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PERSONALIA

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In memory of Evgenii L'vovich Feinberg

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One of the patriarchs of Russian science, an elder of the Department of Theoretical Physics of the P N Lebedev Physics Institute of the Russian Academy of Sciences (FIAN) passed away on 10 December, 2005.

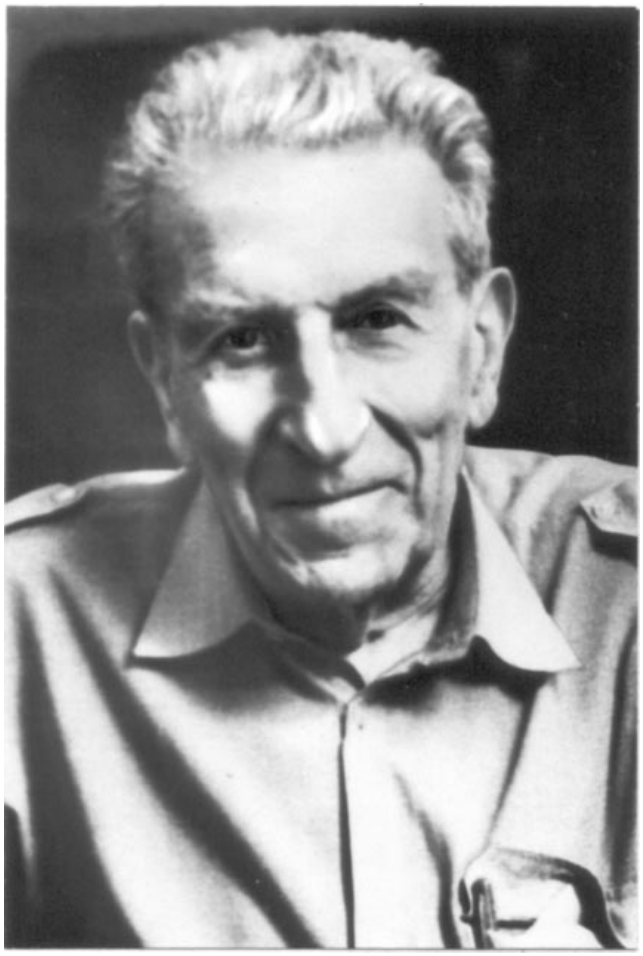
Physicists the world over know well the name Evgenii L'vovich Feinberg. It is associated with an intense and unquenchable thirst for delving into a wide range of physical problems, with the clarity of physical reasoning based on profound knowledge, and with the ability to foresee the pathways of science. In his papers we find formulations and solutions of theoretical problems of principal importance, hypotheses for novel physical phenomena, calculations of concrete physical effects, and also purely applications-oriented work. What these papers also reveal is an elegant fusion of logical and intuitive elements that characterizes a very high level of professionalism and intellect.

Yes, he published many papers and founded new areas of research but just as important was his contribution to nurturing and maintaining the purity of scientific and ethical principles and the creative atmosphere that was always a trademark of the Mandelshtam – Tamm school, to which Feinberg belonged.

Evgenii L'vovich Feinberg was born on June 27, 1912 into the family of a doctor in the city of Baku. In 1918, the family moved to Moscow. Evgenii L'vovich graduated from the Moscow State University Physics Department in 1935 and three years later, having graduated from postgraduate courses, started working in the theoretical department of the P N Lebedev Institute of Physics of the USSR Academy of Sciences (AN SSSR).

The scope of interest of Feinberg the physicist became clear already in his thesis for Candidate of Sciences (1939), where he formulated the theory of atomic ionization in the processes of nucleus beta decay. The main idea was that the ionization occurs in response to an instantaneous perturbation ('shaking') of the atomic electrons caused by the change of the nucleus charge in the process of beta decay. This work led to a series of theoretical and experimental studies. Nuclear physics and high energy physics called Feinberg's attention all his life. However, it did not set the limits on the area of physics in which he worked far from it.

It must be especially noted that during the Great Patriotic War Feinberg worked actively on problems of radiophysics that were directly related to the country's defense. He found new approaches and developed new methods in the theory of propagation of radio waves along the Earth's surface that differed in principle from the predominantly employed Sommerfeld – Weyl approach. This led to the solution of the problem that for 23 years had resisted attacks by outstanding physicists. The results of this and subsequent work were later summarized in the monograph *Propagation of Radio Waves Along the Earth's Surface* (1961) that was recently reprinted (1999). For this work, Feinberg won the L I Mandelshtam Award for Radiophysics in 1951.



Evgenii L'vovich Feinberg
(27.06.1912 – 10.12.2005)

In 1943, he developed the correlation theory which was drastically new at the time: the theory of objective (without human intervention) identification of an acoustic signal against strong background noise (noise-resistant direction finding). He then proposed a practical circuit diagram based on this theory, verified its viability, and then (together with S G Gershman) devised a system that was subsequently widely used in the navy.

Among his early work in nuclear physics we wish to point out the prediction of coherent inelastic processes for mesons interacting with the nucleus (1941) and processes of diffractive dissociation of hadrons (with I Ya Pomeranchuk, 1953). Later on, the study of these typically quantum processes engendered a broad field of research and earned Feinberg the USSR State Prize (1983) and the I Ya Pomeranchuk Award (2000).

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Translated by V I Kisin

Congenial Feinberg's works comprised a group of papers in which he formulated and solved a problem of principle importance: the possibility of the existence and the observability of an electron in a nonequilibrium state in which it has partly lost its electromagnetic field. The conclusions obtained were expanded to hadrons, which led to the introduction of the concept of nonequilibrium hadrons whose properties can be studied through their successive interactions with nucleons within the nucleus. The solution of this problem is closely related to the improvement, to which Feinberg contributed directly, in understanding the important role of interference phenomena and the concept of process formation time as high-energy particles pass through a medium.

Feinberg paid special attention to the question of the mechanism of inelastic processes of hadronic interactions at high energies. As early as 1951 – 1953, he emphasized the importance of peripheral processes of hadronic interactions. The model of one-meson exchange, developed later by his pupils, laid the foundation of the multiperipheral diagram of inelastic processes.

Among other phenomena, Feinberg predicted the direct generation of leptons and photons in hot hadronic matter (1959 – 1961) and, in particular, in quark – gluon matter (1976), as well as the generation of hadrons with large transverse momenta as a consequence of leakage at the early stages of the matter expansion (1967). Another result worth noting here is the calculation, experimentally confirmed, of production cross sections of deuteron, tritium, and helium antinuclei (1967), as well as the ideas and publications of his last ten years on establishing the role of constituent quarks in the extreme states of nuclear matter.

Feinberg also made a considerable contribution to the physics of cosmic rays.

We also need to single out his papers (1944 – 1949) on the theory of the uranium – graphite reactor and moderation of neutrons, where he discovered, among other aspects, the effect of monochromatization of neutrons in the course of their moderation; using this, he proposed (in collaboration with L E Lazareva and F L Shapiro) a method of slowing-down time spectrometry of neutrons, which gained wide recognition.

Feinberg's entire creative effort is characterized by close ties with experimental studies. It was no accident that he received the S I Vavilov Gold Medal (1988). Even in his last years he headed a wide range of projects that used automatized processing of nuclear emulsions.

In 1966, Feinberg was elected Corresponding Member of the AN SSSR, and in 1997 Full Member of the Russian Academy of Sciences. In 1953, he received the Order of Honor and in 1972 and 1975 the Orders of the Red Banner of Labor. His work was rewarded with the official gratitude of the President, Russian Federation (1999). We can only marvel at the enviable energy with which he continued his organizational and science-popularizing activities.

This obituary notice is too short to mention all of Feinberg's publications and all his results. In fact, the full list would fail to reflect the scope of his interests which, together with science, also covered literature, music, and art history. In his book *Cybernetics, Logic, Art* (1981), in which he summed up many years of deliberations on the philosophy of science and art, he discussed in detail problems of interrelations between science and art, between the logical and illogical, and the roles they play. Its translation was published under the title *Art in the Science-Dominated World* (1987) and later in a substantially expanded version as *Two Cultures* (1992) (*Zwei Kulturen* in German translation, 1998).

In his scientific and publicistic essay "Epoch and personality" (1999) he created literary portraits of Niels Bohr, L I Mandelshtam, I E Tamm, L D Landau, and S I Vavilov, in which the professional career of each scientist was outlined against the background of the times he lived in. An expanded second edition of this work was published in 2003.

A brilliant lecturer and teacher, Feinberg had the gift of explaining things with ultimate clarity. He taught at Gorky State University and at Moscow Engineering Physics Institute (MIFI) from 1944 to 1954.

Feinberg lived a long life with its share of hardships. During his 93 years there was much to be nervous or apprehensive or frightened about, which turned him into an extremely well poised, wise, and shrewd person, but at the same time one to whom indifference and cynicism were equally alien and whose attitude vis-à-vis the events around him never deviated from the noblest standards.

The defining feature of Feinberg's personality was his absolute presumption of a benevolent attitude toward people. This was his core, in a way his categorical imperative. His profound and active compassion for the fate of other people made itself felt with special strength in his actions that were aimed at supporting Academician Andrei Sakharov during Sakharov's Gorky exile or in his efforts to protect the memory of S I Vavilov from insinuations that appeared in a number of superficial and tendentious publications. This feature, combined with his enormous charm, never failed to attract a great many people to himself.

The warm memory of Evgenii L'vovich Feinberg will always live in the hearts of his friends, colleagues, disciples, and numerous others who came to know him.

I V Andreev, V L Ginzburg, A V Gurevich, I M Dremin, N S Kardashev, L V Keldysh, O N Krokhin, G A Mesyats, Yu S Osipov, V I Ritus, I I Royzen, V Ya Fainberg