PERSONALIA

Vladimir Mikhaĭlovich Shekhter (Obituary)

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Vladimir Mikhailovich Shekhter, director of the Laboratory of Theoretical Physics at the Institute of Nuclear Physics in Leningrad, widely known in this country and abroad as a theoretical physicist, died July 8, 1980. We have all suffered a heavy loss: a good physicist and a good man has died.

V. M. Shekhter was born on April 22, 1930, in the Ukraine in the town of Priluki. In the fall, his parents returned to Leningrad, and here Vladimir Mikhaĭlovich lived all his life (except during the war years, when he was evacuated to Kuĭbyshev). In 1948, V. M. Shekhter finished school and entered the physics department at Leningrad University. Here, he began his scientific career: he published his first work as a student.[1]

After graduating from the university, V. M. Shekhter in 1955 began work at the Physicotechnical Institute (PTI). This was a time when over a comparatively short period a group of young theoreticians entered the PTI who later formed the core of the Theoretical Division of PTI and then, of the Institute of Nuclear Physics in Leningrad after it had separated from the PTI in 1971. V. M. Shekhter was one of the creators of this division: he directed the Division of High Energy Theoretical Physics, and shortly before his death he became the Director of the Laboratory of Theoretical Physics at the Institute of Nuclear Physics in Leningrad (LINP).

Over the course of twenty-five years of work at the PTI-LINP, V. M. Shekhter published about one hundred papers. Let us briefly consider some the paths of his scientific career, in which he obtained his most significant results.

During the first years of work at the PTI, V. M. Shekhter worked primarily on problems in the theory of weak interactions. Not long before the creation of the universal four-fermion interaction theory, he proposed the possibility of a direct interaction of electrons with the neutrino and calculated the scattering cross section for $\nu_e + e^- \to \nu_e + e^-$.[2] Later, he carried out the first calculation of the probability of leptonic decay of hyperons. Up to this day, V. M. Shekhter's work is the most complete investigation of the phenomenology of such decays.[3-5]

Another area in which V. M. Shekhter was interested, in which he obtained very significant results, is the symmetry of strong and weak interactions. As far back as 1960, not long before the appearance of the famous works of Gell–Mann and Neeman on SU(3)-symmetry, V. M. Shekhter proposed an algebraic

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method for determining the possible symmetries of strong interactions. The several variants that he indicated also include SU(3) symmetry,[6] which has played such an important role in the future of elementary particle physics. Developing these ideas, V. M. Shekhter in later work introduces, actually, concepts involving U- and V-spin (names which were later proposed by Lipkin and Meshkov) and with their help he obtains a unitary symmetry relation for the scattering amplitudes.[7] In the same article,[7] V. M. Shekhter examines vector currents in leptonic decays of strange particles from the point of view of symmetry. The relations that he found between the amplitudes later formed a large part of the well-known scheme of Cabibbo.

V. M. Shekhter's idea concerning the approximate baryon invariance of strong interactions, i.e., degeneracy of the energy of states with respect to the baryon number, was a daring idea in its time.[8] The fruitfulness of the idea of mixing states that differ greatly in mass became clear only much later.

V. M. Shekhter had a remarkable ability to retain and work over an enormous quantity of scientific material. This characteristic became extremely useful during the

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period of the physics of resonances when Shekhter, undoubtedly, became the most competent specialist in our country in this area. He is the author of many original papers concerned with the classification of resonances, determining their quantum numbers, and so on. A review monograph by V. M. Shekhter on resonant states,[9] published in 1965, is widely known.

In recent years, V. M. Shekhter's scientific activities centered on the study of the quark structure of hadrons with the help of the quark model. An interesting prediction that was obtained within the framework of this approach was the assertion that hadrons must be created primarily by formation and subsequent decay of resonances.[10-11] This contradicted the then existing understanding of the processes of multiple creation of hadrons. In order to ascertain the truth, V.M. Shekhter established close contacts with experimental groups at Dubna, Moscow, Serpukhov, and many centers abroad. V. M. Shekhter deserves great credit for establishing the now widely recognized fact that most of the created long-lived hadrons are a product of the decay of resonances.

Another series of articles completed by V. M. Shekhter in the 1970's is concerned with the problem of the so-called double structure of hadrons. Many facts in high energy physics can be naturally explained if it is assumed that hadrons consist of dressed quarks, the dimensions of which are much smaller than the characteristic dimensions of hadrons. V. M. Shekhter was one of the first physicists to realize that the study of the creation of fast particles in hadron-nucleus collisions gives the possibility of analyzing the structure of a decaying hadron, in particular, judging the number of objects of which the hadron consists.[12]

V. M. Shekhter himself liked his papers from the quark series. He continuously sought and posed new problems, in which in his opinion the quark structure of hadrons could be manifested. His last paper,[13] completed several days before his death, concerns these same questions: the problem of reconciling the double structure of hadrons with the quantum chromodynamic nature of forces. V. M. Shekhter's scientific interests were distinguished by their breadth. For this reason, much of his very interesting work remains outside his primary scientific work enumerated above. For example, this includes his work in the low energy scattering of γ-quanta by nucleons.[14,15]

V. M. Shekhter's entire scientific life was connected with the Physicotechnical Institute, and later with the Leningrad Institute of Nuclear Physics. Here, he defended his Candidate's and Doctor's dissertations,[16,17] trained students, gave lectures at the traditional Winter Schools of Physics at the LINP (he was one of the scientific directors of this school: he was responsible for the program and selection of lectures). The

affairs of the Laboratory of Theoretical Physics were the most important personal work for Vladimir Mikhailovich. His remarkable human qualities attracted to him many new friends.

He was seriously ill for the last fourteen years. Many people in this situation would have made a compromise: they would have attempted to lighten the pressured schedule according to which he worked and lived. But he continued to work intensely and fruitfully. And although he died barely reaching his fiftieth year, it is difficult to refer to his bright life as short, since it included so many events.

Vladimir Mikhaĭlovich Shekhter's memory will always remain in the hearts of those who knew him.

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[4]"Interference of form factors in leptonic decay of hyperons," Zh. Éksp. Teor. Fiz. 38, 534 (1960) [Sov. Phys. JETP 11, 387 (1960)].

[5]"Possibility of determining the form factors in leptonic decay of hyperons." (with V. P. Belov and B. S. Mingalev), Zh. Éksp. Teor. Fiz. 38, 541 (1960) [Sov. Phys. JETP 11, 392 (1960)].

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[8]"Baryon invaraince of strong interactions," Zh. Éksp. Teor. Fiz. 48, 1459 (1965) [Sov. Phys. JETP 21, 976 (1965)].

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[15]"Low-energy Compton effect on a nucleon," Yad. Fiz. 7, 1272 (1968) [Sov. J. Nucl. Phys. 7, 756 (1968)].

[16]"Leptonic Decay of Hyperons," Candidate's Dissertation (1960).

[17]"Problems in the Symmetry of Elementary Particle Interactions," Doctoral Dissertation (1967).

Translated by M. E. Alferieff