

3 Questions: David Kaiser on Thomas Kuhn's paradigm shift

If you've ever talked about a "paradigm shift," you've channeled Thomas Kuhn, the historian and philosopher of science whose landmark 1962 bestseller, "The Structure of Scientific Revolutions," changed how people discuss the scientific enterprise. Kuhn asserted that most research takes place during periods of "normal science," which are occasionally upended when scientists find a new and more compelling framework, or paradigm, for interpreting known observations — such as Newton's overturning of Aristotelian ideas about motion. To Kuhn, this also suggested that scientific knowledge does not consist of a straightforward accumulation of objective facts — a controversial view often seized upon by skeptics of science, to Kuhn's chagrin.

Kuhn spent the last 17 years of his career at MIT, until his death in 1996. On Dec. 7, the Institute [hosted a symposium](#) on Kuhn's thought and influence, on the 50th anniversary of his celebrated book. MIT News spoke with David Kaiser, the Germeshausen Professor of the History of Science, about Kuhn's work.

Q. Over 50 years, we've become highly acclimated to Kuhn's ideas. In retrospect, what was so innovative about them?

A. It's not that every word in the book was without precedent, but it presented many ideas with a great cleverness and clarity. One of them was that science might not be progressing toward a single truth — although Kuhn was at pains the rest of his life to say that didn't mean he thought it was all made up, either. But nonetheless, scientific knowledge could be a great deal more complicated and rich than the notion that we just get closer and closer to some sort of ultimate truth. There could be a kind of progress of knowledge that was not a linear progress, nor progress toward a particular end.

A related notion that Kuhn helped further was this idea that even very careful scientists take in the world through a lens of prior concepts, or engage in "theory-laden observation." Science is driven by ideas to start with, and our engagement with the world is based on this active lens of ideas. Sometimes we do change our conceptual filters [a "paradigm shift"]. These radical ruptures, though rare, Kuhn thought, could really reshuffle the basic facts of science — because those facts, he argued, are not separable from the reigning ideas or theoretical explanations of the time. That wasn't totally unique to Kuhn, but it was a pretty new way to think about the scientific endeavor and the notion of change over time.

Q. You wrote [an essay](#) in *Nature* earlier this year in which you said that "The Structure of Scientific Revolutions" reminds you of the kind of "toy model" that physicists use — and Kuhn was a trained physicist — to simplify the world in a productive way. For all the authority people have invested in this book, to what extent should we regard it as a

kind of work in progress?

A. Many readers over the years have suggested that certain parts of Kuhn's book required additional analysis, to clarify just what he meant by "paradigm," for instance, and Kuhn worked fervently for decades to write follow-up essays and clarify. Even in the preface to the 1962 book, he said this was a first pass at a longer book. It was never meant to be a final text. The whole book was originally commissioned to be an encyclopedia article, and the project grew and deepened. May all our first passes be so rich in ideas and challenging notions! And it was perfectly normal for close readers to come back and say, "You use this word paradigm a lot. Does it mean this, but not that? What counts as a paradigm?"

I've gone through a large chunk of Kuhn's correspondence, which is here at the Institute Archives, and you can see him trying to work this out in individual conversations in the mail, which crystallize into some of his better-known later essays. So right from the fall of 1962, readers were writing to him with great excitement, and with really good questions. And Kuhn acknowledged that. He would give some ground, defend at other times, and revisit his arguments. ...

That's what toy models are for. The world is remarkably complicated, so let's capture something worthy of focus, and then let's refine, and ask new questions, add in new features, add in maybe finer distinctions. I think that's what Kuhn intended to do, and did do, when he sent this book out into the world.

Q. Ultimately, is opening up this whole discussion about how scientific knowledge arises, even if his ideas are subject to much revision, Kuhn's central legacy?

A. Certainly as I see it. Kuhn had an ambition with the book, which was common at the time: He really thought there was a structure, a hidden key that makes science tick. I think many of my colleagues today in the history and sociology of science would find that ambition wrong-headed. There is not a single magical key that will unlock the way science gets done, now and forever. And isn't that a good thing? The plurality of methods in science is a source of its strength.

On the other hand, we are certainly more attuned to thinking that progress in science need not be linear, it can be interrupted, or noncumulative, or that whole fields of inquiry can get dropped, not because they're wrong, but because they're deemed irrelevant in light of later research. There is a very complicated interplay between ideas, practices, communities and building up the storehouse of the facts of nature in science. That doesn't mean facts are made up or wrong. But we can't turn the clock back to a pre-Kuhnian reading of science and ignore those issues. ... We don't have to buy everything people subsequently claimed on Kuhn's behalf, one needn't sign on to particular philosophical programs [about the construction of scientific knowledge], but

there are themes and ideas we should be attuned to even if we draw different conclusions in the end.