue an immensely difficult course, one that led (in Derrida's phrase) between 'the Scylla and Charybdis of logicizing structuralism and psychologistic geneticism'.¹³ That is to say, it must respect both the necessary rigours of a transcendental critique and the requirement that thinking not give way before a drive toward system and method – a 'structuralist' ideal of conceptual closure – that would ignore or suppress whatever lay beyond its methodological reach. For on this latter account there is no possible means of understanding how the mind can have access to those various thoughts, meanings, intentions, discoveries, or acts of reflective self-knowledge that have made up the history of the natural and the human sciences to date. Yet it is also the case – and here Husserl is fully in agreement with Frege – that no such understanding could ever be achieved if it rested on a purely psychological appeal to ideas in the mind of this or that originating thinker or subsequent enquirer.¹⁴ For it is only in virtue of their objectivity (their 'absolute ideal

¹¹ See especially Derrida, *Speech and Phenomena* (op. cit.).

¹² Edmund Husserl, *Formal and Transcendental Logic*, trans. Dorian Cairns (The Hague, Martinus Nijhoff, 1969); also *The Crisis of European Sciences and Transcendental Phenomenology*, trans. David Carr (Evanston, Northwestern University Press, 1970); *Logical Investigations*, two vols., trans. J. N. Finlay (New York, Humanities Press, 1970); *Cartesian Meditations: an introduction to phenomenology*, trans. Cairns (Nijhoff, 1973); *Experience and Judgement: investigations in a genealogy of logic*, in Ludwig Landgrebe (ed.) trans. J. S. Churchill and K. Ameriks (Northwestern University Press, 1973); *Ideas: general introduction to pure phenomenology*, trans. W. R. Boyce Gibson (London, Collier MacMillan, 1975).

¹³ Derrida, 'Genesis and Structure' (op. cit.) p. 158.

¹⁴ See Gottlob Frege, *Foundations of Arithmetic*, trans. J. L. Austin (Oxford, Blackwell, 1959); also *Translations from the Philosophical Writings of Gottlob Frege*, in Peter Geach and Max Black (ed.) (Blackwell, 1952) and Frege, *Logical Investigations* (New Haven, Yale University Press, 1977).

objectivity', as Husserl is quite willing to construe it) that the truth-claims of the sciences, pre-eminently those of mathematics and geometry, can be handed down through a tradition of thought which provides for their constant 'reactivation' and also for the process of continuing refinement, elaboration, and critique. However this must also be a 'living' tradition in the sense that it cannot exist in isolation (in 'absolute ideal objective' isolation) from those various essentially *repeatable* acts of discovery – of conscious or reflective grasp – which constitute the history of the discipline and which subsequently make all the difference between rote-like mechanical learning and genuine conceptual grasp. Thus objectivism should not go so far as to treat those discoveries as somehow pertaining to a realm of Platonic truths that exist – and have always existed – quite apart from the process of their coming-to-light through advances in human knowledge. For, according to Husserl, there is a sense in which even 'primordial intuitions' such as those of Euclidean geometry must have both a genesis and a history. That is to say, they cannot be understood except on the presumption that they once occurred to some investigative mind (that of the 'original' geometre) in the first act of discovery, and were then taken up into a sequence of further such acts whereby that knowledge was maintained and progressively developed.

Hence, no doubt, the charge of 'psychologism' that has often been levelled against Husserl by analytic philosophers who have taken their lead from Frege's review of his *Philosophie der Arithmetik*.¹⁵ As I have said, it is a charge that Dummett repeats in qualified form, since he allows – more so than earlier critics such as Ryle – that Husserl devoted considerable effort to maintaining a version of the Fregean distinction between subjective 'ideas' (the province of empirical psychology) and objective 'concepts' (those that possess transcendental validity-conditions).¹⁶ However Dummett is in the end unconvinced that Husserl was able to uphold this distinction with sufficient clarity or rigour. Thus his argument amounts to a careful re-statement of the standard 'analytic' case against philosophy in the recent 'continental' (post-Husserlian) line of descent. On this view it is the chief fault of such thinking, even where it claims 'transcendental' warrant, that there is always an appeal to *ideas in the mind* of this or that individual thinker, ideas that are somehow (impossibly) required to provide a guarantee of objectivity and truth. Much better – so the argument runs – had these thinkers taken the alternative route that avoids all the inbuilt problems and dilemmas of epistemology from Descartes to Husserl by adopting a logico-semantic approach on the Fregean model.

¹⁵ See Ryle, *Collected Papers*, Vol. 1 (op.cit.); also Frege's *Philosophical and Mathematical Correspondence*, ed. Brian McGuinness, trans. Hans Kaal (Oxford, Blackwell, 1980).

¹⁶ Dummett, *The Origins of Analytic Philosophy* (op. cit.); also Frege: *philosophy of language*, rev. edn. (London, Duckworth, 1981) and *The Interpretation of Frege's Philosophy* (Duckworth, 1981).

Now Derrida is far from suggesting that Husserl was able to resolve those problems. On the contrary, he shows how intractable were the various tensions and conflicts of priority in Husserl's project, among them (as I have said) those that emerge between the strictly incompatible claims of genesis and structure, content and form, diachrony and synchrony, or 'expressive' and 'indicative' signs. More generally, it is the conflict between phenomenology and structuralism, understood not so much as particular (culture-specific) movements of thought but rather as two opposed projects that have always exerted a hold upon philosophy, often – as is evident with Husserl – in highly unstable conjunction. I must now quote at length from Derrida's essay 'Genesis and Structure' since I want to bring out both its close engagement with these problems in Husserlian thought and the precise relationship that exists between Derrida's critique and the kinds of argument typically brought against Husserl by commentators in the 'other' (analytic) tradition. 'In Husserl's mind at least', Derrida writes:

there was never a 'structure-genesis' problem but only a privilege of one or the other of these two operative concepts . . . In this phenomenology, where, at first glance, and if one takes inspiration from traditional schemas, motifs of conflict or of tension appear numerous (it is a philosophy of essences always considered in their objectivity, their intangibility, their apriority; but, by the same token, it is a philosophy of experience, of becoming, of the temporal flux of what is lived, which is the ultimate reference . . .), one finds no clashes; and the mastery of the phenomenologist at work would have assured Husserl of a perfect serenity in the usage of these two always complementary operative concepts. Phenomenology, in the clarity of its intention, would be offended, then, by our preliminary question.¹⁷

This 'question' is precisely that which arises when exegetes of Husserl – Derrida and Dummett among them – take it as by no means self-evident that those two dimensions of Husserlian thought can be perfectly harmonized or reconciled. Hence what Derrida more compactly describes as 'the principled, essential, and structural impossibility of closing a structural phenomenology'.¹⁸ Hence also Dummett's conclusion that Husserl was never able to achieve his twofold (and contradictory) aim of providing a transcendental justification for what remained, on his account, essentially subjective (or ideational) modes of knowledge and experience.

Up to this point, therefore, Derrida's and Dummett's readings of Husserl have a good deal in common and should perhaps be seen as a further indication of the current convergence of interests between philosophers in the two traditions. At any rate there is no reason – customary prejudice apart – for continuing to place them firmly on opposite sides of the typecast 'analytic' versus 'continental' line. Nevertheless it would be wrong to sink the

¹⁷ Derrida, 'Genesis and Structure' (op. cit.) p. 156.

¹⁸ Ibid, p. 162.

difference altogether and suggest in a vaguely ecumenical spirit that these thinkers are saying much the same thing, give or take a few localized peculiarities of technical idiom. For we should then be adopting Richard Rorty's advice to the effect that nothing hangs on these seemingly specialized intra-philosophical disputes, save perhaps the preferred self-image of various intellectuals who opt to cultivate this or that language-game, style, discourse, 'kind of writing', or whatever.¹⁹ In which case it could scarcely be worth pursuing any fine distinctions or detailed points of disagreement between Derrida's and Dummett's readings of Husserl. These could only come down to a difference in the language, the preferred 'final vocabulary', that each thinker chose to deploy in the business of interpreting Husserl's text. That is to say, there would be nothing further at stake, no appeal to properly 'philosophical' criteria of truth, logic, rational consistency, evidential grounds, and so forth, that could possibly settle the issue between them or provide some means of assessing their rival accounts. Thus, for Rorty, such disputes are entirely pointless in so far as they involve incommensurable language-games which must always be talking at cross-purposes, without any prospect of achieving consensus over a range of agreed-upon terms, concepts, or normative criteria.

This idea is of course familiar enough from various present-day contexts of debate, among them post-Kuhnian philosophy of science, post-Quinean talk of ontological relativity and the 'theory-laden' character of observation-statements (along with the reciprocal 'underdetermination' of theory by evidence), and a whole variety of kindred arguments from supporters of a cultural-relativist approach to 'science studies' and the strong programme in sociology of knowledge.²⁰ All these are taken pretty much for granted in Rorty's version of the argument. What gives that version its distinctive twist is the idea that Derrida has brought this lesson home by showing that philosophy is indeed just another kind of writing, one that can exploit all manner of literary tricks – metaphor, fiction, irony, parody, the full range of linguistic or rhetorical devices – in order to wean us off the old-fashioned belief in

¹⁹ See for instance Richard Rorty, *Contingency, Irony, and Solidarity* (Cambridge, Cambridge University Press, 1989); *Objectivity, Relativism, and Truth* (CUP, 1991) and *Essays on Heidegger and Others* (CUP, 1991).

²⁰ See Quine, 'Two Dogmas of Empiricism' (op. cit.); Thomas Kuhn, *The Structure of Scientific Revolutions*, 2nd ed. (Chicago, University of Chicago Press, 1961); Peter L. Berger and Thomas Luckmann, *The Social Construction of Reality: a Treatise on the Sociology of Knowledge* (Harmondsworth, Penguin, 1967); David Bloor, *Knowledge and Social Imagery* (London, Routledge & Kegan Paul, 1976); Barry Barnes, *T. S. Kuhn and Social Science* (Oxford, Blackwell, 1982); Steve Fuller, *Science* (London, Sage, 1997); E. Doyle McCarthy, *Knowledge as Culture: the New Sociology of Knowledge* (London, Routledge, 1996); also my discussion of the 'strong programme' and related developments in Christopher Norris, *Against Relativism: Philosophy of Science, Deconstruction and Critical Theory* (Oxford, Blackwell, 1997).

its constructive, rigorous, truth-seeking virtues.²¹ Thus, despite his occasional pretence of even-handedness, Rorty clearly sides with Derrida as the writer who has gone furthest toward ‘deconstructing’ (that is to say, toward debunking or rendering absurd) such quaintly philosophical notions. And indeed, the whole drift of Rorty’s thinking, from *Philosophy and the Mirror of Nature* to his latest publications, has been a passage of increasingly ironic detachment from ‘analytical’ philosophy in its various forms, and a turn toward literature (fiction especially) as the ‘kind of writing’ most likely to promote an attitude of healthy scepticism in this regard.²²

I shall now offer another lengthy citation from Derrida’s ‘Genesis and Structure’ by way of suggesting: (1) what is wrong with Rorty’s account of Derrida; and (2) – on related grounds – just where Derrida’s reading of Husserl engages *analytically* with issues raised by Dummett and other Anglophone commentators. This passage is all the more relevant in so far as it concerns questions in the philosophy of mathematics which also go to the heart of Dummett’s Frege-inspired understanding of issues in logic, philosophical semantics, and the theory of knowledge. ‘Husserl’s originality’, Derrida writes:

Is to be recognized in that (a) he distinguishes number from concept, that is, from a *constructum*, a psychological artefact; (b) he underlines that mathematical or logical synthesis is irreducible to the *order* – in both senses of the word – of psychological temporality; (c) he bases his entire psychological analysis on the *already given* possibility of an objective *etwas überhaupt*, which Frege will criticize under the denomination *bloodless specter* (*blutloses Gespenst*) but which designates the intentional dimension of objectivity, the transcendental relation to the object that no psychological genesis can institute but can only presuppose in its own possibility. Consequently, the respect for arithmetical *meaning*, for its *ideality* and its *normativity*, forbids Husserl any psychological deduction of the number at the very moment when both his stated method and the tendencies of the period should have pushed him toward one. It remains that the intentionality presupposed by the movement of genesis is still conceived by Husserl as a *trait*, as a *psychological structure of consciousness*, like character and the state of something factual. Now, the meaning of the number can do very well without the intentionality of a factual consciousness. This meaning, that is, this ideal objectivity and normativity is precisely independent from any factual consciousness; and Husserl quickly will be obliged to acknowledge the legitimacy of Frege’s criticisms; the essence of the number derives from psychology to the same extent as does the existence of the North Sea. Moreover, neither unity nor zero can be engendered on the basis of a multiplicity of positive acts, facts, or psychic events. What is true for arithmetical unity is also true for the unity of every object in general.²³

²¹ See Rorty, ‘Philosophy as a Kind of Writing: an essay on Derrida’, in *Consequences of Pragmatism* (Brighton, Harvester, 1982) pp. 89–109.

²² Rorty, *Philosophy and the Mirror of Nature* (Oxford, Blackwell, 1980); also *Contingency, Irony, and Solidarity* (op. cit.).

²³ Derrida, ‘Genesis and Structure’ (op. cit) pp. 157–8.

I want to make four main points about this passage in ascending order of specificity. First, it is a piece of *analytic* commentary and typical of Derrida's writings on Husserl, not merely in the honorific sense that it examines certain concepts or conforms to certain minimal requirements of textual close-reading. The passage also merits that description in so far as it raises crucial questions concerning the logical form of Husserl's arguments, the issue of priority between 'structure' and 'genesis', and the extent to which any transcendental argument (one that starts out from the conditions of possibility for thought and knowledge in general) can explain or accommodate whatever belongs to the dimension of lived or intentional experience. Second, it offers a *critique* of Husserlian phenomenology that is no less rigorous than Dummett's – and indeed a good deal more so – for approaching these issues (so to speak) 'from inside', that is to say, from a standpoint achieved by working through the various problems that arise in the course of Husserl's project. Third, it treats those problems *not* as having resulted from a mere wrong turn toward 'psychologism', 'subjectivism', etc., but rather as strictly unavoidable problems, *aporias* in the precise usage of that term, that will always confront any rigorous enquiry into the genesis, history, and validating logic of concepts in the exact sciences.

Whence (fourth) the most important difference between Derrida's and Dummett's readings: that where Dummett in the end takes Frege's side on the issue of 'structure' *versus* 'genesis', Derrida refuses to see this question as definitively closed either way. For it is, he argues, a chief virtue of Husserl's thinking that it keeps these problems steadily in view, unlike the analytic (or 'structuralist') approach that claims direct access to a supposed realm of 'absolute ideal objectivity', or the alternative (psychogenetic) approach that thinks to ground knowledge in acts of individual consciousness, and thus encounters all the well-known problems pointed out by, among others, Frege and Wittgenstein. Thus: how could analysis ever gain access to those ideal objective truths if not by way of intuitions or concepts that must at some point have occurred to a conscious mind in the act of reflective grasp? But, on the other hand, how could such knowledge be achieved and passed on were it not for the distinction that Frege draws between subjective 'ideas' and objectively valid 'concepts'? Analytic philosophy is characterized for the most part by its stress on this latter line of argument as against any kind of 'mentalist' or 'subjectivist' approach, including (as some would have it) Husserl's project of transcendental phenomenology. However, it is far from evident *either* that Husserl should properly be charged on this count *or* that philosophy in the analytic mode can indeed push through with its programme of expunging all reference to acts of consciousness. For in that case it could offer no justification – except in tautological or purely circular terms – for those various presumptive laws of thought (such as non-contradiction and excluded middle) which are taken to define the very nature and scope of logical enquiry. Such justification must finally be sought, so Husserl argues, in those structures of

thought that are progressively revealed through a process of transcendental critique, or a rigorous 'bracketing' of all that pertains to the realm of merely psychological or subjective ideas.²⁴

What is therefore at issue between the two lines of descent from Frege and Husserl is the question whether certain disciplines – pre-eminently mathematics and logic – should be thought of as requiring this further appeal to constitutive acts of consciousness. From the analytic standpoint any such appeal is ruled out on the grounds: (1) that it involves a retreat to naïve 'psychologism'; and (2) that it has been rendered otiose by the advent of a logico-semantic approach which can henceforth provide all the necessary criteria of truth, objectivity, and method. From the Husserlian standpoint, conversely, that argument falls in with just those kinds of unreflective positivist thinking which had taken hold in many quarters of the natural and the human sciences alike. Hence the various symptoms of 'crisis' that Husserl diagnosed in his writings of the 1930s, a crisis engendered by the widening gulf between, on the one hand, a purely instrumental or objectivist conception of reason, and on the other an extreme reactive retreat into forms of irrationalist, vitalist, or cultural-relativist thought.²⁵ The only way through and beyond this crisis – so Husserl argued – was the path marked out by the project of transcendental phenomenology, that is to say, by a process of rigorous critical reflection on the genesis and structure of all experience and knowledge, from the most basic (pre-predicative) level to the most advanced forms of conceptual understanding. 'From the start', Derrida writes:

Husserl refuses, and will always refuse, to accept the intelligibility and normativity of this universal structure as manna fallen from a 'heavenly place' (*topos ouranios*), or as an eternal truth created by an infinite reason. To seek out the subjective origin of arithmetical objects and values, here, is to turn back toward perception, toward perceptual ensembles, and toward the pluralities and totalities found in a premathematical organization. By virtue of its style this return to perception and to acts of colligation or numeration yields to the then frequent temptation vaguely named 'psychologism'. But Husserl indicates his reservations on more than one score and he never reaches the point of construing an *actual* genetic constitution as an epistemological validation.²⁶

This last point is crucial for grasping what is wrong with the received 'analytic' view which holds Husserl to have fallen into just that error, and which ignores – or discounts – all those passages of closely-worked argument where he elaborates the threefold distinction between psychological, eidetic, and transcendental modes of judgement. Indeed, it was on these grounds precisely that Husserl claimed to have transformed and radicalized

²⁴ See entries under Note 12, above.

²⁵ See especially Husserl, *The Crisis of European Sciences* (op. cit.).

²⁶ Derrida, 'Genesis and Structure' (op. cit.) p. 157.

the tradition of epistemological critique descending from Descartes to Kant and beyond. Just as Kant took issue with Descartes for confusing those properly distinct orders of thought, knowledge and experience, so Husserl in his turn criticized Kant for not having followed that argument through with sufficient clarity and rigour.

My point here is that Derrida stands in a similar relation to Husserl: a critical relation that leads him to diagnose the various problems and aporias in Husserl's thought, such as the unresolved tension between 'genesis' and 'structure', while also affirming the value of that project as a strictly indispensable resource for any further such critical-investigative treatment. Hence, as Derrida describes it:

the deepening of a work which leaves intact what has been uncovered, a work of excavation in which the baring of both the genetic foundation and the original productivity not only neither shakes nor ruins the superficial structures already unearthed, but also brings eidetic forms once again to light, that is the 'structural a prioris' – this is Husserl's expression – of genesis itself.²⁷

Of course it may be said – most likely from an 'analytic' standpoint – that these are mere metaphors (drawn from the fields of archaeology, architecture, geology, etc.) and can thus scarcely serve to advance our understanding of issues in logic, epistemology, or philosophy of language. Moreover, as Derrida remarks, Husserl's entire discourse is permeated by these and kindred metaphors, among them, notably, the terms 'genesis' and 'structure', neither of which can be construed in anything like its (presumptive) 'literal' sense. All the same such figures of thought are indispensable to Husserl's project since there exist no alternative words or expressions (no plain-prose literal equivalents) that could serve to articulate the points at issue.²⁸ For that matter, it can be shown that analytic philosophy is likewise dependent on a range of figural resources – such as the distinction between 'literal' and 'metaphoric' sense, or the very term 'analysis' (= 'untying a knot') – which are strictly examples of the figure *catachresis*, that is to say, metaphors that cannot be cashed out into any straightforward non-metaphorical paraphrase. But to make this point, as Derrida does, is *not* to deny that advances in knowledge can indeed come about through the analysis of various kinds of metaphor in various distinct contexts or regions of enquiry. For there is no valid argument from the fact that thinking is often conducted in or through metaphors to the conclusion that any results thus produced are *for that very reason* necessarily devoid of cognitive, scientific, rational, or knowledge-conducive import. This could only be the case if metaphor served as the merest of ornamental adjuncts to language in its

²⁷ Derrida, 'Genesis and Structure' (op. cit.) p. 156.

²⁸ See also Derrida, 'White Mythology: metaphor in the text of philosophy', in *Margins of Philosophy* (op. cit.) pp. 207–71.

‘proper’ (literal) usage, or as a makeshift substitute for other, more adequate modes of representation.

Such a view has indeed been maintained at different times by philosophers of various persuasion, whether rationalists (like Plato and Descartes) anxious to purge their thinking of reliance on seductive figures of thought, or empiricists from Locke to the Vienna Circle who saw no legitimate place for metaphor in a language confined to observation-statements and logical constructions out of them. However it is a view that can scarcely stand up against those detailed arguments from history and philosophy of science which point to the formative role of metaphor in the process of conceptual paradigm-change or the elaboration of new scientific theories.²⁹ On this point Derrida is clearly in agreement with philosophers, among them Max Black and Mary Hesse, who have made a strong case for the indispensability of metaphor as a vital creative-exploratory resource in the natural sciences and elsewhere.³⁰ However, that case would be severely weakened if it came to no more than the Rorty-style ‘textualist’ idea that since scientists, philosophers and others always have resort to metaphorical forms of expression, therefore we should simply give up on the attempt to distinguish or theorize the different types of metaphor, and henceforth try to create as many new language-games as possible. For this is just the flipside – the opposite extreme – of the idea that metaphor is merely a distracting ornament or an obstacle in the way of clear and precise analytical thought.

III

Now it seems to me that there is close connection between, on the one hand, this issue of metaphor in the discourse of science and philosophy and, on the other, those arguments against Husserlian phenomenology deployed by philosophers in the Anglo-American analytic camp. It can best be brought out by reference to Gaston Bachelard’s conception of scientific paradigm-change and of the role in that process which has often been played by metaphors, analogies, and modes of ‘naïve’ (anthropomorphic or image-based) thinking.³¹ For it is Bachelard’s point, taken up by Derrida, that

²⁹ On this topic see also Max Black, *Models and Metaphors* (Ithaca, N.Y., Cornell University Press, 1962); Eva Feder Kitay, *Metaphor: its cognitive force and linguistic structure* (Oxford, Clarendon Press, 1987); W. H. Leatherdale, *The Role of Analogy, Model and Metaphor in Science* (Amsterdam, North-Holland, 1974).

³⁰ Black, *Models and Metaphors* (op. cit.); also Mary Hesse, *Models and Analogies in Science* (London, Sheed & Ward, 1963).

³¹ See Gaston Bachelard, *La formation de l’esprit scientifique* (Paris, Corti, 1938); *Le rationalisme appliqué* (Paris, Presses Universitaires de France, 1949); *Le matérialisme rationnel* (P.U.F., 1953); *The Philosophy of No: a philosophy of the new scientific mind* (New York, Orion Press, 1968); *The New Scientific Spirit* (Boston, Beacon Press, 1984); also G. Lafrance (ed.), *Gaston Bachelard* (Ottawa, University of Ottawa Press, 1987); Mary Tiles, *Bachelard: science and objectivity* (Cambridge, Cambridge University Press, 1984).

science can no more dispense with such heuristic aids and devices than it can dispense with the labour of analysis, of ongoing 'rectification and critique', whereby they are progressively developed and refined to the stage of a more adequate conceptual grasp.³² And this argument finds a parallel in Bachelard's approach to what might be called (in Husserlian terms) the issue of 'genesis and structure' as applied to matters of scientific truth, knowledge, and theory-construction. For it is a distinctive feature of that approach that it rejects any direct Cartesian appeal to the thinking subject as a source of indubitable truths or 'clear and distinct ideas', while also denying that philosophy of science can break altogether with the epistemological paradigm, that is to say, the necessary reference to acts of consciousness in so far as such acts are presupposed in the very idea of scientific discovery or knowledge acquisition.

This is what Bachelard means by his phrase 'applied rationalism' (*le rationalisme appliqué*): a process of rigorously critical reflection on the sources of scientific knowledge which allows for the role of concepts, intuitions, thought-processes, etc., but which treats them as always susceptible to change – sometimes to radical transformation – under newly emergent conditions of scientific practice.³³ In part this is a matter of philosophy's need to catch up with developments (such as non-Euclidean geometry, relativity theory, and quantum mechanics) that present large obstacles to any theory based on Cartesian – or indeed Kantian – notions of a self-assured access to truth through the mind's innate powers of intuitive-conceptual grasp.³⁴ But it can also be seen as rejecting the idea, the typically 'analytic' idea, that philosophy of science should always be conducted in the mode of 'rational reconstruction', that is, by applying covering-law theories or hypothetico-deductive principles that are answerable only to our present best standards of rational enquiry, and which need not at any point go by way of whatever is supposed to have occurred in the mind of this or that enquirer. For this latter approach will appear naïvely 'subjectivist' or 'psychologistic' only if one takes it for granted – as do many analytically-inclined critics of Husserl – that there is no real difference (abstruse terminology aside) between the orders of empirical, eidetic and transcendental subjectivity.

Thus Bachelard's argument, more simply put, is that knowledge could never have progressed beyond the stage of naïve sense-certainty were it not for this capacity of critical thought to revise and modify its own preconceptions in response to new challenges or obstacles. These latter may arise in the form of anomalous experimental findings or theories that are based on the best current evidence but which then turn out to entail problematical or strongly counter-intuitive consequences. Or again, they may result from the

³² See Derrida's commentary on Bachelard in 'White Mythology' (op. cit.) pp. 259–62.

³³ See especially Bachelard, *Le rationalisme appliqué* (op. cit.).

³⁴ On this topic see especially C. Alberto Coffa, *The Semantic Tradition from Kant to Carnap: to the Vienna Station* (Cambridge, Cambridge University Press, 1991).

kind of 'internal' blockage that occurs when thought is too rigidly bound by certain fixed habits of belief. Such would be, for instance, the concepts supposedly self-evident to reason that Descartes took as his epistemological anchor-point, or primordial intuitions (such as those embodied in the classical Newtonian space-time framework) which Kant considered to be given a priori as the very condition of possibility for human knowledge and experience. Thus, according to Bachelard, '[t]he danger of immediate metaphors in the formation of the scientific spirit is that they are not always passing images; they push toward an autonomous kind of thought; they tend to completion and fulfilment in the domain of the image'.³⁵

This is not to deny that metaphors and images can play a role – sometimes a decisive role – in the progress toward more adequate scientific concepts. Bachelard's work itself provides many striking examples of the way that such advances in knowledge come about through the process of ongoing rectification and critique.³⁶ However, that process cannot be understood unless in the context of a jointly historical and epistemological enquiry into the various episodes which constitute its development to date. This in turn requires that it take due account of the various 'obstacles' that thought confronted as well as the various means through which it overcame them, whether by replacing intuitive metaphors with more adequate concepts, refining certain useful or productive metaphors to a higher degree of conceptual precision, or, in some cases, adopting heuristic metaphors that go beyond the limits of existing (inadequate) descriptive or explanatory concepts. Which is also to say that philosophy of science must always at some point concern itself with issues of epistemology or with the genesis of scientific theories through acts of consciousness that mark a definite stage of advance in the production of scientific knowledge. And this despite Bachelard's insistence that ultimately the truth of theories is in no way dependent on their intuitive appeal, their (supposed) a priori warrant, or other such epistemological criteria. For it is precisely his point that some of the most signal advances in fields such as geometry, mathematics, and subatomic physics have been achieved *despite and against* what appeared self-evident to previous enquirers. Indeed, those beliefs may remain self-evident at a commonsense-intuitive level and yet have become scientifically obsolete through just the kind of critical-evaluative process that Bachelard describes.

Bachelard therefore concurs with philosophers like Black and Hesse, not to mention Aristotle, in rejecting the 'ornamentalist' notion of metaphor and stressing its role as a vital resource in the acquisition of scientific knowledge. However he also insists (unlike Rorty and the current 'strong' textualists) that scientific metaphors are always open to criticism since they can

³⁵ Bachelard, *La formation de l'esprit scientifique* (op. cit.) p. 81; cited by Derrida, 'White Mythology', p. 259.

³⁶ See Note 31, above.

work just as often to retard that process as to bring about new discoveries. Thus it is wrong – explanatorily vacuous – to treat them as just so many optional ‘language-games’ or Rortian ‘final vocabularies’, invented mainly out of boredom with old ways of talking and therefore best dropped as soon as they become literalized in the discourse of ‘normal’, workaday science.³⁷ For this is to abandon every last distinction between concept and metaphor, knowledge and belief, progressive and degenerating research-programmes, or scientific truth as defined by our current best theories and methods of enquiry, and what once passed for scientific truth according to some then-prevalent way of thinking. It is an outlook that falls in readily with the so-called ‘strong’ programme in sociology of knowledge and with other movements of thought, such as its offshoot discipline of ‘science studies’, which likewise operate on a strict principle of parity as between various belief-systems past and present, scientific and non-scientific, or ‘true’ and ‘false’ according to our own (culture-specific) lights.³⁸ Again, Rorty’s writings have the propaedeutic virtue of pushing this case as far as it will go and drawing implications that are tactfully downplayed by other, more cautious exponents. What drops out completely on his account is any idea that there might exist different criteria or validity-conditions for assessing (say) theories in the natural sciences and interpretive approaches in literary criticism or cultural anthropology. For in the one case as in the other – so this argument runs – the only distinctions that are really worth drawing are those between ‘normal’ and ‘abnormal’ language-games, or conventional and unconventional modes of discourse, or the sorts of description that standardly apply during periods of routine activity and those that are typically thrown up during periods of revolutionary turmoil.³⁹

Of course it will appear from the ‘normal’ viewpoint that there exists a far more basic distinction, one having to do with the natural and the human or social sciences, their respective object-domains, and the kinds of knowledge, or better understanding, that can properly be sought in each case. Thus the natural sciences are aimed toward providing an ever more detailed, comprehensive, and predictively accurate knowledge as applied to objects and events in the physical domain, while the humanistic disciplines mostly adopt a hermeneutic or interpretive approach. However, according to Rorty, this distinction is one that holds good only for the purposes of

³⁷ See various of the essays collected in Rorty, *Objectivity, Relativism, and Truth* (op. cit.).

³⁸ See entries under Note 20, above; also Harry Collins and Trevor Pinch, *The Golem: what everyone should know about science* (Cambridge, Cambridge University Press, 1993); Steve Fuller, *Social Epistemology* (Bloomington, Ind., Indiana University Press, 1988); Bruno Latour and Steve Woolgar, *Laboratory Life: the social construction of scientific facts* (London, Sage, 1979); Steve Woolgar, *Science: the very idea* (London, Tavistock, 1988); Steve Woolgar (ed.) *Knowledge and Reflexivity: new frontiers in the sociology of knowledge* (London, Sage, 1988).

³⁹ See especially Rorty, ‘Texts and Lumps’, in *Objectivity, Relativism, and Truth* (op. cit.) pp. 78–92.

present-day 'normal' thinking and research, that is to say, for people (whether scientists, philosophers, literary critics, or whatever) who see no problem in placidly accepting the current disciplinary *status quo*. For others, – the strong textualists (Rorty among them), it will seem just an irksome and boring constraint, a refusal to explore the full range of opportunities for 'redescribing' (say) the notional objects of particle physics through metaphors borrowed from literary theory, or enlivening the discourse of cultural criticism with analogies from molecular biology, or shaking analytic philosophy out of its dogmatic slumbers by exposing it to challenges from way outside its supposed expert domain.

Thus there is no reason in principle, certainly no reason 'in the nature of things', why the physical and the human sciences should stick to their normal (academically accredited) styles of talk and avoid mixing language-games or picking up metaphors from any other discourse that happens to take their fancy. For this is just the way that 'revolutionary' changes come about, whether through Kuhnian paradigm-shifts in the discourse of scientific knowledge, through transformations in the currency of philosophic talk such as that which Rorty hopes to speed along by the switch from 'analytic' to 'hermeneutic' ways of thinking, or through strong-revisionist readings of texts in the literary canon. It is also, he urges, why we need to stop fretting about all those old 'epistemological' problems, problems that can now be seen, with the benefit of hermeneutic hindsight, to have involved nothing more than a handful of metaphors mistakenly treated as concepts, metaphors such as that of the mind as a 'mirror of nature' or of knowledge as a matter of attaining ever more accurate representations of 'external' reality. Indeed, the very notion of epistemology as 'first philosophy', as something which philosophers need to sort out before moving on to other (e.g. ethical or aesthetic) concerns, is just a part of that normalizing discourse that has exerted such a hold on thinkers from Kant to the present-day analytic mainstream. Once that notion is overcome, so Rorty believes, then philosophy can take its rightful place as just another 'kind of writing' with no delusions of epistemological grandeur but with a lot more to say on matters of shared human and cultural concern. And the best way to shed those delusions is to wean philosophers off their fixation with science – especially physics – as a privileged discourse or exemplary model for the conduct of disciplined, truth-seeking thought. Rather, we should view it as one set of language-games amongst all the others currently on offer, and liable, like them, to lapse into routine habits of talk if it is not periodically shaken up by importing 'revolutionary' idioms or metaphors from whatever source-texts come most readily to hand. For there is nothing intrinsic to the various objects of scientific knowledge: atoms, molecules, DNA proteins, viruses, chemical affinities, weather patterns, geological formations, astrophysical events, or whatever; that marks them out as properly and uniquely suited to certain kinds of disciplined scientific enquiry. All the more reason that we should now give up on this deluded quest for 'objective' knowledge and

truth, along with the kinds of self-authorizing 'expert' discourse that have served mainly to block communication between and across the various disciplines. And if that means occasionally picking up tips about nuclear physics from literary theorists or about art criticism from molecular biologists then so much the better, Rorty thinks, since we shall otherwise be forever stuck in the rut of this or that 'normal' discourse and resist any new or 'revolutionary' challenge to habituated modes of thought.

It is not hard to see how such ideas have taken hold among those – Rorty and others – disenchanted with the rigours of old-style analytic philosophy. For one thing they could point to Quine's hugely influential essay 'Two Dogmas of Empiricism', with its attack on the logical-empiricist distinction between analytic and synthetic statements (or 'truths of reason' and 'matters of fact'), and its doctrine of thoroughgoing meaning-holism as applied to the physical sciences and every other branch of human enquiry.⁴⁰ Thus, for Quine, the entirety of knowledge at any given time can best be envisaged as a 'fabric' or 'web' of beliefs with certain items (the so-called logical 'laws of thought') occupying a region close to the centre and hence often considered immune from revision, while others (e.g. empirical observation-sentences) are located at or near the periphery, and can thus be revised or replaced under pressure from conflicting evidence. However it is Quine's contention that we can hang on to any item of belief 'come what may' if we are willing to make adjustments elsewhere in the web or to redistribute predicates over the fabric with a view to avoiding internal contradictions. Most often this will mean reinterpreting some discrepant or anomalous observation-sentence so as to preserve a 'central' belief such as one's commitment to the logical laws of bivalence or excluded middle. But it is not unthinkable, and may indeed prove necessary in certain fields such as quantum mechanics, to reverse this process and abandon or modify the logical 'laws' in order to save empirical appearances or retain a theory's predictive power in respect of those same appearances. In such cases it can only be a matter of achieving the maximum possible coherence in our overall system of beliefs, and accepting science (or the best current theory in the physical sciences) as our most reliable means of deciding where changes have to be made.

From all of which it follows, according to Quine, that we must relativize ontology (or questions of the sort: which things exist? what are their properties, distinctive attributes, spatio-temporal locations? etc.) to the particular framework or conceptual scheme in which those candidate items appear. Nor is this argument restricted to specialised issues such as those of quantum non-locality or the wave/particle dualism, where advanced work in the physical sciences may be thought to entail some drastic change either to our common-sense physical ontology or to the accepted logical 'laws of thought'. For on Quine's account it applies just as much to the sorts of disagreement that might

⁴⁰ Quine, 'Two Dogmas of Empiricism' (op. cit.).

crop up between those who (like himself) place considerable trust in the findings of physical science and adherents to various other world-views, mythologies, or systems of religious belief. Hence his well-known remark in 'Two Dogmas of Empiricism' that, in point of epistemological footing, there is nothing to choose between such diverse items as centaurs, Homer's gods, numbers, mathematical sets, and brick houses on Elm Street. The question whether or not these items 'exist' is simply the question as to whether or not they figure in some given 'ontological scheme', or some method of distributing quantified truth-values over the whole range of statements which make up that particular scheme.

Of course Quine himself has some fairly strong preferences in this regard. Thus, 'speaking qua lay physicist', he is happy enough to admit a predilection for brick houses and mathematical sets over centaurs and Homer's gods. But speaking qua philosopher and one firmly disabused of those two 'last dogmas' along with all their attendant metaphysical baggage, he can see no way to justify that preference except as a matter of 'pragmatic inclination'. Certainly it is not an issue that can be settled by adducing epistemological criteria or by claiming warrant for certain beliefs through critical scrutiny of our various, more or less reliable, processes of knowledge-acquisition. For Quine is adamant that these issues must be dealt with from a strictly logical point of view, and that there is no room for any such appeal to 'subjectivist' (intuitive or a priori) notions of meaning, validity and truth.

IV

Let me now bring together the various lines of argument developed so far in this essay. My chief point in relation to Quine is that his anti-epistemological approach results from his rejecting any grounds for knowledge or criteria of truth other than those canonically expressed in the form of modern post-Fregean symbolic logic. He arrives at this position mainly on account of the problem about quantifying into 'opaque' (intentional or belief-related) contexts, a problem that Frege himself addressed, though without drawing such sceptical conclusions, in the second part of his essay 'On Sense and Reference'.⁴¹ Moreover, Quine's argument goes far beyond the standard 'analytical' objection to subjectivist or psychologistic talk of mind-states, intentions, beliefs, utterer's meaning, and so forth. For he is just as much opposed to the notion of 'meaning' in its other (intensional-with-an-s) sense, that is to say, the idea that these issues can be treated in a properly objective or rigorous fashion by adopting a logico-semantic approach that distinguishes the various orders or structures of meaningful statement. After all, it is Quine's chief purpose in 'Two Dogmas' to knock away the

⁴¹ Frege, 'On Sense and Reference', in *Translations from the Philosophical Writings of Gottlob Frege* (op. cit.) pp. 56–78.

entire system of concepts on which this project had been thought to rest, among them the analytic/synthetic distinction and its logical-empiricist counterpart, i.e. that between logically self-evident truths of reason and empirically warranted observation-sentences. This he does by maintaining: (1) that all attempts to define what counts as an 'analytic' statement will involve a purely circular appeal to other notions, such as that of 'synonymy', for which again we possess no adequate (non-circular) definition; and (2) that we are likewise at a loss to define what counts as a straightforward empirical observation-statement since such statements are always in some degree 'theory-laden' and those theories themselves 'underdetermined' by the best evidence to hand. Thus the upshot of Quine's reasoning, in accord with his overall sceptical approach, is to block not only the dubious appeal to subjectivist notions of meaning and truth, but also any attempt to avoid that appeal by providing more adequate definitional criteria for the various sorts of statement that figure in the natural sciences and elsewhere.

Other commentators, notably Hartry Field, have raised what I take to be some strong counter-arguments to Quine's doctrines of ontological relativity and radical meaning-variance.⁴² On their view, briefly summarized, it is possible for certain terms to retain a sufficient continuity of reference across different theories, observation-languages, paradigms, scientific world-views, etc. just so long as we possess adequate criteria for deciding which of their various possible meanings are operative in any given context. Thus, for instance, the term 'mass' has been applied in very different ways down through the history of its various usages, from Newton to Einstein's special and general theories of relativity. But we need not conclude with Quine and Kuhn that those usages are strictly incommensurable, since the meaning of 'mass' is a function of its role within the total fabric of beliefs-held-true at this or that time, or its shifting currency from one paradigm to the next. Rather, there are several distinct senses of the term: 'absolute mass', 'rest mass', 'inertial mass', 'relative mass', which have separated out at different stages in the history of scientific thought, and which now form a complex semantic field with various degrees of partial overlap between them. What thus provides a basis for inter-paradigm translation or comparison is the fact that we can now, from a post-Einsteinian viewpoint, assign a suitably restricted sense to each particular occurrence of the term as it figured in the discourse of Newtonian physics. These latter are conserved as limiting cases, or as still possessing a regional validity, within the more comprehensive framework of General Relativity.

This helps to pinpoint one major problem with the Quine/Kuhn case for radical meaning-variance: that it fails to offer any adequate explanation of our knowledge of the growth of knowledge. More specifically, it can make no

⁴² See for instance Hartry Field, 'Theory Change and the Indeterminacy of Reference', *Journal of Philosophy*, Vol. 70 (1973) pp. 462–81 and 'Quine and the Correspondence Theory', *Philosophical Review*, Vol. 83 (1974) pp. 200–28.

sense of the way that scientific progress comes about through a constant process of mutual interrogative exchange between theory and experiment, concept and intuition, or hypothetical conjecture and results obtained in the course of empirical research. On Quine's account this process is best viewed as a matter of pragmatically adjusting various items in the total fabric of belief so as to minimize local tensions and maintain some measure of overall coherence. But in that case it is hard to see why scientists should ever have revised their thinking in response to some perceived anomaly, let alone entertained the kinds of drastic shift from one to another 'paradigm' that have signalled major revolutions in scientific thought. For they would always pragmatically opt to 'adjust' whichever item entailed least disturbance to current habits of belief, whether by redistributing predicates here and there in the system, by finessing some otherwise 'recalcitrant' piece of empirical evidence, or else, at the limit, by revising the logical 'laws of thought' so as to prevent conflicts at some other point. What finds no place in this view of scientific paradigm-change is the constant dialectical tension between theory and experiment which typifies science even during its periods of Kuhnian 'normal' activity, and which sometimes, during periods of pre-revolutionary 'crisis', generates problems that cannot be resolved by any process of flexible negotiated trade-off like that described by Quine or Kuhn. Such a view will appear in some degree plausible only if one accepts the twin Quinean theses of ontological relativity and meaning-holism, the latter reinforcing the former in so far as it entails the idea of radical meaning-variance between different ('incommensurable') paradigms. However, as Field and others point out, there is no need to draw these highly problematic conclusions if indeed it can be shown that terms retain some stability of sense and reference, even in cases (like 'mass') where they have undergone successive redefinitions from one period to the next. For it is just this partial fixity of meaning, across and despite paradigm-shifts, that explains how genuine conflicts can arise between two rival theories, or between a given theory and the observation-data which might have been expected to confirm it.⁴³

On the Quinean account such conflicts would perhaps register briefly and then be resolved through a process of holistic adjustment at various points along the manifold threads connecting the 'core' of logical beliefs to the observational 'periphery'. But this metaphor conspicuously ducks the issue as to just why certain problems can be settled by improving or refining the means of empirical observation, while others require a more far-reaching process of conceptual change, and others again – in the rarest case – a revision of what standardly or properly counts as a logical 'law of thought'. Quantum mechanics is frequently taken, by Quine and others, as a powerful illustration of the fact that changes of thinking in the physical sciences can force radical changes at every point in the fabric of accredited beliefs. These

⁴³ See also Sandra Harding (ed.), *Can Theories Be Refuted? essays on the Duhem-Quine thesis* (Dordrecht & Boston, D. Reidel, 1976).

changes, so it is argued, might extend all the way from high-level theories (which in the quantum context are famously 'underdetermined' by the evidence) to the ground-rules of classical bivalent logic (which may perhaps need revising so as to admit paradoxical conclusions like the wave-particle dualism or the impossibility of assigning precise simultaneous values of particle location and momentum).⁴⁴ Thus quantum mechanics would appear to offer strong support for Quine's ontological-relativist thesis that there is no 'law of thought' or item of belief so firmly entrenched that it might not be subject to radical revision under pressure from conflicting evidence.

However there are reasons to reject this argument, or at any rate to think it decidedly premature. First, it is based on just one interpretation of quantum mechanics, the 'orthodox' Copenhagen account, which even its advocates (Niels Bohr most prominent among them) admit to be fraught with unresolved problems and paradoxes.⁴⁵ Second, that account has itself been challenged by alternative (Bohm-type 'hidden variable') theories which entail nothing like such a drastic affront to our basic conceptions of scientific truth and method.⁴⁶ And third, whatever the puzzles about quantum mechanics, they cannot be viewed as lending support to a doctrine of full-scale ontological relativity, or radical meaning-holism, where everything is thought of as somehow simultaneously up for grabs, from observation-data to the ground-rules of logical reasoning. For in that case it is hard to explain why those puzzles have continued to vex the minds of so many physicists and philosophers of science, from the year 1900 (when Planck first enounced the basic principles of quantum mechanics in connection with the phenomenon

⁴⁴ See for instance J. S. Bell, *Speakable and Unspeakable in Quantum Mechanics: collected papers on quantum philosophy* (Cambridge, Cambridge University Press, 1987); Martin Gardner, 'Is Quantum Logic Really Logic?', *Philosophy of Science*, Vol. 38 (1971), 508–29; Peter Gibbins, *Particles and Paradoxes: on the limits of quantum logic* (CUP, 1987); Susan Haack, *Deviant Logic: some philosophical issues* (CUP, 1974); Tim Maudlin, *Quantum Non-locality and Relativity: metaphysical intimations of modern science* (Oxford, Blackwell, 1983); Peter Mittelstaedt, *Quantum Logic* (Princeton, N.J., Princeton University Press, 1994); Hilary Putnam, *Mathematics, Matter and Method* (CUP, 1979); Michael Redhead, *Incompleteness, Nonlocality and Realism: a prolegomenon to the philosophy of quantum mechanics* (Oxford, Clarendon Press, 1987).

⁴⁵ See for instance Niels Bohr, *Atomic Theory and the Description of Nature* (Cambridge, Cambridge University Press, 1934); *Atomic Physics and Human Knowledge* (New York, Wiley, 1958); *The Philosophical Writings of Niels Bohr*, 3 vols. (Woodbridge, Conn., Ox Bow Press, 1987); also John Honner, *The Description of Nature: Niels Bohr and the philosophy of quantum physics* (Oxford, Clarendon Press, 1987) and Dugald Murdoch, *Niels Bohr's Philosophy of Physics* (Cambridge, Cambridge University Press, 1987).

⁴⁶ See especially David Bohm, *Causality and Chance in Modern Physics* (London, Routledge & Kegan Paul, 1957); David Bohm and B. J. Hiley, *The Undivided Universe: an ontological interpretation of quantum theory* (London, Routledge, 1993); David Z. Albert, 'Bohm's Alternative to Quantum Mechanics', *Scientific American*, Vol. 270 (May 1994), 58–63; F. J. Belinfante, *A Survey of Hidden Variable Theories* (Oxford, Pergamon Press, 1973); James T. Cushing, *Quantum Mechanics: historical contingency and the Copenhagen hegemony* (Chicago, University of Chicago Press, 1994); Peter Holland, *The Quantum Theory of Motion* (Cambridge, Cambridge University Press, 1993).

of black-body radiation), through Einstein's well-known series of debates with Bohr about quantum non-locality and the wave/particle dualism, to more recent discussions in the wake of Bell's Theorem and its sharpened re-statement of the issues.⁴⁷ No doubt the standard (Copenhagen) view is one that consorts well enough with Quine's approach since it holds, in pragmatic-instrumentalist fashion, that the quantum theory has achieved a high measure of predictive success, which is all that should properly be expected of it, considering the kinds of problem that arise when one seeks to interpret those predictions in realist or causal-explanatory terms. But again there is an obvious problem here, namely the fact that every major development in quantum mechanics from its inception down has been spurred by just such problems concerning its conceptual foundations, its empirical warrant, its status *vis-à-vis* the 'laws' (or conventions) of classical two-valued logic, and so forth.

Thus, for instance, Einstein's disagreements with Bohr concerned precisely the question whether quantum mechanics could be thought of as a 'complete' physical theory, given the drastic choice that it seemed to impose between abandoning local realism – an option which Einstein found wholly unacceptable – or maintaining the possibility of some alternative account that would conserve the quantum formalisms but also the tenets of Special Relativity and the ground-rules of scientific reason.⁴⁸ To Einstein the choice seemed clear: *against* any kind of 'spooky action-at-a-distance' (such as that entailed by remote simultaneous or faster-than-light quantum correlations) and *for* the maintenance of bivalent logic plus the speed of light as an absolute constant forbidding such phenomena. Something had to give, both parties agreed, since the quantum theory despite its impressive degree of confirmation as a matter of statistical-predictive warrant nevertheless turned out to entail such highly paradoxical or counter-intuitive results. Where Einstein opted for retaining as much as possible of the standard (Special-Relativity) framework, Bohr took the view that any ultimate 'reality' subtending these quantum phenomena might lie forever beyond reach of an adequate descriptive-explanatory account. That is to say, we had no choice but to operate with the concepts and categories of 'classical' physics, even though there existed a body of evidence, from empirical observation and thought-experiments, which pointed to their not holding good for processes or events at the subatomic level.⁴⁹

⁴⁷ Bell, *Speakable and Unsayable in Quantum Mechanics* (op. cit.); also James T. Cushing and Ernan McMullin (eds.) *Philosophical Consequences of Quantum Theory: Reflections on Bell's Theorem* (Indiana, University of Notre Dame Press, 1989).

⁴⁸ See the papers by Einstein and Bohr collected in P. A. Schilpp (ed.) *Albert Einstein, Philosopher-Scientist* (Evanston, Ill., Library of Living Philosophers, 1949); also Arthur Fine, *The Shaky Game: Einstein, Realism, and Quantum Theory* (Chicago, University of Chicago Press, 1986).

⁴⁹ See entries under Note 46, above; also Henry J. Folse, *The Philosophy of Niels Bohr: the Framework of Complementarity* (Amsterdam, North-Holland, 1985).

Bohr's philosophy thus worked out as a kind of extreme instrumentalism – 'never mind what it is or how it works so long as the formalisms match the results!' – combined with a version of the Kantian argument for a realm of noumenal reality to which we can never gain access, confined as we are to the phenomenal realm of humanly possible knowledge where intuitions must be brought under adequate ('classical') concepts. To this extent it might seem perfectly in keeping with the Quine/Kuhn doctrine of ontological relativity, or the notion that entities may be said to 'exist' just in so far as they play some role in this or that paradigm, conceptual scheme, theoretical framework, etc. Even so it may be argued that Bohr arrived at these conclusions only through a process of consequential reasoning on the evidence, or extrapolating logically from that evidence through a series of ingenious thought-experiments, which retained a great many of those same classical concepts. Thus in order for his arguments *contra* Einstein to possess probative force they required: (1) the resources of classical (two-valued) logic without which they could prove nothing either way; and (2) the supposition that any evidence thereby obtained, whether through empirical observation or through conjectural testing in 'the laboratory of the mind', must have reference to processes or events in the quantum-physical domain. For in default of (2) those arguments would belong to a realm of purely abstract hypotheses and proof-procedures, a realm (that is to say) where the operative truth-conditions are those of mathematics and formal logic rather than the physical sciences. There would then be no difference in point of ontological status between, say, the consequences of Gödel's undecidability-theorem with respect to mathematical knowledge and the consequences of quantum mechanics – e.g. Heisenberg's Uncertainty-Principle – as applied to our knowledge of what goes on at the subatomic level. That Gödel espoused a strictly Platonist view of mathematical truth is all the more reason for not running these arguments together as if they amounted to much the same thing.⁵⁰ Such is at any rate the pyrrhic upshot of Bohr's instrumentalist approach: that the whole apparatus of quantum mechanics, its concepts, descriptions, predictive hypotheses, probability functions, etc., should be treated as a framework inescapably imposed by our own cognitive limits, and hence as affording no possible access to the putative 'reality' of quantum-physical events.

Of course it is still open for defenders of Bohr to protest that this was exactly his point. Thus we *must* continue to deploy such 'classical' concepts, – from the ground-rules of logic to the framing of causal explanations and the idea that there exists a salient distinction between observer and observed – since they are built into the very nature and structure of human understanding. And this despite our knowledge (somehow achieved from within that conceptual prison-house) that their deployment is no longer

⁵⁰ See the essays collected in S. G. Shanker (ed.) *Gödel's Theorem in Focus* (London, Routledge, 1987).

valid once the threshold is crossed from the macro- to the microphysical realm. So it is not hard to see why Quine – and others of a kindred persuasion – have used the example of quantum mechanics as a prime exhibit in their generalized case for the framework-relative character of even our most basic, firmly entrenched items of belief. What is not so clear is their justification firstly for adopting one particular (Bohr-derived) construal of the quantum-physical evidence, and secondly for assuming its lessons to apply outside and beyond the quantum domain. For it is a major problem with this interpretation – pointed out by Schrödinger through his gruesome thought-experiment concerning the cat in the sealed box – that it fails to explain how and where any cut-off point can be drawn between (supposedly) observer-induced microphysical events like the collapse of the wave-packet and (presumably) observer-independent events like that of the cat's having died or not before the box was opened for inspection.⁵¹

I shall not here attempt to summarize the range of views – some of them mind-boggling in the extreme – which have grown up around this particular topic. Suffice it to say that it remains one of the strongest objections to the Bohr/Heisenberg 'orthodox' theory regarding such matters as the intrinsic uncertainty attaching to quantum phenomena and the question whether certain observer-induced measurements (e.g. of anti-correlated particle spin in widely separated systems) may entail a form of retroactive causality. However, my main point here is that none of these issues could ever have arisen, or these problems even registered as problems, had physicists adopted the Quinean approach and counted everything in principle open to revision, from the logical 'laws of thought' to the theory-laden terms that figured in their various observation sentences. The same applies to more recent arguments for and against the 'hidden variables' theory, among them those of J. S. Bell concerning quantum non-locality and the existence (as predicted by the standard theory) of superluminal anti-correlation effects.⁵² For in this case also it is a matter of showing that one is constrained to *make a choice* between various alternative ways of resolving the issue, each of which requires some specified revision to accepted ('classical') concepts and categories, but none of which involves an outlook of wholesale revisionist licence such as that recommended by Quine.

Thus it follows from Bell's Theorem that any causal-realist interpretation which adopts a Bohm-type 'hidden variables' postulate while conserving the well-established quantum-statistical formalisms will also *necessarily* be constrained to admit the existence of superluminal interaction between widely separated particles. As so often, this result was first obtained through a thought-experiment similar to those conducted by Einstein and Bohr, and

⁵¹ See Erwin Schrödinger, *Letters on Wave Mechanics* (New York, Philosophical Library, 1967); also John Gribbin, *In Search of Schrödinger's Cat: quantum physics and reality* (New York, Bantam Books, 1984).

⁵² See Notes 45 and 48, above.

only later, with the advent of more sophisticated measuring devices, borne out by a series of ingenious laboratory tests.⁵³ But in neither case could the experiment have served any purpose (or narrowed the range of compossible options) had it been carried out in the Quinean belief that any 'recalcitrant' data could always be conjured away, whether by redistributing predicates, reinterpreting the observational evidence, or revising the logical ground-rules so as to accommodate any number of otherwise contradictory findings. Indeed, the main reason why Bell's Theorem has assumed such prominence in recent debate is the clarity with which it sets out this issue as between the rival (Copenhagen *versus* Bohm-type) theories and their various logical entailments. Thus Bohm for one accepted – following Bell – that any future defence of a realist or hidden-variables account would have to make terms with the idea of superluminal 'action at a distance', at least in so far as it wished to conserve the basic quantum formalisms. (In fact he saw no problem with this idea just so long as the phenomenon could not be utilized to transmit information, a consequence which is anyway safely ruled out on other practico-theoretical grounds.⁵⁴) However – to repeat – these issues would never have arisen or the alternatives been posed so sharply and productively had Bell, Bohm and other physicists espoused Quine's principle of wholesale ontological relativity.

As I have said, this doctrine finds its closest parallel in Bohr's interpretation of quantum mechanics, or rather Bohr's agnostic refusal to offer any such interpretation, given what he saw as the unbridgeable gulf between quantum 'reality' and the descriptive-conceptual-explanatory resources available to human enquirers. But in Quine's case the problems are even more acute since he extrapolates directly from the micro- to the macro-physical domain and thus raises the issue of Schrödinger's perhaps ill-fated cat in a peculiarly trenchant (if typically insouciant) way. That is, Quine takes it pretty much for granted: (1) that quantum mechanics may indeed force revisions at any point in the total 'fabric' of accredited beliefs; (2) that this fabric extends all the way from analytic (logical) 'truths of reason' to synthetic or empirical observation-statements; and (3) that we can therefore justifiably conclude that ontological relativity affects every item and object of belief, whether concerning such issues as particle location and momentum or macroscopic items like Schrödinger's cat. However one could turn these arguments around point for point and mount a case against Quine's general doctrine as well as his analogy with quantum physics. Thus: (1) there are reasons, some of which I have instanced above, to reject that full-scale holistic view of the sorts of revision forced upon us by developments in the quantum-theoretical domain; (2) these reasons have much to do with the necessary role of logical thought (and of 'classical' two-valued logic at that)

⁵³ A. Aspect, P. Grangier and C. Roger, 'Experimental Realisation of the E. P. R. Paradox', *Physical Review*, Vol. 48 (1982) 91–4.

⁵⁴ See entries under Note 45, above.

as a means of defining the relevant issues in quantum mechanics as elsewhere; and (3) those issues are hopelessly blurred if one fails, like Quine, to distinguish different *ontological* levels of enquiry and the different *epistemological* lessons that may properly be drawn concerning them. To which one might add (item 4) that Quine himself, in his text-book writings on philosophy of logic, explicitly rejects the idea that it could ever be a valid (or rational) option to abandon such basic principles of logic as bivalence or non-contradiction.⁵⁵ How this might square with his argument in 'Two Dogmas of Empiricism' is perhaps a matter best left for Quine's more devoted exegetes.

V

So there is, I submit, no good reason to accept the case for such wholesale revisionist claims with regard to logic, epistemology, and philosophy of science. This case is open to criticism on various grounds, among them the objections to radical meaning-variance raised by commentators like Hartry Field, and also the fact – as I have argued above – that quantum mechanics provides nothing like the measure of support for those claims that Quine and others have supposed. However, there is still the question as to whether 'analytic' (or logico-semantic) approaches of the kind here discussed are themselves fully adequate to meet the challenge mounted by proponents of ontological relativism. For these approaches share a deep-laid suspicion of epistemology in any of the forms that have characterized the 'other' (i.e. post-Kantian or broadly continental) tradition of thought. That is to say, they reject all versions of the appeal to so-called 'subjectivist' or 'psychologistic' criteria, even though the main thrust of that tradition, from Kant to Husserl and beyond, has been precisely to establish its critical distance from any such dubious grounds of appeal.

No doubt it is the case that there occurred a parting-of-the-ways after Kant's First *Critique*, with one line of thought focused chiefly on issues from the 'Transcendental Analytic', while the other (Hegel-to-Heidegger) line can be seen as a working-out of certain problems bequeathed by the 'Transcendental Aesthetic'. But this is to ignore some very large differences of view within (as well as between) the two supposedly antagonist camps. Thus Husserl must surely be counted an 'analytic' philosopher except on the narrowest definition of that term, that is to say, the sense in which it equates with a purely logico-semantic approach, and hence excludes any critical reflection on the grounds or conditions of possibility for human thought, knowledge and experience. (We have seen already how this prejudice marks the various Anglophone responses to Husserl even among relatively well-informed commentators like Ryle and Dummett.) Conversely, there are

⁵⁵ Quine, *Philosophy of Logic* (op. cit.).

signs of a growing *rapprochement* between, on the one hand, those 'post-analytic' schools of thought inspired in large part by Quine's ideas about ontological relativity and meaning-holism, and, on the other, hermeneutically-oriented theories which take their lead from thinkers like Heidegger and Gadamer.⁵⁶ What finds no place within either camp, whether old-style analytic or new-style hermeneutic, pragmatic, 'strong textualist', etc., is the kind of epistemo-critical approach carried on by Husserl and also represented by that modern French tradition in philosophy and history of science descending from Bachelard. To the analytic way of thinking this approach is irredeemably subjectivist, whatever its claims to operate at a level quite distinct from the realm of empirical psychology or Cartesian appeals to the thinking subject as a source of a priori self-evident truth. Meanwhile, to those in the hermeneutic camp, it appears just a backsliding movement of thought which clings to old ('foundationalist') concepts and categories, and which has not yet shed the illusory idea of knowledge or truth as somehow consisting in accurate representations of a mind-independent world.

At this point we can turn to Derrida's argument in 'White Mythology' concerning the relation between metaphor and concept, or again (more specifically) the role of metaphor in that process of ongoing 'rectification and critique' which marks the emergence of scientific concepts from a matrix of pre- or proto-scientific thought. Undoubtedly there is a sense in which Derrida (like Bachelard) could acknowledge the validity of Rorty's attack on such residual Cartesian metaphors as those of the mind as a 'mirror of nature' or of truth as an accurate matching-up between veridical propositions and factual states of affairs. After all, as we have seen, it is one of Bachelard's chief arguments that scientific progress most often comes about through the critique of naïve, imagistic, or anthropocentric metaphors, figures of thought that have so far blocked the passage toward more adequate knowledge. Such was the precondition for those advances in geometry, mathematics, and the physical sciences which required a break with the evidence of naïve sense-certainty, or with received (commonsense-intuitive) conceptions of space, time, and number.

To this extent Bachelard would be wholly in accord with Rorty's deconstruction of the Cartesian mind-as-mirror metaphor, that is to say, his argument that this image has held us captive for much too long, and should now be replaced by some other (less constrictive or artificial) way of thinking. However he would not, any more than Derrida, go along with Rorty's further advice that we should also give up on the entire post-Cartesian project of epistemological enquiry, whether in the 'continental' line of

⁵⁶ See for instance Hubert L. Dreyfus, *Being-in-the-World: a commentary on Heidegger's Being and Time, Division One* (Cambridge, Mass., M.I.T. Press, 1991); Mark Okrent, *Heidegger's Pragmatism: understanding, being, and the critique of metaphysics* (Ithaca, N.Y., Cornell University Press, 1988); also Rorty, *Essays on Heidegger and Others* (op. cit.).

descent from Kant to Husserl or as transposed into the 'analytic' idiom of thinkers such as Frege, Russell, and their latter-day progeny. Rather, for Bachelard, it is a question of continuing to think these issues through with a maximum attentiveness to various blind-spots of naïve or intuitive self-evidence, but always with the aim of progressively removing those obstacles through a process of ongoing rectification and critique. Least of all would he endorse Rorty's textualist (or 'strong-descriptivist') idea that this is just another, merely optional style of talk which is now long past its sell-by date and should therefore be abandoned in the quest for new and more adventurous language-games. For it is crucial to Bachelard's entire project – his philosophy of science as well as his phenomenological studies in the 'psychoanalysis' of poetic imagery⁵⁷ – that there are indeed valid distinctions to be drawn between metaphors conducive to the advancement of scientific knowledge and metaphors which, belonging to the realm of pre-scientific 'reverie', can only constitute a hindrance or an 'obstacle' to any such progress.

Philosophy therefore has its place marked out as a discourse that mediates between these spheres, that acknowledges the formative role of certain metaphors in the process of scientific theory-construction, but which none the less resists any Rorty-style argument for treating all language-games (science and philosophy included) as metaphorical in character and hence as on a par with respect to issues of knowledge and truth. The point is best made in a lengthy footnote to 'White Mythology' where Derrida remarks on this aspect of Bachelard's thought. Thus:

the metaphoric obstacle is not only an epistemological obstacle due to the persistence, in the field of science, of nonscientific schema deriving from the popular imagination or from the philosophical imaginary. The metaphoric obstacle is sometimes a philosophical one, when scientific schema are imported into a philosophical domain without rhyme or reason . . . A certain naïve scientism on the part of the philosopher can transform scientific discourse into a vast reservoir of metaphors or 'models' for the hurried theoretician. 'Science offers itself to the philosopher as a particularly rich collection of well constructed and well tied together knowledge. In other words, the philosopher simply demands *examples* of science.' These examples 'are always mentioned, never developed. Occasionally, the scientific examples are commented upon according to principles which are not scientific ones; they lead to metaphors, analogies, generalizations'.⁵⁸

Of course Derrida is here not writing directly *in propria persona* but offering a close paraphrase of Bachelard's argument, along with some apt citations to amplify the point. Thus he should not be taken as straightforwardly

⁵⁷ See for instance Bachelard, *The Poetics of Space*, trans. Maria Jolas (Boston, Beacon Press, 1969) and *The Poetics of Reverie*, trans. Daniel Russell (Beacon Press, 1971).

⁵⁸ Derrida, 'White Mythology' (op. cit.) p. 260n.

endorsing the claim that metaphors can be sorted into various well-defined types, or that philosophy is equipped to distinguish clearly between scientific metaphors, those with the potential to produce genuine advances in knowledge, and others belonging to the realm of intuitive or poetico-creative 'reverie'. After all, there are many passages in this essay which argue to precisely contrary effect, i.e. that the philosophic discourse on metaphor is itself shot through with figures of thought such as the very term 'metaphor', along with its antonyms 'concept' and 'literal' (meaning), which that discourse can never fully comprehend or control.

Thus, as Derrida writes:

there is no properly philosophical category to qualify a certain number of tropes that have conditioned the so-called 'fundamental', 'structuring', 'original' philosophical oppositions: they are so many 'metaphors' that would constitute the rubrics of such a tropology, the words 'turn' or 'trope' or 'metaphor' being no exception to this rule.⁵⁹

But to make this point – as Derrida makes it through a close reading of what philosophers have written about metaphor, from Aristotle and Cicero to Descartes, Kant, Hegel, Nietzsche, and Bachelard – is *not* just to say, in Rortian fashion, that we might as well give up on the hopeless attempt to explicate the workings of different sorts of metaphor in relation to particular object-domains or specific disciplines of thought. For it is still undeniably the case that some (and not other) metaphors have proven their scientific worth through a process of 'rectification and critique' which sets them apart from the general run of 'naïve', 'imagistic', or 'anthropocentric' tropes. Moreover, any theory that seeks to explain this fact will need to follow the example of thinkers like Aristotle and Bachelard, those who have acknowledged the centrality of metaphor to every branch of human creative thought, but who have also endeavoured to distinguish clearly between its various structures and modes of application. Hence Bachelard's caution against the kinds of indiscriminate borrowing – whether by science from 'common-sense' intuition, by one branch of scientific knowledge from another, or by philosophy from the natural sciences – whose likeliest result is to block any further conceptual advance.

It is worth pursuing this argument in more detail since it helps to explain what is chiefly at issue between philosophies of science in the two traditions. When Bachelard defends the relative autonomy of philosophic discourse – its need to maintain a certain critical distance from scientific (or quasi-scientific) images and metaphors – he is no doubt thinking of those positivist trends which have periodically captured the high ground of French intellectual culture. But his comments also have a pointed relevance to issues in

⁵⁹ Ibid, p. 229.

recent 'analytic' debate, in particular those surrounding the claim, most vigorously championed by Quine, that philosophy of science is (or should be) 'all the philosophy we need'. Epistemology gets house-room only on condition that it emulate the natural sciences (physics especially) and thus becomes a branch of behavioural psychology, based on the various assenting or dissenting dispositions that speakers manifest when confronted with this or that item of empirical evidence.⁶⁰ It can thereby avoid having recourse to such problematic notions as 'meaning', 'belief', or 'propositional content', all of which involve – Quine argues – a lapse into bad old mentalist ways of thought. In so far as the physical sciences are taken as 'limn[ing] the true and ultimate structure of reality', epistemology must follow suit by espousing a strictly extensionalist semantics along with a likewise pared-down ontology, one that allows no intensional (meaning-based) or intensional (belief-based) predicates. Thus, in Quine's famous phrase, 'to be is to be the value of a variable', with truth-values ranging over just those items that are picked out by the quantified first-order predicate calculus. Any theory that exceeds those limits – as for instance by including intensional terms or claiming to quantify into modal contexts – is therefore not a candidate for serious attention on Quine's austere physicalist terms.

This objection would apply with yet greater force to those projects (such as Husserl's and Bachelard's) that adopt a jointly structural and genetic approach to issues in epistemology or philosophy of science. That is to say, they take account of the *processes of thought* by which knowledge advances beyond the stage of naïve sense-certainty, by which intuitions are subject to ongoing rectification and critique, or again – as in Bachelard's case – by which certain metaphors are tried and tested to the point of more adequate conceptual definition. From a Quinean viewpoint it can be no defence of these projects that they claim to be grounded in the very nature and capacities of human cognitive grasp, as opposed to adopting a merely 'subjective' or 'psychologistic' approach. For of course this argument lacks all force if one takes it, following Quine, that there is just no way – least of all a 'transcendental' way – of upholding the distinction between a priori truths-of-reason and matters-of-fact whose warrant is empirical or always subject to revision under pressure from conflicting evidence.⁶¹ On this account Husserl would be labouring under the same metaphysical delusion as Kant, or indeed the same mistake as those logical empiricists (Carnap chief among them) who thought to establish a clear boundary between first-order observation statements and higher-level theories or covering-law principles. Nor could Bachelard escape this charge even though – as we have seen – he rejects any notion of direct intuitive or a priori access to truth, and considers advances in scientific knowledge as coming about

⁶⁰ See especially Quine, *Word and Object* (Cambridge, Mass., MIT Press, 1960) and *Ontological Relativity and Other Essays* (New York, Columbia University Press, 1969).

⁶¹ Quine, 'Two Dogmas of Empiricism' (op. cit.).

most often through a break with precisely such self-confirming habits of thought. For in his case also there is a constant appeal to that process of self-aware critical reflection through which thinkers have managed to attain the requisite distance or measure of detachment from their own pre-existing 'commonsense' intuitions and concepts. That is to say, Bachelard seeks to reconstruct the various stages through which thinking has passed in its progressive attempts to overcome the adherence to 'naïve', 'imagistic', or 'anthropocentric' metaphors. He is thus clearly in breach of Quine's rule according to which we should avoid any reference to intentional (belief-based) contexts, and adopt a parsimonious ontology that admits only the best-supported 'positives' of the physical sciences plus whatever is needed in the way of pragmatically-adjusted logical linkages between them.

However one may doubt whether Quine's physicalist programme can possibly be carried through in the manner he envisages without in the process depriving science and philosophy of science of any normative standards or critical dimension whereby to explain our knowledge of the growth of knowledge. That dimension is effectively squeezed out between, on the one hand, his narrowly physicalist ('naturalized') account of how beliefs are arrived at and, on the other, his relativist thesis that any new items thus acquired can always be suitably revised or adjusted so as to bring them more into line with our various other standing belief-dispositions. What is thereby left entirely unexplained is that process of reasoning through and beyond certain obstacles to thought which has characterized every phase of scientific advance and which provides the main focus of Bachelard's historico-philosophical studies. All that is left of that process, on Quine's account, is a physicalist theory of belief-formation, based on a crudely reductive version of stimulus-response psychology, and a framework-relativized theory of reference which leaves no room for any treatment of science as a rational, constructive, problem-solving endeavour.

VI

So there are good reasons why philosophers of science in the broadly analytic (or 'post-analytic') tradition should take an interest in developments outside that tradition, more specifically, the two lines of thought descending from Husserl and Bachelard. At present there are signs that this process is indeed under way, as witness Michael Dummett's re-evaluative work on Frege and Husserl.⁶² One could also point to a number of recent books (by Hubert Dreyfus, Stephen Mulhall, Mark Okrent, Joseph Rouse and others) which suggest that one way forward from the dead-end legacy of logical empiricism is the way that also leads back to a renewed engagement with

⁶² Dummett, *The Origins of Analytic Philosophy* (op. cit.).

Heidegger and the project of depth-hermeneutical enquiry.⁶³ However this approach runs the risk of appearing to endorse something very like Rorty's 'strong-textualist' or interpretivist line, that is to say, his idea that interpretation goes all the way down, and hence that the only difference between texts and lumps is a difference in the sorts of language we use in describing such things. Thus it tends to pick up on just those aspects of Heidegger's thinking, as likewise of Wittgenstein's later philosophy, which lead to a view of science as merely one 'language-game' or cultural 'form of life' among others, with no special claim in matters of epistemological warrant. To this extent it simply reinforces the idea among 'old-guard' analytic thinkers that Carnap was right in his dismissal of Heidegger, and of 'continental' thinkers generally, as victims of a hopeless bewitchment by language that removed them from the sphere of rational debate about issues in logic, epistemology, and philosophy of science.⁶⁴

In Heidegger's case, I would say, this is not so much a fixed prejudice as a reasonable estimate of the way that his thinking both devalues the achievements of the physical sciences and confuses those issues through a blanket diagnosis of 'Western metaphysics' and its latter-day extension into the sphere of techno-scientific domination over nature and humankind alike.⁶⁵ However the same cannot be said of Husserl's more nuanced, historically detailed and scientifically informed account of the way that a certain (narrowly positivist) conception of scientific reason has become increasingly detached from the sphere of reflective self-critical thought. Nor can it be said of later projects like that of Jürgen Habermas and the second-generation Frankfurt theorists, which continue this enterprise of thinking through the problems and dilemmas of enlightened modernity rather than following Heidegger's path toward a realm of primordial truth-as-revelation or 'authentic' being-in-the-world.⁶⁶ Least of all can the charge be levelled against Bachelard, concerned as he was to specify precisely the relation between pre- (or proto-)scientific and scientific modes of thought, or again, between science and the various ideologies of science that often usurped that title.

This sets his work decidedly apart from other, less discriminate versions of the argument which hold, like the 'strong' sociologists of knowledge, that *all* science is a product of ideological interests, and therefore that one should not prejudge the issue as between the rival merits of (say) Priestley's and

⁶³ See Note 56, above; also Stephen Mulhall, *On Being in the World: Wittgenstein and Heidegger on seeing aspects* (London, Routledge, 1990) and Joseph Rouse, *Knowledge and Power: toward a political philosophy of science* (Ithaca, N.Y., Cornell University Press, 1987).

⁶⁴ See especially Rudolf Carnap, 'The Elimination of Metaphysics through Logical Analysis of Language', in A. J. Ayer (ed.) *Logical Positivism* (New York, Free Press, 1959).

⁶⁵ For further arguments to this effect, see Norris, *New Idols of the Cave: on the limits of anti-realism* (Manchester, Manchester University Press, 1977) and *Against Relativism* (op. cit.).

⁶⁶ See especially Jürgen Habermas, *Knowledge and Human Interests*, trans. J. Shapiro (London, Heinemann, 1971).

Lavoisier's theories of combustion, or Boyle's and Hobbes's conflicting views concerning the existence or non-existence of vacuum phenomena.⁶⁷ It also brings Bachelard out in sharp disagreement with that whole line of thought about metaphor in the texts of philosophy and science which leads to the postmodern-textualist idea of truth as a purely linguistic or rhetorical construct. That idea has itself taken hold, I suggest, very largely as a result of various problems bequeathed by logical empiricism, among them the ease with which a narrowly physicalist theory of belief-acquisition flips over (as with Quine) into a doctrine of wholesale meaning-variance or radical framework-relativism. It is here that 'continental' philosophy of science has some useful lessons to impart. That is, it offers an alternative approach that avoids the sharp 'analytical' dichotomy between context of discovery and context of justification, or the processes of thought involved in scientific theory-change and the various procedures (inductive, hypothetico-deductive, etc.) brought to bear in the evaluation of such episodes with benefit of rational hindsight. But it doesn't go so far as to collapse that distinction altogether, in company with the textualists or strong sociologists, and argue that truth in such matters *just is* what various parties have supposed according to their own best current notions of scientific truth and method. Rather, it seeks to reconstruct the history of science through a critical assessment of the stages of thought that have marked the advancement of scientific knowledge in its questioning of 'naïve', image-based, intuitive, or other such (erstwhile) self-evident truths.

I should also want to claim that Derrida's early work belongs very much in that line of descent, engaging as it does with Husserlian phenomenology on the one hand, and with Bachelard's epistemo-critical philosophy of science on the other. Moreover, it points one possible way forward from the dead-end of logical empiricism, despite the resistances and deep-laid prejudices that have so far marked its reception-history among the heirs to that particular enterprise. At any rate the prospects now appear to be improving for this long-overdue resumption of constructive dialogue between the two intellectual traditions.

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⁶⁷ See Notes 20 and 38, above; also Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the experimental life* (Princeton, N.J., Princeton University Press, 1985) and Norris, 'Why Strong Sociologists Abhor a Vacuum: Shapin and Schaffer on the Boyle/Hobbes controversy', in *Against Relativism* (op. cit.), pp. 265–94.