Paper #1: The Scientific Revolutions of Thomas Kuhn: Paradigm Shifts Explained

TSC 6610: Social System Transformation Theory

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Introduction

What is a paradigm shift within a scientific revolution or indeed outside of a scientific revolution? If I take an extremely liberal viewpoint, the recent political regime change in the United States was a paradigm shift. But that would be stretching the definition to its breaking point as many have abused the term for decades since Kuhn's (1997) original book was written in 1962. Without a coup d'état, one can hardly label the recent regime change a paradigm shift. And while I can point to numerous articles analyzing an infinite number paradigm shifts within google.scholar.com alone, you can do that search easily enough yourself. I question who is doing the defining, however, and who is determining the meaning of the term when paradigm shift has been excessively overused to the point of abuse since the introduction of Kuhn's original book.

My purpose here is to introduce the original meaning of paradigm shift, explore its definition, concepts, and mindsets. Paradigm shifts, according to Kuhn, occur within a scientific community when a fundamental shift in the way normal science proceeds. In other words, science is based on the assumption that one's scientific community knows exactly what the world is like and scientists take great pains to defend that assumption, in a very insular way. The shift happens when something out of that ordinary experience of scientists jars that assumption. Sometimes it is abrupt and sometimes it takes time, perhaps decades or more as in the case of the phenomenon of chaos theory (Gleick, 2011), for example. While this paper will examine the deeper definition of paradigm shifts, it will also explore some of the original parties involved, some of the adversaries interested in the shift itself, how these shifts occur, and some of the criteria to determine when a shift has occurred. This is all simply explained, but is it with the usual suspects, status quo, resistance, and bureaucracy getting in the way?

Scientific Revolutions Defined

Kuhn explains a scientific revolution in a variety of ways, though one of the most colorful and descriptive is his comparison to political revolutions where a section of the political community has grown restless because the existing institutions have failed to adequately meet society's problems, partly because of the environment they created. Scientific revolutions smolder in much the same way when a subdivision of the community becomes aware that the existing paradigm has ceased to function properly. As I mentioned earlier, chaos theory was one area where practitioners felt the existing paradigm didn't fit the discoveries they were making, and establishment's attempts to force round pegs into square holes imploded when scientists across disciplines began communicating with each other and realized that while their disciplines were different, they discoveries were similar.

It remains for history to assess the revolutionary impact of chaos theory upon the sciences though it isn't so isolated as it once was and it has traveled beyond the study of physics and meteorology to be embraced somewhat by the social sciences as dynamic systems (Kiel and Elliot, 1996). However, it does satisfy Kuhn's definition as an example of scientific revolution where a section of the community realizes that the existing structures are not adequate to address the scientific challenges that they have been confronted with. Consider the parties involved in this revolution: On the one hand you have scientists who have been trained, for decades if not a few centuries, to ignore the anomalies at each extreme of the results. On the other hand, you have graduate level students and new professors who are not quite new to the rules of academic history, but they aren't married to those rules either and even for the hard sciences, these are science nerds used to looking at things that are usually ignored by everyone else. Ultimately, gradually, they begin to look at those anomalies even though their academic superiors, otherwise

respected and distinguished professors, insist they ignore those results because they have always been. They begin gathering unused equipment into unused offices to pursue these anomalies in secret. Even Copernicus and Galileo met with resistance. It is only within the last fifteen to twenty years that chaos theory has met with some level of acceptance within and without the hard sciences.

Paradigm Shifts Across Social Systems

Across social systems, no matter what those interrelationships are, whether nations, cities, or academic disciplines, paradigm shifts occur in a variety of ways. How that happens is more complex than the space available here. Sometimes that change can happen evolutionarily with slight changes over centuries making distinct and major changes over centuries and generations. In others, political revolutions, individuals and groups are jarred out of their complacency to consider alternatives, sometimes enough to resort to violence. In the case of the revolutionary war in what became the United States of America, the pressure for change built up over decades. That revolution and its original stirrings did not exist in a vacuum. Writers wrote, people responded, spoke, talked with others, and travelled, and the first revolution influenced a second, the French. The revolutions of 1848 across Europe stirred over several decades and influenced the 1917 revolution in Russia (though that revolution had local influences in earlier revolutions in 1905).

Within the sciences, there is the relatively recent explosion of Chaos Theory and its results that finally cannot be ignored. In recent memory, I would call that a scientific revolution. Kuhn cites several others that have occurred throughout the history of the sciences, but Chaos was still being ignored and he certainly wasn't made aware of it. Barely noticeable little ripples

of activity across physics and climatology were whispering across the halls of academia when Kuhn wrote his book. Slowly, gradually, Chaos Theory began travelling across scientific disciplines. One loan mathematician/meteorologist, Edward Lorenz, became the accidental patron saint of it all when he accidentally discovered the peripheral activity in the linear equations of meteorological predictions. Because Lorenz published his findings, though few noticed the article, several disparate academics and researchers, from physics, to chemistry, to biology, who were discovering a butterfly effect of their own in the peripheral details of their research, noticed and began talking to each other and began meeting, comparing notes and reporting their findings (Gleick, 2011). Even the social sciences began to report similar findings in what they rebranded as dynamic systems.

The Criteria for Scientific Revolutions

While there are criteria for normal science (Kuhn, 1996), that work as guides for some, a set of rules for others, a barrier to others who see them as a barrier to critical thinking, and even a little of all three for others attempting to learn from the past, the present, and the future. For scientific revolutions, the rule book is pretty useless when you are exploring the road less traveled. The process of critical thinking is heightened and explicitly required to discern that the rules, while important, may not apply. In musical culture, this is the equivalent of learning the rules to break the rules, as Miles Davis, John Coltrane, and Django Reinhardt, illustrate rather well. While not completely breaking the rules, Kuhn explains it thus, “Few philosophers of science still seek absolute criteria for the verification of scientific theories. Noting that no theory can ever be exposed to all possible relevant tests, they ask not whether a theory has been verified

but rather about its probability in the light of the evidence that actually exists." (Kuhn, 1996, p. 145). To put it crudely, they utilize critical thinking, intuition, and comparison of prior research.

To determine whether a scientific revolution has occurred is a little more difficult and tenuous. Consider history. It is written by the victors and the dominant power. In the case of the revolutionary war in the United States, the participants who were avowedly loyal to the British crown were generally tarred and feathered and written into the history and out of it as inhuman and "anti-American," at least most. Some moneyed loyalists with friends in high places were allowed to return after the war and their properties were protected from revolutionary looters. In scientific revolutions, the opposite may be the case. During the revolution, the dominant power ignores the revolution, pretends it doesn't exist, and writes it off as insignificant. It is only in hindsight that history and science can dispassionately reflect upon what happened and explain the process, instead of denying it or promoting it like a propagandist.

Conclusion

I am reluctant to label just any movement a paradigm shift, simply because the term has been overused and abused since its introduction in 1962 when Kuhn introduced the term. A cursory search of Google Scholar provides tens, if not hundreds of pages, of results from a variety of disciplines including the business marketing sector which may or may not deserve a paradigm shift of its own. Most references fail to define their paradigm shifts adequately to justify its use. Whether or not, one can observe that paradigm shift across social systems is a matter for ethnographers and social historians. The This short essay doesn't provide enough space to explore this phenomenon at a macro level, except very superficially, there are certain details of the phenomenon that deserve further inquiry, especially in light of dynamical systems

theory, the “adaptation” of paradigm shifts to the social sciences that doesn’t seem to stretch the sensible boundaries of its meaning and criteria as other business and social sectors seem to insist.

References

Gleick, J. (2011). *Chaos: Making a New Science*. Open Road Media.

Kiel, L. D., & Elliott, E. W. (1996). *Chaos theory in the social sciences: Foundations and applications*. University of Michigan Press.

Kuhn, T.S. (1997). *The structure of scientific revolutions* (3rd ed.). Chicago, IL: University of Chicago Press.