Aleksandr Mikhaĭlovich Baldin (On his sixtieth birthday)

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Academician Aleksandr Mikhaĭlovich Baldin was sixty on 26 February 1986. Throughout his working life he has had a single-minded interest in elementary-particle physics. His work in this field has ranged from his participation in the development of accelerators to the creation of theories of the phenomena accompanying high-energy collisions between hadrons. The name of A. M. Baldin is closely linked with the establishment and development of areas of research in subatomic physics such as electromagnetic interactions between nuclei and hadrons, relativistic nuclear physics, quark structure of matter, and the physics and technology of accelerators of particles and nuclei.

The scientific style of Aleksandr Mikhaĭlovich is founded on his rare ability to spot an area ripe for new ideas and new lines of research within the expected range and latent possibilities of theory and experiment. He approaches important things in life with a degree of unconcealed emotion that captivates, enthuses, and charges with a "targeting reflex" all his colleagues, collaborators, and pupils.

A. M. Baldin was born in Moscow and resided there until 1968 when he was appointed director of the High Energy Laboratory of the Joint Institute for Nuclear Research at Dubna. A. M. Baldin's development as a scientist was greatly influenced by the Moscow Engineering Physics Institute where he was a student and, later, a professor, and by the Lebedev Physics Institute of the USSR Academy of Sciences where he progressed from a junior researcher to a group leader and professor of theoretical physics. A. M. Baldin's scientific work began at the Physics Institute of the Academy of Sciences (FIAN) even before he completed his studies at the Moscow Engineering Physics Institute in 1949. His early work, performed in collaboration with V. V. Mikhaĭlov and M. S. Rabinovich, was concerned with a wide range of problems in the theory of cyclic accelerators, then an emerging branch of physics, and the development of the physics of the biggest accelerator in the world—the proton synchrotron at Dubna. The "method of envelopes," which became a classic and widely used technique for calculating the parameters of strong-focusing accelerators, occupies a special place in this research. In the 70s and 80s, A. M. Baldin's work also has been mostly concerned with the synchrotron. The machine was transformed under his direction into the first and still the largest accelerator of relativistic nuclei, and the scientific and technological foundations were laid for relativistic nuclear physics.

A. M. Baldin attracted international attention through his work on the physics of electromagnetic interactions, which revealed his talent as a research scientist. Modern physics of electromagnetic interaction between hadrons began after the simultaneous commissioning in 1949 of electron synchrotrons at FIAN and at Berkeley (USA), and the discovery of the photoproduction of mesons. The researches

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of A. M. Baldin and V. V. Mikhaĭlov (1950–1952) were performed at the suggestion of M. A. Markov and provided the initial signposts for experiments in this area. A major contribution to elementary-particle physics was A. M. Baldin's prediction of the basic features of the photoproduction of charged and neutral mesons near the threshold. The pole approximation was formulated by Baldin in 1951 (taking into account the anomalous magnetic moments of nucleons) and became part of the subsequent (1958) dispersion theory of these processes.

Among important results published by A. M. Baldin in a second series of papers was the introduction of the concept of optical anisotropy of atomic nuclei and the development of the theory of tensorial electrical polarizability of nuclei. He was the first to suggest that nuclear deformations could be studied by experiments with oriented nuclei (1958).

The predictions and conclusions of A. M. Baldin's theoretical work were subsequently confirmed by experiments in the USSR and abroad. This work has been acknowledged internationally, and has been influential in the subsequent development of research programs for the investigation of

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photomesic and photonuclear processes at different scientific research institutions around the world. In particular, optical anisotropy of nuclei was discovered experimentally by American physicists who acknowledged A. M. Baldin's priority. A striking feature of A. M. Baldin's work as a theoretical physicist is his wide range and originality of approach to different problems in physics, and his deep understanding of and skilled approach to specific experimental situations. This has enabled him to suggest ideas for new experiments, and also to initiate them in a practical sense and to participate directly in them. A. M. Baldin and his collaborators have been responsible for the discovery of the electrical polarizability of the proton (1957) and for the direct transformation of photons into vector mesons (1967). In 1971, A. M. Baldin, predicted a new phenomenon: the cumulative production of mesons in the interaction of relativistic nuclei with nuclei. The experimental discovery and investigation of this phenomenon was performed under the direction of A. M. Baldin and with his direct participation. It demonstrated, for the first time, the scale invariance of nuclear collisions. This was the beginning of a new branch of high-energy physics, namely, the study of the quark-gluon structure of nuclei, which is currently in a state of intensive development both in the USSR and abroad. The work of A. M. Baldin and his colleagues in this area has led to an essentially new picture of the nucleus, and has set the limits of validity for the proton-neutron model of the nucleus (1975). Studies of relativistic collisions between nuclei in the synchrotron resulted in convincing evidence for multiquark configurations in the nucleus (whose structure is very different from free nucleons), and have led to a new characteristic of the nucleus, namely, the quark-parton structure function (1980). In a series of papers published in 1983–1985, A. M. Baldin developed a new relativistically invariant approach to the analysis of the multiple production of particles. This is based on an analog of a general principle in statistical mechanics, i.e., the principle of reduction of correlations in the space of the relative 4-velocities of the particles. This has been used as a basis for a new determination of hadron "jets" and, hence, an experimental demonstration of the universality of their fundamental properties in a wide range of high-energy processes involving hadrons and nuclei.

A. M. Baldin is chairman of the Scientific Council on the Physics of Electromagnetic Interaction of the USSR Academy of Sciences, Bureau Member of the Division of Nuclear Physics of the USSR Academy of Sciences, Member of the Physics Section of the Lenin and USSR State Prize Committees, and Deputy Editor in Chief of the international journal titled Elementary Particles and Atomic Nuclei. A. M. Baldin has done much for the popularization of science as an author of articles in mass-circulation periodicals, as a lecturer, and as chairman of the Publishing and Editorial Council of the society "Znanie." He actively participates in the organization of major international conferences both in the USSR and abroad. A. M. Baldin has devoted considerable attention to the training of scientists. Many of his pupils have become Doctors and Candidates of Science. He has lectured at the Moscow State University, the Moscow Engineering Physics Institute, and many international physics schools; he has been visiting professor at the University of Bonn (FRG, 1965). A. M. Baldin has contributed very substantially to the development of a special type of scientific and technological collaboration between socialist countries called "Physics at a distance" (or "Suitcase Physis"), which has been of considerable assistance in the training of highly-qualified staff from countries participating in the program of the Joint Institute for Nuclear Research.

As director of the JINR High Energy Laboratory, A. M. Baldin has played a major part in the evolution of the scientific policy for the optimum exploitation of the unique beam facilities afforded by the synchrotron and other major accelerators in the world (at IHEP, FNAL, and CERN) and in the organization of international collaborations. The provision of competitive and even record-breaking conditions for research into the physics of the submicroscopic world has involved the development of fundamentally new technologies, techniques, and instrumentation, and this has been at A. M. Baldin's center of attention. He has directed the development of new types of superconducting magnets, the creation and investigation of a model of the first superconducting accelerator of nuclei, and the development of the "nuclotron"—a new superconducting accelerator.

In his articles and speeches devoted to general questions of scientific research strategy, A. M. Baldin has tirelessly emphasized the influence of "big science" centers on the scientific and technological advances and potential of the country. A. M. Baldin's interest in these questions is founded not only on his personal competence but also on his feelings of civic duty and responsibility, and a deep appreciation of the role of science in modern society. He has demonstrated exceptional boldness in decision making, novelty in his ideas, inexhaustible energy in the implementation of plans, purposefulness, and integrity. His serious interest and participation in sport has had a strong influence on his character. In the 1950s, A. M. Baldin was a leading Soviet mountaineer, with a number of record-breaking climbs to his credit. He became a USSR Master of Sport and was awarded the Diploma of Champion of the Soviet Union (First Class).

A. M. Baldin's services to science have been recognized by the award of state prizes by Soviet and other governments. He is a laureate of the USSR State Prize. He has reached his sixtieth birthday full of creative power, energy, and interesting new ideas. We wish him good health, vigor, and further success for the good of our country.

Translated by S. Chomet