Philosophy of Science // Fall 2016

Handout 13

Scientific revolutions: Kuhn

The background. This is a text both in history and philosophy of science. It is in rich in historical data, somewhat thin on philosophy. Its predecessor is Kuhn's major book on the transition from Ptolemaic to Copernican astronomy (geocentric to heliocentric).

Philosophy of science before Kuhn. Earlier philosophy of science, dominated by positivism, identified science with physics. Scientific progress was largely assumed: science goes from victory to victory. What counts as victory? Perhaps getting at truth, perhaps getting at a better explanation.

History, in any case, has little or no role in understanding science. We were supposed to distinguish between *the context of discovery* and *the context of justification*. Philosophy of science should study the context of justification.

Science was also assumed to be rational. The transition from one theory to another theory goes through experiments.

Kuhn's reaction: an outline. The notion of progress, if there is one, must be refined. This issue is indeed critical in the interpretation of Kuhn's book. There is no distinction between the context of discovery and the context of justification. History is key in understanding scientific change.

Science is not always rational. Again, the notion of rationality must be refined. Scientific change is not determined by experiments, but experiments do still have a role.

Kuhn's picture. (1) Normal science dominated by the paradigm X. Lasts very long. (2) Anomalies appear. Can last for quite some time. (3) Crisis develops. A relatively short period of time. (4) Revolution: paradigm Y replaces X. Almost instantaneous. (5) Normal science dominated by the paradigm Y. The cycle begins anew.

The concept of paradigm. Kuhn uses 'paradigm' in a number of ways. (1) It is an achievement accepted by a given community. (2) It is likely to be codified in a classical book (*Physica*, *Almagest*, *Principia Mathematica*). (3) It is unprecedented attracting many followers. (4) It leaves sufficient space for further research (poses problems, rather than just solves them). (5) It is a 'tradition of research'.

The role of the paradigm. (1) A paradigm grants a researcher a place in the community. (2) The researcher is unlikely to subsequently challenge the paradigm. (3) He shares the commitment is to the same rules and standards with other members of the community. (4) Another key role of paradigms is in their relation to facts. In the absence of a paradigm, the collection of facts is chaotic, since every fact seems as important as any other. (There is no science, just 'contemplation', 'philosophy'.) A paradigm sets the rules of selection, evaluation, and criticism of facts.

The losing side. Once inside the community, the researcher does not challenge the status of the paradigm. Those who obstinately challenge are ignored, isolated, die out, or go to the philosophy department. Textbooks separate between experts and laymen. Their approach is emphatically ahistorical.

The practice of normal science. The nature of science is essentially conservative. This feature is expressed in the practice of 'normal' research. Normal science has the following tasks: (1) Extending the application of the grand theory to more specific instances. (2) No attempt at inventing a radically new grand theory. (3) Articulating the phenomena and theories already suggested by the paradigm.

Initial response to anomalies. (1) Not the abandonment of the old paradigm. (2) But the creation of many adjustments and modifications. (3) A puzzle at one time may become a counterexample at another. (4) The agreement of theory and fact is an illusion for two reasons: normal science engages in puzzle-solving, and, secondly, the science practitioners are unaware of alternative paradigms.

Revolutions. Kuhn's disagreement with the positivists is clear. Revolutions take place (1) not because of the greater accuracy of the alternative, and (2) not because of the greater simplicity of the alternative, but (3) because of the crisis and the long history of the anomalies.

Are revolutions necessary? There is a *logical* possibility of cumulative development. New theories would exhibit aspects of the order of nature unnoticed before. But, Kuhn claims, it is not found in actual practice. Further, there is a general case to be made against possibility-in-principle. Men do not simply look around for solutions: they already have beliefs about where to look for solutions. Therefore, major discoveries are possible only through the destruction of familiar ways of dealing with problems—that is, old paradigms.

Introduction of a new paradigm also requires special conditions. If phenomena are already well-explained by the paradigm, no reason exists for adopting an alternative. Other phenomena are 'puzzles' solved by normal science. Only anomalies call for the introduction of a new paradigm. But this new paradigm cannot be logically compatible with the old one: otherwise anomalies=puzzles.

Paradigm transition. The transition from one paradigm to another is accompanied by change in the following respects: (1) Ontology: what exists. (2) What science is: methods, standards, problem-field. (3) Further, there is meaning change in basic terms, such as, for example, mass, energy, momentum.

Kuhn's argument for meaning change. (1) Scientists never confront nature in its purity. (2) They have to use concepts and tools to formulate theoretical problems. (3) These problems suggest which evidence should be collected. (4) But concepts and tools are determined by the reigning paradigm. (5) Thus paradigms affect the way scientists 'perceive' reality.

Arguments against meaning change. (1) We can begin with an observation that the meaning of key terms does not *have to* change in the course of the paradigm displacement. What could be changing is the extension (i.e. reference) of the terms in question. Kuhn, in insisting on *meaning* change, is blinded by his vague and far too wide notion of paradigm.

(2) Further, if there is meaning change (incommensurability), how can there be a *disagreement* between different paradigms? To disagree on anything, they should be communicating in the same language. With meaning changing, they merely talk past each other.

(3) If there is meaning change, then there are no good reasons to prefer one paradigm over another. The choice is arbitrary. Thus relativism follows.

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