

FRITS ZERNIKE
1888-1966

Zernike was born in Amsterdam on 16 July 1888. His father was a schoolteacher and a well-known pedagogue who wrote several textbooks on arithmetic. Frits Zernike attended the HBS and from 1905 onwards studied chemistry at Amsterdam. At the age of nineteen, in 1907, he answered a prize question of the University of Groningen on probability theory, for which he was awarded a gold medal. He won a second gold medal for a prize question in optics issued by the *Hollandsche Maatschappij van Wetenschappen* in Haarlem (1912). In that year, he passed his doctoral examinations and started work on his dissertation, for which he used his prize winning essay of 1912 as a starting point. In 1913 he was appointed assistant to the astronomer J.C. Kapteyn at the University of Groningen. In 1915 he took his degree in chemistry at Amsterdam with a dissertation *L'opalescence critique, théorie et experiments*.

Shortly after obtaining his degree, also in 1915, Zernike succeeded Ornstein as lecturer in mathematical physics and theoretical mechanics in Groningen and in 1920 he became full professor. In the 1920's Zernike mainly worked in statistical physics. Together with Ornstein, and later with J.A. Prins, Zernike wrote a number of articles on fluctuation phenomena. In molecular statistics he introduced the concept of a radial distribution function, giving the mean number density of molecular centers around an arbitrary molecular center. For the *Handbuch der Physik* he wrote a chapter on probability theory and mathematical statistics (1928). In the 1930s, while not neglecting his work in statistical mechanics altogether, Zernike became more and more interested in physical optics. He had always been a very skillful instrument-maker: as early as 1921, he had constructed a very precise galvanometer and during the 1930s he worked on the construction of the so-called phase contrast microscope. He studied errors in telescope mirrors and discovered that there is a phase difference in the diffraction of light in different substances. By finding ways to increase the phase contrast, Zernike was able to construct a much more powerful microscope, with which one could study living material (staining usually kills the cells). In 1936 he obtained a patent on his invention.

Zernike long remained a bachelor. In the 1920s he lived with his sister, Elisabeth Zernike, who was an author, and with his mother.

Finally, only in January 1930, he married Theodora Willemina van Bommel van Vloten. They had one son (from an earlier marriage his wife already had one daughter). In February 1945, shortly before the liberation of Groningen, Zernike's wife died.

After the war Zernike, whose chair had been redefined as including mathematical and technical physics and theoretical mechanics in 1941, further refined his phase contrast microscope. In 1946 he was elected to the Royal Netherlands Academy of Arts and Sciences. In 1947-1948 he was visiting professor at Johns Hopkins University. Especially after 1950 he received honors all over the world, including in 1953 the Nobel Prize in physics for his phase contrast microscope. In 1956 he became a fellow of the Royal Society.

In the year after receiving the Nobel Prize Zernike married to Lena Baanders, with whom he had no children. He retired in 1958 and in 1961 moved to Naarden (near Amsterdam). His interests were wide ranging, including secondary teaching, natural philosophy and religion. During the last years of his life he was ill and in 1963 he entered a hospital in Amersfoort, where he died on 10 March 1966.

Primary works

Poggendorff, vol. 5, 1409; vol. 6, 2963; vol. 7B, 6181-6183. *L'opalescence critique, théorie et expériences* (Amsterdam, 1915); 'Wahrscheinlichkeitsrechnung und mathematische Statistik,' *Handbuch der Physik*, vol. 3 (Berlin, 1928) 419-492; 'How I discovered phase contrast', in: *Le prix Nobel en 1953* (Stockholm, 1953) 107-114. A list of Zernike's publications can be found in Prins and Nijboer (see below), in Tolansky (see below), and in *Jaarboek der Rijks Universiteit te Groningen* (1966) 37-41. There is a Zernike-collection in the University Library of Groningen.

Secondary sources

H. Brinkman, 'De Nobelprijs 1953 voor Prof.dr. Frits Zernike', *Groninger Universiteitsblad* 4 (December 1953) 1-3; J.A. Prins and B.R.A. Nijboer, in: *Nederlands tijdschrift voor natuurkunde* 19 (1953) 314-328; N.N., in: *Nature* 172 (1953) 938; W.B.F. Schaper, *In het eerste gelid. Twaalf vooraanstaande Nederlanders* (Meppel, 1955) 199-214; H. Brinkman, in: *Nederlands tijdschrift voor natuurkunde* 24 (1958) 139ff.;

W.G. Perdok, 'Leven en werk van J.C. Kapteyn en F. Zernike', *Universitas Groningana 1614-1964. Gedenkboek ter gelegenheid van het 350-jarig bestaan der Rijksuniversiteit te Groningen* (Groningen, 1964) 176-188; E.H. s'Jacob et al., 'Herdenkingsbijeenkomst op 21 maart 1966 in verband met het overlijden van prof.dr. F. Zernike', *Jaarboek der Rijks Universiteit te Groningen* (1966) 30-47; J.A. Prins, in: *Jaarboek der Koninklijke Nederlandse Akademie van Wetenschappen* (1965-1966) 370-377; N.G. van Kampen, in: *Nature* 211 (1966) 465; S. Tolansky, in: *Biographical Memoirs of Fellows of the Royal Society* (London) 13 (1967) 393-402; C. van Winter, in: *Groningse volksalmanak* 1967, 1-13. J.A. Prins, in: *DSB*, vol. 14, 616-617; H. Brinkman, in: *BWN*, vol. 1, 674-677.

[K.v.B.]