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PERSONALIA

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In memory of David Abramovich Kirzhnits

David Abramovich Kirzhnits, a brilliant theoretical physicist, and a Corresponding Member of the Russian Academy of Sciences, died on 4th May 1998. His work greatly influenced, in a number of cases decisively, the evolution of many fields of theoretical physics.

Kirzhnits took an active part in the study of important fields of the physics of condensed media, the physics of atomic systems, quantum field theory, cosmology, astrophysics, the theory of phase transitions, the theory of superconductivity, nuclear physics, and the physics of extreme states of matter (when the parameters of substance — pressure, temperature, or density — reach extremely high values). The results he obtained became a part of standard textbooks in the most diverse fields of physics.

However, his influence and the respect felt towards him by those who knew him did not stem solely from the significance of the results he obtained. David Abramovich's knowledge was profound and widespread and he never refused to give advice to those who needed it. It was not unusual for a discussion with the participation of Kirzhnits to produce a view of a physics problem from a very fresh and fruitful standpoint. This was highly valued by many physicists, including such outstanding names as Igor' E Tamm and Andreĭ D Sakharov. When A Sakharov was exiled to Gor'kiĭ, he more than once requested in his letters that D A Kirzhnits be asked to travel to him in order to "discuss in personal contact the latest and most vibrant research topics, and to avoid separation from the scientific pulse of the Theoretical Department (of the P N Lebedev Physics Institute)."

Kirzhnits loved physics and knew it — not some of its branches but physics as something more than a combination of its fields. He was a magnificent speaker about physics. His talks on the news and breakthroughs in physics were invariably profound and engaging; when he was speaking about such things, his face was illuminated by a happy smile.

David Abramovich Kirzhnits was a master of the mathematical tools of theoretical physics to perfection. However, he relegated these techniques to a secondary role and placed the physical idea at the centre. A joke divides theoreticians into two classes. One class comprises physicists who consider things they can handle but do it as it ought to be done: with brilliant mathematics. The other class comprises physicists who consider things that ought to be considered, but do it only as they can. D A Kirzhnits did not belong to either group: he chose what ought to be chosen, and did it as it ought to have been done.

D A Kirzhnits created a physics school to which many internationally famous physicists belong. He was a strict and exacting teacher. He asked for a lot but gave a lot himself. His lectures at the Physics Faculty of Moscow State University were profound and brilliantly presented. Students hated to miss these lectures; they attracted quite a number of students from other specialities and some teachers as well.

D A Kirzhnits was born on October 13, 1926 in Moscow. His parents belonged to the highly educated intelligentsia. His father, A D Kirzhnits, was a journalist and well-known historian of the revolutionary movement, in which he himself took active part. His mother, L S Beĭlina, was also a journalist for some time. During the World War II she was involved in the statistical processing of war injured in hospitals and later in social and entertainment activities in the health system.

David Abramovich Kirzhnits
(13.10.1926 – 04.05.1998)

In 1938, Kirzhnits' father was arrested on a fantastic accusation: allegedly, he conspired to turn over the land of the Soviet Far East to Japan. In reality the arrest was stimulated by the important role A Kirzhnits played in the formation of the Jewish autonomous region in the USSR. A D Kirzhnits was kept in the Butyrka prison for two years, under 'active examination' (torture, frankly speaking), and these two years critically undermined his health. In 1940, the verdict was changed to not guilty and he gained freedom, but lived for only three months afterwards. As a result, David Kirzhnits grew up without a father from the age of twelve. Remembering his mother, Kirzhnits used to say that anything that was good in him by the time he became independent he owes to his mother.

Two weeks after the start of World War II on the USSR territory D A Kirzhnits, together with children of hospital staff, was evacuated from Moscow to the Ural, to a boarding school in a settlement on the outskirts of Kyshtym, in the Chelyabinsk region, where the secret town Chelyabinsk-40

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was later founded and where a catastrophe struck in 1957, with massive radioactive fallout over a huge territory, with severe consequences for the population.

D A Kirzhnits spent two years as an evacuee. The settlement where Kirzhnits lived had only a seven-grade school, but he already finished such school before the war started. Kirzhnits studied alone and in two years learnt the program for the 8th, 9th and 10th grades, passed all the exams (having travelled for this purpose to Kyshtym) and was issued with the school-leaving certificate. Passing exams without attending school lessons was very unusual, and even more so in provincial Kyshtym. Kirzhnits passed the exams very well, giving detailed and well thought-out answers, and a number of local teachers attended these exams to listen to him do it.

In summer 1943 D Kirzhnits returned to Moscow and entered the Moscow Aviation Institute (MAI). Moscow State University was still in evacuation at the time. When Kirzhnits was a second-year student of MAI, the institute lecturer in physics (A F Gavrilova) saw some of the physics problems invented by Kirzhnits in proper perspective and told Lev D Landau about him. Landau wanted to meet this youth and invited him to his home. The acquaintance of the young student and the great physicist was the turning point in Kirzhnits' fate, and in particular made him choose theoretical physics as his future profession. In 1945, L D Landau helped Kirzhnits to pass on from MAI to the Physics Faculty of Moscow State University. Kirzhnits graduated from the university in 1949. His degree work was done under A S Kompaneets who had a very high opinion of his student engaged on degree thesis. He advised Kirzhnits to discuss one of the problems with Igor' E Tamm. The two met and Igor' Evgen'evich liked Kirzhnits very much indeed. Professor Tamm at that moment was the head of the Theoretical Department of the P N Lebedev Physics Institute, and made the necessary steps to have Kirzhnits assigned to his department after graduation. Alas, this was not possible at the time.

Kirzhnits was sent to work as engineer at a munitions factory, named after Stalin, in the city of Gor'kiĭ. He worked there for four years. His initial assignments completely ignored his high skills as a theoretical physicist. Quite soon, however, he carried out complicated and very urgently needed calculations required for the design of new devices. The administration began to appreciate the analytic brain of the young engineer and he was transferred to the division of the chief engineer, where he proved very useful in a number of projects. In off-work hours, Kirzhnits tried not to lose contact with science, much worked on it independently, and became acquainted with the physicists of the Gor'kiĭ State University and also with professor Vitaliĭ Ginzburg from the Theoretical Department of the P N Lebedev Physics Institute, who regularly came to Gorkiĭ as a lecturer for students of the radiophysics faculty. Kirzhnits also kept in contact with Igor' Tamm.

In 1954, Tamm succeeded at last in having Kirzhnits transferred from the munitions factory in Gor'kiĭ to the P N Lebedev Physics Institute of the USSR Academy of Sciences (FIAN) in Moscow. He began working at the Theoretical Department of FIAN, and continued working there to the end of his days.

In 1963 his book "Field Theoretical Methods in Many-Body Systems" was published. Several years later it was translated into English and published by Pergamon Press. It became a standard textbook for several generations of physicists learning field-theoretical approaches. At the same time the material that Kirzhnits included in this monograph in fact reflected his particular interests and presented some results which the author obtained in the quantum theory of many-body systems. The most important of these results was the improvement in the Thomas – Fermi method with consideration for quantum effects (correlation effects, effects taking into account field inhomogeneity, etc.). Kirzhnits continued working in this field in later years. In 1998, David Abramovich Kirzhnits and his disciple G V Shpatakovskaya won the I E Tamm Prize of the Russian Academy of Sciences for the series of works on "Improvement of the Thomas – Fermi method with applications to atomic physics and the physics of high energy density".

Kirzhnits' idea that the early stage in the evolution of the Universe can be treated as a phase transition in the physical vacuum due to spontaneous symmetry violation became widely known. This approach made it possible to consider the evolution of the Universe at its earliest stages in terms of the latest achievements in elementary particle theory. At the same time, this approach allowed the effect of cosmology ('inverse effect') to be used as a test of elementary particle theory. This work by D A Kirzhnits and his disciple Andreĭ D Linde brought them the M V Lomonosov Prize of the USSR Academy of Sciences for 1978.

D A Kirzhnits made significant contribution to the theory of superconductivity, especially to the problem of the production of high-temperature superconductors. He was one of the authors and editors of the book "The Problem of High- Temperature Superconductivity" published in Russian in 1977 and in English translation in 1982 (i.e. several years before the discovery and synthesis of high-T_c superconductors). The most important fact was that Kirzhnits was able to find the conditions of stability of matter in terms of permittivity, and showed that the stability criterion accepted prior to his work was incorrect (it was this wrong criterion that led then to the conclusion that high-temperature superconductivity was impossible).

It would be impossible to list with any degree of completeness all the important results obtained by D A Kirzhnits in various fields of theoretical physics. Let us emphasize one of them: the conclusion that white dwarfs — stars consisting of matter at tremendous density and at temperatures of tens of thousands of degrees — have a crystalline structure. Kirzhnits was also able to give a noncontradictory formulation of nonlocal field theory, although many well-known physicists refused to believe that such a formulation was possible.

In his last years, D A Kirzhnits suffered from severe illness but never ceased his research or teaching. Among other things, he read a course of lectures to students of nuclear physics on phenomena at the interface between nuclear physics and solid-state physics. The lectures treated the points of impact of low- and high-energy nuclear physics and macroscopic physics, primarily the physics of condensed matter. Much of the course was based on the results obtained by Kirzhnits himself. The course was published by Moscow State University Publishing House.

For those of us who knew David Abramovich Kirzhnits, he was not only an outstanding physicist but also a highly attractive personality, in whose behaviour merged a wonderful culture, humanity and a rare inner beauty. This is how we shall remember him.

A F Andreev, B M Bolotovskiĭ, V L Ginzburg,
N S Kardashov, L V Keldysh, A D Linde,
V I Ritus, Yu A Romanov, A N Skrinskiĭ,
S M Stishov, M M Fiks, G V Shpatakovskaya