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PERSONALIA

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In memory of Iosif Leonidovich Rozental'

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Iosif Leonidovich Rozental', an outstanding Russian physicist, DSc in Physics and Mathematics, has passed away. His death on February 27, 2004 is grieved as a sad loss for the entire scientific community.

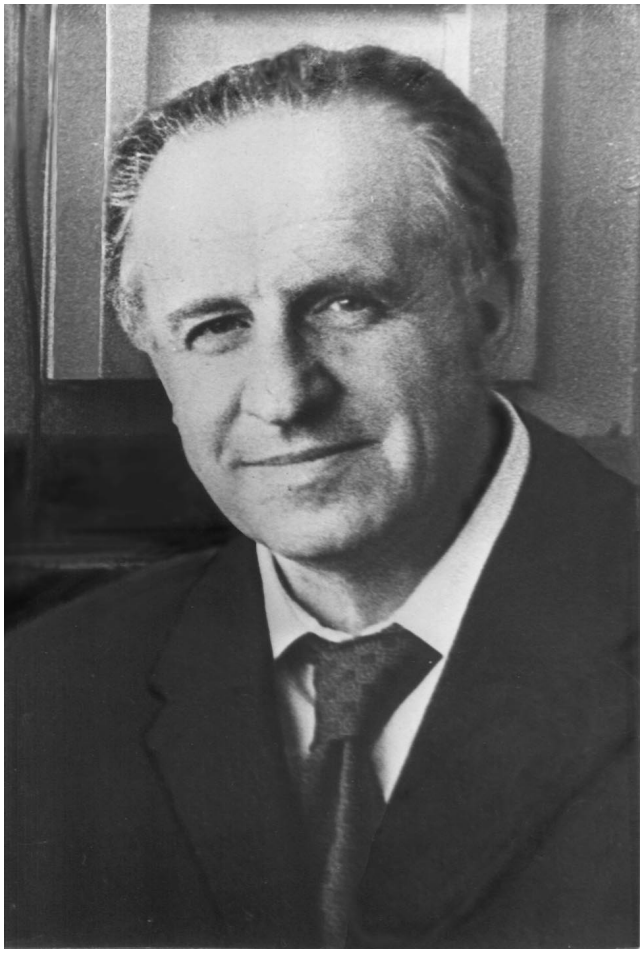
The scope of Rozental's scientific interests was impressive: cosmology, particle physics, physics of cascade processes, and astrophysics. A number of experiments were carried out under his guidance. He authored more than 200 papers and 18 monographs (the last one soon to appear in print), many of which were translated into English, Japanese, German, and Polish. Rozental's monographs *High-Energy Astrophysics* and *Relativistic Kinetics and Fluid Dynamics* became essential handbooks for many physicists and astrophysicists in the 1970s and 1980s. The monographs *Kinematics of Nuclear Reactions* and *High-Energy Nuclear Physics* are still important guides for students and postgraduates.

Iosif Leonidovich Rozental' was born in Moscow on January 30, 1919. He used to say that he lived in his childhood among 'middle semi-intelligentsia'. His mother was a dentist, and his father a civil engineer in the underground railway building industry. Already in high school, Rozental' showed how exceptionally gifted he was. He grew into a person of well-rounded education, capable of writing in perfect literary style. When he entered the Physics Department of Moscow State University (MGU) in 1936, his friends were much surprised: "Why not the Philological Department?" He loved chess and at the age of 16 won a game against the world champion Emanuel Lasker in a multi-board chess-play; at the same time he also played against Vassily Smyslov, future world champion. Rozental' remembered that he did entertain the thought of going into chess in a serious way but then changed his mind. He graduated from MGU in 1941 and took his last graduation exam just three days after the Great Patriotic war broke out.

When the Moscow people's volunteer corps was organized in July 1941, Rozental', among other students and teachers from MGU, volunteered. However, the local military registration and enlistment office recalled a group of physicists who had just graduated from MGU from active service and sent them to military schools for special military training. Rozental' first became a cadet of the Academy of Artillery, then went to the Higher Military Defense School where his training continued till June 1942. Until the end of the war he was then in active service as an artillery battery commander at the Northern and Central fronts. He received the Order of the Patriotic War of Second Class and a number of battle medals. In 1945, Rozental' was recalled from the army and assigned to work on the Soviet Atomic Project.

This was the moment when he started research in high-energy physics that he was to pursue throughout his long life in science. He started it at the Physics Institute of the USSR Academy of Sciences as an experimentalist in the physics of cosmic rays (considered at the time as part of the Atomic Project) but switched rather soon to the theory of high-energy physics. Rozental' was the founder of the cascade theory of electron – photon and cascade nuclear showers. At the beginning of the 1950s, he conducted pioneer studies of the role played by the nuclear cascade process in the formation of 'narrow' and extensive air showers. His results on the theoretical analysis of nuclear cascade showers are still used in many laboratories both in this country and abroad to analyze experimental data on extensive air showers produced by cosmic rays. In the 1960s, Rozental' carried out research which demonstrated that cosmic rays can trigger cascades in the interstellar medium. He came to the conclusion that photon fields affect the propagation of cosmic rays before the primordial cosmic microwave background was discovered.

The study of the hydrodynamic theory of the multiple creation of particles and the interpretation of the quark – gluon plasma on its basis played a considerable role in



Iosif Leonidovich Rozental'
(30.01.1919 – 27.02.2004)

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Translated by V I Kisin

Rozental's work; they made it possible to determine important characteristics of multiple processes at high energies. In this connection, he had a correspondence with Heisenberg who introduced the concept of the multiple creation of particles. In his work Rozental' was guided by hydrodynamic approach and obtained the most important characteristics of multiple processes: the transverse distribution of momentum and constraints on its mean value, and the exceptionally weak dependence of transverse momentum on collision energy.

Rozental' was actively engaged in the study of processes taking place in cosmos. He analyzed the physics of metagalactic space and published a series of papers on cascade processes in the Metagalaxy. Rozental' kept alive his interest in researching cascades in various media until the last days of his life. By the end of the 1990s, he carried out calculations, in collaboration with Russian and Japanese colleagues, of cascade processes in a strong electromagnetic field. This work found applications in the study of one of the most interesting natural phenomena — high-power bursts of cosmic gamma radiation. It was he who came up with the hypothesis, later brilliantly confirmed, that sources of gamma bursts will be observable in various energy ranges except for the interval typical for gamma bursts, which extends from several keV to several MeV.

Astronomers analyzing observations of remote type-Ia supernovas discovered in 1998 – 1999 that the cosmological term is nonzero and a vacuum dominates in our Metagalaxy in modern epoch. Rozental' suggested that the vacuum must contain all gauge bosons but in strongly bound states, which entails a very small observable value of the cosmological constant. He was unable to complete the work on this hypothesis within the time left to him but students and colleagues he left behind are currently continuing this line of research.

Rozental' let his talent shine in other branches of high-energy physics as well: the application of kinematic methods to other fields, the hydrodynamic theory of multiple processes, the analysis of the origin and creation of cosmic muons. In his last years, he went with passion into fundamental problems of physics and astrophysics — the existence of a multitude of universes, the analysis of the outer space, and the nature of a physical vacuum.

Rozental' had a very broad span of interests. He formulated the problem of life's origin in the Universe in a uniquely original manner (like many other things he did in science). He was able to show that the world constants in our Metagalaxy are compatible with the existence of life and, moreover, are such that life is predetermined to arise. To the question, ''How did it happen that this set of constants got formed in our Metagalaxy?'', he gave an answer that was 100% Rozental': ''The Metagalaxy is such as it is because we live in it''. This line of reasoning was widely accepted and continues to be quoted in the framework of the anthropic principle.

Rozental' began to teach at Moscow Institute of Engineering Physics (MIFI) at the end of the 1950s; from 1960 to 1969 he headed the Chair of Experimental Nuclear Physics of MIFI. He acted as advisor and supervisor to research work of numerous graduate and postgraduate students, chaired seminars and delivered lectures to MIFI students virtually until the end of his life. From 1970 on, he was a Senior Researcher in the Division of Long-Term Planning of the RAN Institute for Space Research.

I L Rozental' repeatedly published his papers in *Physics Uspekhi*, *Earth and Universe*, *Science and Technology in Russia*, and numerous science journals devoted to fundamental problems of physics and astrophysics, such as vacuum in the Universe, the Universe and elementary particles, and synergy in the Universe. He also published a good number of articles concerned with the history and problems of physics and the personal lives of physicists in this country. His writing was invariably marked with perfect style and form, his most profound knowledge of history and literature, and his civic anxiety about the fate of science and of the entire social structure.

Rozental' was an outstanding scientist but at the same time a very modest man who never boasted of his achievements in science.

We, friends, students, and colleagues of Iosif Leonidovich Rozental', will always keep the image of this wonderful person in our memories.

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