



Nobel Prizes and the Quantum Theory

The Nobel Prizes in Physics have been awarded every year for almost a century, beginning in 1901 (except for the years '31, '34, '40, '41 and '42). It is interesting to see which of them were in recognition of contributions to quantum theory, one of the two major conceptual revolutions of the century. They are: 1918 – to Max Planck "in recognition of the services he rendered to the advancement of physics by his discovery of energy quanta"; 1921 – to Albert Einstein "for services to theoretical physics, and especially for his discovery of the law of the photoelectric effect"; 1922 – to Niels Bohr "for his investigations of the structure of atoms, and of the radiation emanating from them"; 1929 – to Louis Victor de Broglie "for his discovery of the wave nature of electrons"; 1932 – to Werner Heisenberg "for the creation of quantum mechanics, the application of which has, *inter alia*, led to the discovery of the allotropic forms of hydrogen"; 1933 – to Erwin Schrödinger and Paul Dirac "for the discovery of new productive forms of atomic theory"; and 1954 – to Max Born "for his fundamental research in quantum mechanics, especially for his statistical interpretation of the wave function." The 1921–22 and the 1932–33 Prizes were in each case awarded jointly.

It is interesting to recall here Heisenberg's uneasiness about the way the 1932–33 prizes were divided among the three founders of quantum mechanics. On November 27, 1933, he wrote to Niels Bohr: "Concerning the Nobel Prize, I have a bad conscience regarding Schrödinger, Dirac and Born. Schrödinger and Dirac both deserved an entire prize at least as much as I do, and I would have gladly shared with Born, since we have also worked together."

In the following pages we present Schrödinger's Nobel address describing his wave mechanics. He begins with a beautifully simple account of Fermat's principle for light rays, and then goes on to explain why it is the wave theory of light which gives the proper basis for understanding the behaviour of rays. In this context, waves are real and rays fictitious. Hamilton's mathematical analogy between mechanics and optics, discovered in the early 1800's, combined with de Broglie's inspired idea of matter waves, then became in Schrödinger's hands more than just an analogy. The lucidity of his prose and the charm of his imagery – characteristic of all his writings – are clearly evident.

On page 103 we reproduce a historic photograph taken at the Stockholm train station in December 1933, showing Schrödinger, Heisenberg and Dirac accompanied respectively by wife, mother and mother. Evidently the latter two were highly "suitable boys" at that time! Schrödinger, the eldest of the three, married Anne-Marie Bertel in 1920. Heisenberg (born 1901) married Elisabeth Schumacher in 1937, while Dirac (born 1902) married Margit Balasz (nee Wigner) also in 1937.

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