Papers on neutrino masses and oscillations by B.M. Pontecorvo

Neutrino oscillations - periodic mutual conversions of neutrinos of various types, which are possible only for a nonzero neutrino mass - are among the particle physics phenomena that are currently studied most intensely. First and foremost, they are interesting as a unique incontestable laboratory proof that the Standard Model of the electroweak particle interaction is incomplete and a ``new physics'' exists beyond it. The neutrino mass is also very important in a number of effects in astrophysics and cosmology.

The idea of neutrino masses and oscillations was first put forward by B.M. Pontecorvo in 1957-1958. His first papers on neutrino oscillations were published in JETP and are brought to the reader's attention here.

These works opened a new area of research in the neutrino physics and a new era in particle physics, the era of a detailed study of neutrino masses, mixing, and nature (Dirac or Majorana?). Pontecorvo arrived at the idea of neutrino masses and oscillations soon after the two-component neutrino theory had been proposed. At the time, the neutrino was universally believed to be a massless particle. Pontecorvo was the first to note the possibility of a small neutrino mass. He arrived at the idea of neutrino oscillations starting from a similarity between weak interactions of hadrons and leptons. First, Pontecorvo considered muonium-antimuonium oscillations [*Mesonium and antimesonium*, JETP **6**, 429 (1957)]. In that paper, he mentioned the possibility of neutrino oscillations. However, he did not dare to publish a dedicated paper on that subject. A rumor about ``events" in a reactor-neutrino experiment, which might be potentially explained by oscillations, motivated him. In a subsequent paper [*Inverse beta processes and nonconservation of lepton charge*, JETP **34,** 172 (1958)], Pontecorvo considered the mixing of low-mass Majorana neutrinos and suggested the first experiment to search for reactor-neutrino oscillations. Next [*Neutrino experiments and the problem of conservation of lepton charge*, JETP **26**, 984 (1968)], he studied the effect of neutrino oscillations in solar-neutrino experiments and, for the first time, pointed out that the solar neutrino flux should be decreased by a factor of two compared with the expected one because of the oscillations. He thus envisaged the so-called ``solar neutrino problem" in this work. The priority of Pontecorvo has been acknowledged by the world scientific community: the neutrino mixing matrix is named after Pontecorvo, Maki, Nakagawa, and Sakata (the PMNS matrix).

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