

Mikhail Fedorovich Shirokov (Obituary)

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Soviet science suffered a grievous loss when on October 24, 1982 the prominent Soviet scientist Professor Mikhail Fedorovich Shirokov, Honored Scientist and Technologist of the RSFSR, Doctor of physico-mathematical sciences, died in his eighty-first year after a brief serious illness.

Mikhail Fedorovich was born in 1901 in the village of Nikulino of Vladimir region into a peasant family. On graduating in 1919 from a secondary school in the city of Perm' he entered the Physic-mathematical Faculty of Perm' State University where at that time Professor A. A. Fridman occupied the Chair of Physics and Mechanics. From him Shirokov took for the first time lectures in relativity theory and became fascinated by its fundamental problems in which he retained an interest throughout his life. Here began his scientific career as an assistant to A. A. Fridman.

In 1921 Shirokov transferred to the Physico-mathematical Faculty of Moscow State University from which he graduated in 1925. From that time onward he devoted his life to research and pedagogic activity.

Between 1929 and 1941 Shirokov worked in a number of institutions of higher education in our country, during which time he occupied the Chair of Physics in the Ivanov Textile Institute and later in the Voronezh State University. Simultaneously between 1932 and 1938 he was a scientific member of the staff of the physico-technical laboratory of the F. E. Dzerzhinskii All-Union Institute of Heat Technology. In 1941 Shirokov occupied the Chair of Physics in the Moscow Aviation Institute and his life became closely associated with this leading higher educational institute of aviation in our country. Many well known scientists and technologists, engineers, designers and cosmonauts attended physics lectures of M. F. Shirokov. He was deeply involved in the education and preparation of scientific manpower. At the same time, being a professor in the Physics Faculty of the Moscow State University Shirokov gave there a number of theoretical courses and, in particular, a specialized course in tensor analysis and general relativity theory which he introduced in 1945.

Shirokov's scientific interests were very broad. In his first papers (1931–1934) he developed a theory of the viscosity of a real gas obeying the van der Waals equation and, using the transition to the high density limit, gave a molecular-kinetic interpretation of the well known empirical relation of A. I. Bachinskii for the viscosity of liquids. The results of this theory have found fruitful application to calculations of the viscosity and heat conductivity of vapors under conditions close to critical.

In those same years Shirokov was systematically studying problems of gas dynamics and the thermodynamics of flows at near-sound velocities on the basis of a complete sys-



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(1901–1982)

tem of rigorous hydrodynamic equations. He was the first to obtain the equations for the dynamics of turbulent flows by means of averaging the exact equations of gas dynamics. He solved a number of problems on the resistance and heat exchange in gas dynamics flows and demonstrated the essential role played by friction for gas dynamic heat exchange and elucidated the physical nature of the so-called "retardation temperature". Naturally this work has found wide application in aviation and heat technology. Shirokov called attention to the role played by the heat of dissipation in the processes of heat exchange and hydraulic resistance in a thin laminar sublayer directly adjacent to the wall of an object past which the flow takes place. The lack of properly taking this circumstance into account led to significant errors in calculating the force of resistance due to flow past wings of rapidly moving machinery.

Of considerable interest is the work of Shirokov on the acoustics of moving sources of sound carried out in war time and utilized for calculating the parameters of sound waves from aircraft propellers.

In parallel with his work in the field of gas dynamics and magnetic gas dynamics Shirokov during the last decades was fruitfully involved in problems of the general theory of relativity and gravitation. Here we should first of all note the major contributions of Shirokov during the 1940's and 1950's in defending the materialistic content of the general theory of relativity. He devoted much attention to the development of methodological problems of gravitational theory. In his papers and speeches he consistently adhered to the relativistic concept of space and time according to which in physical space only those concepts are meaningful in which the position of an object is related to the position of another object, while spatial extent is interpreted as dimensions of material bodies. He made a big contribution to the elucidation of the essence of such fundamental problems of the general theory of relativity as the problem of the energy-momentum of the gravitational field and the role played by coordinate systems and systems of reference. The work of Shirokov on the theoretical prediction and analysis of new general relativistic effects has gained recognition. Thus the difference predicted by him in the frequencies of two orthogonal oscillations of test bodies on a circular orbit in a Schwarzschild field has acquired the name of the "Shirokov effect". Unfortunately he did not have time to carry out an experimental test of this and of some other effects.

M. F. Shirokov is the author of more than 100 scientific papers on thermal physics, statistical physics, gas dynamics,

magnetohydrodynamics, acoustics, theory of relativity and philosophical problems of science. His monograph "The physical foundations of gas dynamics" was published in 1958.

M. F. Shirokov was an active popularizer of science. In his public lectures he knew how to present the most complex topics in physics and technology at a high scientific level and in easily accessible form. Being the chairman of the Physico-mathematical Council of the "Znanie" ("Knowledge") Society of the RSFSR Shirokov carried out extensive organizational work on the dissemination of polytechnical and scientific knowledge.

The socio-scientific work of M. F. Shirokov is multifaceted. He was a member of the expert commission of VAK (Higher Attesting Commission) on heat technology, a member of the gravity section of the scientific-technical Council of the Ministry of Institutions of Higher Education of the USSR, and of other organizations.

M. F. Shirokov was the recipient of the Order of the Red Banner of Labor, the Order "Badge of Honor", and three medals of the USSR.

The bright memory of Mikhail Fedorovich Shirokov—communist, scientist—will remain forever in the hearts of his colleagues, friends and grateful pupils.

Translated by G. Volkoff