Igor' Yur'evich Kobzarev (Obituary)

A. A. Belavin, A. V. Berkov, M. B. Voloshin, N. A. Voronov, V. I. Zakharov, A. Yu. Morozov, L. B. Okun', B. M. Pontecorvo, Yu. A. Simonov, M. V. Terent'ev, K. A. Ter-Martirosyan, and M. G. Shchepkin

Usp. Fiz. Nauk **161**, 215–218 (September 1991)

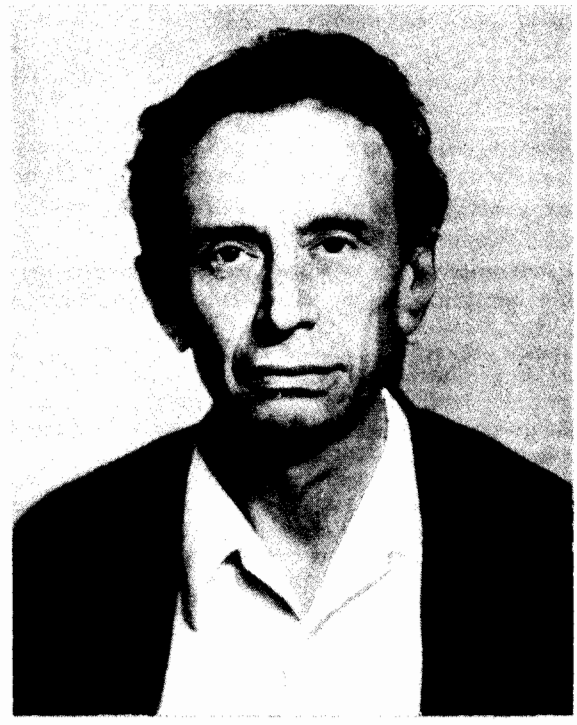
Igor' Yur'evich Kobzarev—an unusual man and a remarkable theoretical physicist who had devoted his life to elementary-particle physics died on 20 January 1991 in the 59th year of his life.

I. Yu. Kobzarev was born on 15 October 1932 in Leningrad. In 1950 he entered the Moscow Mechanics Institute (now reorganized into the Moscow Engineering Physics Institute). Kobzarev's entire scientific life was spent in the theoretical department of the Institute for Theoretical and Experimental Physics which he entered while still a student and where in 1956 he became a graduate student of I. Ya. Pomeranchuk.

Kobzarev published his first scientific paper in 1955. In it he obtained isotopic relations for the anhiliation of a nucleon and an antinucleon into two pions. Subsequent publications of the 1950's were devoted primarily to the properties of strange particles—the proof of the impossibility to explain the stability of a Λ-hyperon by its having a large spin, the verification of the $\Delta T = 1/2$ rule for nonleptonic decay of Σ-hyperons, an analysis of the hypothesis of degeneracy with respect to parity which was rejected when nonconservation of parity was discovered, an analysis of the $\pi \to ev\gamma$, decay which led to the conclusion of the uselessness of the tensor variant of the weak interaction. Kobzarev at the same time proposed the use of a Dalitz plot for the analysis of K_{l3} —decay (until then it was used only for the $K_{\pi 3}$ decay). The principal result of this period is the prediction of the lifetime and the probabilities of individual decay channels for the long-lived neutral K meson (1958). This prediction was soon confirmed by the experiment of L. Lederman. In 1959 Kobzarev defended his Candidate's dissertation.

The set of problems with which Kobzarev busied himself in the 1960's is unusually wide. In his papers on weak interactions he first posed the problem of the sign of the difference in the masses of the K_L and K_S mesons, and he investigated the hypothesis of the dynamic origin of the $\Delta T = 1/2$ rule. The central place among them is occupied by the paper in which he formulated the hypothesis of the restricted universality of weak interactions and from this obtained the relations between the decays of K_{l2} and π_{l2}, K_{l3} and π_{l3}, later repeated by N. Cabibbo.

A series of papers of the 1960's is devoted to models of the vector interactions of hadrons and leptons. In them, in particular, he proposed the mechanism of mixing of a vector meson ("vecton") and a γ quantum (as a result of which one of the vector particles is massless as before, while the mass of the other is shifted), and he analyzed the generalization of the vector model (including in it strange particles and the muon) that leads to neutral currents. In this list one can recognize a number of characteristic elements of the modern standard model of strong and electroweak interactions.



IGOR' YUR'EVICH KOBZAREV
(1932–1991)

In the papers on SU(3) symmetry he undertook one of the first efforts to classify vector particles according to SU(3) multiplets, he predicted mesons with $J^P = 1^+$ and 2^+, he gave an analysis of renormalization of vector constants of beta-decays of hyperons as a result of violation of SU(3), he pointed to the possibility of existence of exotic (as it is now said) states—analogs of four-quark resonances widely discussed at present. Along with the predications of decays of η- and η'-mesons he found a natural explanation of the smallness of the width of the ω meson and predicted a comparitively high probability of the decay $\omega \to \pi\gamma$ found soon after that at the Institute for Theoretical and Experimental Physics.

In 1966 Kobzarev defended his Doctoral dissertation "Symmetries and Interactions of Hadrons." The results contained in it can be carried over without change into the model of quarks with fractional charges.

In the 1960's he also published a series of classical pa-

 0038-5670/91/090837-02$01.00

pers on gravitation in which he gave an analysis of the interaction of fermions with gravitons and the precession of spin in a gravitational field, and formulated low-energy theorems for gravitons. Also at the time he published papers in which he analyzed the problem posed by I. Ya. Pomeranchuk concerning photon mass and refuted the generally accepted arguments in favor of a strictly massless photon, and studied the hypothesis of the existence of mirror particles and, as a result, of mirror matter in the Universe.

In the 1970's Kobzarev published a series of brilliant papers on the cosmological consequences of spontaneous violation of discrete symmetries. In them he investigated properties of the domain structure of vacuum arising in this connection and showed that the existence of domains would lead to a radical change in the cosmological evolution of the Universe. In the case of a nonsymmetric Lagrangian he investigated the mechanism of the breakdown of the "upper" metastable vacuum. A study of the dynamics of processes in the Universe with a spontaneously broken discrete symmetry turned out to be so rich in new physical problems that following these publications an entire field appeared in the physics of metastable states. Kobzarev attentively followed its development and initiated a number of papers of his pupils.

Already from the mid-1950's Kobzarev was interested in neutrino oscillations. Later in the 1980's his papers on these problems provided for the first time a full investigation of the possible variants of the mass matrix of the neutrino.

Starting with 1975 Kobzarev's scientific interests were associated primarily with the study of phenomena due to the nonemergence of quarks. Within the framework of phenomenological approaches taking into account the nontrivial properties of the QCD vacuum he developed a consistent quantum description of spin effects in hadrons and predicted the masses of the lightest gluon states. In recent years he investigated orbitally excited hadrons. In these papers he noted that in hadrons with high spins prominent effects should be manifested of spin-orbit interaction associated with the Thomas precession and having a sign opposite to the Coulomb case. It is characteristic of his work that his predictions are unambiguous and await their experimental verification.

Kobzarev had published more than 100 papers on theoretical physics. He was tireless in discussing concrete problems in physics, giving a lively response to each new problem. The majority of the articles mentioned above were written with coauthors. Among his coauthors there were physicists both of the older generation (Ya. B. Zel'dovich, I. Ya. Pomeranchuk, and I. E. Tamm) and also his colleagues and pupils. These papers made a significant contribution to the physics of elementary particles, but Kobzarev's influence on those surrounding him, and the place occupied by him in physics are defined not only by this. He was one of the best educated persons of our time and had the rare gift of historic thinking, which is atypical for the majority of theoretical physicists whose everyday life and work are quite pragmatic. He has written remarkable books: "Newton and His Time," "Elementary Particles. Mathematics, Physics and Philosophy" (together with Yu. I. Manin; so far it has been published only abroad), articles in "Priroda" and the Great Soviet Encyclopedia. In the history of science, just as in theoretical physics, he was a professional of the highest class. For 15 years Kobzarev was a member of the Board of Editors of the journal "Priroda" published by the Academy of Sciences of the USSR. In 1971 Kobzarev was elected as a member of the Scientific Council of the Institute for the History of Natural Science and Technology, and from 1980 he became the Editor-in-Chief of the annual "The Einstein Collection" published by the Academy of Science of the USSR.

Kobzarev devoted much effort to pedagogic activity. His lectures at the Moscow Engineering Physics Institute (MIFI, where he taught starting in 1967, and became a professor in 1971) on the theory of elementary particles and the general theory of relativity are an invaluable contribution to the education of new generations of physicists. The lectures given by him were published in collaboration with colleagues from the Moscow Engineering Physics Institute as textbooks. Among them the book "Einstein's Gravitational Theory and its Experimental Consequences" is a unique textbook which significantly complements well known monographs on the general theory of relativity. As Ya. B. Zel'dovich has stated in his review in the journal UFN (translated by AIP as Soviet Physics-Uspekhi), "the reading of this book affords a true pleasure, such as one experiences holding in one's hand a well crafted object."

Being averse to making compromises and being strict in evaluating ability for scientific work he was at the same time a very kind teacher. Many students aspired to work under his direction, and he trained excellent students. Many of them are now scientists with worldwide reputations.

Kobzarev recognized no authority other than reason, and possessed rare independence of judgment in demolishing established stereotypes.

Eternal life belongs to the category of religious concepts. It can be interpreted in the narrow sense as the trace which one individual either consciously or accidentally imprints in the memory of other people,—something which changes their soul and their thoughts and later is transmitted further and further. I. Yu. Kobzarev left such a trace in the life of many people. May memory of him be preserved forever.

Translated by G. M. Volkoff