Aleksei Petrovich Rudik (Obituary)

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Aleksei Petrovich Rudik died on July 29, 1993. A. P. Rudik belongs to the post-war generation of scientists who founded in our country the physics of elementary particles, nuclear physics, and atomic energy.

A. P. Rudik was born on July 16, 1921 in Moscow. His father, Petr Antonovich Rudik, was a professor of psychology. Aleksei Petrovich probably acquired from his father a deep understanding of people—a trait he carried throughout his life. In 1940, after finishing school, A. P. Rudik was drafted into the army and was sent to the front at the very beginning of the war. After several months we was wounded—a serious, multiple, shrapnel wound. He spent more than six months in hospitals. Operations due to his wounds continued up to 1958; shrapnel pieces were removed many times.

After demobilization in 1943 he entered Moscow Aviation Institute, and in 1946 he transferred to the Moscow Mechanics Institute (MMI, now the Moscow Engineering Physics Institute) to study engineering physics. The engineering physics department was created in order to prepare specialists for work on the atomic problem. The department was granted special rights: The faculty could acquire upper-level students from any institute. The expectations were high and the studies were difficult. In spite of the infirmities associated with his wounds Aleksei Petrovich was actively engaged in work, and in 1948 he became a student of I. Ya. Pomeranchuk, who lectured at MMI on quantum mechanics and quantum theory of fields and simultaneously at Moscow State University on neutron physics and the theory of nuclear reactors. I. Ya. Pomeranchuk strived to give his students, of which A. P. Rudik was the first one after the war, the same versatility.

In 1949 Aleksei Petrovich went to work in the theoretical laboratory, directed by I. Ya. Pomeranchuk, at the Institute of Theoretical and Experimental Physics (at that time Laboratory No. 3 of the USSR Academy of Sciences, and then the Heat Engineering Laboratory of the USSR Academy of Sciences), and started work on the theory of nuclear reactors. His first work on this subject was the theory of resonance absorption of neutrons in uranium blocks containing a moderator. A. P. Rudik performed physical calculations of the first commercial heavy-water reactors in our country and participated in the start-up and assimilation of these reactors.

At the same time A. P. Rudik worked on the theory of elementary particles: He worked on the theory of charge exchange and radiative capture of pions and capture of muons in deuterium. Aleksei Petrovich was an active participant of a seminar, organized by I. Ya. Pomeranchuk, on the quantum theory of fields, where he studied a new development of the theory associated with Feynman, Schwinger, and Dyson. He was one of the first in our country to use Feynman's techniques for calculating physical processes.

In 1956, when Lee and Yang put forth the hypothesis of parity nonconservation in weak reactions, A. P. Rudik and his coauthors proved that the experimentally observed P-noninvariant pair correlations of particle spins and momenta should indicate breakdown of C-invariance (this work was later declared a discovery). Subsequent experimental observations of such correlations in β decay and decays of pions and muons established the breakdown of charge symmetry in weak interactions. At the end of the 1950s and beginning of the 1960s A. P. Rudik developed the theory of β decay with nonconservation of parity and he studied the analytical properties of the Feynman diagrams.

During these years Aleksei Petrovich conducted parallel work on the theory and calculation of nuclear reactors. He was one of the few physicists who for many years performed fruitful work in these two diverse fields. It was only at the end of the 1970s that due to his failing health A. P. Rudik concentrated his work to one field particularly on the theory and calculation of nuclear reactors.

The work on the reactor problem, ending up, as a rule, with specific results and development of commercial reactors meeting high safety and reliability requirements, demanded that the investigator take the greatest responsibility for his results. A. P. Rudik had this quality; it was a feature of his character.

A. P. Rudik was one of the creators of the atomic industry in our country. He is well known for his works on damped spatial xenon oscillations near the stability limit and compensation of samarium poisoning of a high-flux reactor due to fission of short-lived plutonium 239. He is rightly considered to be the founder of the direction involving optimization of the physical characteristics of reactors on the basis of Pontryagin's maximum principle. He developed the foundations of optimization of the spatial characteristics of reactors by arranging the nuclear fuel and absorbers; he investigated the problem of the temporal transient processes, determined by the xenon poisoning; he analyzed in detail a number of questions concerning the burnup of nuclear fuel in high-power reactors in this coun-

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try, and the results of these works form the basis for the chemical technologies for reprocessing spent nuclear fuel; he developed the theory of conversion and production of radioactive nuclides in reactors. In the last few years A. P. Rudik worked actively on the problem of eliminating radioactive wastes by irradiating them in powerful neutron fluxes, and he was interested not only in the reactor-physics aspect of the problem, but also in its social-ecological aspects.

He performed all this scientific work while his health continued to worsen. He suffered an infarct; later he suffered a second one. He had an unsuccessful glaucoma operation which resulted in blindness; his hearing worsened. However, he could still think! A. P. Rudik typed his last works on a typewriter designed for blind people or he dictated them into a tape recorder together with commentaries for his coworkers: such and such a formula should appear here, the numerator contains such and such and the denominator such and such, the integrand is such and such, and in any case trust the proof thus and so. An outsider could hardly imagine that the author performed all calculations mentally. A. P. Rudik's scientific work during his last few years differed little from previous years.

A. P. Rudik devoted a great deal of attention to scientific-pedagogical work on very many levels. He taught and worked with his students and lectured to students and specialists. In addition, he worked constantly to impart correct physical knowledge to specialists in the applied professions of atomic energy and the atomic industry. Finally, he disseminated physical-ecological knowledge, required for developing the correct position in the standoff, arising in the last few years, between supporters and opponents of atomic energy. A. P. Rudik wrote nine monographs and more than 300 scientific works.

A. P. Rudik's multifaceted scientific work has been recognized with Orders and Medals. He was elected Honorary Member of the Worldwide Laboratory and International Center of Scientific Culture (Erice, Geneva, Rome). Aleksei Petrovich was an excellent chess player. He was especially strong in blitz tournaments, where he often took one of the first few places, ahead of many grand masters—here he evidently was aided by his good understanding of psychology.

A. P. Rudik's principal traits were outstanding moral qualities—true nobility and exceptional decency. In the best traditions of Russian intelligentsia he was never mean, boorish, arrogant, or rude.

Translated by M. E. Alferieff