LAKATOS, IMRE
(1922–1974)

LIFE

Imre Lakatos did important work in the 1960s and 1970s in the philosophy both of mathematics and science. He was born Imré Lipsitz in Debrecen Hungary, and by the time he left for England after the Hungarian Uprising in 1956, he had already lived a complex, charged, and controversial life. A convinced and influential Marxist, he had been unofficial leader of a group of young Jews in hiding from the Nazis after the invasion in 1944. As a high ranking official in the Ministry of Education after the war, he was involved in significant and controversial education reform before being arrested by the secret police in 1953 and held for three years under appalling conditions, sometimes in solitary confinement, in Recsk—the worst of the Gulag-style camps in Hungary.

He studied mathematics, physics, and philosophy at the University of Debrecen, graduating in 1944. He obtained a first PhD (with highest honors) from the Eötvös Collegium in 1947—this for a thesis on the sociology of science that he later insisted was worthless. After leaving Hungary in 1956, he obtained a Rockefeller Foundation grant to study for a second PhD at the University of Cambridge. From 1959 onward he regularly attended Karl Popper's seminar at the London School of Economics (LSE). Popper became the most important influence on him; amongst other things, Popper's Open Society views reinforced the decline of his faith in Marxism that had begun in 1956. Lakatos accepted a lectureship in logic at LSE in 1960 and was promoted to a personal chair (in Logic, with special reference to the philosophy of mathematics) in 1970. He was only fifty-one years old and still teaching at LSE at the sadly early time of his death from a heart attack in 1974.

PHILOSOPHY OF MATHEMATICS

Lakatos's Cambridge PhD thesis became the basis for his *Proofs and Refutations*. This work, published initially in the form of journal articles in 1963–1964 and in book form only posthumously in 1976, constitutes his major contribution to the philosophy of mathematics. A dialogue between a group of frighteningly bright students and their teacher, it reconstructs the process by which Euler's famous conjecture about polyhedra (that they all satisfy the formula: number of vertices plus number of faces minus the number of edges equals two) was proved and, in the process, heavily modified and transformed. Lakatos's claim was that although the eventual proof of the theorem in mathematics may be cast as a straightforward deduction, the process by which the proof is found is a more exciting process, involving counterexamples, reformulations, counterexamples to the reformulations, and careful analysis of failed proofs leading to further modifications of the theorem. Any number of interesting claims about both the history and philosophy of mathematics are thrown in to the mix—sometimes in the main text, sometimes in one of the voluminous footnotes. The work is a literary tour de force.

The extent to which *Proofs and Refutation*s represents a distinctive epistemological view that might challenge more traditional accounts in the philosophy of mathematics, such as logicism or formalism, is a controversial one. Lakatos sometimes described himself as extending Popper's fallibilist-falsificationist view of science into the field of mathematics, and there are even hints of Lakatos's Hegelian past in some of the claims about the autonomous development of mathematics. An alternative view, however, is that the main significance of his work is to cast light simply, though importantly, on the development of mathematics—on how mathematical truth is arrived at—and that it has nothing distinctive to say about the epistemological status of mathematical truths once they have been arrived at. But even if this alternative view is correct, there is a good of undoubtedly epistemological significance in some of the particular issues raised (for example, what he calls the problem of translation highlighting issues about how the formal systems, within which effectively infallible proof can be achieved, relate to the informal mathematics said to be captured by those formal systems).

PHILOSOPHY OF SCIENCE

As indicated, Lakatos thought of himself for some years as extending Popperianism, developed as an account of natural science, into the seemingly unlikely field of mathematics. However, he eventually began to discern faults in Popper's philosophy of natural science. Most significantly, in comparing Popper's views with those of Thomas Kuhn, Lakatos came to realize that Popper's view on the way that evidence impacts on scientific theories is seriously awry.

Lakatos claimed that science is best viewed as consisting not of single, isolated theories but rather of broader research programs. A hard core of principles characterizes such a program, but this needs to be supplemented by an evolving protective belt of more specific and auxiliary assumptions in order to come into contact with experiment. When the latest theory produced by a program proves to be inconsistent with some empirical result, then the standard response of the program's proponents will be to retain the hard core and look to modify some element of the protective belt. This is a process much closer to Kuhn's idea of adverse experimental results being treated as anomalies than to the standard Popperian idea of falsification. However, while Popper used his framework to defend the idea that theory-change in science is a rational process, Lakatos believed that to accept Kuhn's account of paradigms and paradigm shifts was in effect to abandon the view that the development of science is rational. Kuhn's view, he (in)famously claimed, makes theory-change a matter of mob psychology. He was therefore led to make the important distinction between progressive and degenerating programs. The latest Newtonian theory was inconsistent with observations of Uranus's orbit; Newtonians reacted not by giving up the basic theory but by postulating a new planet.

Philip Gosse (1810–1888) realized that claim that God created the world essentially as it now is in 4004 BC is inconsistent with what Darwinians believed to be the fossil record; Gosse reacted not by surrendering the basic creationist theory (hard core), but by postulating that the alleged fossils were parts of God's initial creation. The first was a great scientific success; the second bears the clear hallmark of pseudoscience. Why? Lakatos's answer is that the Newtonian shift was progressive: It not only solved the anomaly of Uranus but made extra predictions (of the existence of a new and hitherto unsuspected planet) that could be tested empirically and were indeed confirmed (by the discovery of Neptune). Gosse's shift is degenerating: All it does is reconcile the basic creationist theory with observation but permits no independent test. The development of science consists of the replacement of degenerating programs by progressive ones. There are many other interesting aspects of the methodology, particularly concerning the role of heuristic principles, and of whether it does satisfactorily save the rationality of science.

See also Epistemology; Hegel, Georg Wilhelm Friedrich; Kuhn, Thomas; Logic, History of: Precursors of Modern Logic: Euler; Marx, Karl; Newton, Isaac; Philosophy of Science; Popper, Karl Raimund.

Bibliography

WORKS BY LAKATOS

With Alan Musgrave, eds. *Criticism and the Growth of Knowledge*. Cambridge, U.K.: Cambridge University Press, 1970.

Proofs and Refutations. The Logic of Mathematical Discovery, edited by John Worrall and E.G. Zahar. Cambridge, U.K.: Cambridge University Press, 1976.

The Methodology of Scientific Research Programmes and Mathematics, Science and Epistemology. Philosophical Papers. Vols. 1 and 2, edited by John Worrall and Gregory Currie. Cambridge, U.K.: Cambridge University Press, 1978.

With Paul Feyerabend. *For and Against Method: Including Lakatos's Lectures on Scientific Method and the Lakatos-Feyerabend Correspondence*, edited and with an introduction by Matteo Motterlini. Chicago, IL: University of Chicago Press. 1999.

WORKS BY OTHERS

Kampis, George, Ladislav Kvasz, and Michael Stölzner, eds. *Appraising Lakatos: Mathematics, Methodology and the Man*. Dordrecht, Netherlands: Kluwer, 2002.

Larvor, Brendon. *Lakatos: An Introduction*. London: Routledge, 1998.

John Worrall (2005)

LALANDE, ANDRÉ

(1867–1964)

André Lalande, the French philosopher, was born in Dijon and entered the École Normale Supérieure in 1885. He took his doctorate in 1899 and taught in *lycées* until he was appointed first to a lectureship and then, in 1904, to a chair of philosophy at the University of Paris.

Lalande was a rationalist whose whole life was devoted to the cause of international communication and the dissemination of knowledge. His constant preoccupation after 1902 was the launching, and subsequent reediting, of the *Vocabulaire technique et critique de la philosophie,* which aimed at the concise definition and standardization of philosophical terminology. His own philosophical work corresponds to this recognition and promotion of an interdependent humanity.

In his thesis of 1899, *L'idée directrice de la dissolution opposée à celle de l'évolution,* Lalande challenged Herbert Spencer's thesis that progress is evolutionary and differentiating, and held that, on the contrary, dissolution—or, as he later called it, involution—is more widespread and significant. Involution, or movement from the heterogeneous to the homogeneous, is observable in nature as entropy, or increase of randomness. In human life, however, this movement toward uniformity is fruitful and is served by reason, which, in scientific investigation, leads to the progressive subsumption of more and more classes of phenomena under fewer general laws.

Lalande disapproved of an imposed uniformity, which represents merely the transference from the indi-