Yuriĭ Mikhaĭlovich Shirokov (Obituary)

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The prominent theoretical physicist, Director of the Laboratory of Field Theory at the Scientific Research Institute of Nuclear Physics at the Moscow State University, Doctor of Physicomathematical Sciences, Professor Yurii Mikhailovich Shirokov died suddenly in the prime of his creative life, full of brilliant scientific ideas and plans, at the age of 55 on July 5, 1980.

Yurii Mikhailovich Shirokov (1925–1980)

Yuriĭ Mikhaĭlovich was born on June 21, 1925, in Moscow in the family of M. F. Shirokov, who was later a well-known professor of theoretical physics at the Moscow State University and at the Moscow Aviation Institute. In 1948, having graduated from the Physics Department of the Moscow State University, he entered graduate school, where his advisor was D. I. Blokhintsev. He already exhibited the basic traits of his scientific work, such as a deep critical analysis of commonly accepted points of view, originality of the approach to the problems being studied, and the urge to obtain completed results, during these early years. In his candidate dissertation, Yu. M. Shirokov carried out a detailed analysis of the assumptions, on which the theory of infinite dimensional relativistic equations are based, and having generalized them, he was the first to obtain equations with an increasing mass spectrum. In the same work, he gave a clear definition of spin and center of inertia in relativistic quantum theory.

In 1957–1960, Yuriĭ Mikhaĭlovich published a series of fundamental works on the theory of representations of Poincare groups. This was the time when the importance of the deep mathematical analysis of Poincare's group for the needs of relativistic quantum theory was only beginning to be realized. His investigations of Poincare's group increasingly influenced the development of the physics of the microscopic world.

Yu. M. Shirokov's series of works on the investigation of the conditions for microcovariance and microcausality in the general covariant formulation of the quantum theory of fields is distinguished by its great depth. Yuriĭ Mikhaĭlovich made use of the metric tensor as the functional argument and expressed the causality condition in terms of the variational derivative of the energy–momentum tensor, thereby giving it a very general form. Further, he introduced new physical quantities, the dynamic momenta, with the help of which he showed that the existence of the Hamiltonian description follows from the existence of the scattering matrix.

Beginning in 1967, Yu. M. Shirokov together with his coworkers investigated the analytical properties of two-particle matrix elements of the electromagnetic current, which made it possible to carry out a number of interesting calculations: to find the relation between the asymptotic form factors of a nucleon and the characteristics of pion–nucleon scattering, to give a relativistic description of the form factors of the deuteron, and others.

Yuriĭ Mikhaĭlovich carried out important investigations in the theory of the nucleus. He made use of the theory of the Poincare group in an elegant and clever manner in order to obtain approximate conditions for relativistic invariance in the quantum many body problem (1959). His works on the genealogical coefficients for mixed configurations, on the calculation of the levels of light nuclei, on the study of the phenomena of expansion of light nuclei on excitation, on the calculation of the two nucleon model of the giant resonance in photonuclear reactions, on the investigation of the effect of

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the violation of P and CP invariance on the fine structure of nuclear levels, and so on, should also be noted.

Yu. M. Shirokov also carried out a number of interesting separate works in different areas of theoretical physics (calculation of atomic isotopic molecules, nonquantum relativistic model of an extended particle, theory of non-S-matrix experiments, two-channel Yost matrix, asymptotic behavior of generalized functions and Fourier transformations, theory of radiation from a laser with a moving mirror, and others).

In the beginning of the 1970's, Yu. M. Shirokov took up the study of the properties of single-time commutators, He constructed an explicitly covariant formalism for single-time commutators of general form with an arbitrary finite number of gradient terms. The beautiful idea introduced by Yurii Mikhailovich, which permitted solving this problem, was the use of universal algebras.

A characteristic trait of Yurii Mikhailovich's scientific style was the fact that in working on a specific problem he did not forget the deeper aspects of the problem. Thus, he went on from the problem of quasiclassical expansions to a general study of the relationship between classical and quantum mechanics. For this purpose, he invented a unified algebra, in which both classical and quantum observables are realized. The difference between classical and quantum mechanics in this case reduces to different operations in multiplying observables.

In 1979, Yurii Mikhailovich developed a general method for studying strongly singular concentrated potentials in quantum mechanics, for which it turns out that the commonly used theory of extensions of symmetrical operators is inapplicable. For this purpose, it was necessary to construct an associative algebra of generalized functions, which in itself was a solution of a nontrivial mathematical problem. Yurii Mikhailovich intended to apply the algebra of generalized functions for solving the most important problems of relativistic quantum theory of fields, but these plans were not to come to fruition.

Throughout his work, Yu. M. Shirokov was closely associated with the V. A. Steklov Mathematical Institute of the Academy of Sciences of the USSR, where he directed one of the best seminars on the quantum theory of fields until his last days. He imparted his own scientific style to this seminar. Here, there was never any hurry and everyone was always friendly. The lecturer was listened to sometimes for two and three meetings in succession, as many as were necessary to sort out the problem. And this was always interesting and fruitful both for the participants and the lecturer.

Yu. M. Shirokov was always surrounded by students. When, after a seminar, he left to go into a neighboring room "to speak with graduate students," it appeared that another unannounced seminar, which could continue without any time limits, began. He spent much effort on teaching. He is an author (together with N. P. Yudin) of the fundamental textbook entitled Nuclear Physics. A three-volume physics course for technical colleges is currently being published under his general editorship (with A. V. Astakhov as coauthor).

From 1963 to 1973, Yurii Mikhailovich successfully collaborated with the Department of Physics at the Moscow College of Mines. The goal of his pedagogical search for many years in the higher technical school was a technique for teaching in which modern physical points of view were emphasized.

Yu. M. Shirokov trained tens of students, candidates and doctors of science, who are working successfully in different areas of physics. His powerful intellect permitted him to solve problems in a wide range of science, from pure mathematical problems in the theory of generalized functions to the theory of sudden emissions of wastes from coal and gas. Yurii Mikhailovich authored more than one hundred published works.

Yu. M. Shirokov's social work was also significant, in particular his work in the Section on Educational Literature at the Ministry of Higher Educational Institutions of the USSR, as a member of the governing board of the society Znanie (Knowledge) of the Russian Soviet Federated Socialist Republic, and participation in conducting the All Russian Olympiad for school pupils.

Yurii Mikhailovich was a skilled mountain climber, a Master of Sport of the USSR, champion of All-Union Competition in mountain climbing (1952), a judge in the republic category, and he was active in the mountain climbing federation of the USSR.

He loved mountains. It seemed that in the mountains he charged himself with energy for the entire year. And he died suddenly in the mountains on the Moskvina Glacier in Pamir. His heart suddenly stopped beating.

Yurii Mikhailovich Shirokov's most important trait, probably, was his true love of science. He was a person who combined high demands with great kindness and benevolence to people in an amazing manner. For many people who knew him, it was comforting simply to know that such a person exists. The bright memory of Yurii Mikhailovich will always remain a source of support.

Translated by M. Alferieff