Pavel Alekseevich Cerenkov (on his seventieth birthday)

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July 28, 1974 was the seventieth birthday of Academician Pavel Alekseevich Cerenkov, the celebrated Soviet experimental physicist.

Cerenkov was born in the village of Novaya Chigla in Voronezh Oblast'. There he received his elementary and intermediate education, and in 1928 he graduated from the Voronezh State University.

Cerenkov's career as a scientist began in 1932, when, as a graduate student in the USSR Academy of Sciences P. N. Lebedev Physics Institute, he began an investigation of the luminescence of uranyl-salt solutions under exposure to γ rays at the suggestion of S. I. Vavilov.

In the course of this study, Cerenkov discovered a new and startlingly beautiful physical phenomenon that was of fundamental significance. He established that γ rays produce a faint glow that differs sharply from ordinary luminescence. In experiments that were surprisingly simple by modern standards, but laborious in execution, in which he used photometry at the visual threshold, Cerenkov observed a number of characteristic properties of the emission that he had discovered. Cerenkov's traits of character were brought out sharply in the conduct of these experiments—his dedication, his uncommon perseverance in the pursuit of his goal, his ability to find the simplest paths to solution of the problems that arose, his attention to the "fine points" of the experiment.

Even in his early investigations he succeeded in establishing definitely such properties of the emission as its polarization, its insensitivity to luminescence-extinguishing factors, and the increase of the energy in the emission spectrum as the wavelength of the primary γ quanta was reduced. In 1934, this enabled Vavilov to conclude that the new form of emission was associated with electrons formed in the solutions on Compton scattering of the γ rays.[1)]

Cerenkov then devoted several years to detailed experimental studies of the properties of this unique emission. His experiments covered all of the basic properties of the new physical phenomenon, for which a theory was developed in 1936 by I. E. Tamm and I. M. Frank. They showed that the emission discovered by Cerenkov is the emission of charged particles moving at velocities faster than light in matter.

Supplementary experiments that Cerenkov performed in 1936—1937 confirmed the quantitative aspect of the Tamm-Frank theory. The characteristic emission angle and its dependence on the refractive index of the medium were measured approximately in the new experiments, and the distribution of the energy in the emission spectrum and the absolute brightness of the emission were later established with good accuracy.

In the metaphor of the late Academician G. S. Landsberg, Cerenkov's investigations, which have now become classics, are the "crowning glory of Soviet physics." They have won worldwide fame, and the new type of emission has come to be known as "Cerenkov radiation."[2)]

Cerenkov's discovery has, in addition to its enormous purely scientific interest, practical importance that would now be difficult to exaggerate. In high-energy physics, for example, the most important experimental studies made over the last two decades were made possible only by the use of particle-registration methods based on an application of Cerenkov radiation or, to use the now favored term, Cerenkov counters. Threshold and differential (gas-filled) Cerenkov counters, Cerenkov shower spectrometers, various types of Cerenkov chambers—all of these are instruments without which it would be impossible to conceive of the development of experimental elementary-particle research.

In 1958, Cerenkov, Tamm, and Frank were awarded the Nobel Prize in physics "for their discovery and explanation of the Cerenkov effect."

Cerenkov, Vavilov, Tamm, and Frank had previously—in 1946—been awarded a First Degree USSR State Prize for these studies.

During the Second World War, Cerenkov engaged in the development of an instrument with defense applications that was based on the use of certain nuclear-physical methods.

During the postwar years, Cerenkov's interests turned to cosmic-ray research. A result of these inves-

tigations was the detection of multiply-charged ions in the secondary component of the cosmic radiation.

Beginning in 1946, Cerenkov participated in the development and construction of the first electron accelerators in the laboratory headed by V. I. Veksler.

For their contribution to the development of the 250-MeV electron synchrotron, Cerenkov and the research team were awarded a USSR State Prize. Cerenkov later headed research on the improvement of the main components of this synchrotron, raising its parameters to a level above any other installation of this class in the world. As a result, the Soviet Union acquired what was then a contemporary experimental base for the furthering of research in the physics of electromagnetic interactions in the medium-energy range.

Since 1959, Cerenkov has headed the USSR Academy of Sciences Physics Institute's Laboratory of Photomesonic Processes. Research on the electromagnetic interactions of elementary particles can be the basic scientific trend at this laboratory. A series of fundamental studies of photon-nucleon interactions were carried out during this time under Cerenkov's supervision. The photodisintegration of the lightest nuclei was also studied in detail at energies up to 250 MeV.

During the same period, Cerenkov collaborated with Yu. M. Ado in proposing and implementing a new method for the storage and production of colliding electron-positron beams on operating synchrotrons.

In the years that followed, Cerenkov directed work on the planning and construction of the new FIAN scientific complex at Krasnaya Pakhra for research on electromagnetic interactions, which included a high-intensity 1.3-GeV accelerator and a modern measuring and recording center. Without waiting for completion of this complex, Cerenkov's laboratory began work on high-energy electromagnetic processes on the Dubna and Serpukhov accelerators. One important step in the conduct of this research was the creation of electron beams on the Serpukhov proton accelerator in a joint effort with the Institute of High-Energy Physics and the Erevan Physics Institute.

Like most outstanding scientists, Cerenkov is in constant creative communication with scientific youth. The world scientific community is well acquainted with the team that he heads.

Cerenkov has done a great deal of teaching work over what is now more than a quarter of a century. Beginning as an instructor at the Moscow Power Engineering Institute, he is now a Professor of the Moscow Engineering-Physics Institute.

Cerenkov's name is a familiar one not only to the world scientific community. He is also well known as a man who has given much effort to the struggle for peace. For many years he has been a member of the Presidium of the Soviet Committee for Peace, a member of the Soviet committee for European Security and Collaboration, and a participant in the Pugwash movement of scientists.

Cerenkov holds an Order of Lenin, two Orders of the Red Banner, an Order of the Badge of Honor, and USSR medals. His high accomplishments have also been recognized with orders bestowed by various foreign countries.

It is a pleasure to report that his seventieth birthday finds Cerenkov full of creative plans; his energy and enthusiasm could be the envy of many young scientists.

[1)] At that time, Vavilov subscribed to the erroneous belief that the phenomenon was electron bremsstrahlung.

[2)] The later development of Cerenkov radiation theory is associated with the names of I. E. Tamm, I. M. Frank, and a number of other Soviet physicists; for example, a quantum theory of this radiation was developed by V. L. Ginzburg.

Translated by R. W. Bowers