Dmitriĭ Apollinarievich Rozhanskiĭ, 1882–1936

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This year marks the centennial of the birth of the eminent Soviet physicist Dmitriĭ Apollinarievich Rozhanskiĭ, a corresponding member of the USSR Academy of Sciences. Rozhanskiĭ belonged to the remarkable constellation of Russian physicists who made their entry into our science around the turn of the twentieth century. That of course was just the time when the concepts of classical physics were being overthrown. X rays and radioactivity had been discovered; quantum theory and the special theory of relativity were being founded. The leading representatives of Russian physics at that time were P. N. Lebedev, N. A. Umov, A. S. Popov, A. G. Stoletov; and right behind them some younger men were coming in—D. S. Rozhdestvenskiĭ, A. F. Ioffe, L. I. Mandel'shtam, N. D. Papaleksi. One of these was Rozhanskiĭ.

Rozhanskiĭ was born on September 1 (August 20, O. S.), 1882. His father was a technological engineer; his mother, a doctor. Having completed high school in 1899, Rozhanskiĭ enrolled in St. Petersburg University, and on graduating in 1904 he left to begin preparation for his career as a professor. For a few years he worked as a laboratory assistant in the physics department of the Electrical Engineering Institute in St. Petersburg; that department was headed by Popov. Rozhanskiĭ spent the summer terms of 1905–1906 in Göttingen, where he worked under N. T. Simon. His studies during these and the next several years formed the basis of his master's dissertation, "The effect of a spark on the oscillatory discharge of a condenser," which he defended in 1911. That investigation brought him the Popov prize.

Following his dissertation Rozhanskiĭ spent ten years at Khar'kov University, first as an instructor and later as professor and chairman of the physics department. He published a number of papers during this period, including: "On the theory of resonance phenomena," "The effect of a spark on the oscillations of inductively coupled oscillators," and "The quenching influence of a spark on coupled vibrations." He also wrote two textbooks: *The Principle of Electromagnetic Oscillations and Waves* and *Electric Beams*, as well as several chapters in O. D. Khvol'son's *A Course in Physics*.

In 1919 the Nizhegorod Radio Laboratory was founded. Rozhanskiĭ took an active part in organizing it, and later, from 1921 to 1923, he carried on work there. In 1923 he returned to Leningrad, where he worked at the Physics and Technology Institute and at its "spinoff" Institutes of Electrophysics and Telemechanics. At the same time he served on the physics and mechanics faculty of the Polytechnic Institute.

D. A. ROZHANSKIĬ

During 1932–1933, while continuing his research in radiophysics, Rozhanskiĭ proceeded to set up a laboratory of gas-discharge physics. Here investigations were carried on into processes in low-temperature plasma and phenomena taking place in ion apparatus: phanatrons, thyratrons, mercury-arc rectifiers. Meanwhile Rozhanskiĭ engaged in regular consultations with personnel in industry (at the Élektrosila and Svetlana plants). He organized a Leningrad seminar on gas discharge.

In speaking of the distinctive features of Rozhanskiĭ's career one is impressed above all by the breadth of his scientific outlook and interests. While these interests centered chiefly in the fields of radiophysics and electronics, he was attracted as well to topics peripheral to these main lines of research. Examples of these sidelines were a 1926 paper, "On the theory of the Compton effect," in which he studied the intensity distribution of scattered rays, and another paper, "The ferromagnetism of nickel and its quantum state."

Rozhanskiĭ's work closely tied together theory and experiment, but just as closely it combined pure science with the solution of practical problems—even their technical implementation.

In the experiment on which his master's dissertation was based, Rozhanskiĭ employed a Brown tube to scan the aperiodic discharge of a circuit with known parameters. As a result he could study oscillations with periods as short as 300 nsec. It is pertinent to recall here that not only during these years but for some time afterward there was no such thing as a trade-model oscilloscope. Rozhanskiĭ contributed major refinements

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to the design of the Brown tube and circuitry, and he essentially built the prototype of modern high-frequency oscilloscopes.

His short stay at the Nizhegorod Laboratory was exceptionally fruitful. The role this laboratory played in the development of Soviet radio engineering is widely acclaimed. Among those who brought about that fame was Rozhanskiĭ. He did fundamental work at the laboratory in several vital areas of radio engineering. Particularly notable was his research in antenna theory ("The dynamical constants of an air conductor," "On the radiation emanating from an antenna") and his engineering calculation of an antenna for the Khodyn radio station. His theoretical studies of radio-frequency processes begun during these years were continued at Leningrad and laid the groundwork for the theory of quartz stabilization of vacuum-tube oscillators. Among the other valuable work of his Leningrad period was an elegant method for measuring dielectric constants at high frequencies, a procedure well suited to substances having a large absorption coefficient for electromagnetic waves.

Rozhanskiĭ played a particularly significant role in the development of technology for the radio detection of aircraft. Under his supervision, the special laboratory that he organized at the Ioffe Physics and Technology Institute in Leningrad carried out studies of the scattering of meter-wavelength radio waves by aircraft, and devised a pulsed radar technique that could be applied for detecting aircraft at great distances. In fact the USSR State Prize was later conferred on several of the laboratory staff (Yu. B. Kobzarev, P. N. Pogorelko, N. Ya. Chernetsov) for work brought to completion after Rozhanskiĭ's death.

The gas-discharge laboratories headed by Rozhanskiĭ carried on considerable research in low-temperature plasma physics and processes in ion apparatus. A modification of the sounding method was employed to measure the ratio of the directed and the random electron current. The method itself was subjected to careful analysis—particularly the effect of the ion current on the sonde. Much attention was paid to transitional processes in thyratrons and mercury-arc rectifiers.

The deep, far-reaching research by Rozhanskiĭ, with its great significance for theory and practice, brought him well merited recognition when in 1933 he was elected a corresponding member of the Academy of Sciences.

Along with his scientific work Rozhanskiĭ devoted much effort to teaching, which occupied him for more than thirty years. In Khar'kov his lectures were given at the University; in Leningrad, mainly at the Polytechnic Institute. While his course in general physics for undergraduates tended perhaps to be a bit on the academic side, his lectures on special topics (electromagnetic oscillations, gas discharge) penetrated to the forefront of science: they were thought-provoking and captivating. Of outstanding interest were the students' seminars on the physics of corpuscular rays, magnetic phenomena, and electromagnetic vibrations. The topics of the papers which the students contributed to these seminars were chosen with thoughtful care, and lively discussions would ensue. After each talk Rozhanskiĭ would usually offer some further comments broadening the scope of the paper.

But the works published by Rozhanskiĭ were not limited to scientific articles. He authored a number of books, texts as well as books of popular science. Mention has been made above of the books that came out while he was at Khar'kov and the chapters he contributed to Khvol'son's physics course. In addition, he wrote a popular article, "The electromagnetic theory of light," for the volume *An Elementary Account of the Principles of Physics*, as well as the section "Oscillations and waves; Sound; Light" for the multivolume physics course conceived by Ioffe, which was later revised to make a fundamental textbook, *Acoustics and Optics*. In 1934 a concise volume, *Physical Principles of Short-Wave Propagation*, appeared, describing mainly the research by Rozhanskii and his students. Rozhanskii's last work, *Gas-Discharge Physics*, was published after its author's sudden death, which occured on September 27, 1936. This book, the first such monograph in the world, treated gas-discharge processes in the context of modern atomic physics.

A man of wide education, Rozhanskiĭ by no means confined his interests to science. He loved and understood art; in company with young people he engaged in travel and sport. He was fluent in three European languages and in Latin and Greek as well, and had an excellent knowledge of the literature of antiquity, which he was fond of reading in the original.

Our profile of Rozhanskiĭ would hardly be complete without some mention of his personal qualities. Deeply principled, firm in his convictions, never one to bargain with his conscience, he at the same time was distinguished for his humanity and his kindness. Dmitriĭ Apollinarievich was always ready to help when needed; he would willingly share his broad knowledge, but he would never stifle by virtue of his authority. In research work he was inclined to let everyone have as much freedom as possible, but at the critical juncture he would invariably offer his support and assistance.

His indubitable personal charm attracted many to Rozhanskiĭ, especially young people, who sensed in him a wise and attentive teacher, a keen and responsive friend.

Translated by R. B. Rodman