

Mikhail Aleksandrovich Krivoglaz (obituary)

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Mikhail Aleksandrovich Krivoglaz, a prominent theoretical physicist whose name is associated with many first-class achievements in solid-state physics, died suddenly on 30 June 1988.

M.A. Krivoglaz was born in 1929 in Kiev. In 1950 he graduated from the Physics Faculty of Kiev University. The entire scientific activity of M.A. Krivoglaz from 1951 to the last days of his life has been associated with the Institute of Metal Physics, Academy of Sciences of the Ukrainian SSR (initially—Metal Physics Laboratory of the Academy of Sciences of the UkrSSR. In 1954 he defended his candidate's dissertation, and in 1962 his doctoral dissertation. From 1964 he was head of his division, and in 1978 he was elected as associate member of the Academy of Sciences of the UkrSSR.

A significant role in Krivoglaz's education had been played by his collaboration with S.I. Pekar. They maintained a close friendship and a deep mutual respect during all the years of their common work. Outstanding investigations of M.A. Krivoglaz on the theory of spectra of the absorption of light by impurity centres (1953) were carried out together with S.I. Pekar. The existence in the electronic-vibrational spectra of narrow phononless lines was predicted. This result, obtained prior to the discovery of the Mössbauer effect, is now known as its optical analog. Unfortunately the paper by M.A. Krivoglaz and S.I. Pekar was published in a not very easily accessible collection of papers [Proceedings of the Institute of Physics, Academy of Sciences of the Ukrainian SSR (in Russian)]. Optical spectroscopy of phononless lines has now acquired great scientific and applied significance. M.A. Krivoglaz repeatedly returned to investigations of phononless lines. Recently he developed a theory of their broadening in glasses. The application of the Mössbauer effect to investigations of crystal imperfections is based on the theory of broadening of Mössbauer lines developed by M.A. Krivoglaz.

Since the mid-1950's M.A. Krivoglaz together with A. A. Smirnov was actively developing the theory of alloys. The results were summarized in the monograph by M.A. Krivoglaz and A. A. Smirnov "The Theory of Order-Disorder in Alloys" published in 1959 in the USSR, and later in England and the USA. This book which has now become a bibliographical rarity remains a necessary reference for all those who deal with alloys. Since the late 1950's the range of the primary interests of M.A. Krivoglaz began to extend to scattering of x rays by real crystals. The results obtained by him define the level of world science in this field, they have been



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experimentally confirmed and have achieved widespread international recognition. A classification of defects was carried out in terms of the contour of x-ray lines formed by them. The method of fluctuational waves was proposed in the theory of diffuse scattering. M.A. Krivoglaz analyzed the scattering of x rays by defects of practically all known types. The results obtained by him made it possible to develop methods of finding close-range order and interatomic interaction in solutions, the Fermi surfaces of alloys, the structure of point defects and dislocations, and to investigate the special features of critical fluctuations. Of fundamental significance was the prediction of the suppression of critical fluctuations by long-range dipole forces, which has been organically incorporated in the theory of phase transitions of

the second kind. M.A. Krivoglaz made a big contribution to creating the mathematical apparatus of the theory of inelastic neutron scattering, while the results obtained by him stimulated the development of methods of studying relaxation characteristics of elementary excitations in ideal and nonideal crystals. Among the fundamental achievements of M.A. Krivoglaz in the physics of nonideal crystals are the theory of defects in strongly anisotropic crystals, a new way of looking on the nature of close-range order in metallic solutions, the discovery of equilibrium states with heterogeneous local order, investigation of the influence of the dislocation framework on phase transitions of the second kind. The results have been summarized by M.A. Krivoglaz in a monograph which was published in first edition in 1967 (republished in France and the USA) and in second edition, in two volumes, in 1983 and 1984 (a new edition is in preparation abroad).

Of great significance is the theory of fluctuations created by M.A. Krivoglaz—self-trapped states of a new type arising in systems with easily varying parameters. Such quasiparticles have unique properties. A prominent place in his work was occupied by a nonlinear oscillator interacting with a medium. In these papers a new mechanism is predicted of the modulation broadening of local oscillations, which was later discovered in the infrared absorption spectra of a number of impurity centers.

The monograph by Ya. E. Geguzin and M.A. Krivoglaz "Movement of Macroscopic Inclusions in Solids", published in 1971 (and later translated in the USA) is a unique one for an author-theoretician. In it are investigated processes that determine the heat resistance of heterogeneous alloys that are important materials of present-day technology.

The foregoing list of Krivoglaz's publications does not cover many, even quite significant, directions of his re-

search. The range of his scientific interests was very broad. In Krivoglaz's articles the intellectual power of his talent was evident, his ability to think on a truly physical level, and at the same time to achieve elegance and precision of the mathematical apparatus. Each of M.A. Krivoglaz's papers allowed an experimental test of the results. Such verifications, as a rule, followed without delay. And new scientific directions arose from many of his papers.

M.A. Krivoglaz passed on to his pupils his high level of demand on himself and others, his utter devotion to serving science, his high physical and mathematical level of posing and solving problems, his drive to bring the solved problem to comparison with experiment, and his ability to work with experimentalists. His pupils number more than twenty. M.A. Krivoglaz was also involved in scientific-organizational work. He was a member of the Scientific Councils of the Academy of Sciences of the Ukrainian SSR and of the Academy of Sciences of the USSR and of editorial boards of Soviet and foreign journals.

In 1978 and 1988 M.A. Krivoglaz was awarded the State Prize of the Ukrainian SSR in the field of science and technology, and in 1986 he was awarded the E.S. Fedorov Prize of the Academy of Sciences of the USSR.

M.A. Krivoglaz was an unusually kind and deeply delicate man, devoted to science and free from caring about "worldly" goods. A warm friendship bound him to many physicists. The bright memory of this outstanding scientist—Mikhail Aleksandrovich Krivoglaz—will be preserved both in science, and in the hearts of his friends, colleagues and pupils.

Translated by G.M. Volkoff