

Vitalii Iosifovich Gol'danskiĭ (on his seventieth birthday)

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On 18 June 1993, academician V. I. Gol'danskiĭ attained his seventieth birthday. Vitalii Iosifovich Gol'danskiĭ was born in the city of Vitebsk. Since 1928, he has been living in Leningrad (currently St. Petersburg), where in 1939, he began his studies in the faculty of chemistry of the university. The war interrupted his studies and Gol'danskiĭ enrolled in a student construction battalion. He was wounded, survived the blockade winter, and then was evacuated to Kazan'. Having resumed there his studies at the university Gol'danskiĭ at the same time became a laboratory assistant in the laboratory of one of the oldest members of the Institute of Chemical Physics—S. Z. Roginskiĭ.

Having been transferred together with the laboratory to Moscow, Gol'danskiĭ graduated in 1944 from the Chemistry Faculty of the University of Moscow, and became a graduate student of N. N. Semenov and in 1947 defended his thesis for the candidate degree on problems of catalysis.

Subsequently the circle of his scientific interests of necessity sharply changed—he switched over to the nuclear field. From the first days of the commissioning of the synchrocyclotron in Dubna Gol'danskiĭ investigated there problems of absorption and multiplication of high-energy neutrons in heavy targets and in 1954 defended his doctoral dissertation at the Scientific Council presided by I. V. Kurchatov. The experimental data obtained by him became the basis for all the subsequent estimates of the possibility of electronuclear breeding of nuclear fuel.

During 1952–1961, Gol'danskiĭ worked in the Physics Institute of the Academy of Sciences (FIAN) in the laboratory of V. I. Veksler. The precision investigations of the photoproduction of π^0 mesons on hydrogen near the threshold made it possible to separate the contributions of the P- and S-states to this process. A series of clever experiments on elastic γ , p scattering led to the discovery of the phenomenon of electromagnetic polarizability of hadrons and numerical determination of the constants of the polarizability of a proton. These experiments are rightfully regarded as being classical, their results have been incorporated into handbooks and textbooks on the physics of elementary particles.

Starting with 1954, Gol'danskiĭ has successfully combined experiments with theoretical calculations on different problems of nuclear physics. His pioneering work on Cherenkov radiation from cosmic particles in the atmosphere (1954—together with G. B. Zhdanov) became the basis of an effective method of recording extended atmospheric showers, and the creation of a correlational statistical method of determining the absolute yield and the mechanism of nuclear reactions (1955—together with M. I. Podgoretskiĭ) made it possible to sharply extend the pos-

sibilities of the famous β, γ coincidence method and to show that it is only a special case of the correlation method.

The greatest recognition among this cycle of papers has been accorded to Gol'danskiĭ's research relating to nuclei situated at some distance from the region of beta-stability. Having proposed formulas for an exact calculation of the masses he successfully predicted the existence and the properties of dozens of neutron deficient isotopes which were not known at the time.

Of special interest was his prediction in 1960 of new types of radioactive decay of nuclei—involving the emission of pairs of nucleons—two-proton radioactivity—emission of delayed pairs of neutrons and pairs of protons. The latter two processes were experimentally observed in the USA: neutron pairs in 1979, and proton pairs in 1982. Together with A. I. Larkin in 1967, Gol'danskiĭ predicted the nuclear Josephson effect—the tunneling of “Cooper” pairs between nuclei leading to a sharp increase in the probability of transfer of such pairs in reactions of heavy ions. And this prediction was also confirmed in a number of examples during 1974–1982 in several laboratories in Germany, USA, and Italy.

On returning in 1961 to the Institute of Chemical Physics, Gol'danskiĭ directed his main effort to the formation of modern nuclear chemistry as a new field of science that investigates the relationships and the effect of chemical properties of a material and the various characteristics of the transformation of nuclei (for example, of Mössbauer nuclei) and elementary particles (for example, positrons, μ^\pm and π^\pm -mesons) and utilizing on this basis the observation of nuclear phenomena for obtaining multifaceted, sometimes unique information on the structural and dynamic properties of the molecular and crystalline surrounding of these nuclei. In 1988, Gol'danskiĭ became the director of the Institute of Chemical Physics.

Among the numerous papers of Gol'danskiĭ on the Mössbauer effect, we shall mention here the discovery and explanation of the asymmetry of quadrupole splitting of spectra of isotropic and polycrystalline powders as a result of the anisotropy of motions of atoms in molecules and crystals (the Gol'danskiĭ-Karyagin effect). On this basis one can investigate the anisotropy of the dynamical properties of single crystals in experiments with polycrystals analogously to the manner in which the Debye powder diagrams in x-ray analysis provide the static structure of single crystals from experiments with polycrystals and powders. This circle of investigations is closely related to the fundamental research on the dynamics of proteins with the aid of methods of Mössbauer spectroscopy and the original ideas of producing a γ laser based on Mössbauer



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transitions in short-lived nuclei subjected to powerful pulsed pumping (together with Yu. M. Kagan).

We do not dwell here on the chemical investigations of Gol'danskiĭ, but shall speak only about one of the outstanding achievements of modern chemical physics—the discovery by him (1970–1973) of the quantum low-temperature limit for the rate of chemical reactions as a result of tunnel transitions of the reacting atoms and molecular groups below the activation barrier. This discovery is of a strongly expressed revolutionary nature; it has shown the inapplicability of the main law of chemical kinetics—the Arrhenius law—at low temperatures. The discovery of the chemical reaction capability of a substance even close to absolute zero opened up new possibilities for expanding the formation of complex molecules in deep outer space, and this was confirmed by the discovery by astrophysicists of the role played by formaldehyde in dark interstellar gaseous dust clouds and in the investigation of Halley's comet by space instruments. This opens up new possible paths of chemical and prebiological evolution. Gol'danskiĭ during the last decade has devoted much attention to problems of prebiological evolution and, in particular, to the investigation of the problem of the origin of the lack of symmetry between the “left-handed” and “right-handed” properties in living nature.

The pedagogical activity of Gol'danskiĭ, which began in 1947 at the Engineering-physics faculty of Moscow State

University, continued later in the department of experimental nuclear physics of the Moscow Engineering-Physics Institute and the chemical faculty of the Moscow State University. The combination of research and pedagogical work had a beneficial and defining effect on the formation of the Soviet school of nuclear chemistry and high-energy chemistry whose acknowledged leader is V. I. Gol'danskiĭ. To his credit, we have the creation and guidance in the course of more than 20 years of the Scientific Council of the Academy of Sciences on high-energy chemistry, and also the organization and editorship of a journal of the same name, the guidance of the Commission on synchrotron radiation attached to the Praesidium of the Academy of Sciences and other everyday scientific-organizational affairs. At the present time, Gol'danskiĭ is the chairman of the Scientific Council of the Russian Academy of Sciences on chemical kinetics and structure of matter, and also he is the editor-in-chief of the journal “Chemical Physics.”

He also devotes much time to the troublesome duties of a member of the editorial boards of a number of Russian and foreign scientific journals.

Gol'danskiĭ has published several fundamental monographs, repeatedly translated into different languages—on Mössbauer spectroscopy, on nuclear physics, on physical chemistry of positrons and positronium: practically every direction of his research finds its embodiment in an appropriate monograph which is also characteristic for the head of a scientific school.

The rapid reaction and wit characteristic of Gol'danskiĭ in everyday life, which make him a very interesting conversationalist, leave their imprint on the style of his numerous popular-scientific publications which have led to his wide recognition among his readers.

The achievements of V. I. Gol'danskiĭ in science, his pedagogical, scientific-organizational and social activity have been rewarded by the Order of Lenin, twice by the order of the Red Banner of Labor, the Order of the October Revolution and by several medals. In 1980, he was named as a laureate of a Lenin Prize. In 1962 the Academy of Sciences elected him a Corresponding Member and 1981 as a Full Member. His publications have received academic awards—the D. I. Mendeleev gold medal, the D. I. Mendeleev and B. G. Khlopin prizes; he received the A. P. Karpinskiĭ prize (FRG), the prize of the New York Academy of Sciences (USA), the Alexander von Humboldt prize (FRG).

The name of V. I. Gol'danskiĭ carries great authority among scientists abroad. He has been elected honorary or foreign member of many academies and scientific organizations. He is an active participant in the Pugwash movement, and since 1988 he is the chairman of the Pugwash committee.

It might appear surprising, that with such strenuous activity which one might think should occupy all his working and “free” time, not leaving any for contact with literature, theater, art and social activity, he is continuously involved in the social life of the country and of the main events of cultural life invariably astonishing his numerous

friends and acquaintances by the precision and depth of evaluations and a lively reaction. Between 1989 and 1992, Gol'danskiĭ was a People's Deputy of the USSR elected from the Academy of Sciences and member of the Interregional group of deputies, one of the creators of which was Andreĭ Dmitrievich Sakharov.

V. I. Gol'danskiĭ has attained his seventieth birthday

in the full flowering of his talent with which he has been generously endowed, full of new projects and ideas. We wish him good health and further successes in his fruitful work for the benefit of science.

Translated by G. M. Volkoff