Evgeniĭ L'vovich Feĭnberg (On his seventieth birthday)

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For many physicists, the name of Evgeniĭ L'vovich Feĭnberg is associated primarily with an untiring lively interest in a broad range of physical problems, with lucidity of physical thought rooted in profound understanding, and with the ability to foresee the future course of the science. Going through his papers, we find formulations and solutions of fundamental theoretical problems, hypotheses bearing on new physical phenomena, calculations of specific physical effects, and purely applied research. In his work one can trace the organic blending of logical and intuitive elements characteristic of a high level of professionalism and intellect.

Feĭnberg was born on June 27, 1912 into the family of a physician at Baku. His family moved to Moscow in 1918. Evgeniĭ L'vovich graduated from the Physics Faculty of Moscow State University in 1935, and three years later, having completed his MSU graduate studies, went to work in the theoretical section of the USSR Academy of Sciences P.N. Lebedev Physics Institute, where he has headed the sector on particle interactions at high energies since 1959.

Feĭnberg's scientific destiny was no doubt determined in large part by the fact that as a student he happened to be placed under the direction of the prominent Soviet theoretical physicist I.E. Tamm. The high scientific and personal principles of the "Tamm school" were so consonant with Feĭnberg's own character that even now, more than a decade after Tamm's passing, he may be termed one of the most consistent repositories and perpetuators of the traditions of this school.

Feĭnberg's scientific interests began to crystallize while he was still a graduate student, when he formulated a theory of the ionization of atoms in beta decay of nuclei. The basic idea was that the atom is ionized as a result of an instantaneous perturbation ("shakeup") of its electrons resulting from the rapid change of charge in the beta-decay process. This study gave impetus to a series of theoretical and experimental investigations.

Thus was determined the basic direction of Feĭnberg's subsequent scientific activity: nuclear and high-energy physics. Reviewing his work in this field, we note first of all his prediction of coherent inelastic processes on the interaction of mesons with the nucleus (1941) and of the diffractive dissociation processes of hadrons (with I.Ya. Pomeranchuk, 1953). The study of these typically quantum processes later burgeoned into a broad field of research.

Evgeniĭ L'vovich Feinberg

Kindred in spirit are the studies in which Feĭnberg stated and solved the fundamental problem of the possibility of observing the electron in a nonequilibrium state in which the electron is deprived of part of its electromagnetic field. He extended his conclusions to hadrons, and this led to the notion of nonequilibrium hadrons, the properties of which can be studied on their repeated interactions with nucleons within the nucleus. The solution of this problem was also closely related to the development of ideas concerning the importance of interference phenomena in the passage of high-energy particles through a medium, a development in which Feĭnberg was directly involved.

Feĭnberg was particularly interested in the mechanism of inelastic hadron-interaction processes at high energies. As early as 1951–1953, he was stressing the importance of peripheral processes of hadrons interaction. The single-meson exchange model that was later developed by his students formed the basis for what is now the most widely accepted scheme of the inelastic processes, the multipheral scheme. A distinctive feature, of this model is the formation (together with a resonance) of intermediate, comparatively heavy quasi-

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classical objects–fireballs or clusters. The scheme successfully withstood detailed comparisons with experiment in a broad range of energies.

Study of the role of thermodynamic subsystems (fireballs) in peripheral processes is closely related to other thermodynamic-theory problems that Feĭnberg was the first to examine. Among them we note the direct production of leptons and photons in the hot hadron plasm (1959–1961) and specifically in the quark-gluon plasma at high density and high temperature (1976), the production of hadrons with large transverse momenta as a result of leakage in the early stages of plasma expansion (1967), and calculation of the cross sections for generation of the deuteron, tritium, and helium antinuclei (1967).

The entire range of problems listed above was treated with orientation to truly high energies. Therefore the results could be compared initially only with the limited data that had been obtained in cosmic rays, but later they were confirmed on new accelerators at increasingly high energies.

In cosmic ray physics, Feĭnberg also contributed significantly with his theory of the meteorological variations of cosmic rays (1946), which formed the basis for numerous later studies in this area.

We should also mention Feĭnberg's 1943–1949 work on neutron moderation theory, in which, in particular, he referred to the monochromatization of neutrons in the process of moderation and proposed on this basis (with L.E. Lazareva and F.L. Shapiro) the moderation-time method of neutron spectroscopy that is now in wide use.

During the war, Feĭnberg worked actively on problems of radiophysics and statistical acoustics that had a direct bearing on the country's defense. He designed fundamentally new approaches and new methods in the theory of radio propagation along the ground, which were summarized in his monograph "The Propagation of Radio Waves Along the Earth's Surface" (USSR Acad. Sci. Pres, Moscow, 1961) and have now even been incorporated into college courses. Feĭnberg was awarded the L.I. Mandel'shtam Prize for radiophysics in 1950 in recognition of these efforts.

In 1943, he stated a then fundamentally new correlation theory of signal recognition in the presence of strong noise (noise-immune direction finding), proposed and tested (with V.I. Veksler) a practical block diagram based on this theory, and then completed (with S.G. Gershman) a detailed experimental verification of the theory.

Feĭnberg was elected a Corresponding Member of the USSR Academy of Sciences in 1966. He was awarded the Badge of Honor in 1953, and Orders of the Red Banner of Labor in 1972 and 1975.

It is, or course, impossible even to cite in a brief note each of Feĭnberg's papers, of which over a hundred have been published, and all the results to his credit. But even a full listing would still not reflect the breadth of his interests, which span not only science but also literature, music, and the arts. His book "Cybernetics, Logic, and Art" (Radio and Communications Press, Moscow, 1981) discusses in detail problems of the relationship and roles of science and art, of the logical and extralogical, summing up his many years of meditation on science and art in the modern world, samples of which had been published in journals. He is also the author of a number of biographical articles devoted to Bohr, Mandel'shtam, Tamm, and Vavilov, where the scientific path of the subject is traced against the backdrop of the culture of his time. A brilliant lecturer and teacher, Feĭnberg has the skill to clarify the essentials of his topic with extreme lucidity and succinctness. He taught from 1946 through 1954 at Gor'kiĭ University and at the Moscow Engineering Physics Institute.

Perhaps the most salient of Feĭnberg's traits is his high moral character—his acute sense of responsibility for his every undertaking, his deep and active interest in the fate of others. This quality, in combination with his tremendous personal charm, explains his enormous and unvarying popularity.

His friends, colleagues, and students extend to Evgeniĭ L'vovich Feĭnberg their warmest wishes for good health, continued success, and long years of active work.

Translated by R. W. Bowers