Kuhn, Cognitive Science, and Conceptual Change

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Beginning in the Postscript to *The Structure of Scientific Revolutions*, Kuhn interpreted paradigms primarily as exemplars rather than worldviews or disciplinary matrices. The elaboration of his views on exemplars led him to develop a sophisticated account of concepts that could be directly supported by results in cognitive science. However, Kuhn showed little interest in the ongoing revolution in cognitive science, preferring instead to attempt to further his insights through a kind of linguistic analysis. Without exploration of the cognitive aspect of concepts by either Kuhn or others in philosophy of science, discussions of conceptual change, the key theme of Kuhn's philosophy of science, became increasingly sterile and largely disappeared from the literature.

Interest in conceptual change has been revived, on the one hand, because of Hoyningen-Huene's penetrating study of Kuhn's philosophy of science and, on the other hand, because of a movement in philosophy and history of science that brings a "cognitive-historical" method of analysis to bear on understanding the nature and processes of conceptual change in scientific practice.

An essential feature of the "cognitive-historical" analysis is its reflexive nature -- its uses cognitive theories to the extent that they help interpret historical practices, while it tests to what extent current cognitive theories need refinement and revision when they are applied to scientific thinking. The purpose of this symposium is a reflexive examination of the cognitive models of concepts used in the analysis of conceptual change.

In the discussion of conceptual change, difficulties have been created by the choice -- largely implicit and unexamined -- of the cognitive models of concepts. With only a few exceptions, the classical account that concepts are represented by neatly bundled and individuated units, that is, sets of necessary and sufficient conditions, is still widely adopted in the discussion. But the definability of concepts in terms of necessary and sufficient conditions is now seriously questioned in cognitive psychology.

A more satisfactory account has been developed over the last decade using "frames" or "schemas" as the basic vehicle for representing concepts. Unlike the traditional account that concentrates on compositional properties, the frame/schema representation of concepts emphasizes structural properties, outlining relations within and between concepts. In the symposium, we will employ the frame/schema representation of concepts to propose accounts of conceptual change that more adequately reflect the history of science; at the same time, we will examine to what extent the frame/schema representation of concepts can be employed in historical-scientific contexts while comparing the resources of currently available accounts of both frames and schemas.

Chen and Barker's paper argues that the changes characteristic of scientific revolutions, especially taxonomic changes, can occur in a continuous manner when concepts are represented by frames. The transformation from one taxonomy to another can be achieved in a piecemeal fashion not preconditioned by a crisis stage, and a new taxonomy can arise naturally out of the old frame instead of emerging separately from the existing conceptual system.

Andersen and Nersessian's paper focuses on Kuhn's notion of nomic terms, which cannot be captured by the pure family resemblance account popular in current cognitive studies but calls for an extension. They show that nomic concepts can be represented in frame-like structures and argue that this account is consistent with and extends current cognitive science research that connects concept representation with theoretical principles. They argue that continuity can be established between different representations of nomic concepts through chains-of-reasoning, and finally explore the implications of the account for the problem of cognitive equilibrium preceding conceptual change.

Nickles' paper examines the implications of the frame/schema account for methodology of science. Since schemas could be implemented in terms of distributed parallel processing instead of by rules, Nickles argues that the frame/schema account potentially offers a more naturalistic account of scientific inquiry, although not one that need be antisocial.