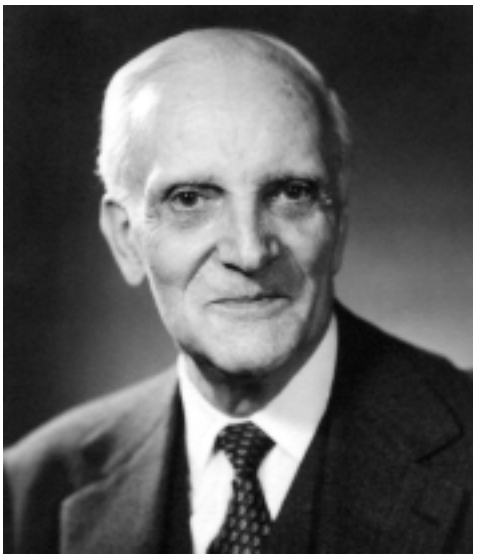
Léon Brillouin
1889-1969



Léon Brillouin, born in Sèvres in 1889, was admitted to the Ecole Normale Supérieure in 1908. In contrast with most young French physicists of the time, Brillouin continued his education (1912) at the Institute of Theoretical Physics in Munich, which was under the direction of A. Sommerfeld. The Von Laue experiment on «the diffraction of Roentgen rays» (X-rays) by a crystal took place there, several months before his arrival. On his return to France (1913), he began a thesis on the theory of solids; he proposed an equation of state based on the atomic vibrations (phonons) that propagate through a solid. He also studied the propagation of monochromatic light waves and their interaction with acoustic waves; he showed that the scattered wave is made up of the sum of three components (Brillouin effect): one at the frequency of the incident wave (ω_o), the two others at frequencies located relative to it ($\omega_o \pm \Delta\omega$) (Brillouin doublet); their separation is dependent on the scattering angle. It wasn't until ten years later that this theoretical prediction was observed experimentally. His work came to a halt during the First World War (1914-1918); in 1920 Brillouin defended his thesis (Jury: Marie Curie, Paul Langevin, Jean Perrin!).

Thus began for Léon Brillouin a period of great scientific production with major contributions in the «quantum revolution» in several areas of physics:

- he proposed an approximate resolution method of Schrödinger's equation (B.K.W. method: **B**rillouin, **K**ramers, **W**entzel), applied to electrons;
- he modified the theory of paramagnetism (Langevin had provided a «classical» model twenty years earlier) by introducing the quantification of the orbital moment (the Brillouin function, 1927);.
- during the course of his work on the propagation of electron waves in a crystal lattice, he decided to introduce a concept that would be found particularly useful in the theory of crystalline solids: the Brillouin zones (1930);
- he published a series of articles in which he discussed methods for the study of systems with several electrons (Brillouin-Wigner formula).

Along with his research activities, Brillouin also taught. His first position was at the Sorbonne where he was offered the Theoretical Physics Chair in 1928; he then taught at the College de France to which he was elected in 1932.

In August 1939, a month before the declaration of war against Germany, Léon Brillouin, as a specialist of wave propagation, was named director of the French National Radio-diffusion. In May 1940 came the collapse of France; the government and the high administration of which he was a member, retired to Vichy. He remained there for six months before resigning and leaving for the United States where he joined the « France libre » organization. There he participated in the war effort by working in the field of radar at Columbia University in New York. At the end of the war, he decided to stay in the United States where he taught at Harvard and at Columbia; Brillouin was elected to the U.S National Academy of Sciences in 1953. Far from abandoning research, he became involved in a new field: «The Theory of Information». He invented the concept of «Neguentropy» (negative entropy) to demonstrate the similarity between entropy and information, and accordingly, that «Maxwell's Demon» does not violate Carnot's principle. He died in New York in 1969.

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More information: « Léon Brillouin, A la Croisée des Ondes », R. Mosseri, Belin (1999).