Prof. Nicola Cabibbo
Professor of Theoretical Physics at the University of Rome 'La Sapienza'

Most important awards, prizes and academies

Awards: Premio Alcide De Gasperi per le Scienze (1968); J.J. Sakurai Prize for Theoretical Particle Physics of the American Physical Society (1989); High Energy and Particle Physics Prize of the European Physical Society (1991). *Academies*: Socio Nazionale dell'Accademia Nazionale dei Lincei, Rome; Socio Nazionale dell'Accademia delle Scienze, Turin; Foreign Member of the National Academy of Sciences, USA; Foreign Member of the American Academy of Arts and Sciences; Member of the Pontifical Academy of Sciences. Loeb Lecturer, Harvard University (1965).

Summary of scientific research

Nicola Cabibbo was a theoretical physicist who worked on different aspects of elementary particles and their interactions. He made important contributions to the theory of weak interactions, in particular through the discovery of the phenomenon of quark and current mixing. This discovery established the existence of a new class of physical constants, whose first example is the Cabibbo angle which determines the mixing of strange quarks with non-strange quarks. At the same time this discovery clarified the behaviour of weak interactions for different quark species, thus creating

the basis for the development of unified theories of weak and electromagnetic interactions. N. Cabibbo carried out (in collaboration with R. Gatto) the first theoretical studies on the use of electron positron colliding beam machines, demonstrating their great promise for revealing new aspects of elementary particle structure. An important contribution to the theory of strong interaction was the demonstration that the extended nature of hadrons as quark composites implies the existence of a new phase of hadronic matter (obtained at high temperature or high density) where quarks are deconfined. An experimental signature for the existence of this phase is given by the exponential nature of the hadron spectrum. In his final years N. Cabibbo's scientific activity had been centered on the use of large computers for the numerical simulation of quark interactions. He established the methods for applying numerical simulation to the study of weak interaction of quarks. In the same period he became interested in computer architecture and was engaged in building a Supercomputer (APE) particularly adapted to the problems of numerical simulation.

Main publications

Cabibbo, N., Gatto, R., 'Electron-Positron Colliding Beam Experiments', *Physical Review*, 124, p. 1577 (1961); Cabibbo, N., 'Measurement of the Linear Polarization of g Rays by the Elastic Photoproduction of p 0 on He 4', *Physical Review*, 124, p. 1577 (1961); Cabibbo, N. and Gatto, R., 'Proton-Antiproton Annihilation into Electrons, Muons and Vector Bosons', *Il Nuovo Cimento*, 24, pp. 170-80 (1962); Cabibbo, N., 'Unitary Symmetry and Leptonic Decays', *Phys. Rev. Lett.*, 10, pp. 531-3 (1963); Cabibbo, N. and Maksymowicz, A., 'Determination of the Form Factors in Kμ3 Decays', *Phys. Lett.*, 9, pp. 352-3 (1964); Cabibbo, N., 'Unitary Symmetry and Nonleptonic Decays', *Phys. Rev. Lett.*, 12, pp. 62-3 (1964); Cabibbo, N. and Radicati, L.A., 'Sum Rule for the Isovector Magnetic Moment of the Nucleon', *Phys. Lett.*, 19, pp. 697-9 (1966); Cabibbo, N., Parisi, G. and Testa, M., 'Hadron Production in e+ e- Collisions', *Lettere al Nuovo Cimento*, 4, pp. 35-9 (1970); Altarelli, G., Cabibbo, N. and Maiani, L., 'The Drell-Hearn Sum Rule and the lepton Magnetic Moment in the Weinberg Model of Weak and Electromagnetic Interactions', *Phys. Lett.*, 40B, pp. 415-9 (1972); Bahcall, J.N., Cabibbo, N. and Yahil, A., 'Are Neutrinos Stable Particles?', *Phys. Rev. Lett.*, 28, pp. 316-8 (1972); Cabibbo, N. and Parisi, G., 'Exponential Hadronic Spectrum and Quark Liberation', *Phys. Lett.*, 59B, pp. 67-9 (1975); Cabibbo, N., 'Bag Models', *Proceedings of the International Neutrino Conference*, Aachen (1976); Cabibbo, N., 'Time Reversal Violation in Neutrino Oscillation', *Phys. Lett.*, 72B, pp. 333-5 (1978); Cabibbo, N., 'The Impact of Gauge Theory on Elementary Particle Physics', *Proceedings of the Thirteenth 'Gauge Theories Leptons' Rencontre de Moriond*, Vol. II, (J. Tran Thanh Van, ed.)(1978); Cabibbo, N., 'Parton Distributions and their Q2 Dependence', *The Whys of Subnuclear Physics*, Plenum Publishing Corporation (1979); Cabibbo, N. and Maiani, L., 'The Vanishing of Order-G Mechanical Effects of Cosmic Massive Neutrinos on Bulk Matter', *Phys. Lett.*, 114B, pp. 115-117 (1982); Cabibbo, N. and Marinari, F., 'New Method for Updating SU(N) Matrices in Computer Simulations of Gauge Theories', *Phys. Lett.*, 119B, p. 387 (1982); Cabibbo, N., 'Gauge Theories and Monopoles' (A Modest Introduction) Techniques and Concepts of High Energy Physics (Thomas

Ferbel, ed.), NATO ASI Series, Series B: Physics, vol. 99 (47) Plenum Press (1983), New York, *Proceedings of the Second NATO Advanced Study Institute*, Lake George (July 1982); Allega, M., Cabibbo, N., 'Acoustic Detection of Superheavy Monopoles in Gravitational Antennas', *Lett. Nuovo Cimento*, 38, pp. 263-9 (1983); Cabibbo, N., Martinelli, G. and Petronzio, R., 'Weak Interactions on the Lattice', *Nuclear Physics*, 244B, pp. 381-91 (1984); Cabibbo, N., 'Quark Mixing', *Proceedings of the X Capri Symposium, 30 Years of Elementary Particle Theory* (May 1992).