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David Abramovich Kirzhnits (on his seventieth birthday)

13 October 1996 is the 70th anniversary of the birth of David Abramovich Kirzhnits, a prominent theoretical physicist and a Corresponding Member of the Russian Academy of Sciences.

D A was born in 1926 in Moscow. His father, then a historian, had formerly been a revolutionary, a member of the Bund organization. Already as an undergraduate student at the Moscow State University Physics Department, D A found himself in the sphere of influence of theorists like L D Landau, N N Bogolyubov, and I Ya Pomeranchuk. At the same time he met I E Tamm, an acquaintance which predetermined both his life and professional career.

In 1950 – 1954, while an MIC plant engineer in Gor'kiĭ, D A also continued to work in theoretical physics. A paper he sent to I E Tamm during this period stimulated I E's efforts to arrange for D A a transfer to Moscow — to the Physical Institute of the Academy of Sciences. Late in 1954 D A joined and has since been a staff member (currently, a senior research worker) of what today is the Theoretical Physics Department of the P N Lebedev Physical Institute.

In describing D A's work, only his most important ideas will be mentioned and most active and pioneering research areas outlined here.

As long ago as the late 40s D A started his work on the improvement of the Thomas – Fermi model, a topic in which he has been active, on and off, until very recently. This work has yielded the density functional approach, now a widely accepted tool in the theory of condensed state, and a number of methods for describing compressed materials, which have for long been used in applied science. Kirzhnits's now classic equations-of-states papers are among the most frequently cited in this field. It is the first in this series of works which provided the basis for his candidate dissertation in 1957.

In the late 50s D A was the first to demonstrate that, despite the huge temperatures in the interior of white dwarfs, their matter is in fact in the solid — specifically crystalline — state. This accounted for the presence of linear series in the Hertzsprung – Russell diagrams and made it possible to determine the chemical composition of the dwarfs.

From the early 60s, staunchly opposed to the widespread opinion that nonlocal field theory is inherently wrong, D A has devoted much of his energy to overcoming the difficulties faced by this theory. The success of this endeavour was due to the realization of the fact that it is the poor choice of a local formulation of the theory — namely, the introduction of the form factor — where the problem lies; after which this kind of trouble was no longer feared in nonlocality work. The corresponding results were part of D A's doctor dissertation

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(1966) and were widely used by I E Tamm in his generalization of space-time quantization theory.

In a major spin-off from his nonlocal work, D A developed an new technique in which quantum mechanical behaviour is viewed as a function of the coupling constant rather than of time and which is one of the most convenient versions of the axiomatic approach. The use of the method in quantum field theory removes the difficulties one encounters in the old weak interaction theory and quantum electrodynamics. Its application to the quantum mechanical problem of three and more bodies has turned the method into a widely used technique in atomic and low-energy nuclear physics.

The work D A is best known for is perhaps his study of phase transitions in vacuum in field theories with the spontaneous breaking of symmetry, and the application of its results to the cosmology of the early Universe . D A's phase transition picture has given rise, among other things, to inflation cosmology and cosmic string theory and is currently an indispensable element of our understanding of the Universe. For their pioneering work in this field D A Kirzhnits and his student A D Linde were awarded the Academy of Sciences M V Lomonosov Prize in 1978.

In the mid-1970s, as a member of the FIAN high-T_c team, D A was able — and this well before the discovery of high-T_c materials - to disprove the popular preconception that static dielectric permittivity is bound to be positive. Later, a wide

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class of negative permittivity materials were found: exactly the condition for high-T_c superconductivity to occur.

In the 80s D A develops the theory of, and derives important universal relations for, the deceleration of particles (such as charges, neutrino, and magnetic monopoles) in an arbitrary medium. A further theory of his of the same period reflects his realization of the importance of nonadiabatic effects involved in the interaction of light particles with a coupled system of heavy particles.

Most recently, a series of works by D A Kirzhnits played an important role in extending our knowledge about superfluidity in neutron stars and about the general relativity effects on the rotation of superfluid nucleonic systems.

Ranging widely in the physics of the extreme states of matter, in astrophysics, and in low- and high-energy nuclear physics, D A has also made numerous first-class contributions to many other areas of physics and related sciences. He has made about 250 scientific publications and is the author or a co-author of four monographs. His *Field Methods in Multiparticle Theory* has been a standard diagram technique reference for generations of students and researchers. Always very serious about the educational aspects of science, D A is a long-term lecturer at Saratov and Moscow State Universities and the Moscow Physical Technical Institute. For the past few years he has been a professor at MSU Physics Department. Over the years, D A Kirzhnits has directed about 20 candidate and more than ten doctor dissertations, and among his former students one finds Corresponding Members of the Russian and Kazakh Academies.

D A's warm and kind personality, his interest in the work of others, and his continual readiness to discuss his colleagues' results from any conceivable area of theoretical physics have always made him a centre of attraction for both young and already experienced physicists. Personal contacts with him are always beneficial and his valuable advice invariably helps one to resolve a difficult situation, whether in science or out. D A's friends and students deeply appreciate his support and encouragement and are grateful for his well-reasoned and invariably helpful criticism.

Congratulating D A Kirzhnits on his 70th birthday, we wish him with all our heart to conserve for many years ahead his indefatigable enthusiasm for and infectious interest in physics and life.

A F Andreev, B M Bolotovskiĭ, V L Ginzburg,
A V Gurevich, G F Zharkov, N S Kardashov,
L V Keldysh, A D Linde, V I Ritus,
V Ya Faĭnberg, E L Feĭnberg, E S Fradkin