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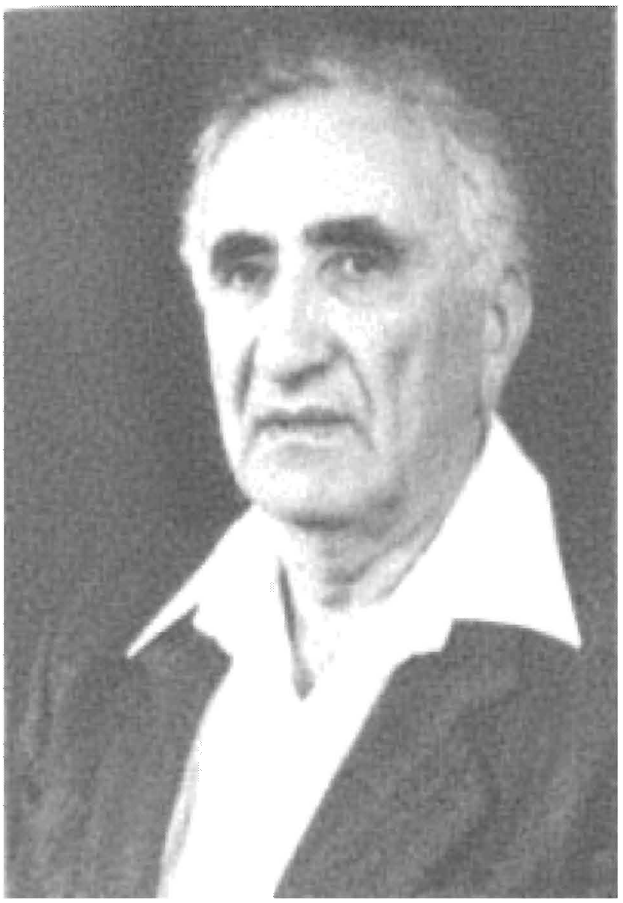
Mikhail Isaakovich Podgoretskii

Russian science has suffered a heavy, irreparable loss. On 19 April 1995 Professor Mikhail Isaakovich Podgoretskii died prematurely in Dubna. He was an outstanding physicist, chief research scientist at the Laboratory of High Energies of the Joint Institute for Nuclear Research, and Doctor of Physicomathematical Sciences.

The life of M I Podgoretskii was an example of selfless daily work in the service of science. His creative activities extending over about 50 years have been fruitful and surprisingly varied. Deep intuition, the ability to understand the meaning of the phenomena, to separate the important from the secondary, and his feeling for the unity of physical sciences enabled M I Podgoretskii to achieve major results in the physics of elementary particles, atomic and nuclear physics, optics, and neutron physics. His work is widely known both in Russia and abroad. It is difficult to overestimate the popularity of Mikhail Isaakovich as a researcher of the highest grade, a talented teacher, and an exceptionally good-natured and sensitive man. His sudden death has left his nearest friends and colleagues grieving and with heavy hearts.

M I Podgoretskii was born on 22 April 1919 in the city of Zaporozhe in the Ukraine. In 1941 he graduated from Moscow State University. During the Great Patriotic War, M I Podgoretskii served in the Soviet Army and took part in the fighting, commanding an artillery battery. After demobilisation in 1946, M I Podgoretskii started work at the P N Lebedev Physics Institute and became active in the Laboratory of Cosmic Rays led by V I Veksler. In his early work, M I Podgoretskii first proposed and provided a scientific basis to a method for selective absorption of gamma rays by atomic nuclei. This stimulated systematic investigations of resonant absorption of gamma rays, which finally led to the discovery of the Mossbauer effect.

A major series of investigations by M I Podgoretskii dealt with extensive atmospheric particle showers and statistical analysis of the shower particles with the aid of proportional counters and ionisation chambers. Mikhail Isaakovich participated in several Pamir expeditions during which important research was carried out on the physics of cosmic rays. The results of M I Podgoretskii on the statistics of readings and analysis of the experimental information have been summarised in a monograph well-known to experimentalists and written by him together with V I Gol'danskii and A V Kutsenko. These results have become widely known and have been used frequently in the development of new methods.



Mikhail Isaakovich Podgoretskii

In 1955 Mikhail Isaakovich went to Dubna and from the foundation of the Joint Institute of Nuclear Research headed a section of the Laboratory of High Energies. He made a major contribution to the improvements of the photoemulsion method which, with his active participation, was used in the first important experiments on the proton – proton interaction carried out at this Laboratory on the synchrophasotron at energies which were record values at the time. In the late fifties and early sixties, M I Podgoretskii carried out a series of investigations of the physics of elementary particles and nuclear physics, which formed the subject of his doctoral thesis in 1964. Isotopic relationships for moderately large ensembles of pions, the mechanism of the capture of K mesons, properties of hyperfragments, correlation of secondary particles in

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nuclear interactions, coherent interactions of high-energy particles with nuclei, and resonances in the meson–nuclear system is only a partial list of the interests of Mikhail Isaakovich at that time. The solutions which he obtained are elegant and unconventional. An example is an effective method for the generation and identification of hypernuclei that he proposed.

A special place in the research carried out by M I Podgoretskii is occupied by a systematic analysis of interference phenomena in quantum physics. Podgoretskii was one of the first to achieve deep understanding of the role of interference of quantum states as a precise means for the investigation of physical processes. His pioneering work on modulations and beats in atomic and nuclear transitions has served as the basis of a new direction in optics and in nuclear spectroscopy.

In 1964–1965 M I Podgoretskii obtained important results on neutron optics of polarised media. He predicted a new effect, nuclear precession of the neutron spin in a polarised target, confirmed experimentally later by French physicists. The nuclear precession effect has been used to develop and implement methods for precise determina- tion of the spin dependences of the amplitudes of the scattering of neutrons by nuclei, and in measurements of the degree of polarisation of nuclei, spin relaxation time, and low temperatures of the order of 0.001 K. In 1979 the nuclear precession of the neutron spin was recognised officially as a discovery.

In the sixties M I Podgoretskii studied in detail the interference oscillations encountered in the decay of neutral K mesons. He put forward the idea of experimental observation of the interference of two-pion decay of short- and long-lived states, which made it possible to determine the modulus and phase of the parameter characterising CP invariance violation. These experiments were subsequently carried out in laboratories of various countries. M I Podgoretskii made a series of studies of the analysis of correlation properties of neutral K-meson pairs. Extension and development of the results of this work led Podgoretskii to propose a fundamentally new approach to the problem of identity and distinguishability of particles in quantum mechanics. The framework of this approach was used to formulate a general method for solving quantum-mechanical and thermodynamic discontinuity paradoxes, including the Gibbs paradox. In 1975, M I Podgoretskii published a monograph on this subject.

An important stage in the scientific activity of Mikhail Isaakovich was a study of the influence of the Bose statistics on two-particle correlations of identical pions with similar momenta. A close analogy between interference phenomena in optics and in high-energy physics enabled M I Podgoretskii and G I Kopylov to develop an original method for the determination of the space–time dimensions of the region of generation of identical particles under multiple creation conditions. The Kopylov–Podgoretskii method of 'narrow pair correlations' has given rise to a new direction in the physics of high energies, stimulating thousands of experimental and theoretical investigations. These investigations, discussed at many international conferences, have provided fundamental information on the nature of multiple processes involving hadrons and nuclei. Some of the papers of M I Podgoretskii published in the last 25 years deal comprehensively with practically the full range of problems relating both to the fundamental basis of the method of narrow correlations and practical applications of this method. The last work of M I Podgoretskii was a theoretical analysis of spin correlations of identical nucleons with small relative momenta and was sent to press three weeks before his death.

The unconventional style of the creativity of M I Podgoretskii could be seen also in many other studies such as, in particular, the investigations of the emission and multiple scattering of ultrarelativistic charged particles passing through crystals, in the solution of the interesting problem of the passage of ultrarelativistic positronium through thin layers, and in dealing with the problem of the Archimedes force acting on separate molecules of matter in an external field. The results obtained by M I Podgoretskii and the physical relationships established by him are simple and transparent, but frequently unexpected in the light of current ideas. It will not come as a surprise that Mikhail Isaakovich was the coauthor of several discoveries.

Mikhail Isaakovich combined harmoniously his scientific research with major painstaking work in the specialist training of physicists. For several years he lectured at the Moscow Physicotechnical Institute and right up to the last days of his life he was Professor of Moscow State University. His natural teaching gifts were well known, not only to students and immediate pupils, but also to many colleagues both in Russia and abroad. An exceptional charm, a clear critical mind, the width and depth of his thinking, the rare ability to listen carefully to somebody else and irrespective of the time it took to penetrate the essence of a problem under discussion, and the generosity with which Mikhail Isaakovich shared his ideas and thoughts, in combination with an authentic democratic approach to others attracted to him both younger and older generations. For over 30 years with great responsibility and maximum devotion M I Podgoretskii led regular scientific seminars at the Laboratory of High Energies of the Joint Institute for Nuclear Research, and largely set the high level for the work done at the seminars.

To the end of his days M I Podgoretskii was young in spirit, and full of energy and creative ideas. It is difficult to imagine the city of Dubna, near Moscow, without Mikhail Isaakovich and it is not possible to reconcile ourselves with his sudden premature death. We shall always keep the memory of this remarkable scientist and man.

A M Baldin, V L Ginzburg, V I Gol'danskii, I M Gramenitskii, V G Kadyshevskii, D A Kirzhnits, A A Kuznetsov, V L Lyuboshits, I L Rozental', D S Chernavskii, D V Shirkov