

## New books on physics and related sciences: August 2023

DOI: <https://doi.org/10.3367/UFNe.2023.07.039507>

**Frank A I** *Questions regarding longwave neutron optics* (Dubna: JINR, 2022) 335 p. ISBN 978-5-9530-0583-8.

The book is a collection of selected works by the doctor of physics and mathematics and a chief researcher at the I M Frank Laboratory of Neutron Physics of the Joint Institute for Nuclear Research (JINR). The works were devoted to several problems of longwave neutron optics and were published in Russian and English-language journals in the period from 1978 to 2021. The articles are reproduced in the language of the original. The book consists of four parts, including works with close subjects: Part 1. Neutron microscopy; Part 2. Neutron waves in a medium; Part 3. Quantum phenomena in neutron optics; Part 4. Optics of moving media and the effect of acceleration. Each part is premised by an introduction written specially for this book. The presentation of the book took place on 23.03.2023 at a seminar at the I M Frank Neutron Physics Laboratory of JINR. The presentation of A I Frank's report is accessible at [http://flnph.jinr.ru/images/book\\_presentation230323.pdf](http://flnph.jinr.ru/images/book_presentation230323.pdf). (JINR, Publishing Department: e-mail: [publish@jinr.ru](mailto:publish@jinr.ru), URL: <http://www1.jinr.ru/index.html>)

**Malakhov A I** *Relativistic nuclear physics*. (Dubna: JINR, 2021) 181 p. ISBN 978-5-9530-0554-8.

The book is based on the lecture course, Introduction to Relativistic Nuclear Physics, delivered by the doctor of physics and mathematics, Professor Aleksandr Ivanovich Malakhov at the Educational Scientific Center of the Joint Institute for Nuclear Research (JINR) and at Dubna University. The approach to the investigation of relativistic nuclear interactions in a four-dimensional velocity space, developed by academician A M Baldin, is described in sufficient detail. Other approaches are also briefly considered. The most widespread modern detectors, applied in investigations in relativistic nuclear physics, are described. Experiments in this field, which are being performed at the Laboratory of High Energy Physics at JINR, are outlined. Information is presented about global physical accelerator centers working in the field of relativistic nuclear physics and about the most important physical results obtained at these centers. The book is recommended as a manual for senior students and postgraduates specializing in nuclear physics. (JINR, Publishing Department: e-mail: [publish@jinr.ru](mailto:publish@jinr.ru), URL: <http://www1.jinr.ru/index.html>). The electronic version of the book is accessible at [http://www1.jinr.ru/Books/Malakhov\\_2022.pdf](http://www1.jinr.ru/Books/Malakhov_2022.pdf))

**Bulyubash B V** “*Mister neutrino*”: *pages from the biography of academician Pontecorvo*. (Moscow: Novyi khronograf, 2019) 300 p. ISBN 978594881-458-2.

In September 1950, at the height of the Cold War, Bruno Pontecorvo, a researcher at the Atomic Energy Research Establishment in Harwell, moved with his family to the USSR. The true motives behind his actions remain a mystery. Pontecorvo lived in Dubna and worked at the Joint Institute for Nuclear Research for over four decades. For his research on the physics of neutrinos and weak interactions, Bruno Maksimovich Pontecorvo was awarded the Lenin Prize and was elected to the USSR Academy of Sciences. The first book in Russian about the life and scientific activity of B M Pontecorvo presents the main stages of his scientific biography. Bruno Pontecorvo was born in Pisa into a family of a prominent industrialist. After graduating from the University of Rome, he worked in Enrico Fermi's group; in the very first year of his work, Pontecorvo became a participant in the collective discovery of the effect of slow neutrons. An important detail is noted: the Fermi group patented the discovery first in Italy and then in the USA. As is known, slow neutrons are used in the production of plutonium. Therefore, after testing atomic weapons, the patent holders asked the American Government for monetary compensation. Negotiations dragged on for several years, and in 1955 the government paid 300 thousand dollars to the authors of the discovery (except for Pontecorvo, whose whereabouts were unknown at that time). Starting in 1935, Pontecorvo had been living and working in Paris. Studying the isomerism of atomic nuclei under the guidance of Frederic Joliot-Curie, he discovered the effect of nuclear phosphorescence. In Paris, his political views were formed: he was passionate about communist ideas and fascinated by the USSR. In 1940, France was occupied, and Pontecorvo emigrated to the USA. While working for an oil exploration company, he invented a search method using the properties of neutrons—a neutron logging method. During these years, the USA and Great Britain began working on the creation of nuclear weapons, and the Britons, who were afraid of invasion, localized part of the research in Canada. There, in the city of Chalk River, it was planned to build an exploratory heavy water nuclear reactor. Bruno Pontecorvo received an invitation to participate in this project. He began working in Canada in January 1943. It is noted that Pontecorvo's scientific priorities—the physics of weak interactions and the physics of neutrinos—were determined during this Canadian period. In Canada, Pontecorvo measured the upper limit of neutrino mass and invented a technique for neutrino recording—the so-called chlorine-argon method. In December 1948, the English period of his biography began. In July 1950, Pontecorvo left Harwell for a vacation, as it turned out, forever. In the USSR, Pontecorvo put forward at least

two world-class hypotheses: the existence of two types of neutrinos and neutrino oscillations. The book details the history and background of both hypotheses, including issues of priority. In both cases, putting forward the hypotheses required great courage from Pontecorvo, since the hypotheses were incompatible with the opinion of the expert community. In 1957, Pontecorvo assumed the existence of neutrino-antineutrino oscillations, which, in turn, suggested the existence of neutrino mass. At the same time, following L D Landau, the scientific community considered the neutrino to be a massless particle. “His ideas became the foundation for my research...” The quoted words about Pontecorvo were said by Arthur McDonald, a winner of the 2015 Nobel Prize in physics (together with Takaaki Kajita) “for the discovery of neutrino oscillations showing that the neutrino has mass.” (Novyi khronograf Publishing House, e-mail: nkhnograf@mail.ru. URL: [www.novkhron.info](http://www.novkhron.info). The electronic version of the book is available at [https://www.elementy.ru/bookclub/chapters/436718/Mister\\_neytrino\\_Glava\\_iz\\_knigi](https://www.elementy.ru/bookclub/chapters/436718/Mister_neytrino_Glava_iz_knigi))

Prepared by

*M S Aksent'eva* (e-mail: [maria@ufn.ru](mailto:maria@ufn.ru))

*E V Zakharova* (e-mail: [elena.zakharova.office@gmail.com](mailto:elena.zakharova.office@gmail.com))