

HENDRIK ANTHONY KRAMERS  
1894-1952

Kramers was born on 17 December 1894, the fifth son of a physician in Rotterdam. He attended the HBS, passed the necessary examinations in Greek and Latin in 1912, and then went to Leiden to study physics. There he was one of the students of Paul Ehrenfest. In the spring of 1916 he became a teacher at a secondary school in Arnhem and in June 1916 he passed his doctoral examination.

In September 1916 Kramers broke away from the normal life of a physicist and traveled to Copenhagen, where he offered his assistance to Niels Bohr. Kramers worked with Bohr on the development of Bohr's provisional quantum theory. On 8 May 1919 Kramers took his degree (in Leiden) with a dissertation on some of the mathematical formalisms he had worked out for Bohr's theory. The next year Kramers became the first assistant at Bohr's newly founded Institute of Theoretical Physics. In 1924 he became a lecturer. His work during these years concentrated on quantum theory. In 1924, together with Bohr and J. C. Slater, Kramers published an article in which it was stated that the principle of the conservation of energy might not hold in elementary processes. He also worked on the dispersion of light in atoms (1924-1925), which provided one of the stepping stones for Heisenberg's new quantum mechanics.

In 1926 Kramers returned to Holland. He became professor of theoretical physics at the University of Utrecht and in addition, in 1931, became honorary professor at the Technical College in Delft. In 1934, after the tragic death of Ehrenfest, Kramers was called from Utrecht to succeed his teacher at Leiden. On 26 September 1934 he gave his inaugural lecture in Leiden on *Natuurkunde en natuurkundigen* (Physics and physicists). His work now became more diverse. Kramers' central concern was still the mathematical formalism of the new quantum mechanics. In addition to several articles, he also wrote a two-volume handbook on quantum mechanics (1933-1938). But now he also dealt with magnetism (also in relation to low temperature physics and adiabatic demagnetization), statistical and kinetic theory, and relativistic formalisms in particle theory (in connection with the theory of radiation). Most of his work was of a very technical character and it contained no new and spectacular ideas that could easily be explained to a larger audience. Even though his interests were very diverse (Kramers was very musical, for instance, and had

many linguistic talents), he was not well known outside a circle of physicists. He was, of course, a member of the Royal Netherlands Academy of Arts and Sciences.

Although during the Second World War Leiden University was closed and Kramers and other professors resigned (1943), he continued his research. But after the war he became more and more involved in the administration of science. In 1946 he was elected chairman of the Scientific and Technological Committee of the United Nations Atomic Energy Commission. In this capacity, he presented a report on the technological aspects of the control of atomic energy. From 1946 to 1950 he presided over the International Union of Pure and Applied Physics. In the Netherlands, he was also instrumental in bringing about the founding of FOM and the cooperation of Norway and Holland in nuclear research.

Kramers died on 24 April 1952 in Oegstgeest near Leiden.

#### *Primary works*

*Poggendorff*, vol. 5, 677; vol. 6, 1395-1396; vol. 7B, 2585-2588. *Intensities of spectral lines on the application of the quantum theory to the problem of the relative intensities of the components of the fine structure and of the Stark effect of the lines of the hydrogen spectrum* (Copenhagen: Host, 1919); *Die Grundlagen der Quantentheorie*, in: *Hand- und Jahrbuch der chemischen Physik*, vol. 1 (Leipzig, 1933); *Quantentheorie des Elektrons und der Strahlung*, vol. 2 (Leipzig, 1938); an English translation of these two books was published as *Quantum mechanics* (Amsterdam, 1965); *Collected scientific papers* (Amsterdam: North-Holland, 1956). Lists of his publications, including popular and general articles, in: *Nederlands tijdschrift voor natuurkunde* 18 (1952) 173-180, and in ter Haar (see below), 277-282.

#### *Secondary sources*

J. Becquerel, in: *Comptes-rendus hebdomadaires des séances de l'Académie des sciences* 234 (1952) 2122-2126; F.J. Belinfante and D. ter Haar, in: *Science* 116 (1952) 555-556; N. Bohr, in: *Nederlands tijdschrift voor natuurkunde* 18 (1952) 161-166; H.B.G. Casimir, 'The scientific work of H.A. Kramers', in: *Nederlands tijdschrift voor natuurkunde* 18 (1952) 167 ff.; *idem* in *Jaarboek der Koninklijke Nederlandse Akademie van Wetenschappen*



(1952-1953) 302-305; J. Romein, in: *Jaarboek van de Maatschappij der Nederlandse Letterkunde* (1951-1953), Levensberichten, 82-91; J. Romein, in: *De Nieuwe Stem* 7 (1952) 575-578; J.A. Wheeler, in: *Yearbook of the American Philosophical Society* 1953, 355-360; M. Dresden, *H.A. Kramers. Between Tradition and Revolution* (Berlin and New York: Springer, 1987); D. ter Haar, *Master of Modern Physics. The Scientific Contributions of H.A. Kramers* (Princeton: Princeton University Press, 1998).

H.B.G. Casimir, in: *BWN*, vol. 1, 322-333; *idem*, in: *DSB*, vol. 7, 491-494.

[A.v.H.]