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REVIEW

ALEXANDER BIRD

Thomas Kuhn
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Alexander Bird's superb book is on Kuhn the philosopher, not Kuhn the historian who wrote *The Copernican Revolution*, *Black-Body Discontinuity*, and several remarkable essays on historical topics in *The Essential Tension*. This is not to fault Bird for ignoring these works, but I think it is always good advice to philosophers to read Kuhn's wonderful history of science, too. One then comes to see how philosophically-important good history can be, and how historically-important good philosophy should become. Bird's declared aims in *Thomas Kuhn* are (1) to give an exposition of the main doctrines of Kuhn's famous *Structure of Scientific Revolutions* (e.g., normal science, paradigms, incommensurability, etc.); (2) to locate the source of many of Kuhn's ideas in logical positivism/empiricism, the very account of science that Kuhn was explicitly rejecting, and (3) to show that Kuhn fell short of complete rejection of the logical empiricist past, and that this is a decided shortcoming in Kuhn's work.

One theme that Bird alludes to, but does not address, concerns how we might evaluate theories in this area. Bird is half right to say Kuhn is doing 'theoretical history' *rather than* philosophy. But I would say that he is doing theoretical history *and* that it is a very philosophical thing to do. It is, for instance, loaded with norms. Scientists do not merely, as a matter of fact, work within a paradigm. This is the way they ought to work, says Kuhn, since it is so effective, and to that end he advocates a rather dogmatic education for those being brought into the profession. How should we evaluate normative claims that are simultaneously claims about the actual practice of science? The problem arises rather naturally when thinking about the relationship between history of science and philosophy of science. Bird does not address it, but I hope others might. This remains an unsolved problem, though Lakatos, Laudan, and others have tried their hand at it.

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Bird muses on Kuhn's relation to the social constructivists—is he one? In so far as paradigm change seems non-rational, the case for saying he is a constructivist looks good. Barry Barnes (*T. S. Kuhn and Social Science*) certainly claimed this. Bird thinks that if Kuhn is, then his version of social constructivism must be very weak. This strikes me as about right. Kuhn himself did not like the idea at all. In an earlier terminology, he always thought of himself as an 'internalist', that is, he took the course of science to be driven by scientific factors, not by 'external' social or psychological ones. He was, of course, not so foolish as to deny all external factors (e.g., national sentiments), but these are not the dominant influences guiding the development of science.

Bird compares Kuhn to van Fraassen saying there are 'surprising affinities' (142–6). I doubt this is so. The comparison is little more than a digression, but it is worth taking up, since Kuhn and van Fraassen illustrate two very distinct ways of being an anti-realist. I will characterize realism as follows. The *aim* of science is to give a true (or approximately true) description of reality. This goal is realizable, since:

1. Scientific theories are true or they are false; their truth (or falsity) is literal, not metaphorical; it does not depend in any way on us, or on how we test those theories, or on the structure of our minds, or on the society within which we live, etc.

2. It is possible to have evidence for the truth (or falsity) of a theory. (It remains possible, however, that all the evidence supports some theory T, yet T is false.)

Kuhn and van Fraassen are both anti-realists, but for quite different reasons. Clause (1) would be accepted by van Fraassen (at least in *The Scientific Image*). One of his chief claims is that previous empiricism (instrumentalism, positivism) had tried to make untenable distinctions between theory and observation based on language or on how we come to know. Since these were all failures, we must, says van Fraassen, take scientific theories at face value. Thus, a statement such as 'There is an electron in the cloud chamber' is true or is false in a perfectly straightforward, literal way; its truth in no way dependent upon us. By contrast, Kuhn would deny (1), since theories/paradigms are imposed on the world which has no paradigm-independent properties of its own. He infamously remarked that scientists 'create' the world with their paradigms. Kantians, verificationists, pragmatists, and Dummettians would similarly deny (1), since truth is dependent on us (on the structure of our minds, or on the method of testing, etc.). It is the denial of (1) that makes Kuhn an anti-realist. The form of realism that he rejects has in recent years come to be called metaphysical realism.

Not so van Fraassen, whose anti-realism hangs on the rejection of (2). It is a form of scepticism, though only partial. We can have knowledge of observable things; but not of electrons. In the theoretical realm, says van Fraassen, we are forever ignorant (or, a bit more accurately, we have no need to commit ourselves to anything beyond empirical adequacy). Bird notes that under-determination plays a big role in van Fraassen's account. It is what leads him to the rejection of (2). Considerations such as simplicity, explanatory power, or features of a paradigm are not part of rational theory choice, according to van Fraassen, but they may play a role in practical decision making. (That is, it has to do with pragmatic considerations, not with truth.) These considerations, which include a role for paradigms, greatly narrow the choice down from indefinitely many empirically-adequate alternatives, notes Bird. This may be so, but it seems a rather small point of similarity.

The crucial thing seems to be this: Kuhn and van Fraassen would agree that the realist aim of truth is unrealizable, so must be abandoned. But their reasons for thinking that truth is a hopeless goal are quite different. In claiming a similarity between Kuhn and van Fraassen, Bird concedes one big difference: van Fraassen upholds a theory-observation distinction, while Kuhn is at pains to undermine it. Given this difference and given that they reject realism for quite distinct reasons, it is the contrast between Kuhn and van Fraassen that is enlightening, not their small similarities. However, these remain tricky questions with lots of room for disagreement, especially since the notion of realism itself is not completely transparent.

Bird notes (rightly) that Kuhn was not so radical on the question of incommensurability as he is often taken to be. Incommensurability does not mean non-comparability. It only means that there is no common language, or perhaps more to the point, there are no common concepts shared by distinct paradigms. The idea of incommensurability was introduced by Kuhn and Feyerabend with ancient mathematics in mind. The diagonal of a square is incommensurable with its side; thus $\sqrt{2}$ cannot be expressed as a ratio of whole numbers, m/n, no matter what m and n are. Kuhn's claim is arguably as interesting and important to philosophy as the discovery made by the Pythagoreans is to mathematics, but neither implies the impossibility of any sort of comparison. Too often this claim is made on behalf of Kuhn, and Bird rightly resists it. If you have the concept $\sqrt{2}$, and if I am confined to the rational numbers, then I still can give an approximate meaning in my language, namely 14/10. And if that's not good enough, then I could say 141/100; and if still more accuracy is wanted, then I would say the meaning of your term $\sqrt{2}$ in my incommensurable language is 141421/100000. The one thing I cannot do is specify the meaning of $\sqrt{2}$ exactly, but I can approach it arbitrarily closely. This is the model Kuhn explicitly had in mind.

Why is incommensurability important? Because it makes clear that meaning and belief are intimately interconnected—a change in one results in a change in the other. Kuhn and Feyerabend were not the first to notice this. It is interesting to see what non-philosophers have said. David Hilbert (discussing his axiomatization of geometry) remarked:

> each axiom contributes something to the definition, and therefore each new axiom alters the concept. 'Point' is always something different in Euclidean, non-Euclidean, Archimedean, and non-Archimedean geometry respectively. (Hilbert in Frege [1971], p. 13)

The same outlook has been advanced by prominent physicists in *Gravitation*, a very influential textbook on general relativity:

> that view is out of date which used to say 'define your terms before you proceed'. All the laws and theories of physics [...] have this deep and subtle character, that they both define the concepts they use [...] and make statements about these concepts. Contrariwise, the absence of some body of theory, law, and principle deprives one of the means properly to define or even use concepts. Any forward step in human knowledge is truly creative in this sense: that theory, concept, law, and method of measurement—forever inseparable—are born into the world in union. (Misner, Thorne and Wheeler [1973], p. 71)

Implicit definition and incommensurability go hand in hand. These quotations could have come from Kuhn himself.

There has been much discussion of incommensurability in the context of different accounts of reference. Could the so-called causal theory of Putnam and Kripke come to the rescue? In that theory reference is independent of our beliefs, so it looks promising. Kuhn's reaction to Putnam's twin-earth thought experiment was to deny its coherence. If we discovered that the stuff on twin earth is actually XYZ instead of H_2O, then far from having any influence on our account of language, it would bring about a crisis in our current thinking about chemistry. Bird's reaction is to say that Kuhn fails to appreciate Putnam's point (p. 182). But I am not so sure. Philosophers often find the reactions of non-philosophers to their thought experiments frustrating. We wonder: 'What if you could split like an amoeba?' and in response we hear: 'But you *can't* split like an amoeba,' which makes us suspect that the rest of the world is hopelessly dim-witted and unimaginative. I am all in favour of wild speculation via thought experiments, but I think it is also fair to criticize them for possible incoherence or to draw quite different conclusions from the same thought-experimental set up.

Never mind philosophers of language for the moment; try to imagine how an ordinary chemist would react to discovering XYZ on twin earth. Is she going to draw morals for reference? Not likely. She has visions of a Nobel Prize for the chemical revolution she is about to initiate, and 'Water is H_2O' is

likely to go down the drain with 'phlogiston is released on burning'. I do not mean to suggest that water is really XYZ, but rather that if current thinking in chemistry says water is H_2O here and that something water-like seems to be XYZ on twin earth, then the current chemical thinking that led to this is wrong. This strikes me as a more sensible response to the twin-earth situation, and like Kuhn, I am inclined to draw no morals for the philosophy of language from it.

One of Bird's main themes is that Kuhn was deeply influenced by the positivists and that he retained many of their doctrines. Incommensurability, for example, stems from common positivist accounts of language wherein theoretical terms pick up their meaning only implicitly by being employed in a theory. Obviously, if the theory is changed, then the meanings of the terms would be different. Bird thinks Kuhn's infamous views about truth are similarly derived from positivist sources. There is some justice in this. Typically for the positivists, theoretical terms do not hook onto an independent reality. Theories are neither true nor false, but are rather instruments for predicting experience. Kuhn's famous image is of theories evolving like Darwinian species. They are not drawn toward any goal such as truth, but are merely driven from behind, better adapting to the existing environment. In an intellectual or scientific environment, this just means getting better at solving problems.

Perhaps a better comparison would have been with Carnap's 'Empiricism, Semantics, and Ontology'. Carnap was very favourably impressed with Kuhn's *Structure*. This is likely because he saw so many resemblances with his own view; one cannot read that 1950 article without being struck by the similarities. This is not much discussed in the literature on Kuhn (though Kuhn himself noticed it), but it has become a point of interest in recent literature on the history of positivism.

Throughout Bird's book, there are numerous interesting speculations. Indeed, much of its appeal consists in the extensive analysis and evaluation of Kuhn in terms of contemporary doctrines. Thus, there are discussions of connectionism, for example. The claim is made that working with paradigms is best understood on a connectionist (or neural nets) model of cognition, since neither is explicitly rule-based. Internalism vs externalism is taken up at length in conjunction with meaning and again with epistemology. (Externalism says that the meaning of a term or that the content of a belief is in part dependent on things external to the individual.) Kuhn, not surprisingly, is portrayed as an internalist, just as his Cartesian, empiricist, and positivist predecessors were. But Bird claims that several of Kuhn's main doctrines could be improved if recast in an externalist way. In particular, he thinks, an externalist version of Kuhn could have prevented incommensurability problems in language and sceptical relativism worries in knowledge. Whether

this is true or not may depend on the outcome of current debates over externalism. (I have already expressed some doubts about the use of the causal theory of reference, an externalist doctrine.) However, the fact that the issues of connectionism and of externalism are still up in the air does not prevent Bird's discussion of them in relation to Kuhn from being highly edifying.

There have been a number of interesting publications recently, including: Paul Hoyningen-Huene, *Reconstructing Scientific Revolutions: Thomas S. Kuhn's Philosophy of Science*; Paul Horwich (*ed.*), *World Changes: Thomas Kuhn and the Nature of Science*; Steve Fuller, *Thomas Kuhn: A Philosophical History for Our Times*, and, of course, Kuhn himself, *The Road Since 'Structure': Philosophical Essays, 1970–1993, with an Autobiographical Interview*. Alexander Bird's very thorough, very lucid, and very suggestive work on Kuhn's philosophy of science is a welcome addition to this growing literature on one of the most important thinkers of the 20th Century, making very substantial contributions to the understanding of the subtleties of Kuhnian issues. As a straightforward introduction for serious beginners to Kuhn's philosophy of science, Bird's book is surely the best thing going.

Earlier in his career, Vice President Al Gore said that *The Structure of Scientific Revolutions* was his favourite book. During the election he changed this to Stendhal's *The Red and the Black*, which is also a great work. He was defeated by a man who preferred to read the *Bible*. So much for the influence of intellectuals in the larger society. As for Kuhn's influence on academics, it is almost incalculable.

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