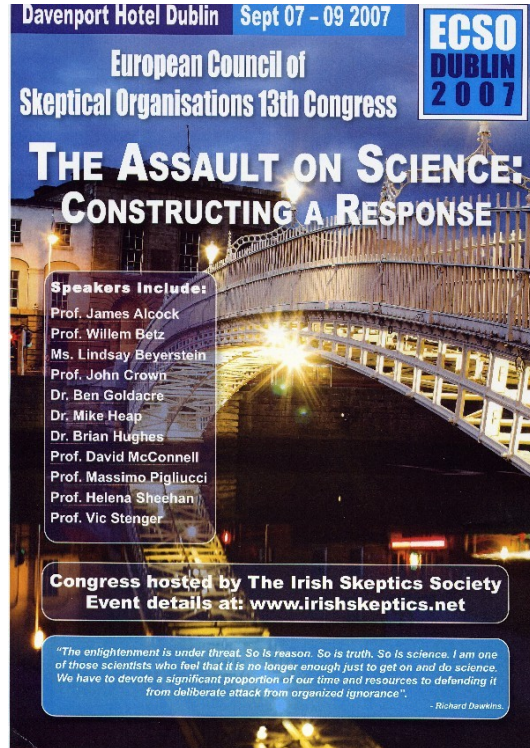


The assault on scientific rationality: historical analysis and epistemological response

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What are the historical origins of the current assault on science that this congress has convened to address? What role has philosophy of science played in accentuating or alleviating this assault? What underlying forces have driven the attack on scientific rationality? Why is there an epistemological crisis of our time? What would be an appropriate epistemological response?

It is not possible, I believe, to understand the assault on science and the role that philosophy of science has played in relation to it in terms of science or philosophy of science alone. Both have reflected a deep-seated crisis in the very notion of scientific rationality. I think it necessary to probe the socio-historical roots of the epistemological fragmentation and confusion in the

fragmentation and confusion of contemporary experience. It plays out in parallel ways within a number of academic disciplines and also within the wider sphere of popular culture.

Science, once seen to be the source of enlightenment and liberation, is now regarded with suspicion and even hostility, sometimes even castigated as mystification and bondage.

Even the natural sciences, once thought to be the rock bottom of our knowledge, are now declared to be only a discontinuous succession of incommensurable paradigms, in respect of which questions of truth or falsity, rationality or irrationality, cannot meaningfully be raised. We are left with no criteria for judging between one theory and another, one paradigm or another. And so, as Feyerabend has declared, 'anything goes'. Astrology or astrophysics: take your pick.

There is a wide spectrum of positions on the question of the epistemological status of science. At opposite poles are positivist and postmodernist responses. There are realist and anti-realist positions, empiricist and anti-empiricist positions. These positions, although they may take esoteric forms in academic journals and conferences, also reflect the tensions of a larger process in the wider culture.

The various forms of empiricism – positivism, neo-positivism, naturalism, marxism – have attempted to shine a clarifying light into the confusion, whereas postmodernism has wallowed in the confusion. Disciples have waxed lyrically, but not lucidly, about Derrida and Deleuze and Lyotard and Lacan and their world of floating signifiers with no signified, their celebration of randomness and fragmentation, their pronouncements of the death of truth, of humanism, of history, of meaning, of reference, of value. However, a reassertion of positivism is not the answer, whatever Dawkins might think.

The intellectual landscape includes everything from the most airy, anti-empirical, rootless theoreticism to the most pedestrian, simple-minded, fact-gathering empiricism. Every sort of false dichotomy proliferates. In so many different areas we find the same parallel trends: the plodding particularity on the one hand and the deconstructionist exotica on the other. Despite the enormous gap between the unreflective simplicity of the one and the hyper-reflexive complexity of the other, both fall back on a pluralism of random fragments of experience, which cannot be unified. Whether it be a modernist belief in autonomous subjectivity or postmodernist pronouncements of the death of the subject, both reflect the inability to integrate experience and to achieve any sort of socio-historical perspective.

Such parallel trends raise the questions: What is it about our times that produces such intellectual fragmentation? Why the persistence of so many false dichotomies? Why all the pronouncements that there are no laws, that there is no truth, that there is no meaning, that there is no progress, that there can be no coherent narrative?

It is my belief that there is something in the very essence of the present social order, which structurally inhibits integrated thinking, which undermines the very foundations of rationality and sanity and morality. There is something at the very core of contemporary experience, which blocks access to totality, which keeps theory flying so far from experience and keeps experience groping so helplessly in the dark. This dynamic penetrates to the very core of personality. Only by breaking its boundaries, only by penetrating to the very source of the society's inner tensions and perceiving the mechanism generating the fragmentation, only by naming the system and taking it on, can the way beyond it be discerned.

Both positivism and postmodernism bear witness to the disintegrative power of contemporary capitalism. Both regard the totality as unrepresentable. This manifests itself on many fronts. A force that has achieved power tends to distract from the nature of its power. In the case of today's global system, the most totalising in the history of the world, there is paralysis of systemic analysis, there are multiple pressures against totalising thinking.

We seem to be caught in a whirlpool of relativity, our heads spinning with the discovery of the enormous variability that has existed over the centuries and in various cultures in numbering procedures, colour nomenclatures, modes of production, socio-political institutions, legal systems, moral codes, aesthetic values, religious beliefs, epistemologies, ontologies, cosmologies. We live amidst a vertigo of conflicting claims. Criteria for distinguishing truth from falsity, rationality from irrationality, fact from fantasy, possibility from absurdity, become ever difficult to formulate in a way that inspires conviction and consent.

The crisis has been several centuries in coming. The decline of feudalism brought the displacement of a single centre of intellectual and moral authority which many had found in catholicism. The medieval synthesis gave way to the exigencies of capitalist accumulation, the protestant reformation and a social order characterised by ever-increasing divisions of labour and ever more atomistic patterns of thinking. In its great expansionary period, explorers of new worlds brought tales of an unimaginable diversity of cultures, customs, codes, criteria. The 18th century, in the great tradition of enlightenment rationalism, sought to make sense of it all by finding some sort of invariance in all the swelling variety and variability in a concept of a timeless order of nature, in an unchanging human essence, in ahistorical and universal principles of rationality and morality. The 19th century, however, found such concepts difficult to sustain, dominated as it was by the idea of evolution, giving rise as it did to a sweeping and demystifying historicism; to a new sense of time and historical process, a new sense of genesis, mutability and upward movement; a new sense of context.

More and more, there was incontrovertible evidence of the natural origins of natural phenomena, of the human origins of human institutions, values, customs, beliefs and criteria of rationality. Eternal verities were discovered to have a time and place of origin and to have been shaped within highly complicated patterns of development, often with lines branching off in the most various directions. No longer could the human species and our institutions, principles and norms be seen as having sprung full blown from the hands of a creator or somehow having a transcendent validity, as these were discovered instead to be products of a long and complex evolutionary history. No longer could one set of beliefs, practices and norms of any one culture or any one period be taken for granted as valid for all cultures and all times. Each culture, it began to be said, could be judged only by its own norms. With the fragmentation continuing yet further, it in time came down to each individual being judged only by his or her own norms.

A consequence of it all has been a far-reaching relativisation of religious beliefs, moral norms, aesthetic values, social customs, socio-political institutions and intellectual disciplines. Cognitive relativism, emerging parallel to various forms of political, moral and aesthetic relativism, came first to the humanities and then to the sciences.

By the early 20th century, the crisis had come even to physics, seemingly the area best able to withstand the rush of the relativist tide. The crisis in physics, a multi-faceted phenomenon, which has undergone various phases and persists to this day, has stemmed from a number of converging

causes. It has often been analysed throughout these phases as if it stemmed purely from problems developing within physics itself and as if a solution could be found within physics alone.

It is certainly true that the crisis emerged as new discoveries called into question traditional concepts of time, space, matter, energy, causality, objectivity. However, it is also true that both classical and post-classical concepts of physics, have been formed within a more encompassing socio-intellectual milieu. Moreover, the various responses to the crisis all reflect the various tensions within the broader intellectual milieu - from the tradition of positivism from Mach through the Vienna Circle on, to the various marxist analyses of the crisis in Caudwell, Bernal, Langevin and Joliot-Curie on, who have sought to demystify the crisis, to the various theologising scientists and scientising theologians, who have mystified the crisis in Sunday sermons, Templeton-funded university courses, celebrity lectures, radio and tv broadcasts, airport best sellers, internet blogs, dvds, always ready to declare that science has come to its limits and there found God once again.

What was for decades the dominant tradition in the philosophy of science - logical positivism and variants upon it - emerged from this crisis. In reaction to the various forms of obscurantism feeding off this crisis, they sought to set scientific rationality once again upon secure foundations, to formulate demarcation criteria, to subject all belief to the clear light of reason and the rigour of experiment. They did so, however, from a base that was too narrow, employing criteria that were too restricted, leaving out of the picture too much that was all too real, excluding historical, psychological, sociological, metaphysical dimensions as irrelevant.

The trajectory of this tradition, from positivism to the many varieties of post-positivist philosophies of science, has reflected the pressure of a complex reality upon conceptions too restricted to give an adequate account of it. The successive modifications of the tradition over the years, from verification to falsification to paradigm shifts to methodological dadism, have been sometimes impressive but still inadequate attempts to come to terms with the metaphysical and historical dimensions of science.

Despite significant departures from the anti-metaphysical and ahistorical heritage of the Vienna Circle, it still cannot be said that philosophers of science have yet brought to bear the full weight of the implications of historicity or world view for science. Moreover, insofar as these dimensions have come into play, they have tended to do so in a negative way, in that they have been perceived as undermining the rationality of science. Many of the current debates are rooted in a persistent inability to reconcile the rationality of science with the metaphysical and socio-historical character of science. In a strange way, the residues of positivism linger on and colour the views of even the most radical anti-positivists.

The underlying question is: How can science be the complex, uncertain, precarious, human process that it is, inextricably bound up with all sorts of philosophical assumptions and with all sorts of wider socio-historical processes, and still be reliable knowledge on nature?

As the drama has played itself out within the philosophy of science, we have been confronted with extreme polarisation:

On the one side, there are those who have responded to the dilemma with attempts to justify scientific rationality by formulating ahistorical, context-independent criteria for judging between rival theories and paradigms. For Popper, Lakatos and Laudan, socio-historical explanation

comes in only where rational explanation fails. Those who think in this way think always in terms of the *intrusion* of social factors, social *constraints*, ideological *distortion*, external *interferences* in science.

Against this trend, I wish to argue that it is a mistake to confine socio-historical explanation to the irrational, to conceive of the impact of social order upon science only in terms of intrusion, constraint, distortion, or to construe the relation of social milieu to science as an external one.

On the other side, there are the historicist currents, responding with an emphasis on the socio-historical character of science which tends towards rejection of any criteria of differential assessment of theories and paradigms and leads in some cases to renunciation of the very notion of scientific rationality. Here I refer to Feyerabend, to the Edinburgh School, to postmodernism. Against these schools, I wish to argue that the full realisation of the socio-historical character of science should not involve renunciation of differential assessment, nor should it undermine the status of scientific rationality.

There are to be sure, various intermediate positions taken by such philosophers of science as McMullin, Newton-Smith, Harré and Hesse, which go a long way towards reformulating a defence of scientific rationality in light of the historicist challenge. They seek to find case by case the right balance between rational factors and social factors. To me, however, there is an unsatisfactory randomness to this account, which sees social factors as playing a part, but a somewhat fortuitous part.

There is also marxism which has affirmed a deeper historicity, a more integral connection between the cognitive and social dimensions of science.

The position I wish to uphold is one which is strongly rationalist and strongly historicist at the same time. In my view, what is required is not simply a matter of conceding the importance of referring to the social context of scientific developments or of working out the right balance between rational and historical considerations. It is a matter of seeing that rationality itself is thoroughly historical. It is a matter of realising fully that rationality itself has a history and is constituted by that history.

Many philosophers are oblivious of the fact that philosophy is historical, except in the most trivial and superficial sense. Even when they do look at the history of philosophy, and many analytic philosophers don't, they do so in a thoroughly ahistorical and non-contextual way, such that anybody could virtually have said anything at any time. The ideas of Plato, Descartes, Hume, Kant, Hegel, Carnap and Quine are treated as discrete and interchangeable units, virtually independent of time and place, as generated in an autonomous activity with no necessary or integral connection to anything else. If temporal sequence or economic, social, political or scientific developments be mentioned, it is only in an accidental or circumstantial way. It is exceedingly rare today to find a philosopher with a real sense of the flow, the movement, the process of the history of philosophy and with a vivid sense of its integral connection with economics, culture, politics and science.

Many analytic philosophers have never studied the history of philosophy. Continental philosophers have dissipated it in a postmodernist reading. Foucault, still much quoted, saw the history of knowledge as characterised by brute facticity and stressed the radical contingency of the concepts emerging at any given time. There is no progress to report, no continuity to be discerned.

There is no theory about the nature of knowledge or society or history. Indeed, there is strong denunciation of the very notion of having one.

The collapse of the idea of progress in the political realm is not unrelated to its collapse in history and philosophy of science. It is time to take it up again, to move beyond the demystifying and debunking operations, to move beyond epistemological paralysis in the face of the problems of false theories, underdetermination, ideology, socio-historical causation.

We need to be more robust, more daring. We need to stop conceptualising knowledge as either 100% certainty or as 0, therefore any opinion is as good as any other. We need to be paralysed by uncertainty, to be more willing to take our risks in an uncertain universe, to stake our lot with well-grounded but uncertified possibilities, with warranted assertibility, with sound probability. We need to go beyond debating between one-sided extremes and re-inforcing fragmented perspectives. We need to forge richer, reconstructed concepts of scientific rationality and scientific progress, in continuity with the older concepts, but incorporating an understanding of all that has brought them into crisis, particularly an understanding of the importance of the socio-historical context of science.

To sketch roughly what I mean in the way of reconstructed concepts:

An insistence on the relevance of history and social context does not rest on the recognition that it is nice to know, or even useful to know, but on the fact that it is *crucial* to know. Human thought cannot be divorced the history and context of human thinking without thoroughly distorting what it actually is. The history of knowledge cannot be abstracted from the process of its development in complex interaction with a whole network of other processes without failing utterly to comprehend what it was really all about. The stages in this process have not been simply sequential, nor have the interactions within it been merely fortuitous. New philosophical trends have not emerged simply because someone thought them up. New scientific theories cannot be exhaustively accounted for by recounting the experimental results.

There is a striking parallelism in the history of ideas between scientific theory, social order and world view. There was reason *why* such modes of thought as mechanism or historicism arose when they did. It was, for example, no accident that the corpuscular theory of matter emerged contemporaneously with individualist social theories, atomistic ontologies, mechanistic cosmologies, protestant theologies and the exigencies of capitalist accumulation. It would be myopic not to see some connection between ideas of the autonomy of reason, art for art's sake, naturalistic fallacy, emotivist ethics and a social order marked by ever increasing division of labour. It could come as no surprise to find that the theory of natural selection in biology arose at the same time and in the same place as the theory of laissez-faire in political economy or that the call for proletarian science in the Soviet Union came into its own during the 1st 5 year plan and not during the new economic policy.

I do not think that it is a matter of looking always for one to one correspondences between ideas and class interests. The connections are not always direct or immediate or conscious. There are many complications, subtleties, overlapping and even countervailing tendencies.

What is involved is a highly complex process. To come to grips with it, I believe it is best to focus on the total zeitgeist of a period, the spirit of the age, the whole interacting nexus, which expresses the tensions of a given social order, forms the fundamental patterns of thought, puts problems on

the agenda, sets the terms of the debate. It is to these overall patterns of thought, and to the realities of the socio-economic orders in which they are grounded, that we should look to understand the history of knowledge. It is the total push and pressure of the age that shapes the scientific imagination as well as everything else. Science develops in terms of core images, key metaphors and philosophical assumptions generated within a much larger process. It is thoroughly within history.

Rationality itself has a history and it is constituted by that history. In our way up from mud and the dark, from our first stumbling experiments with artefacts to its most sophisticated instruments of listening to the rumblings of remote galaxies, our species *homo sapiens* has reached out into its environment and moulded through its praxis the complex cognitive apparatus that many today take as given. But the unfolding of history at every stage entered into and decisively shaped the scientific and philosophical thought process itself. There are no non-contextual, ahistorical norms. Nor is there any need for any. There is no archimedean point. There is no news from nowhere. There is no truth standing above history or beyond history. History is all there is.

There is nothing in any of this that should undermine our confidence in scientific rationality. Quite the contrary. The fact that our canons of rationality are historically forged should not make us conclude that they are groundless, but should highlight for us how well grounded they actually are, for they represent the embodiment of centuries of striving, of trial and error, of continuous refinement or our cognitive apparatus. Our knowledge has its grounding in this process.

Historicity does not imply irrationality, arbitrariness, groundlessness, discontinuity, incommensurability, deconstruction or hyper-reflexivity. It most certainly does not rule out differential assessment of conflicting claims to knowledge, of rival theories and paradigms. On the contrary, it requires it. The historical process by which our embodied knowledge and our criteria for what is to count as knowledge have come to us has been one marked by constant differential assessment of alternatives and continual testing of alternative methods of differential assessment of alternatives. It is to the test of this embodied experience, socio-historically evolved, that we bring every new experience and move our own thinking and even the history of ideas onward.

The foundations of our knowledge are in this process and we do need to seek foundations either in a transcendental realm of pure reason or rock-bottom level of theory-neutral observation statements. We do not need to seek cognitive reliability in criteria of rationality which are context-independent. We do have criteria of rationality and they are all context-dependent and no less reliable for that. We consider beliefs to be rational if they are grounded in experience, in the fullness of experience, if they are open to new experience, if they are logically coherent and if they are structured into an organised system of beliefs. We consider beliefs to be irrational if based on no experience or inadequate experience, if immune from revision in light of further experience, if based on irrelevant considerations, if incoherent, if incompatible with other beliefs held.

There is nothing in any of this to draw us away from historical context. On the contrary. All of it involves reference to experience and experience is always in context. The point is that beliefs must prove themselves in a plurality of contexts, not that they must be independent of context. To assess beliefs, indeed to adjudicate between all the conflicting claims to knowledge in a culture, does not (contra many) involve appeal to an ahistorical neutral matrix. What it does involve, on the contrary, is appeal to the historical process.

The dichotomy between rationality and historicity, between science as reliable knowledge of nature and science as a socio-historical process, is a false one. It comes down in the end to what epistemology underlines our approach to these questions.

We need, first of all, to avoid the pitfalls of passivist, individualist, contemplativist, objectivist theories of knowledge, which see scientists as unproblematically discovering the 'raw facts' about nature as it is 'in itself' and science as a growing stockpile of such facts about nature, requiring no reference to theory or socio-historical context. We never know nature apart from our knowing of it, nature as it is itself, apart from the way it is mediated through the historical evolution of our whole socially constructed conceptual apparatus of human knowledge. We encounter nature only in and through human history, only in and through the socially evolved categories of human thought.

However, we ought not to be immobilised by this and fail to see that we *do* encounter nature. We understand the whole process as participants in it. We understand the world in interaction with it. In this interaction we come unmistakably against a world quite irreducible to ourselves.

So it is necessary as well to avoid the other pitfall, that of a hyper-reflexivist, social-conventionalist, subjectivist theories of knowledge, which tend to be so paralysed by historical variation in interpretation of facts, even of experimental results in the natural sciences, as to back away from the issue of whether there is any matter of fact at stake at all and to conclude that we are left only with ourselves and our own contingent, fortuitous, arbitrary choices.

It is true that we can never extricate ourselves from our social milieu to be able to say what the world looks like apart from it, but we can transcend the narrow boundaries of parochial cultures and uncritical acceptance of dogmatic traditions and assimilate as much as possible of the cultures of the centuries. We can make our own the best cognitive achievements of the ages and bring into our deliberations as much data as the present state of knowledge allows. We can expose ourselves to the arguments of all conflicting trends and ground our intellectual choices on as firm a base as possible.

To do this competently, we need an appropriate epistemology, an interactionist epistemology, as opposed to the objectivist and subjectivist epistemologies of the past, epistemologies taking as their starting point a radical cleavage between object and subject, between nature and history, between the world and ourselves. They are, to be sure, both epistemologies with a socio-historical basis, representing stages in the development of our rationality, but stages to be transcended.

What we need is an epistemology taking its starting point in a higher level of integration, in the interaction between the world and ourselves. It is an interaction which bears always the impress of ourselves and of all the socio-historical forces which have made us what we are, as well as the impress of a world we encounter as irreducible to ourselves. It is an interaction which yields in the end, in its own complex way, some of the time, reliable knowledge both of the world and of ourselves.

We need to reconstruct our notions of scientific rationality and scientific progress at this higher level of integration. We need to see science as the highly complex, cognitive process that it is, intricately and inextricably interwoven with a larger network of processes and to see it as a process that has been one of progress. It has been a movement forward, not a straight line, but a turbulent path littered with discarded concepts, inadequate criteria, setbacks, mistakes, delusions,

lies, tragedy, cruelty, indeed even much 'subterfuge, rhetoric and propaganda', but also much that we can confidently call knowledge.

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