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IN MEMORY OF IGOR' EVGEN'EVICH TAMM

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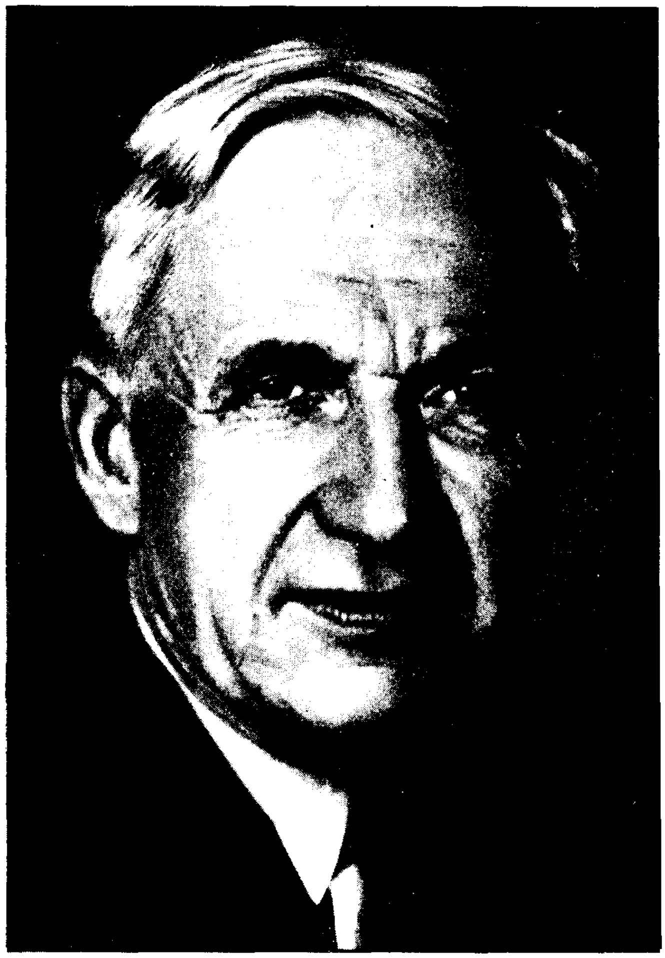
IGOR' Evgen'evich Tamm has passed away. A scientist who was the embodiment of the bond with the Einstein-Bohr epoch is gone. A man who was a standard for probity in science and in public life is gone. A man who was physically and spiritually courageous; a powerful and subtle theoretical physicist; an unobtrusive tactful teacher, who taught by example and well-meaning criticisms, and not by detailed "guidance" and the precepts of an elder; a true friend; a man who was jovial and serious, charming and persistent. A man who won the love and joyous respect of a great many and himself extended his friendship to many. Never to give up until he had achieved a difficult aim, be it the most complicated of scientific problems or a mountain summit. A very good man and a great scientist has passed away.



The life of Igor' Evgen'evich is known to a great many. But the last time his short biography was published was 15 years ago and a new generation of physicists has grown up during this time. Therefore, let us recall the main facts of this life.

He was born on July 8, 1895 in Vladivostok into the family of an engineer, which shortly after moved to Elizabetgrad (now Kirovograd) in the Ukraine. In 1913 he finished secondary school, studied for a year in the University of Edinburgh, and from 1914 through 1918—in the Moscow University. His education was repeatedly interrupted: at first he voluntarily left as a "male nurse" for the battle-front of the First World War and later became utterly absorbed in active social work (Igor' Evgen'evich was a member of the executive committee of the Elizabetgrad Soviet and a deputy of the First Congress of Soviets). After graduating from the University he taught Physics at the Crimean University and the Odessa Polytechnical Institute. Here he made friends with L. I. Mandel'shtam, who greatly influenced the scientific life of Igor' Evgen'evich. From 1922 Igor' Evgen'evich lived in Moscow and from 1924 began working at the Moscow University where he soon became head of the Department of Theoretical Physics and directed it till 1941. When in 1934 the Academy of Sciences moved to Moscow, Igor' Evgen'evich organized the Theoretical Division of the P. N. Lebedev Physical Institute (FIAN) and directed it till the last years of his life. The famous weekly Tamm Theoretical Physics seminar, which was for a third of a century the center of attraction for a great many of Moscow's physicists, was at first held at the University, but in 1936 its base was shifted to FIAN, which became for Igor' Evgen'evich the principal working place and a home. When in 1944 the Moscow Engineering Physics Institute (MIFI) was founded, Igor' Evgen'evich was obliged to leave the University, organized a Department of Theoretical Physics at MIFI and directed it for many years.

These formally sketched outlines contain the extraordinarily intensive scientific work which was begun in the mid Twenties and which was uninterrupted even in the years of the last painful illness. They also embrace the training of numerous pupils. The characteristic style of this training was such that the individuality of the pupils was in no way suppressed. On the contrary, any manifestation of personal traits was favorably encouraged, although criticisms at discussions were always uncompromising. It is not surprising that among the pupils of Igor' Evgen'evich's are scientists with totally different independent directions and styles of work.

The best papers of Igor' Evgen'evich himself were first and foremost on the theory of beta-forces—the first systematic theory of nuclear interactions (1934). Having constructed a quantitative theory, Igor' Evgen'evich verified himself that these forces were weak and it was not possible to explain with their aid the stability of the nucleus. But this work served as the prototype of subsequent theories which were constructed on its scheme; this is, first and foremost, true of the Yukawa theory.

Further, we should mention the work in which Tamm and Il'ya Mikhaĭlovich Frank explained the physical nature of the Vavilov-Cerenkov radiation and constructed its complete theory (1937). As is well known, this work earned a State and a Nobel price.

It is necessary to say something here about Tamm's internationally recognized work on Rayleigh and combination scattering of light in crystals. Here, for the first time, the quantization of elastic waves (the concept of phonons, 1930) was systematically investigated in the framework of perturbation theory. In papers on the Dirac theory of the electron a consistent quantum-electrodynamic derivation of the Klein-Nishina formula was presented. He demonstrated, in particular, the inevitability of the presence of states of negative energy and obtained other important results (1930). Investigations into the quantum theory of metals led to the discovery of bound electron crystal-surface states ("Tamm levels"), known to every worker in the quantum theory of solids (1932). In 1940 Tamm proved the impossibility of the existence of stationary states of a spin-1 charged particle in the Coulomb field ("collapse to the center"), and this played at one time a big role since the spin of the meson was initially assumed to be equal to one. In the years 1954—1956 Tamm jointly with a number of coworkers published a series of papers on the isobaric states of nucleons and their role in various processes. Here, the concept of fast-decaying nucleonic resonances (well known now) was for the first time employed with success—contrary to the opinion of many skeptics. Finally, we must emphasize the great importance of his basic work on thermonuclear fusion (1950—1953). It is interesting to note that the concept of a magnetic surface formed entirely by lines of force, which has only now acquired a significant role in research into a magnetic thermonuclear reactor, was first introduced and developed as one example as far back as in the first edition of his celebrated book "The Principles of the Theory of Electricity" (1929).

We have enumerated Tamm's most important scientific works, recognizing the subjective nature of this selection. The list could easily be continued. However, no simple enumeration can communicate that ardor with which these works were done.

The breadth of the range of questions touched upon in his works is remarkable. As a scientist, he was equally easily a master of classical electrodynamics, the quantum mechanics of specific processes, the relativistic theory of elementary particles, hydrodynamics (the paper on the width of high-intensity shock waves, 1947), the theory of elasticity, technical electrodynamics (the computations on the degaussing of ships in time of war and many other papers). There remains over and above this list the uncompleted work by which he was literally possessed during the last seven years of his life. This was an attempt to construct a theory of elementary particles devoid of divergences. This work, demanding an incredible labor, was not discontinued during the last three painful years of his life, when he was confined to a respirator.

Everybody knew that Tamm was a courageous person, and this not only as a mountaineer and not in the face of cutthroat Petlura gang in the civil war. He calmly and with dignity endured an unjust treatment when it fell to his lot and at the same time boldly fought against pseudoscientific methods in physics and biology. And yet nobody could, perhaps, anticipate that this extraordinarily lively, energetic, and athletic human being (he performed his last mountaineering feat in 1965 when the disease had already sneaked up), who passionately participated in everything—from waterskiing on Lake Geneva to inner Academy affairs—could be preserved fully as a person under the conditions of the dreadful disease that fell to his lot, retain his lucid mind, his benevolence and calm dignity. This is fortitude of the highest class, propped up, of course, by his remarkable intellect.

During the last two decades Tamm was honored many times: government awards—orders, title of a Hero of Socialist Labor—State prizes, election to the U.S.S.R. Academy of Sciences and foreign academies, the Nobel prize. But to these honors secured by official deeds must be added a personal recognition extraordinarily widespread in scientific circles, here and abroad, which cannot be measured and expressed quantitatively. In Tamm people saw a man of principle, kind and intelligent; a great optimist and a fighter by nature.

The feelings, which his numerous pupils and friends had, and will to the end of their lives have, towards Tamm are: an everlasting esteem, love and gratitude. Love and gratitude for his human generosity and benevolence; profound respect for his scientific work, for his talent, for his courage and conduct in all circumstances of his long, often hard but excellent life.

Translated by A. K. Agyei