Vitaliĭ Iosifovich Gol'danskiĭ (on his sixtieth birthday)

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June 18 marks the 60th birthday of Academician V. I. Gol'danskiĭ. Born in Vitebsk (northern Belorussia) in 1923, Vitaliĭ Iosifovich came to Leningrad in 1928, and it was here that in 1939 he began his studies in the chemistry department of the University. The war interrupted his training: he served in a students' line battalion, was wounded, survived the winter siege, and was evacuated to Kazan'. Resuming his studies at the University there, Vitaliĭ Iosifovich at the same time acted as an assistant in the laboratory of a leading member of the Institute of Chemical Physics staff, S. Z. Roginskiĭ.

Accompanying the laboratory in its transfer to Moscow, Gol'danskiĭ completed his courses in the University chemistry department in 1944, enrolled with one of us (N. N. Semënov) as a graduate student, and in 1947 defended his candidate's dissertation on topics in catalysis.

But then an abrupt change perforce occurred in his fields of scientific activity: he took up nuclear physics, and as soon as the Dubna synchrocyclotron came into operation he used it to investigate the absorption and multiplication of high-energy neutrons in heavy targets. By 1952 he was ready to defind his doctoral dissertation before the Scientific Council, chaired by I. V. Kurchatov. The experimental data he obtained laid the groundwork for all later assessments of the prospects for electronuclear breeding of nuclear fuel.

During 1952–1961 Gol'danskiĭ was working at the Lebedev Physics Institute of the Academy, in Vladimir I. Veksler's laboratory. His high-precision experiments with π^0 meson photoproduction in hydrogen near threshold enabled the contributions of the P and S states to this process to be discriminated. Through a series of ingenious experiments on elastic γ, p scattering he discovered the phenomenon of electromagnetic polarizability of hadrons and was able to evaluate numerically the polarizability constants of the proton. These experiments have justifiably come to be regarded as classical; their results have found a place in manuals and textbooks on elementary-particle physics.

In 1954 Gol'danskiĭ successfully began to couple his experimental work with theoretical calculations relating to various problems in nuclear physics. A pioneer 1954 study (jointly with G. B. Zhdanov) of the Čerenkov radiation of cosmic-ray particles in the atmosphere formed the basis of an efficient technique for recording

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extensive air showers. With M. I. Podgoretskiĭ he developed in 1955 a statistical correlation method for determining the absolute yield and mechanism of nuclear reactions; as a result the capabilities of the notable β, γ coincidence method were greatly expanded, and it was shown to be merely a special case of the correlation method.

Of all Gol'danskiĭ's research in this area, the most prominent was that concerning nuclei distant from the island of β-stability. Proposing new equations for accurate mass evaluation, Gol'danskiĭ correctly predicted the existence and properties of dozens of neutron-deficient isotopes not hitherto known.

Particularly interesting was his 1960 prediction of some new forms of radioactive nuclear decay, involving the emission of pairs of nucleons: two-proton radioactivity, and the emission of delayed neutron pairs and proton pairs. These last two processes have recently been detected experimentally in the United States: neutron pairs in 1979, and proton pairs in 1982. In 1967 Gol'danskiĭ and A. I. Larkin predicted the nuclear Josephson effect: a tunneling of "Cooper pairs" between nuclei, which would sharply increase the transport probability of such pairs in heavy-ion reactions. This

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prediction too has been confirmed by a number of successful experiments during 1974–1982 conducted in West Germany, Italy, and the United States.

Returning to the Institute of Chemical Physics in 1961, Gol'danskiĭ began to put his main efforts into organizing modern nuclear chemistry as a new branch of science, studying the interrelations and effects of the chemical properties of matter and the manifold transformation characteristics of nuclei (such as Mössbauer nuclei) and elementary particles (including positrons and μ^+, π^+ mesons), and on this basis untilizing observations of nuclear phenomena to acquire diversified, sometimes unique information on the structural and dynamical properties of the molecular and crystal environment of those nuclei.

Among Gol'danskiĭ's numerous investigations of the Mössbauer effect, we would mention particularly his discovery and explanation of the asymmetry in the quadrupole splitting of the spectra of isotropic polycrystalline powders, due to the anisotropic motions of atoms in the molecules and crystals (the Gol'danskiĭ-Karyagin effect). One can take advantage of this effect to study the anisotropy in the dynamical properties of single crystals through experiments with polycrystals, just as Debye diagrams in x-ray analysis enable experiments with polycrystals and powders to furnish the static structure of single crystals. Bordering on this line of research is the original concept (developed jointly with Yu. M. Kagan) of designing a γ-ray laser based on Mössbauer transitions in short-lived nuclei subjected to a powerful injection of pulses.

Without dwelling on Gol'danskiĭ's work in chemistry, suffice it to point out one of the signal achievements of modern chemical physics: his discovery (in 1970–1973) of the low-temperature quantum limit on the rate of chemical reactions that results from tunnel transitions of the reacting atoms and molecular groups beneath the activation barrier. This was quite a revolutionary finding, for it demonstrated that the fundamental law of classical chemical kinetics, Arrhenius's law, is inapplicable at low temperatures. The discovery that matter can be chemically reactive even close to absolute zero has opened up new avenues for explaining how complex molecules can form in dark clouds of interstellar dust, and suggested some possible new paths of chemical and prebiological evolution.

Gol'danskiĭ devotes much time to his teaching activity, which started in 1947 in the engineering physics faculty of Moscow University; for more than two decades he has been teaching students in the experimental nuclear physics department of the Moscow Engineering Physics Institute. This coupling of research with teaching has had a decisive and salubrious influence on the development of the Soviet school of nuclear chemistry and high-energy chemistry, of which Gol'danskiĭ is the acknowledged leader. He has been responsible for founding and directing the Academy's Scientific Council on High-Energy Chemistry, for organizing and editing the journal of that title, for heading the Commission on Synchrotron Radiation under the Presidium of the USSR Academy of Sciences, and for other tasks on the everyday agenda of scientific planning.

He also spends a good deal of time in burdensome duties as a member of the editorial boards of several domestic and foreign scientific journals.

Gol'danskiĭ has written several fundamental monographs, which have been published in various languages: on Mössbauer spectroscopy, on nuclear physics, on the physical chemistry of the positron and positonium. Almost every one of his research interests has been embodied in a corresponding monograph—and that is but typical of the leader of a school in science.

In daily life Vitaliĭ Iosifovich is famous for his quickness of response and his wit, which make him a delightful conversationalist and which leave a sparkling imprint on the style of his many ventures into the field of popular science, winning him wide renown among his readers.

Gol'danskiĭ's service for Soviet science and his organizational, teaching, and public activities have been rewarded with an Order of the October Revolution, the Order of the Red Banner of Labor on two occasions, the Badge of Honor, and a number of medals. In 1980 he was named Laureate of the Lenin Prize. The USSR Academy of Sciences elected him a Corresponding Member in 1962, and a full Member in 1981. Academic awards have been conferred on his work as well: the Mendeleev Gold Medal and the Mendeleev and Khlopin Prizes.

Among scientists abroad, Gol'danskiĭ's name carries high prestige. He has been elected an honorary or foreign member of many academies and scientific societies, and he is an active participant in the Pugwash movement.

One might think that Vitaliĭ Iosifovich's versatile activities would occupy all his working and free time, leaving him no change to pursue literature, the theatre, the fine arts. But in some inscrutable fashion he manages to take in all the main cultural happenings, invariably astonishing his innumerable friends and acquaintances with the depth of his perceptions and his lively reactions.

At 60, Gol'danskiĭ is in the full flower of the talent with which he is so generously endowed—replete with new projects and ideas. We bid him good health and continued success in his fruitful efforts for the boon of Soviet science.

Translated by R. B. Rodman