

In memory of Fedor Ivanovich Fedorov

Physical science suffered a major and irreplaceable loss. Fedor Ivanovich Fedorov, a major theoretical physicist and the well known founder and organiser of physical science in Belarus, died prematurely on 13th October 1994. The heart of a man who devoted more than sixty years of his life to selfless and extremely fruitful activity as a scientific researcher, teacher, and science organiser in the Republic and who created a major scientific school in the field of theoretical physics has ceased to beat.

Fedor Ivanovich Fedorov was born on 19th June, 1911 in the village of Turets in the Grodno Region to the family of a village teacher—subsequently a famous Belorussian writer of children's books Yanko Mavr. He graduated from the Secondary School in Minsk at the age of 17 and from the Physico-mathematical Division of the Pedagogic Faculty of the Belorussian State University at the age of 20. In 1936, he defended his Candidate's Dissertation on "The Application of the Method of Functionals to Certain Problems of the Theory of Radiation"—a study which he carried out under the supervision of Academician V A Fok as a postgraduate at the Leningrad University (1933–1936), and in 1954 he defended his Doctoral Dissertation on "Invariant Methods in the Optics of Anisotropic Media". In 1957, Fedorov was awarded the title of Professor and in 1956 he was elected Corresponding Member and in 1966 Full Member of the Academy of Sciences of the Belorussian SSR.

Fedorov began his working career in 1931 as a teacher of physics and mathematics at the Technical Teaching College in Krichev in the Mogilev region. From 1936, Fedorov devoted all his strength, his entire talent as a scientist, and his outstanding gift as a teacher to the organisation of teaching and the initiation of research at the Physico-mathematical Faculty of the Belorussian State University. He became Reader, Head (1938–1962), and Professor in the Department of Theoretical Physics, and Dean of the Faculty (1943–1950)—these were the principal stages of this career at the Lenin Belorussian State University. The students and postgraduates at the Faculty of Physics at the Lomonosov Moscow State University, where Fedorov was invited to deliver a course of lectures on the theory of elastic waves in crystals, were able to appreciate at that time his brilliant talent as a lecturer.

Fedorov's creative powers as a scientist and scientific organiser manifested themselves unusually strikingly during his work at the Academy of Sciences of the Belorussian SSR, especially after the opening in 1953 of the Sector and



Fedor Ivanovich Fedorov
(1911–1994)

then in 1955 of the Institute of Physics and Mathematics of the Academy of Sciences of the Belorussian SSR. He became the founder and permanent director (up to 1987) of the Laboratory for Theoretical Physics of the Institute of Physics of the Academy of Sciences of the Belorussian SSR. Since its foundation (1963) until 1987, he headed the Division of Physics and Mathematics of the Academy of Sciences of the Belorussian SSR (since transformed into the Division of Physics, Mathematics, and Information Science of the Academy of Sciences of Belarus). Until his premature death, Fedorov worked as an advisor to the Praesidium of the Academy of Sciences of Belarus.

Three principal aspects may be distinguished in Fedorov's multifaceted creative endeavours: crystal optics, crystal acoustics, and theory of elementary particles. They are related by the generality and novelty of the formulation of the problem and by the elegance and novelty of the mathematical ideas. The subsequent development and

application of a unique covariant approach to the solution of problems in theoretical physics and the extensive employment of direct (coordinate-free) methods of the tensor and matrix calculus enabled Fedorov to obtain numerous scientific results of primary importance in each of these three fields.

Fedorov constructed a consistent theory of the optical properties of anisotropic bodies, which embraced for the first time all possible types of natural and enforced anisotropy. The major and novel monographs by Fedorov—*The Optics of Anisotropic Media* (1958), *The Reflection and Refraction of Light by Transparent Crystals* (1976, jointly with V V Filippov), and *Theory of Gyrotropy* (1977)—marked a new stage in the development of crystal optics and became standard texts for investigators working in the field. For his work on the optics of anisotropic media, Fedorov was honoured in 1976 by the State Prize of the USSR. Fedorov is the discoverer of the scientific phenomenon ‘lateral shift of the light beam on reflection’, registered in 1980 (priority from 8th December 1954), which has been called ‘the Fedorov shift’ in the world literature.

Fedorov’s application of covariant methods in crystal acoustics proved to be extremely fruitful. He was able to solve the very complex problem of the construction of a general theory of the propagation of elastic waves in crystalline media of any symmetry. These results have been described in Fedorov’s fundamental monograph ‘Theory of Elastic Waves in Crystals’ (Moscow, 1965; New York, 1968, second extended edition) and recognised by the State Prize of the Belorussian SSR in 1972.

The covariant approach in the theory of elementary particles and of their interactions is based on the general method of projective matrix-diads in the theory of relativistic first-order wave equations for particles (fields) with any spin value, the complex-vector parametrisation of finite transformations in the theory of a homogeneous Lorentz group, and the theory of universal nonlinear matrix equations for the description of arbitrary interacting fields, all of which were introduced and consistently developed by Fedorov. Fedorov’s fundamental ideas and researches in this field of modern physical sciences constituted the content of his monograph *The Lorentz Group* (Moscow, 1979), which has become widely familiar among specialists.

The unusual breadth and depth of Fedorov’s scientific erudition have been reflected also in a whole series of his novel researches in other branches of science: general theory of relativity, atomic physics, mathematics, and the history and methodology of natural science. Many of his theoretical studies have served as the foundation for extensive experimental and applied investigations.

Altogether Fedorov published more than 400 works, including six monographs.

Fedorov’s scientific ideas and the research methods which he developed have found extensive application and have been developed further in the studies of his numerous students, who nowadays constitute the generally recognised scientific school of Belorussian theoretical physicists. His students include Academicians and Corresponding Members of the Belorussian Academy of Sciences as well as tens of Doctors and Candidates of Science, who are actively engaged both in science and in the system of higher education.

The inexhaustible nature of Fedorov’s creative potential and his surprising and unflagging, literally until the last day of his life, scientific and social activity struck all those around him. The last communications which he had written were still in the press when he left us.

Fedorov was President of the Belorussian Physical Society and member of the Coordinating Council of the European Physical Society. As an honorary member, he also belonged to the Praesidium of the Russian Gravitational Association and the Rozhdestvenskii Russian Optical Society and he was also member of the American Mathematical Society.

Fedorov’s exceptional achievements in physical science and in the establishment and development of higher education and of scientific research in physics and mathematics in Belarus have been recognised by the highest state awards, including the honorary title of Hero of Socialist Labour. In 1994 he became Honorary Soros Professor of Physics—the first in the Republic.

As a sensitive and caring leader, brilliant teacher and lecturer, demanding instructor and educator, and talented scientist and scientific organiser, Fedorov gained deserved authority among an extensive scientific community and enjoyed the sincere sympathy of all those with whom he associated. He was distinguished by an intimate combination of rare human qualities: exceptional intelligence, invariable tact in his relations with people, and at the same time unusually high principles and great civic courage.

A bright remembrance of Fedorov will forever remain in the hearts of those who were fortunate to know him and to live and work with him.

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