ERRATA

Evgenii Mikhaĭlovich Lifshitz (On His Sixtieth Birthday)

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ergy) is determined from longevity measurements. Comparison of the values of $\gamma_0$ (those obtained by Zhurkov and his co-workers) with the activation energies of thermal decay of interatomic bonds (the sublimation energy in metals and crystals and the thermal destruction energy in polymers) showed good agreement between these quantities. This agreement definitely confirms the conclusion that the energy of the thermal fluctuations is expended to disconnect atoms in solids under loads, which is the essence of the failure process. But then what is the role of the external mechanical force? In light of the new, kinetic conception of failure, the tensile stress applied to a body has two effects: the first is to reduce the decay energy of the bonds and thereby sharply increase the probability of their fluctuations (failure, and the second, an especially important effect, is to lower the recombination probability by moving disconnected atoms farther apart. It might be said that the external force acts as a kind of valve that directs the destructive effects of the thermal fluctuations. Here it is important to stress that the mechanical force in operation directly at the sites at which interatomic bonds decay proves to be much larger than would follow from the average-stress ($\sigma$) values. This is indicated by the fact that the value of $\gamma$ in the longevity equation is tens and hundreds of times larger than the volume of the atom (the approximate value of the activation volume of interatomic-bond decay). These overstresses arise as a result of the structural heterogeneity of real bodies, which results in nonuniform distribution of the external load among the interatomic bonds. It is naturally at these points that thermal-fluctuation bond-breakage processes advance most actively. Failure centers, whose development culminates in the falling apart of the body, are formed here.

Thus, according to the theory developed by Zhurkov, the failure process is an atomic-kinetic process. Moreover, the strength of a body as a measure of its resistance to an external force disturbance is determined not only by interatomic cohesion forces, but also by the intensity of the thermal motion. Hence arose the concept in which the strength of solids is of kinetic nature. Introduction of these new conceptions should be recognized as a very great contribution to the development of strength physics. The approach to the analysis of failure as a kinetic process consisting of a sequence of elementary interatomic-bond decay events moved Zhurkov to introduce extremely progressive changes into the very nature of experimental research on failure. With the object of confirming the kinetic concepts and following the progress of failure in its details, Zhurkov was the first to bring a wide range of physical and physicochemical methods to bear on the solution of "mechanical" problems in his laboratory. Methods that were "unconventional" in strength research were used: infrared spectroscopy, electron paramagnetic resonance, mass spectrometry, nuclear magnetic resonance, chromatography, small-angle x-ray scattering, etc. Using this arsenal, Zhurkov and his co-workers succeeded in obtaining unique data on the true local stresses on the interatomic bonds, on the failure of these bonds, on the secondary molecular-destruction processes initiated by these bond failures, on the generation of embryonic breaks in continuity—extremely minute embryonic cracks, on the kinetics of progressive enlargement of these cracks, and so forth. The use of precision modern methods made it possible to raise the experimental study of failure to a new level, to make this study genuinely physical. This approach opens broad prospects for the development of strength research in its fundamental aspects—for the construction of a quantitative and detailed theory of strength.

Zhurkov’s work has won wide recognition in the USSR and all over the world. It has had a strong influence on the development of the strength-physics research undertaken way in many countries.

This is witnessed by the election of Zhurkov as Vice President of the International Congress on Failure of Materials.

His birthday finds Serafim Nikolaevich Zhurkov, a major scientist and a Communist, embarking on bold new searches and profound new investigations whose aim is to solve the most important problems in the way of development of the ultrastrong materials of the future.

Translated by R. W. Bowers

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Evgeniǐ Mikhaǐlovich Lifshitz (On His Sixtieth Birthday)

Through a regrettable error the translation of the following first paragraph of this article was omitted:

The outstanding Soviet physicist Evgenii Mikhaǐlovich Lifshitz celebrated his sixtieth birthday on the 21st of February this year. Much of Lifshitz’s splendid work has predetermined for a long time the development of entire branches of theoretical physics. Thus, while we frequently encounter in recent physics journals references to the "Landau-Lifshitz equation" (in the theory of magnetic resonances), the "Lifshitz criterion" (in the theory of phase transitions), or "the Lifshitz theory of molecular forces," we often lose sight of the fact that the equation was derived more than forty years ago, the criterion dates back almost thirty-five years, and the molecular-force theory is more than twenty years old. Not to mention even his recent work on cosmology, without reference to which practically no article on this subject is complete.