THOMAS S. KUHN

The Road Since 'Structure': Philosophical Essays, 1970–1993, with an Autobiographical Interview
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T. S. Kuhn's masterpiece, The Structure of Scientific Revolutions, was first published in 1962, and has been issued in two subsequent editions (1970, 1996). No other work in the history and philosophy of science has enjoyed remotely the same degree of success. The widespread impact of Structure made Kuhn, arguably, the most influential thinker about science of the second half, if not the entirety, of the twentieth century. Indeed, Structure was so influential that, somewhat paradoxically, Kuhn's own later work was overshadowed by Structure. Generations of readers have come to know Kuhn's work by way of Structure with no significant exposure to the ideas which Kuhn developed in his later work. To this day, it is possible to find sophisticated commentators on Kuhn who interpret his views on the basis of Structure, thereby failing to realize that Kuhn's actual views continued to evolve in a quite substantial manner for twenty-five years after the revised second edition of the book. The present reviewers therefore welcome the publication of the present volume, The Road Since 'Structure', which collects together the most significant publications from the final two decades of Kuhn's career, along with a highly informative interview.

Part One of the book consists of five essays which elaborate the positive core of Kuhn's later thought. The essays address a number of issues. But there is sustained emphasis on refinements of Kuhn's version of the thesis of the incommensurability of scientific theories, especially the claim that there is translation failure between the vocabulary employed by such theories.
In 'What Are Scientific Revolutions?', Kuhn addresses the question of the characterization of scientific revolutions. He employs historical cases (Aristotle's physics, the Voltaic cell, the black-body problem) to illustrate his fundamental claim that revolutionary scientific change typically involves reconceptualization of the domain to which the change relates. Such change induces change in the vocabulary, and the meaning of the vocabulary, which scientists use to describe phenomena in the domain of study. Kuhn isolates three characteristic features of revolutionary change. It is holistic: change in the generalizations which underlie theoretical descriptions cannot be made in a piecemeal fashion. It leads to taxonomic change: revolutionary change alters the system of taxonomic categories which scientists use to classify the objects of study. It changes basic metaphor: the metaphor-like similarity relations between members of taxonomic categories also undergo change.

'Commensurability, Comparability, Communicability' was presented in a symposium at the 1982 meeting of the Philosophy of Science Association, with comments by Philip Kitcher and Mary Hesse. Kuhn's response to the commentary is included as a postscript. The principal aim of the paper is to defend the thesis of incommensurability against a pair of objections levelled against the thesis by such philosophers as Donald Davidson, Kitcher, Hilary Putnam and Dudley Shapere. The first objection is that incommensurability precludes empirical comparison of theories, though its proponents seem to compare putatively incommensurable theories. The second objection is that the incommensurability thesis is self-defeating, since terms of a theory must be translated into our own language in order to show it to be incommensurable. Against the first objection, Kuhn points out that incommensurability is localized translation failure between interdefined clusters of key terms within the special languages of theories. This enables comparison of incommensurable theories to be undertaken on the basis of the vocabulary shared by the theories. Against the second objection, Kuhn distinguishes between translation and interpretation of a language. While it may not be possible to translate from the vocabulary of one theory into that of another, it may be possible to interpret (i.e. understand) what is said using the untranslatable terms. Toward the end of the paper, Kuhn introduces the idea of a 'lexicon' or 'lexical structure', which came to figure as a central theme of his later thinking about incommensurability.

'Possible Worlds in History of Science' was presented at the 65th Nobel Symposium in 1986, with comments by Arthur I. Miller and Tore Frängsmyr. Again, Kuhn's response is included as a postscript. The paper provides further elaboration of the notion of a lexicon and of issues relating to the untranslatability of incommensurable theories. Kuhn adapts the idiom of possible worlds to his own purposes, claiming that the lexicons of incommensurable theories provide linguistic access to disjoint sets of
mutually inaccessible possible worlds. Given the close connection between
possible world semantics and the causal theory of reference, Kuhn turns his
attention to the appeal made by realist critics of incommensurability to the
causal theory of reference. Kuhn raises doubts about the coherence of Hilary
Putnam's celebrated example of water on Twin Earth, which is composed of
XYZ rather than H₂O. He also points to the theory-dependence of the
specification of the natural kind (e.g., liquid, solid, gas) under which
baptismal samples of water might be picked out, thereby noting an issue
which has led a number of philosophers working in the area to propose
causal-descriptive accounts of reference-fixing.

'The Road since Structure' was Kuhn's presidential address to the 1990
meeting of the Philosophy of Science Association. In view of the history of
Kuhn's relation to the profession of the philosophy of science, this is itself a
noteworthy circumstance. Several novel themes emerge in the course of the
paper. Kuhn notes, for example, that the sciences inevitably become
increasingly specialized in a manner that parallels the process of biological
speciation. Of more significance are Kuhn's remarks about the nature of
truth. Kuhn is well-known for criticizing the correspondence theory of truth
in the Postscript to the second edition of Structure. Kuhn here maintains his
opposition to the correspondence theory. But he argues that some substantial
conception of truth (e.g., a redundancy conception) is required in order to
provide a rationale for theory acceptance and rejection. An important
refinement of Kuhn's treatment of translation also emerges in this paper.
Kuhn introduces the no-overlap principle, which requires that 'no two kind
terms [...] may overlap in their referents unless they are related as species to
genus' (p. 92). The no-overlap principle is what prevents the terms from one
lexicon being translated into another lexicon which incorporates an opposing
taxonomic structure.

'The Trouble with the Historical Philosophy of Science' is the text of the
first Robert and Maurine Rothschild Lecture which Kuhn gave at Harvard
University in 1991. In it, Kuhn describes difficulties with the received view of
science which gave rise to the historical approach to the philosophy of science
which he championed. He writes critically of the appropriation of the
historical approach by radical proponents of the sociology of science, who see
no role for reason or truth in science, reducing it instead to power and
rhetoric. The sociology of science, Kuhn argues, rests on misconception, since
it erroneously adheres to a traditional conception of scientific knowledge as
the basis of its critique of science. Against such tendencies, Kuhn argues that
the authority of science may be preserved once attention shifts from the
rational justification of belief to the rational justification of change of belief.
For while there may be no external Archimedean point from which to
evaluate all beliefs, that is not to say that there is no rational justification for
change of belief which is undertaken on a gradual, piecemeal basis. This should give pause to those critics and followers of Kuhn, who have seen in his work the basic inspiration for the sociology of science.

Part Two contains six papers composed in response to commentary on Kuhn's work. Thus, while these papers contain novel developments of his ideas, and many important qualifications, they are positioned within a specific context of debate.

'Reflections on My Critics' is a well-known paper reprinted from *Criticism and the Growth of Knowledge* (which has for some time been out of print), edited by Imre Lakatos and Alan Musgrave. This volume contains the somewhat expanded proceedings of the Fourth International Colloquium in the Philosophy of Science, held in London in July 1965. Kuhn's paper is the final essay in the volume, answering the critical discussion of his work by John Watkins, Stephen Toulmin, L. Pearce Williams, Karl Popper, Margaret Masterman, Imre Lakatos, and Paul Feyerabend. Its main purpose is the correction of various misreadings of *Structure*, mainly by the members of Popper's group. Many of these misunderstandings still form the core of the stereotypical image of Kuhn. Thus, it is useful to have the essay available again. The essay was completed in 1969, as were Kuhn's Postscript in the second edition of *Structure* and his 'Second Thoughts on Paradigms', published in 1974 in *The Structure of Scientific Theories* (edited by F. Suppe). These three pieces together represent fairly clearly Kuhn's position seven years after the publication of *Structure* in the light of the intensive criticism which followed publication of that book.

'Theory Change as Structure Change: Comments on the Sneed Formalism' (in the original with hyphens between 'Theory' and 'Change' and between 'Structure' and 'Change') is Kuhn's reaction to Wolfgang Stegmüller's elaboration of mainly the last chapter of *The Logical Structure of Mathematical Physics* by Joseph Sneed. In the paper, Kuhn praises Stegmüller for having understood his work: 'better than any other philosopher who has made more than passing reference to it' (p. 177; see also pp. 317-9 of the present book). This reaction was met with raised eyebrows by many Anglo-Saxon philosophers, as Stegmüller's essentially positivistic and formalistic project seemed to be in the strongest opposition possible to Kuhn's historicist project. As Kuhn concedes, the Sneed formalism does not leave space for one essential element of his view of scientific development. Where Kuhn sees incommensurability, Stegmüller only perceives a rationality gap which should be closed by an appropriate reduction relation.

Kuhn's 'Metaphor in Science' is a response to a presentation by Richard Boyd. In spite of large areas of agreement with respect to metaphors or metaphor-like processes in the introduction of (scientific) terms, Kuhn is
much less convinced of the merits of the causal theory of reference with respect to kind terms than Boyd is. This has consequences not only for semantic theory but also for the ontological commitments associated with a system of scientific terms. Whereas Boyd favors a realistic theory of scientific progress, Kuhn tries to articulate a dynamic neo-Kantian view (although he sees himself, as he sees Boyd, as an ‘unregenerate realist’).

Kuhn’s close interaction with Carl G. Hempel during his Princeton years is reflected in ‘Rationality and Theory Choice’, which was presented at an American Philosophical Association symposium on the philosophy of Hempel in December 1983. The question discussed (and the point of some disagreement with Hempel) is under which circumstances the ‘criteria which scientists are observed to use when evaluating theories are, in fact, also rational bases for their judgement’ (p. 209). Hempel suggested that these criteria are definitional of science and that thereby, their justification is given in a near-trivial way. But Kuhn thinks that Hempel’s point is, in fact, deeper because the apparently definitional character of the criteria is not the result of a convention concerning the term ‘science’. It is rather the result of a historical process that generated the system of the sciences with their specific interrelations. Thus, the criteria of theory evaluation are not justified as analytic consequences of the concept of science, but as statements that Kuhn described from the late 1980s on as (close to) synthetic a priori (see p. 71, and p. 74, n. 19 of the present volume).

‘The Natural and the Human Sciences’ is a discussion of Charles Taylor’s famous paper ‘Interpretation and the Sciences of Man’. Whereas Kuhn largely agrees with Taylor about the characteristics of the human sciences, he disagrees with him with respect to the natural sciences. Taylor subscribes to the traditional image of the natural sciences, which includes a robust realism about its objects. In opposition to this picture, Kuhn claims that the natural sciences have a ‘hermeneutic base’ without becoming hermeneutic disciplines.

In May 1990, a two-day conference in Kuhn’s honor was held at MIT. ‘Afterwords’ is Kuhn’s written reply to nine papers initially given at this conference that deal with various aspects of his work. Until the eventual publication of the book (unfinished at the time of his death) on which Kuhn worked for the last 15 years of his life, this essay will remain the richest published source about the direction in which his thought moved during the 1980s and 90s. Kuhn’s main project during these years was the development of a theory of the meaning of empirical terms, especially kind terms, that would ground his more or less intuitive ideas about incommensurability. One finds, for example, further elaboration of Kuhn’s idea of a lexicon, the no-overlap principle and the nature of truth.

Part Three is the edited text of an extended interview with Kuhn, covering many biographical topics, conducted in Athens (Greece) on October 19–21,
1995. It is a rich source of information about Kuhn. Besides many other things, it nicely conveys the ironic distance that Kuhn could also develop to himself ('I mean, I am an anxious, neurotic—I don’t bite my nails but I don’t know why I don’t bite my nails', p. 321). There is only one obvious factual mistake in the interview. This concerns Larry Laudan, to whom Kuhn’s relationship was less than smooth (this also holds for the other direction of the relationship). Kuhn ascribes to Laudan the traditional view of scientific progress as a movement 'closer and closer to the truth' (p. 311), whereas, in fact, Laudan is a prominent critic of this view. It is difficult to understand how Kuhn could mistake Laudan's view for its opposite. But apart from that, one gains a vivid impression from the interview of who the man was who had such an extraordinary impact on so many areas of meta-scientific thought in the second half of the twentieth century.

The volume opens with a Foreword by Kuhn’s widow, Jehane Kuhn, and an Editors’ Introduction by James Conant and John Haugeland. It closes with a comprehensive bibliography of Kuhn’s published work.