
As an undergraduate at Wesleyan University, I particularly enjoyed browsing through the course books in the bookstore at the start of each semester. Although my motivation now escapes me, I used to regularly carry out a Kuhn survey, to see how many different courses had The Structure of Scientific Revolutions as a required text. It was never fewer than half a dozen courses in a single semester, sometimes in the most surprising departments. That was twenty years ago, but sales have hardly sagged since: Structure has now sold more than three-quarters of a million copies in English and has been translated into nineteen languages. It must be the most widely read book ever written by a historian of science or a philosopher of science.

This popularity is no surprise. Kuhn's account of the nature and development of the sciences is dramatic and beautifully told, and his central notions of paradigms and incommensurability are highly suggestive, with apparent application to many areas outside the history of science, from art to business management. But Structure is often misunderstood, and this misunderstanding takes many different forms. At one extreme, the book is taken to be an entertaining but uncontroversial account of the history of science, whose main novelties are the claims that researchers take some of their theories for granted and that the acceptance of new theories sometimes entails the rejection of parts of old ones. At the other extreme, Structure is read as a virulent attack on the rationality of science which attempts to reduce scientific "method" to a combination of mob psychology and mystical conversions.

Hoyningen-Huene to the rescue: Reconstructing Scientific Revolutions is an intelligent, accurate, and detailed discussion of what Kuhn really said in Structure and of how his views have developed since. Kuhn himself provides a foreword, in which he writes of Hoyningen-Huene: "No one, myself included, speaks with as much authority about the nature and development of my ideas" (p. xi). This is an amazing and slightly disturbing claim, but it may be true. Certainly Hoyningen-Huene has done an exceptionally good job of bringing together the many components of Kuhn's philosophy of science and of tracing out their consequences.

At the core of Kuhn's account is the idea that scientific research is driven by examples rather than by rules. The process begins in undergraduate education, where the problem sets that figure so prominently serve not just to test understanding but to instill it. Students solve these standard problems by finding ways of seeing them as somehow similar to other problems already solved in textbooks or in the classroom. Standard problems don't just illustrate the theory, they bring it to life: it is only by working through these "exemplars" that the student comes to understand the content and application of relevant theory.

According to Kuhn, this technique of solving new problems by drawing analogies to old ones is also central to professional research during most periods of its development. During such a period of "normal science," researchers in a given specialty use a common and unquestioned set of exemplary solutions to select and solve new problems. Eventually, however, this consensual puzzle-solving activity breaks down, as increasingly precise and esoteric lines of research generate anomalies whose resolution the familiar exemplars will not support. The result is a scientific revolution, which brings in new exemplars and hence a new web of analogies that restructures the form of scientific research.

Kuhn's emphasis on the role of concrete examples in scientific education and research ought to strike a cord both with science students and with their teachers. It is also a corrective to the philosopher's prejudice that rational inquiry must be governed by explicit, general, and logically precise rules. But Kuhn's view has a sting in the tail. Exemplars don't just guide research: they also partially constitute the object of study. Kuhn insists that science cannot describe the world as it is "in itself," but only the world as it is structured by the theoretical concepts of the time, which are given their content through exemplars. Consequently, the switch of exemplars that marks a scientific revolution entails not only a change in theories and practice, but also a change in the world that is the object of inquiry. We must thus abandon the idea that the history of science is a history of increasingly accurate and comprehensive descriptions of an independent reality. In this sense, truth is not a possible goal of science. The real business of science is rather to solve puzzles that are in part its own creation. From this point of view, science is a rational and progressive activity, though what counts as a relevant puzzle will change over time.

Kuhn's abandonment of truth is no casual skepticism: it is based on a profound treatment of the challenging issues of meaning and reference in the philosophy of language. Hoyningen-Huene's exposition brings out the philosophical depth underlying Kuhn's radical claim very effectively; but that exposition also reveals, it seems to me, that the underlying arguments are too weak to establish so extreme a conclusion. Moreover, although Kuhn's claims about the continuity of normal science and the discontinuity of scientific revolutions are linked together by his exemplar mechanism, it may be possible to accept one part of the story without accepting all of it. We may, that is, be able to accept much of what Kuhn says about the role of examples as a guide to research without going along with his radical denial of the possibility of knowledge of the world as it is in itself.

With so much physics to learn, science courses cannot include much metaphysics. Nevertheless, a scientific education ought to include some exposure to the issues raised by historians and philosophers of science, and assigning Structure is one of the best ways to provide this. The book is a good read; it combines serious history and philosophy in one source; and it debunks an over-simple cumulative view of scientific progress. It might even encourage students to treat their problem sets with the seriousness they deserve. Students reading Structure for the first time will, however, need help to avoid misunderstanding what Kuhn is saying, but any teacher who takes the time to study Reconstructing Scientific Revolutions will be well placed to act as a guide.
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