

Paradigms, Presuppositions, and Information: Kuhn's *Structure of Scientific Revolutions*

Summary

As Kuhn defines it, a paradigm is a set of theories, ideas, abstractions, beliefs that "provide models from which spring particular traditions of scientific research" (1996). Kuhn's examples of paradigm shifts, which are primarily from the physical sciences, include Aristotelian dynamics, Copernican astronomy, Newtonian optics, and Einstein's theories of relativity. A paradigm shift is a crisis brought on by conflict between two or more paradigms, in which the "fittest" paradigm survives. There is no synthesis: Kuhn claims that paradigms are incommensurable (incompatible), hence the crisis; the resulting change is comparable to a revolution. Implicit in this argument is the claim that science is an instrument for solving problems. Thus, Kuhn's evolutionary and instrumental model of science calls into question the teleology (purpose) of the scientific enterprise. As Kuhn states, "we may...have to relinquish the notion...that changes of paradigm carry scientists closer and closer to the truth" (1996).

Assessment

Kuhn calls into question the notion of scientific progress with his conception of the paradigm and paradigm shift. Suggesting an evolutionary model, in which the fittest paradigm survives in conflict with the incommensurable, science acts as an instrument for solving problems, not for discovering truth. Surprisingly, what Kuhn does not question is the very problem of science itself. What problems can science solve, and what purpose does their solution possess?

Kuhn states that scientific development occurs, "without benefit of a set goal, a permanent fixed scientific truth" (1996). But what is the value of the scientific enterprise without such a goal? If science is simply an instrument for solving problems as Kuhn suggests must not the first solution be the problem of its own goal? Perhaps this is a problem that science cannot resolve: as Einstein observed, "One can have the clearest and most complete knowledge of what *is*, and yet not be able to deduct from that what should be the *goal* of our human aspirations" (1929).

There are many problems concerning scientific presuppositions that Kuhn does not address; for example, the presupposition that there is a "truth" and that it can be discovered. "The great ocean of truth

lay all undiscovered before me” asserts Sir Isaac Newton. But as the physicist James Jeans (1931) suggests,

“The essential fact is simply that *all* the pictures which science now draws of nature, and which alone seem capable of according with observational fact, are *mathematical* pictures...They are nothing more than pictures – fictions if you like, if by fiction you mean that science is not yet in contact with ultimate reality.”

And physicist Arthur Eddington (1929) echoes, “We have learnt that the exploration of the external world by the methods of physical science leads not to concrete reality, but to a world of symbols.”

Another scientific presupposition: that “truth” has value, that this value is “good,” and that its pursuit is a worthy and desirable goal. Albert Einstein has a revealing comment here, “The knowledge of truth...is so little capable of acting as a guide that it cannot prove even... the value of the aspiration toward that very knowledge” (1929). And as Picasso remarked, “The genius of Einstein leads to Hiroshima.”

As a historian of science, Kuhn was sensitive to historical criticism: “History, we too often say, is a purely descriptive discipline” (1996). But on the descriptive nature of science Kuhn is silent. How does science explain fire (a change in molecular structure), music (a vibration within a gaseous medium), thought (a change in electrical potential of a biological system). Descriptions of increasing complexity and sophistication can be made, but what they all hide is a lack of explanation and “such phenomena remain as magical to us as it did to the most primitive human beings” (Gene & Chan, 1997, p 59).

Yet another scientific presupposition: that there is a “cause.” That such a concept is problematic is suggested by the historian and natural philosopher David Hume who contends, “Causality is a useful human tool for picturing a process of events – but nothing more” (Gene & Chan, 1997, p 60). A process of events occurs with a passage of time: causative laws and theories rest on the presupposition that the future will resemble the past, but this presupposition is one that science cannot prove. Examples of such causative laws include those of gravity, thermodynamics, and quantum mechanics.

And Kuhn does not address the problem of “cause” and “effect.” “We have arranged for ourselves a world in which we are able to live -with the postulation of bodies, lines, surfaces, causes and effects, motion and rest, form and content: without these articles of faith, nobody could now manage to live!” As Nietzsche suggests, we interpret the world out of human need (Gene & Chan, 1997, p 60); we seek a

“cause” for every “effect” from our inability to interpret events otherwise than as events caused by intentions (an interpretation based on the experience of the human ego).

It should be noted that the physical sciences are by no means unaware of the problem of interpretation as indicated by Heisenberg’s Uncertainty Principle (the insight that both the position and velocity of a particle cannot be simultaneously determined) (Simos, 2003). And even the formal systems of logic have had to face the problem of interpretation with Russell’s Paradox and Godel’s Proof (Hofstadter, 1979). (Russell’s Paradox: Is the set of all sets itself a set? Godel’s Proof: A logical system cannot be both consistent and complete).

The problem of interpretation may be no more obvious than in the social sciences. And perhaps no discipline is more interpretive than *information science*. In fact, many of its educators and practitioners operate within an “interpretivist” philosophical framework that considers reality to primarily be a social construction (Williamson, 2002). This suggests that information science is a discipline that is willing to question the interpretation of its own boundaries; others consider the boundaries to clearly be divided between information systems and users (Allen, 1996). But as Sarton suggests, “The most difficult thing in science, as in other fields, is to shake off accepted views” (1929, p 88).

The recent move from a systems to a user view with such theories as Belkin’s ASK (anomalous states of knowledge), Dervin & Nilan’s sense-making, Kuhlthau’s ISP (information search process), Schamber et al.’s relevance, and Taylor’s information need is one that many in information science consider to be on the level of a paradigm shift (Pettigrew & McKechnie, 2001). But according to Kuhn, such a shift is one that occurs between two or more *incommensurable* paradigms. That systems and user viewpoints are problematic is a reasonable presupposition, but that the two views are incommensurable is debatable. In fact, it may be more meaningful to consider both views as mutually dependant: without information systems there are no information users and without the needs of information users there is no need for information systems.

And while the relevance of search results have been thoroughly considered (Schamber, 1994), the relevance of search engines and information systems on the whole has not; although compromising to information scientists, perhaps such things are novelties at best and have little or no impact on the fundamental problems of life. And intellectual conscience demands that we ask such questions; such

questions as concerns the ambiguous nature of information systems and users: information systems can be used by criminal organizations, government surveillance programs such as TIA (Total Information Awareness: a global surveillance information system currently under consideration by the U.S. Department of Defense) (TIA, 2003), terrorist organizations, totalitarian dictatorships, and more. Perhaps that anonymous “information user” at the local library is seeking information on how to build a bomb or how to pull off a credit card scam? It is recognizable that any efforts to improve information systems and to address the information needs of users can have both positive and negative effect.

In closing, while the term “paradigm shift” has been popularized as of late, perhaps it is the questions that Kuhn’s theories raise that are the biggest paradigm shift of all.

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