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Thomas Kuhn's Philosophy of Science (*The Structure of Scientific Revolutions*)

Important Aspects of Kuhn's Philosophy of Science:

1. Scientific progress is *revolutionary* rather than steady and cumulative.
2. Scientific change cannot be explained entirely as a rational process; sociology and psychology are needed to explain scientific change.

General Pattern of Scientific Change (according to Kuhn):

pre-science → normal science → crisis → revolution →
new normal science → new crisis → . . .

Glossary

“pre-science”—disorganized and unstructured activity characterized by total disagreement and constant debate over fundamentals (e.g., optics before Newton)

“normal science”—structured activity that is directed by a single paradigm, which is uncritically accepted by the (vast majority of the) scientific community

“crisis”—occurs when anomalies become sufficiently numerous and serious to call the current paradigm into question

“anomaly”—a “puzzle” that resists solution within the current paradigm (e.g., the observed orbit of Uranus before the discovery of Neptune within the Newtonian paradigm)

“revolution”—occurs when a crisis is resolved by the scientific community’s abandoning one paradigm and adopting another paradigm (e.g., the Copernican revolution)

“paradigm”—no precise definition; typical components include

1. explicitly stated laws and theoretical assumptions (e.g., $F=ma$)
2. standard ways of applying the fundamental laws to various situations (e.g., ways of applying Newton’s laws of motion to planetary motion)
3. instrumentation and instrumental techniques (e.g., telescopes)
4. general metaphysical principles to guide work within the paradigm (e.g., “God does not play dice.”)
5. general methodological principles (e.g., Attempt to resolve anomalies within the paradigm)
6. criteria of acceptability for scientific explanations (e.g., Explanations may not include any references to the supernatural.)

How *serious* is an anomaly?—factors:

1. The more an anomaly strikes at the “fundamentals” of the paradigm and resists attempts to resolve it, the more serious it is.
2. The more importance an anomaly has for some pressing social need, the more serious it is.
3. The more an anomaly resists concerted attempts by scientists to remove for a lengthy period of time, the more serious it is.

Factors Affecting the Onset of a Crisis:

1. the number of *serious* anomalies
2. the appearance of a rival paradigm

Kuhn on Paradigm Shifts

According to Kuhn, competing paradigms are *incommensurable*:

1. According to rival paradigms, the world is made up of different kinds of things. (e.g., phlogiston vs. oxygen)
2. Rival paradigms regard different kinds of questions as legitimate, meaningful, and/or important. (e.g., the problem of ascertaining the velocity of the earth with respect to the ether)
3. Old terms and concepts have different meanings and different relationships to each other in the new paradigm.
4. Proponents of different paradigms operate in different worlds.

According to Kuhn, a “paradigm shift” is in some ways like a “Gestalt switch” or “religious conversion” and cannot be explained entirely on the basis of logic or rationality:

1. Different scientists are (psychologically) affected by different factors in their decisions about whether to adopt a new paradigm.
2. A paradigm presupposes metaphysical and epistemological perspectives from which other paradigms are inferior. (e.g., The world is deterministic. “Vital forces” exist in nature.)
3. Paradigm shifts do not occur because of a single convincing argument. Rather different arguments convince different scientists.
4. Arguments that scientists use in debating paradigms operate mainly by *persuasion* rather than by logic or rationality.
5. The choice between competing paradigms calls for a “decision between alternate ways of practicing science.”
6. The decision to accept a new paradigm is often a matter of *faith*.
7. Scientists who resist paradigm shifts are not wrong or unreasonable. Rather, because of the changes in the

conception of what science is that is associated with the new paradigm, they cease to be scientists.

Absolutism vs. Relativism:

- *absolutism*—The truth of a proposition depends entirely on what the world is really like and not whether some person, or group of persons, believes it.
- *relativism*—The truth of a proposition depends, at least in part, on whether some person, or group of persons, believes it.

Reasons to suspect that Kuhn is a relativist (although he denies that he is):

1. According to Kuhn, the criteria for choosing one theory over another is part of a paradigm.
2. According to Kuhn, a paradigm shift is like a “Gestalt switch” or a “religious conversion.”
3. According to Kuhn, the arguments that scientists use in debating paradigms operate mainly by *persuasion* rather than by logic or rationality.
4. According to Kuhn, “We may . . . have to relinquish the notion that . . . changes of paradigm carry scientists and those who learn from them closer and closer to the truth.”
(*Structure*, 170)
5. According to Kuhn, there is no higher standard than the “assent” of the scientific community.

Problems for Kuhn:

- If the standards for judging scientific claims as true or false are internal to paradigms, then how may we say that one paradigm is “better” than another?
- If we may not say that a new paradigm is “better” than the old one it replaces, then on what grounds may we say that scientific progress occurs across paradigms?

- If science is not getting closer and closer to the “truth” about the physical universe, then why should we prefer it over “pseudoscience”?