

PROGRESS IN KNOWLEDGE: SCIENCE AND PHILOSOPHY

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The concern of this paper is with the subject of "progress" in philosophy. In seeking a set of criteria for what would count as progress in philosophy, one is forced to take note of the recent controversy which has been raging in the philosophy of science where that very issue of the progress of science has been probed in depth, and where, furthermore, the boundaries of "science" have been so blurred that the results of the controversy spill over into the historiography of philosophy.

Karl Popper holds that "science can progress—just because we can learn from our mistakes."¹ But Popper tends to speak not only of science: his discussion expands to include the progress of all knowledge. Knowledge progresses when "conjectures" (i.e., guesses) are refuted (i.e., put to severely critical tests, and fail). Conjectures may survive many tests, but can never be conclusively justified; absolute certainty is not possible. "Refutations" are the steps forward in the progress of knowledge. Popper formulated this view early in his career when he noticed that the theories of Freud, Adler, and Marx could "explain" every conceivable case which came under their purview; this apparent strength becomes their very weakness, for nothing can refute them, and therefore they can never be tested.² On the contrary, the strength of a truly "scientific" theory like that of Einstein is that there are cases which can refute or corroborate it, and it has passed those tests so far put to it.³ Popper's position can be summed up in his statement that "the criterion of the status of a theory is its falsifiability, or refutability, or testability."⁴ Then, according to this position, the theories of Marx and Freud are not "scientific," and the implications of Popper's position are to deny altogether the title of "knowledge" to those theories.

One of Popper's major opponents in the dispute is Thomas Kuhn, who challenges Popper's falsifiability criterion. Kuhn holds that to verify is to pick out the most viable among alternatives in a particular historical situation. No theory solves all the puzzles confronting it; rather it is the incompleteness of an accepted theory which defines the puzzles which characterize "normal science." If every failure (Popper's 'falsification') were grounds for rejecting a theory, "all theories ought to be rejected at all times."⁵

Kuhn offers a different set of criteria for scientific progress: science develops because (1) scientific theories are constantly better articulated and "matched to nature at an increasing number of points and with

increasing precision;" (2) "the number of subject matters to which the puzzle solving approach can be applied clearly grows with time"; (3) the proliferation of scientific specialties extends the boundaries of science; and (4) a new theory must solve most of the puzzles solved by its predecessors, in addition to solving new puzzles not solved by the predecessors. In short, a "better" system is one which solves more puzzles.⁶ "Progress" here depends upon a particular value-system shared by scientists, and group unanimity is of paramount importance. At present, the scientific value-system aims at solving the puzzles left unsolved by the accepted knowledge system.

"Progress" occurs in two ways: (1) "normal science" is the solving of puzzles (anomalies) within a particular theory in the effort to perfect that theory, and such a theory is usually based upon a particular paradigm (e.g., a particular experiment or model used analogically);⁷ or (2) when the old theory reaches a crisis in its puzzle-solving and a new paradigm arises which apparently solves more puzzles than the previous one or at least some puzzles not solved by it, a "revolution" occurs (such as that from the Newtonian to the Einsteinian theory) and scientists adopt that new paradigm as the basis for their "normal" scientific work of puzzlesolving.

Paul Feyerabend attacks the positions of both Kuhn and Popper. Against Popper, he reminds us that since the formulation of a theory and the development of its supporting sciences (e.g., of physiological optics after the invention of the telescope and the formulation of the Copernican theory) seldom go hand in hand, a refuting instance may only mean that the auxiliary sciences are not yet in phase with the basic theories; therefore a principle of tenacity is useful *even* when one is confronted with inconsistencies and refuting instances.⁸ So, just as there can never be absolutely certain grounds for the acceptance of a theory, neither can there be absolutely certain grounds for its rejection.

Against Kuhn, Feyerabend points out that there is no way that one can judge one scientific paradigm "better" than another, since frequently they are incommensurable.⁹ Furthermore, Kuhn is wrong that normal science follows only one paradigm at a time until a period of crisis; rather it is normal that multiple paradigms exist and are used, even when they are incompatible (e.g., mechanics, thermodynamics, and wave optics), and the growth of knowledge is the result of the interplay of these different views.¹⁰

These philosophers of science posit as one of the features which distinguishes philosophy from science that the function of philosophy is largely critical, but what seems to be forgotten by the philosophers of science is that philosophy has traditionally not been only critical; at different times in history philosophy has been a system-building

enterprise. It is so even now for the Thomists and Marxists, who are carrying out the system-building program with the same degree of intensity, concern with detail, and pursuit of puzzle-solving in accord with a particular paradigm, as are the scientists. How can one distinguish the scientist from the Thomist or Marxist philosopher according to the criteria of the philosophers of science? Popper's criterion of falsifiability cannot do the trick, for Popper applies it not just to "scientific," but to all knowledge; furthermore, Feyerabend and Kuhn have shown that no system is simply falsifiable by any one refuting instance. The major distinction between systems, be they scientific, political, or religious, seems to rest on the paradigm which is being followed. Although the tendency among many recent schools of philosophy, in particular the analytic, has been to reject the systematic aspect of philosophy and to concentrate only on the critical,¹¹ *that* itself is a "program" for research, assuming a "paradigm," defining what philosophy is. The importance of "paradigms" ought not to be so easily forgotten by the heirs of Wittgenstein.

Kuhn criticizes Popper's failure to distinguish philosophy from science, and he places the distinction at the point that: science is considered to *progress* while art, philosophy, and political theory are not.¹² Up through the Renaissance the arts and sciences had not been distinguished; painting, concerned with representation, had progressed technically; it was only when painting became non-representational that it ceased to "progress." Part of what distinguishes "science" is that it makes progress.¹³ Philosophers have been disturbed by the very success in the physical sciences, to the extent that they have tried to imitate science. Kuhn attributes to philosophy the same kind of progress which he attributes to science, i.e., the philosopher solves problems in accord with a shared paradigm, for example, "the philosopher who refines the Kantian imperatives contributes to progress."¹⁴ It is only that there are competing schools that causes us to judge that non-scientific fields make no progress.¹⁵ But then the claims of Popper and Feyerabend that there are always competing schools in science cast doubt on even that distinction between science and philosophy.

Kuhn points out that pre-Darwinian theories of evolution were goal-directed, teleological,¹⁶ science now is seen to progress, not *toward* truth, but away *from* a previous, less adequate scientific position, just as evolution progresses *from* a previously less adequate adaptation. And what is the criterion by which one judges scientific progress? "What better criterion than the decision of the scientific group could there be?"¹⁷ Kuhn speaks of "conversions" from one paradigm to another, so that scientific revolutions are comparable to philosophical or religious

conversions and political revolutions. What are his criteria for conversion?¹⁸ (1) A new paradigm solves problems which have led the old one to crisis; (2) "the new paradigm permits the prediction of phenomena that had been entirely unsuspected while the old one prevailed." (3) the new paradigm appeals to a sense of the aesthetic, for it is "neater," "more suitable," "simpler" and so forth; (4) a new paradigm must often be accepted on faith as to its future problem-solving ability, and that judgment is often personal and inarticulate.¹⁹

Kant, in the Preface to the Second Edition of his first *Critique*, distinguished science from philosophy by the observation that: (1) science goes to a conclusion, and (2) scientists agree on the manner of pursuit of that conclusion.²⁰ These criteria were not applicable to philosophy; but they turn out not to be applicable to science either. Historians and historiographers of philosophy have often supposed these criteria to apply to philosophy also, upon the supposition that philosophy was "scientific." Ortega relates the well known fact that the very success of physics has led philosophy to try to imitate it in recent centuries, as it tried to imitate mathematics earlier.²¹ But now that the revolutions in science have become apparent, science is seen to be no more firmly grounded than philosophy, and as science is turning back to philosophy, philosophy is attempting to rediscover its own proper subject-matter.²² With regard to progress, it is clear that science proves to be no more linearly cumulative than philosophy has been. For both, it becomes more and more apparent that problems are solved within a particular context, and a later context can be, as Feyerabend points out, incommensurable with an earlier one.

Popper's set of criteria agrees with Kuhn on some points: "Reason works by trial and error," he says, and "the better theory is one that has the greater explanatory power: that explains more; that explains with greater precision; and that allows us to make better predictions."²³ Theories are, he admits, "free creations of our open minds" which we criticize by testing them. Theories cannot be *derived* from observations, but can be *tested* by them. Logically, all empirical tests are attempted refutations. But is Popper here speaking only of scientific theories? Logical or mathematical theories can be refuted analytically; empirical or scientific theories can be refuted empirically; philosophical or metaphysical theories can be tested also, since a theory is rational only in so far as it is an attempt to solve certain problems, according to their ability to solve the problems not solved by other theories and their tendency to contradict other theories needed to solve other problems.²⁴ Then for both Kuhn and Popper, precisely that by which theories are judged, problem-solving capacity, is common to both science and philosophy. Popper believes that where philosophy goes wrong is where it is abstracted from the concrete non-philosophical problems it dealt with historically.²⁵

Feyerabend, perhaps without realizing it, leads us to one distinction between science and philosophy which is crucial for the problems we are investigating. He holds that theories, though commensurable in some interpretations, are incommensurable in others. Just as the child in his development goes through *gestalt* switches from one incommensurable world to another,²⁶ so this must be what happens in the case of religious conversions. There is no way to compare two incommensurable theories; to say that the Michelson-Morley experiment is the *same* experiment which refutes Classical Mechanics and confirms Special Relativity, from the point of view of each of those theories, is possible only because one is using a third system which comprehends those two theories, namely a common scientific language and methodology, itself more primitive than either theory.²⁷

The two different scientific theories are both considered to be scientific, not because of the answers they give, but because they are directed toward solving a certain set of problems, and share one basic methodology. Different scientific theories are imbedded in a broader field of concerns, values, and suppositions, within which they can be compared. All scientific theories are argued about in terms of the same logical presuppositions, the same technical language, and a common encompassing philosophy. What some philosophers of science fail to notice about the difference between science and philosophy is that, whereas a specific scientific field or theory can itself be investigated within a broader philosophical framework and from more basic principles, philosophy is characterized by being itself the broadest framework and concerned with the most basic principles. If one looks at a philosophical system, or at the whole history of philosophy, critically, one can only do so from a particular philosophical and logical framework, and from a particular set of basic principles; one can never step outside of philosophy in order to investigate it.

Kuhn agrees that theory choice is determined by logic and observation.²⁸ But he fails to observe where the logic of that claim ought to lead him, namely, to the conclusion that all scientific theories are comprehended within a system of language and logic, and a set of philosophical methodological procedures which determine how one uses observations. That is prior to any scientific activity: it is the metaphysical framework within which science carries on. What is ignored is that that very framework can change, as, for instance, when there are contending systems of "logic" (such as the Aristotelian vs. the Hegelian). Contending scientific systems, and the *progress* of science, can be judged within a particular philosophical framework, for the framework itself provides criteria for judging; but contending philosophical systems, and *progress* in

philosophy, can only be judged philosophically, and that raises a host of philosophical problems not shared by science and not considered by the philosophers of science.

Kuhn, let us remember, has suggested that the criteria for choosing one scientific or philosophical theory over another are: (1) problem-solving capability (including one's intuitive faith in a paradigm's future problem-solving capability), and (2) aesthetic appeal.

The notion of philosophy as problem-solving is widely spread among historians of philosophy; even Collingwood admittedly applies the criterion for progress in science to progress in philosophy when he says that: "Philosophy progresses in so far as one stage of its development solves the problems which defeated it in the last, without losing its hold on the solutions already achieved."¹⁹ It is the second criterion, the aesthetic, which is so widely ignored by contemporary philosophers and historians of philosophy in their efforts to imitate "science."

We have arrived, minimally, at the following criteria by which to judge whether one system of knowledge can be said to represent *progress* beyond another: (1) *internal coherence* (i.e., one system is more consistent than another); (2) *comprehensiveness* (i.e., one system accounts for more of the human experience or solves more of the problems or satisfies more human needs which fall within the purview of the system); and (3) *aesthetic elegance* (which can be a matter of either simplicity or richness). Furthermore, these criteria appear to be so widely shared as to be foundational to the whole tradition of Western thought.

NOTES

¹Karl R. Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge* (New York: Harper Torchbooks, 1968), p. vii.

²Ibid., p. 35.

³Ibid., p. 36.

⁴Ibid., p. 37.

⁵Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1967), p. 145.

⁶Thomas S. Kuhn, "Logic of Discovery or Psychology of Research?," *Criticism and the Growth of Knowledge*, ed. Lakatos and Musgrave (Cambridge: Cambridge University Press, 1970), p. 20.

⁷Margaret Masterman, "The Nature of a Paradigm," *ibid.*, p. 59ff.

⁸Paul Feyerabend, "Consolations for the Specialist," *ibid.*, p. 205.

⁹Ibid., p. 202.

¹⁰Ibid., pp. 207-08.

¹¹This has happened in other periods of history, notably the Hellenistic and Renaissance. Perhaps Kuhn's paradigm is applicable with respect to alternation of system-building and of critical periods in the history of philosophy.

¹²Thomas S. Kuhn, *Revolutions*, p. 159.

¹³Ibid., pp. 160-61.

¹⁴Ibid., p. 161.

¹⁵Ibid., p. 162.

¹⁶Ibid., p. 170.

¹⁷Ibid., p. 169.

¹⁸One might want to bear in mind the similarities here with the descriptions of religious conversions found in William James' *Varieties of Religious Experience*.

¹⁹Thomas S. Kuhn, *Revolutions*, pp. 152-57.

²⁰Immanuel Kant, *Critique of Pure Reason*, trans. Norman Kemp Smith (New York: St. Martin's press, 1961), p. 17.

²¹Jose Ortega y Gasset, *What is Philosophy?*, trans. Mildred Adams (New York: Norton, 1960), pp. 39-46.

²²This point has been made more recently by John P. Anton, in "Science, Culture, and the Teaching of Philosophy," *Buffalo Studies*, Vol. 11, No. 2 (July 1966), pp. 14-15.

²³Karl R. Popper, *Refutations*, p. 192.

²⁴Ibid., pp. 197-98.

²⁵Ibid., pp. 66-74.

²⁶See the work of Piaget on children.

²⁷Paul Feyerabend, *op. cit.*, pp. 223-36.

²⁸Thomas S. Kuhn, "Reflections on my Critics," *Criticism and the Growth of Knowledge*, ed. Lakatos and Musgrave (Cambridge: Cambridge University Press, 1970), p. 234.

²⁹R. G. Collingwood, *The Idea of History* (New York: Galaxy, 1956), p. 332.

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