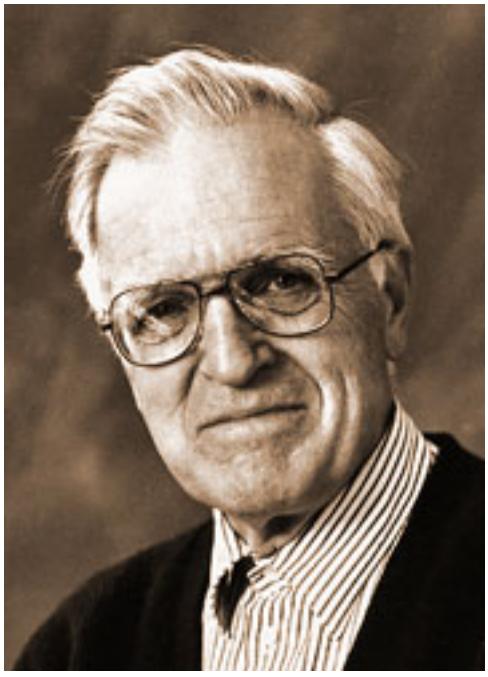
Prof. Aage Niels Bohr
Professor of Physics at the University of Copenhagen.
1975 Nobel Prize in Physics



Most important awards, prizes and academies

Selected awards: Dannie Heineman prize (1960); Pope Pius XI medal (1963); Atoms for Peace Award (1969); H.C. Ørsted medal (1970); Nobel prize in Physics (1975); Ole Rømer medal (1976). *Academies*: Danish, Norwegian, Croatian, Polish, and Swedish Academies of Sciences; Royal Physiographic Society, Lund; American Academy of Arts and Sciences; National Academy of Sciences, USA; Deutsche Academie der Naturforscher Leopoldina; American Philosophical Society; Finska Vetenskaps-Societeten; Kungl Vetenskaps-Societeten, Uppsala; Pontificia Academia Scientiarum.

Summary of scientific research

The main part of his research work was concerned with the structure of atomic nuclei. A recurrent theme was the interplay between collective nuclear motion and the motion of the individual particles (neutrons and protons) of which the nucleus is composed. His work in that area began in 1949 and soon afterwards he was joined by Ben R. Mottelson in a close cooperation that continued over the years. Among the topics that occupied them were: 1) The occurrence of rotational spectra as a striking consequence of nuclear deformation. The role of symmetry in the

description of rotational spectra; 2) The role of correlations between pairs of nucleons that lead to a superfluid phase of nuclear matter; 3) The analysis of the spectrum of quantal channels for the fissioning nucleus passing over the saddle point; 4) The great variety of collective modes, involving the spatial density of nucleons and the spin, isospin, and pairing variables; 5) The development of a unified description of nuclear dynamics based on the coupling between particle and vibrational variables; 6) The effect of angular momentum on nuclear properties and the study of nuclear states with very high spin. In his final years his research activity was focussed on the basis for quantum mechanics, in a joint effort with Ole Ulfbeck. The project centered on the origin of indeterminacy and the related nature of the fortuitous basic events (clicks in counters), which the probabilistic theory deals with. By a sharpened distinction between what happens on the spacetime scene (experiences) and what concerns the symbolic formalism, quantum mechanics is seen as having a fully abstract foundation, based on the representation of spacetime symmetry. The notion of a particle, as an intermediary between source and detector is, thereby, eliminated, as a remnant from classical physics, and the basic events are seen to come by themselves, without a cause (genuine fortuitousness). Finally, in a joint project with Ben R. Mottelson and Ole Ulfbeck, it was found that genuine fortuitousness, as described above, provided the principle behind quantum mechanics. From this principle, which asserts that the basic event, a click in a counter, comes without any cause, the formalism of quantum mechanics emerges, no longer dealing with things (atoms, particles or fields) to be measured, but as the theory of distributions of uncaused clicks that form patterns laid down by spacetime symmetry. The subject, thereby, revealed itself with unexpected simplicity and beauty. The departure from usual quantum mechanics was strikingly borne out by the absence of Planck's constant from the theory. The elimination of indeterminate particles as cause for the clicks, which the principle of genuine fortuitousness implies, was analogous to the elimination of the ether implied by the principle of relativity.

Main publications

Bohr, A., 'The Coupling of Nuclear Surface Oscillations to the Motion of Individual Nucleons', *Dan. Mat. Fys. Medd.*, 26 (14), (1952); Bohr, A., 'Collective and Individual-Particle Aspects of Nuclear Structure' (with Mottelson, B.), *Dan. Mat. Fys. Medd.*, 27 (16), (1953); Bohr, A., 'On the Theory of Nuclear Fission', *Proceedings Intern. Conference on Peaceful Uses of Atomic Energy* (Geneva, 1955), Vol. 2, pp. 151, UN (New York, 1956); Bohr, A., 'Study of Nuclear Structure by Electromagnetic Excitation with Accelerated Ions' (with Huus, T., Mottelson, B. and Winther, A.), *Rev. Mod. Phys.*, 28, 432 (1956); Bohr, A., 'Possible Analogy between the Excitation Spectra of Nuclei and those of the Superconducting Metallic State' (with Mottelson, B. and Pines, D.), *Phys. Rev.*, 110, p. 936 (1958); Bohr, A., 'Quantization and Stability of Currents in Superconductors' (with Mottelson, B.), *Phys. Rev.*, 125, p. 495 (1962); Bohr, A., Elementary Modes of Nuclear Excitations and their Coupling. *Comptes Rendus du CIPN* (Paris, 1964), Centre National de la Recherche Scientifique, pp. 437; Bohr, A., 'Pair Correlations and Double Transfer Reactions', *Nuclear Structure*, IAEA (Vienna, 1968), p. 179; Bohr, A., 'Perspectives in the Study of

Nuclei with High Angular Momentum' (with Mottelson, B.), suppl. *Journal Phys. Soc. of Japan*, 44, p. 157 (1978); Bohr, A., Nuclear Structure, Vol. I: *Single-Particle Motion*, 1969; Vol. II: *Nuclear Deformations*, 1975, (with Mottelson, B.), W.A. Benjamin Inc., New York; Bohr, A., 'Primary Manifestation of Symmetry. Origin of Quantal Indeterminacy' (with Ulfbeck, O.), *Rev. Mod. Phys.*, 67, p. 1 (1995); Bohr, A., 'Genuine Fortuitousness. Where Did That Click Come From?' (with Ulfbeck, O.), *Foundations for Physics*, 31, p. 757 (2001); Bohr, A., 'The Principle Underlying Quantum Mechanics' (with Mottelson, B. and Ulfbeck, O.), *Foundations for Physics*, 34, pp. 405-17 (2004).