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Academician Igor' Evgen'evich Tamm

(On the occasion of his 60th birthday)

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THE outstanding Soviet theoretical physicist, Igor' Evgen'evich Tamm, whose 60th birthday was celebrated last July 8, is among the number of scientists who played an exceedingly important role in the development of Soviet science.

Igor' Evgen'evich was born in 1895 in Vladivostok. From 1899 through 1913 he lived in Elizavetgrad (now Kirovgrad), where he was graduated from the gymnasium. He studied one year at the University of Edinburgh, but at the start of the First World War he transferred to the Moscow University, from which he was graduated in 1918 (Mathematics-Physics Department). Subsequently he carried on educational work in universities.

Igor' Evgen'evich has been working in Moscow since 1922. In 1925 L. I. Mandel'shtam invited him to the Moscow University, where he later headed the Theoretical Physics Department for many years. After the removal of the USSR Academy of Sciences to Moscow, Igor' Evgen'evich has been continuously in charge of the theoretical division of the P. N. Lebedev Institute of the Academy since 1934.

I. E. Tamm's versatile scientific creativeness covered many problems in quantum theory and its applications (to optics, physics of metals, cosmic-ray physics, radiation of fast particles, etc.), the problem of nuclear forces, and generally the principle problems of the theory of interaction of elementary particles, important application problems in theoretical physics, and many others.

In the early years of his scientific activity, I. E. Tamm published material on the electrodynamics of anisotropic media and on crystal optics, as well as on problems that led directly to the foundation of wave mechanics (correspondence principle, para-magnetism, etc.). Igor' Evgen'evich next applied himself actively to the development of the most pressing problems of quantum mechanics. Among them is the investigation (1930) of scattering of light in crystals, including the theory of combination scattering in crystals. These are outstanding for containing the first quantization of elastic waves in a solid body and the first introduction of the concept of elastic quanta (phonons), which was later to play such an important role in solid-state physics. Also dating to the same period are important investigations (1930) in Dirac's theory which at that time was in a very complicated state. Igor' Evgen'evich first systematically investigated quantum-mechanically the scattering of light by a free electron and confirmed the correctness of the Kline-Nishina equation derived earlier by using the correspondence principle,

In the same investigation he reached the fundamentally important conclusion that the Dirac equation for scattering of light of limitingly small frequency can be reconciled with Thomson's classic equation (this correspondence being of course essential) only if electron levels having a negative energy are taken into account. He also proved the inadmissibility of excluding from the theory these levels, which were so difficult to visualize at that time. It was here that Igor' Evgen'evich calculated the annihilation cross section of an electron with a "hole" in the background. For these calculations he employed a convenient method, which was later to receive wide application under the name of the Casimir method.

Also dating back to the early 30's is the research done by I. E. Tamm and his students in the quantum theory of metals. Outstanding among these are two important investigations. First was the investigation (1931-1933, together with S. P.

Shubin) that laid the foundation for the theory of the photo-effect in metals. Second was the investigation (1933) in which he predicted theoretically the existence of a special bound state of an electron on the surfaces of crystals. These "Tamm levels" later played a very important role in the theory of a great variety of surface effects in metals and semi-conductors, and now again play a part in the study of contact properties.

At the same time Igor' Evgen'evich started his research in nuclear theory.

In 1934 I. E. Tamm (together with S. A. Al'tshuler) analyzed experimental data obtained jointly with experimenters Becher and Shiuler and concluded that the neutron has a negative magnetic moment.

In 1934 I. E. Tamm published one of his most important works in which he derived the first equation for the potential of nuclear forces, based on a concrete model, and founded on the hypothesis that the nuclear forces are due to the interchange of electron-neutrino pairs. He also noted in the same communication that these "beta forces" are too weak to account for the observed nuclear interactions. As is well known, the situation was cleared up only a few years later, when mesons were discovered and when it became clear that it was the mesons that carried the nuclear forces. But even later the structure of the theory of nuclear forces was based on Tamm's work.

The study of nuclear and of elementary particles remains central in I. E. Tamm's scientific creativity for many years. However, along with this he carried out many other important investigations. In 1937 Igor' Evgen'evich (together with I. M. Frank) explained and devised a theory for the interesting phenomenon discovered by P. A. Cerenkov in S. I. Vasilov's laboratory; namely, the emission of radiation by a charged particle moving uniformly in a medium at a velocity exceeding the phase velocity of light.

In 1939 I. E. Tamm (together with S. Z. Belen'ko) developed a theory of the electron-photon shower, correctly accounting for the ionization losses of the particles. This was the first to disclose a possibility of accurate quantitative study of the process of cascade multiplication.

During the years of World War II and later, Igor' Evgen'evich performed many extremely valuable investigations of applied character. Among these we can mention, for example, the work on ionosphere currents, on electromagnetic processes in a laminated core, etc.

In 1945 I. E. Tamm returned to the interaction of elementary particles. He investigated the problem of stability of a deuteron, using a method which is now known as the "Tamm method". This method is based on the concept suggested in the theory of elementary particles by V. A. Fok in1933 ("the Fok functional method"). More than 100 scientific investigations have already been performed over the entire world with the "Tamm method".

In the same year I. E. Tamm published the work "On the Uncertainty Relationships for Time and Energy", written jointly with L. I. Mandel'shtam. This work is essential for the understanding of the principal problems in quantum mechanics. Of considerable interest is an investigation (performed together with V. L. Ginzburg) on the possibility of the existence of particles, which can be in a state with different spins.

We cannot even list all of I. E. Tamm's numerous works, covering a great variety of subjects. At the present time he carries on, together with a staff of theoreticians under his guidance, exceedingly active research principally in the region of the central problem of modern physics, namely, the theory of interaction of elementary particles. Here Igor' Evgen'evich is developing simultaneously two methods: a semi-phenomenological method, taking into account the possibility of "Isobar" state of the nucleons, and a new improved form of the "Tamm method".

Together with his research, I. E. Tamm continues to carry out considerable pedagogical and scientific-organizational work. For many years he has been in charge, and actually newly created the department of theoretical physics of the physical faculty of the Moscow University and of the Moscow Engineering-Physics Institute. He wrote one of the best university texts in the world, "Fundamentals of the Theory of Electricity", several editions of which were published. Among his students are more than ten doctors of science (including an academician and an associate member of the academy) and many candidates for science degrees.

I. E. Tamm's scientific activity is well recognized. He was elected an associate member of the Academy of Science of the USSR in 1933, and a full member in 1953. He was awarded the Stalin prize of first degree; he was given two Orders of Lenin, the Order of the Labor Red Banner and many other state awards.

I. E. Tamm enters his 60th birthday performing intense and fruitful work, in a period of new uplift of his creative work and in an atmosphere of recognition of his services and of general respect. The editor of the Journal of Experimental and Theoretical Physics extends to Igor' Evgen'evich warm wishes for health and new successes for the good of Soviet science.

Translated by J. G. Adashko
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