

Georgii Nikolaevich Flerov (on his seventieth birthday)

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The outstanding Soviet physicist, Academician G. N. Flerov, celebrated his 70th birthday on March 2, 1983. G. N. Flerov started his career in science in 1937. He began work in I. V. Kurchatov's laboratory at the famous Leningrad Physicotechnical Institute. This was a time of vigorous development of nuclear physics, generated by a flood of remarkable discoveries at the beginning of the 1930s.

Georgii Nikolaevich revealed his talent as an experimental physicist and his extraordinary persistence and purposefulness in solving very difficult problems in nuclear physics in his first independent works. When the fundamental possibility of a nuclear chain reaction became clear, G. N. Flerov together with L. I. Rusinov performed experiments to determine the key parameter governing the realization of a nuclear chain reaction: the number of secondary neutrons produced by fission.

The agenda included the following question: what is the probability for fission of natural uranium isotopes (238, 235, and 234) induced by neutrons with different energies? To perform these studies, G. N. Flerov together with K. A. Petrzhak developed a technique, which had a record high sensitivity, that permitted him in 1940 to observe for the first time a new physical phenomenon: spontaneous nuclear fission. This fundamental discovery marked the beginning of an entire branch of nuclear physics.

In the early days of the war, G. N. Flerov joined the Leningrad People's Militia, and then completed courses at the Air Force Academy in Ioshkar-Ole. But, even while serving in the army, he continued to follow the scientific literature and think about nuclear fission and the possibility of realizing a nuclear chain reaction.

G. N. Flerov turned his attention to an amazing fact: after a vigorous flow of papers, publications on uranium fission disappeared. He proposed that the investigations of the uranium problem interrupted by the war should be renewed.

In December 1941, in Kazan', he presented a paper to physicists on the necessity of investigating nuclear chain reactions with fast neutrons. In his paper, he indicated the possible paths for solving a number of basic problems.

Work on the development of nuclear science and technology began in the Soviet Union at the end of 1942 and G. N. Flerov was among several physicists with whom I. V. Kurchatov began the analysis and development of



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the entire complex of problems. Later, he actively participated in investigations directly related to strengthening the defensive power of our country and laying the foundations of nuclear power in the Soviet Union.

In 1953, G. N. Flerov's scientific interests turned to the development of a new branch of nuclear physics: collisions of complex nuclei and the fundamental problem of synthesis of new elements. Within a short period of time, under the direction of G. N. Flerov, intense beams of heavy ions were obtained and the first experiments, oriented towards synthesis of transuranium elements, were performed at the Institute of Atomic Energy in Moscow.

In 1957, at the suggestion of I. V. Kurchatov, a laboratory of nuclear reactions, which G. N. Flerov directed for 25 years, was created at the Joint Institute for Nuclear Research in Dubna.

Of all the diverse paths for research with heavy ion beams, Georgii Nikolaevich chose the most fundamental and difficult: synthesis of trans-Fermi elements, located on the boundary of the region of nuclear stability.

Based on extensive methodological work and study of the mechanism of nuclear reactions between complex nuclei, under the direction of G. N. Flerov, successful experiments were performed on synthesis of elements 102, 103, 104, 105, 106, and 107, and new physical phenomena were discovered: accelerated spontaneous fission of nuclear isomers; delayed nuclear fission; decay of nuclei with the emission of delayed protons; a new class of nuclear reactions, namely, reactions with deep inelastic nucleon transfer. The State register of the USSR records 10 discoveries made by G. N. Flerov and his coworkers.

Georgii Nikolaevich devotes much effort and energy to constant development and improvement of the accelerator facilities at the Laboratory and to broadening of the experimental possibilities in the area of heavy-ion physics. The result of this work by G. N. Flerov was the development of a generation of heavy-ion accelerators at the Laboratory: U-300 300-cm cyclotron, U-200 isochronous cyclotron, followed by U-300 + U-200 tandem cyclotrons, and the largest isochronous cyclotron U-400 came on line at the end of the 1970s. The large accelerator facilities of the Laboratory permit conducting investigations on the most urgent problems in the physics of heavy ions, solving important applied scientific problems, and constantly achieving high-quality, internationally recognized results.

At the present time, G. N. Flerov directs a complex of investigations, intended to clarify the possibility of the existence of super-heavy elements. There are two aspects to this work: on the one hand, experiments on synthesis of heavy ions using accelerators are being undertaken and, on the other, an extensive search is being conducted for super-heavy elements in nature.

Investigations of the heavy components of cosmic rays with the help of a unique track technique, developed under the direction of G. N. Flerov (observation of tracks of nuclei in olivine crystals, interspersed in meteorites), are of special interest. Several tracks from very heavy nuclei, presumably with $Z \geq 110$, have been discovered experimentally.

Georgii Nikolaevich's sharp critical approach, ability to analyze clearly all the experimental facts, his profound understanding of the essence of physical phenomena, his unusual energy and persistence, and his ability to take his thoughts to completion are the qualities that determined the brilliant scientific achievements of G. N. Flerov and the group that he heads.

Together with the solution of key fundamental problems in nuclear physics, G. N. Flerov, throughout his career, devoted a great deal of attention to the practical application of the achievements of nuclear physics. He was one of the initiators of the development of nuclear

methods for prospecting for oil and for the most efficient development of oil fields in the USSR.

Under his direction, an improved apparatus was developed at the Moscow Petroleum Institute for neutron and gamma logging of oil reservoirs.

In 1969, G. N. Flerov became the director of the Scientific Council of the USSR Academy of Sciences on the application of nuclear physics in allied fields. He expended much effort and energy on the introduction of the achievements in nuclear physics into the economy, in particular, efficient use of the methods of activation and x-ray fluorescence for trace-element analysis in geology, technology, and agriculture. At the initiative and under the leadership of Georgii Nikolaevich, applied scientific work is being conducted using heavy-ion accelerators on developing polynuclear filters and on radiation aspects of materials science, which is well known. The most important achievement here is the massive introduction of these scientific-technical developments into industry, biology, medicine, and agriculture.

Georgii Nikolaevich's prestige is very great in our country as well as abroad. He is a foreign member of the Royal Academy of Denmark and an honorary member of the German Academy "Leopoldina," and he was awarded an honorary doctorate by a number of foreign universities.

For his outstanding investigations in nuclear physics, having great scientific and practical significance, the government has more than once conferred high awards on G. N. Flerov. The title of Hero of Socialist Labor has been conferred upon him and he has been awarded the Lenin and State prizes, as well as orders and medals of the Soviet Union and other countries.

G. N. Flerov celebrated his 70th birthday at the peak of his creative powers, full of energy and scientific ideas. His range of interests is unusually broad. Super-heavy elements and solar neutrinos, designing and equipping new accelerators (cyclotrons and microtrons), development of new radiation detectors, trace-element analysis of soils and creation of vaccines, all this and much else falls within the purview of Academician G. N. Flerov. His working day begins early in the morning and ends late at night. Many tens of people appear in his study every day to discuss something, to hear a suggestion, and to obtain encouragement. He is often seen in institutes, laboratories, and factories in many cities of the country.

We wholeheartedly wish G. N. Flerov good health, inexhaustible energy, and new successes.

Translated by M. E. Alferieff