Anatolii Petrovich Aleksandrov (on his ninetieth birthday)

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The prominent physicist and organizer of science, Academician of the Russian Academy of Sciences, Anatoliĭ Petrovich Aleksandrov celebrated his ninetieth birthday on February 13, 1993.

A. P. Aleksandrov was born onto the family of a teacher in the town of Tarashe near Kiev in Ukraine. On completing secondary school, concentrating in the sciences, in Kiev he combined study at Kiev University with teaching physics and chemistry in school. While still a student he began independent research at the Kiev X-Ray Institute and in 1929 he published his first scientific paper "High-voltage polarization in ceresine." This work caught the attention of Academician A. F. Ioffe, who invited the young scientist to the Leningrad Physicotechnical Institute.

A. P. Aleksandrov began his scientific career at the Leningrad Physicotechnical Institute with investigations of the electric strength of dielectrics. His precise experiments demonstrated that the electric strength of insulating films does not depend on their thickness and made it necessary to reject the avalanche theory-then being developed-of impact ionization. A. P. Aleksandrov's experiments indicated that so-called "weak spots" play an important role in the electric breakdown of insulators. The idea that weak spots play a special role was very fruitful and was later used for interpreting experimental data on brittle fracture of solids. These studies formed the foundation of the statistical theory of technical cohesive strength, proposed by A. P. Aleksandrov, S. N. Zhurkov, and others. This theory is still important for the modern physical theory of durability of materials.

In the 1930s A. P. Aleksandrov directed his attention to the physics of polymers, which at that time, was a completely new field. The study of the mechanical and electric properties of synthetic polymers—rapidly entering technology—besides being of scientific interest, was also of significant practical interest. It is these directions in physics that attracted Anatolii Petrovich most of all.

Foreseeing the enormous future of polymers, A. P. Aleksandrov launched, together with his coworkers and in creative collaboration with P. P. Kobko, comprehensive investigations of the physical properties of different highmolecular substances and obtained results that made it possible to establish physical laws which are common to all polymers and to reveal the relation between the mechanical and electric relaxational properties. The works performed in this series of works in 1933–1941, which also became the main content of A. P. Aleksandrov's doctoral dissertation,



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formed the foundation of a number of branches of polymer physics, they entered textbooks and monographs, and they determined the future course of many directions in polymer physics. Their results turned out not only to be important for the development of science, but they also acquired practical value—they enabled development of frostresistant rubbers based on a domestic synthetic rubber and extensive technical application of polystyrene—a dielectric which was first investigated in detail by A. P. Aleksandrov.

During World War II A. P. Aleksandrov directed the work on protection of ships from magnetic mines. The scientific foundations of the method of protection were laid under his direct leadership during the prewar years. Besides A. P. Aleksandrov's immediate coworkers, many scientists from other laboratories of the Leningrad Physicotechnical Institute, including I. V. Kurchatov, participated in this work. Successful antimine protection of ships by the method developed at the Leningrad Physicotechnical Institute saved the Soviet fleet, enabled successful fleet operation during the war, and saved the lives of many thousands of sailors.

It is during this period that A. P. Aleksandrov's sci-

entific talents as well as his talents as organizer of scientific research and development, capable of directing the practical implementation of such work, became clearly evident.

Anatolii Petrovich's scientific and organizing work flowered in the research and development work on atomic energy and the application of atomic energy in different areas of the economy and for defense of the country. A. P. Aleksandrov arrived in nuclear science and technology at the end of the war, when he was already a well-known scientist and Corresponding Member of the USSR Academy of Sciences (since 1943). He actively entered into this work, and soon became a director of a large team of scientists and engineers.

From 1946 to 1955 Anatolii Petrovich directed the Institute of Physical Problems of the USSR Academy of Sciences. Under his leadership, besides the Institute's traditional areas of research, an entire complex of extremely complicated work, which was of great significance for solving the atomic problem, was performed there.

Starting in 1948, when A. P. Aleksandrov was appointed to succeed I. V. Kurchatov, he applied all of this talent as a scientist and his enormous experience and energy to the development of nuclear reactors. Here he manifested his amazing versatility and enormous breath of knowledge. He directed and organized the joint work of physicists, builders, and technologists, and he did not simply direct, but he brilliantly understood all the details, proposed solutions, and evaluated results. He also taught this approach to others.

Together with I. V. Kurchatov he laid the scientific foundations for the development of all basic directions in the construction of nuclear reactors in our country.

Becoming the director of the Institute of Atomic Energy after I. V. Kurchatov died in 1960, A. P. Aleksandrov remained for almost the next three decades the scientific director of the most important scientific-technological programs on the development and construction of nuclear reactors of different types. These include large power reactors, which today operate in almost all active nuclear power plants in Russia and "nearby countries"; small research reactors, constructed in many science centers in Russia, former republics, and a number of foreign countries; breeder reactors for producing strategic nuclear materials (plutonium, tritium); and, reactors for use in space.

But, probably, Anatolii Petrovich was and remains most interested in nuclear reactors for the navy. Under the initiative of A. P. Aleksandrov and his scientific leadership, at the beginning of the 1950s work began on the development of nuclear reactors for use in ships. The development of reactors for naval vessels—atomic-powered submarines—and for atomic-powered ice breakers proceeded virtually in parallel.

Anatoliĭ Petrovich personally directed the startup of reactors for the first in the world nuclear-powered ice breaker Lenin and the first Soviet nuclear-powered submarine Leninskii Komsomol. Both vessels were commissioned in 1959.

These ships were followed by new and better ships. The atomic-powered ice breakers Arktika, Sibir', Rossiya, and others made it possible to extend significantly the periods of navigation in the polar basin, almost to year round navigation. Tens of atomic-powered submarines of three generations, equipped with powerful nuclear-armed missiles, became one of the most important components of strategic parity which then existed between the two superpowers during the years of the Cold War.

It is difficult to overstate A. P. Aleksandrov's unique contribution to the development of the Soviet nuclearpowered fleet.

The unusual breadth of A. P. Aleksandrov's scientific interests manifested strikingly and fruitfully at his post as director of the I. V. Kurchatov Institute of Atomic Energy, which he directed until December 1988. He conducted enoromous work on expanding the range of applications of nuclear sources of energy for peaceful purposes (nuclear heat production stations, nuclear power plants for producing high-potential heat for the chemical and metallurgical industries), development of research on plasma physics and controlled thermonuclear fusion. A. P. Aleksandrov always devoted special attention to fundamental research at the Institute. Typical examples are problems in biology and solid-state physics.

During the 1950s, which was a difficult period for Soviet biology, A. P. Aleksandrov, together with I. V. Kurchatov, maintained weak seedlings of molecular genetics, a new science at the time. He was able to foresee the enormous prospects for research on the molecular mechanisms of heredity, and created at his institute a biological division, which later became an independent institute (now the Institute of Molecular Genetics of the Russian Academy of Sciences) and is now a leading center of biological research in this field.

A. P. Aleksandrov was always interested in the field of physical science which he studied as a youth—solid-state physics. This interest was intensified by the fact that the development of atomic science and technology always confronted solid-state physics with new questions and at the same time provided investigators with new methods and technical means for studying the properties of solids.

In the 1960s Anatoliĭ Petrovich created at the Kurchatov Institute a division of solid-state physics with a wide spectrum of experimental and theoretical research and devoted a great deal of attention to it.

A. P. Aleksandrov always had an amazing gift for determining precisely the time when the results of fundamental research should be adopted in technology and a new technology should provide new possibilities for research. Thus, at the beginning of the 1960s, foreseeing the development of applied superconductivity, he initiated at the Institute fundamental research in low-temperature physics and work on the technical applications of superconductivity.

In the 1980s Anatolii Petrovich decided to build at the Institute a source of synchrotron radiation, having in mind applications of this source in fundamental physical and biological research and for the solution of applied problems.

Directing an enormous staff and work on diverse sci-

entific and technological problems of the Institute, A. P. Aleksandrov always looked after not only the construction of apparatus and financial support, but, most important, maintaining a creative and friendly atmosphere. He was able to do this both due to his enormous personal charm and by being attentive and to every staff member at the Institute and showing interest in his work. But his sincere interest in any unknown phenomenon, new problem, or new apparatus was, evidently, most important. Understanding a new theory, realizing new experimental facts, understanding an approach, different from the traditional one, to some known problem—these were all important and interesting to Anatolii Petrovich.

Anatolii Petrovich's unique qualities—wide range of opinions, inexhaustible curiosity, ability to extract from new results an understanding of a physical phenomenon or from the ability to measure something more accurately a method for solving an important technical problem, and together with this his enormous prestige among scientists, deep understanding of engineering-technological questions, sincere friendliness to all people, irrespective of station and titles, combined with extactitude and persistence—enabled him to solve successfully for many years the most difficult and important problems, whose scale far exceeded the possibilities of a single institute, even a large one.

It is these qualities that enabled A. P. Aleksandrov to combine successfully important work on directing the Institute and very large state scientific-research programs with fruitful scientific-social work at the Academy of Sciences of the USSR, of which he became an active member in 1953. In 1960 A. P. Aleksandrov became a member of the Praesidium of the Academy of Sciences of the USSR, and in 1975 he was selected president of the Academy of Sciences of the USSR and remained in office up to 1986. Loyal to the best traditions of Soviet science, he tried to do everything possible for development of progressive directions in modern scientific knowledge. A. P. Aleksandrov's selfless work has been recognized by many high state prizes. A. P. Aleksandrov was named three times Hero of Socialist Labor, he was awarded eight Orders of Lenin, the Order of the October Revolution, and other orders and metals of the USSR as well as a number of other countries. He is a laureate of the Lenin and State Prizes of the USSR.

The long life of the scientist was not always strewn with roses. Things didn't always work out. There were failures and bitter experiences. A. P. Aleksandrov perceived the Chernobyl catastrophe as a great personal tragedy. Although the accident occurred as a result of unthinkable gross breakdown of reactor operation, it became clear that reactors of this type are inadequate and are not protected from human irresponsibility and negligence. Since April 1986 A. P. Aleksandrov has been devoting most of his time to the development of guaranteed reactor safety and work on dealing with the consequences of the Chernobyl accident.

Today, legends are being composed about this man---about how he works and how he rests (and he rests always far from the "centers of civilization," somewhere on an uninhabited island in the Volga Delta; he likes to hunt and fish).

His amazing capacity for work is recounted. But this is no longer a legend. This is his life. Even now, at a comparatively quiet post of esteemed director, he, as in the past, is immersed in work. Coworkers of the Institute and people from other organizations visit him from morning to night; he discusses new results, poses problems, and thinks over plans for new work. He cannot live and work differently. He simply doesn't know how.

Translated by M. E. Alferieff