PAVEL ALEKSEEVICH CERENKOV

(On his 60th Birthday)

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ON 28 July 1964 Pavel Alekseevich Cerenkov, well known for the discovery of the radiation bearing his name, celebrated his 60th birthday.

Cerenkov was born in 1904 in the village Novaya Chigla (Voronezh oblast), in a peasant family. After completing secondary school, he entered the Voronezh State University, from which he was graduated in 1928.

In 1930 he entered the preparatory division for graduate students of the Physics (then Physics-Mathematics) Institute of the Academy of Sciences, and in 1932 he was transferred to the main division of this graduate faculty. As a graduate student he worked under the guidance of Academician S. I. Vavilov and he completed his work by defending a candidate's dissertation (1935). He was then employed as a scientist by the P. N. Lebedev Physics Institute of the Academy of Sciences.

The start of Cerenkov's scientific activity dates back to 1932, when he proceeded, under the guidance of S. I. Vavilov, to study the luminescence induced by x-rays in solutions of uranyl salts.

In this basic and thorough investigation, Cerenkov has shown that the luminescence is identical in all its properties to the luminescence observed in photoexcitation, and that it is due to the electrons which are produced in the solutions by Compton scattering of γ rays.

During the course of this work, Cerenkov discovered a new phenomenon of basic significance. He established that besides ordinary luminescence the γ rays produce an additional glow, which has a universal character and which differs in its properties radically from luminescence. Cerenkov devoted to a thorough and detailed experimental study of this unique phenomenon several of his subsequent investigations, which he performed under the guidance of S. I. Vavilov. He studied the remarkable features of the phenomena and after a theory of the phenomenon was developed by I. E. Tamm and I. M. Frank, Cerenkov obtained in several of his investigations convincing quantitative experimental proof of the theory. These investigations are regarded as classical to this day.

The work of S. I. Vavilov, P. A. Cerenkov, I. E. Tamm, and I. M. Frank on electrons moving in a substance with superluminal velocity became widely known both in the Soviet Union and abroad. In the scientific literature this phenomenon has been named

the "Vavilov-Cerenkov radiation." The discovery of this radiation, in addition to being of great scientific fundamental interest, is also very valuable in practice. Recently, in view of the general progress in science and technology, several possibilities of using this radiation have appeared, particularly for the registration of high-energy particles.

In 1946 Cerenkov, together with Academicians S. I. Vavilov and I. E. Tamm and corresponding member I. M. Frank of the U. S. S. R. Academy of Sciences, was awarded a first-degree state prize for the work done in the study of this phenomenon. In 1958 (after the death of Academician S. I. Vavilov), Cerenkov, Tamm, and Frank were awarded the Nobel Prize in physics.

In the post-war years, Cerenkov was engaged for some time in investigations of cosmic rays, and for several years he took a leading part in the development and construction of accelerators for light parti-

cles, and later in research on photonuclear and photomeson reactions.

For participating in work on the design and construction of the 250-MeV synchrotron of the Physics Institute of the Academy of Sciences, Cerenkov was awarded a second-degree State Prize. Soon after the starting of the synchrotron, Cerenkov took charge of the work performed with this accelerator. Under his guidance, radical improvements in the main units of this accelerator were made during the succeeding years, such as to increase by a factor of several times the intensity of the accelerator-particle beam and to improve sharply the reliability and quality of its operation. As a result of this, the Physics Institute synchrotron is at present outstanding in intensity among installations of this class. By the same token, there has been produced in the Soviet Union a solid foundation for the work on photonuclear reactions with high-energy photon processes and photomeson processes.

At the present time Cerenkov is in charge of the Laboratory of Photomeson Processes of the P. N. Lebedev Physics Institute. Under his guidance, a series of investigations has been carried out in the laboratory on the photo-disintegration of helium, on the photo-production of pions, on photodisintegration of some light nuclei by the induced-activity method, and others. A characteristic feature of these investigations is their thoroughness and high experimental level of performance.

Along with research in the field of photonuclear and photomeson physics, Cerenkov continues to work on accelerators. Worthy of note are the interesting studies undertaken at his suggestion and under his guidance on the incoherent radiation properties of electrons moving in a magnetic field. These investigations have led to the disclosure of several essential features of processes occurring in accelerators.

Recently Cerenkov and his co-workers proposed a new method for obtaining colliding electron-positron beams. Special laboratory experiments have confirmed the possibility of relatively simple realization of these conditions for particle collision, which are exceedingly important for high-energy physics. The work done by Cerenkov's group in this field has aroused great interest among leading physicists.

It is important to note that the laboratory headed by Cerenkov has developed very rapidly and is staffed by a large number of young workers without appreciable scientific research experience. Cerenkov is training young scientists under such conditions.

In addition to scientific work at the P. N. Lebedev Physics Institute, Cerenkov has been carrying out since 1948 extensive pedagogical work, first as Professor of the Moscow Power Engineering Institute, and then at the Moscow Engineering Physics Institute. In 1964 Cerenkov was awarded an order of Lenin and selected a corresponding member of the U.S.S.R. Academy of Sciences. At the present time Cerenkov is full of vigor, energy, and extensive plans for the future. We wish him many years of life and further creative progress in his work.

List of Cerenkov's Papers

1934

1. Visible Glow from Pure Liquids Induced by γ Radiation, DAN SSSR **2** (8), 451.

1935

2. Observation of the Glow of the Night Sky by the Extinction Method, DAN SSSR **1** (2/3), 110 (with N. A. Dobrotin and I. M. Frank).
3. Observation of Cosmic Rays with a Cloud Chamber on Elbrus, DAN SSSR **1** (7/8), 466.

1936

4. Effective Magnetic Field on Visible Glow of Pure Liquids, Induced by γ Rays, DAN SSSR **3** (9), 413.

1937

5. Visible Radiation in Pure Liquids Induced by Hard β Rays, DAN SSSR **14** (3), 99.
6. Visible Radiation Produced by Electrons Moving in a Medium with Velocities Exceeding that of Light, Phys. Rev. **52** (No. 4).
7. Angular Distribution of the Intensity of Glow Produced in Pure Liquids by γ Rays, DAN SSSR **14** (3), 103.

1938

8. Glow of Pure Liquids Induced by Fast Electrons. Izv. AN SSSR ser. fiz. No. 1-2, 29 (with I. E. Tamm and I. M. Frank).
9. Glow Spectrum Due to Fast Electrons, DAN SSSR **20** (9), 653.
10. Absolute Yield of Glow Produced by Electrons Moving in a Medium with Superluminal Velocity, DAN SSSR **21** (3), 117.
11. Spatial Distribution of Visible Radiation Produced by Fast Electrons, DAN SSSR **21** (7), 323.
12. Radiation of Electrons Moving in a Medium with Superluminal Velocity. Trudy FIAN (Transactions, Physics Institute of Academy of Sciences) **2**, No. 4.
13. Experiments with Cloud Chamber at Altitude 3800 Meters, DAN SSSR **29** (6), 789 (with R. V. Sadovskiĭ, L. S. Éĭg, and I. V. Chuvilo).

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17. Distribution of Energy in the Spectrum of Interference Radiation from Electrons Moving in a Synchrotron, DAN SSSR **110** (1), 35 (with Yu. M. Ado), Soviet Phys. Doklady **1**, 517 (1957).
18. Use of Cloud Chamber for the Investigation of Photonuclear Processes, PTÉ, No. 2, 29 (with A. N. Gorbunov and V. M. Spiridonov).
19. Incoherent Radiation of Electrons in a Synchrotron and Some of its Applications for the Investigation of Accelerator Operation. Atomnaya énergiya, Appendix to No. 4, 49 (with Yu. M. Ado).
20. Features of the FIAN 280-MeV Synchrotron, Atomnaya énergiya, Appendix to No. 4, 57 (with A. Ya. Belyak, V. I. Veksler, V. N. Kanunnikov, and B. N. Yablokov).

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21. Ranges of Recoil Nuclei and the Mechanism of Certain Photonuclear Reactions, JETP **35**, 544 (with F. P. Denisov), Soviet Phys. JETP **8**, 376 (1959).

1959

22. Search for Particles with Masses from 6 to 25 Electron Masses, JETP **37** (6), 534 (with A. S. Belousov, S. V. Rusakov, and I. E. Tamm), Soviet Phys. JETP **10**, 377 (1960).
23. On the Existence of a Particle with Mass $2m_e \leq \mu \leq 25\ m_e$, JETP **38** (1), 69 (with A. N. Gorbunov and V. M. Spiridonov), Soviet Phys. JETP **11** 51 (1960).

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