VIKTOR GRYGOROVYCH BAR'YAKHTAR
(to the 80-th anniversary of his birthday)

On August 9, 2010, Academician of the National Academy of Sciences (NAS) of Ukraine Viktor Grygorovych Bar'yakhtar celebrated his 80-th anniversary. This famous Ukrainian scientist is well-known by his outstanding results in the fields of theoretical physics, physics of magnetic phenomena, solid-state physics, and ecological problems of consequences of the Chornobyl disaster.

Viktor Grygorovych was born in the town of Mariupol. He started his scientific activity after the graduation of Kharkiv State University in 1953 under the guidance of Academician Oleksandr Illich Akhiezer, who had already been recognized by the world scientific community.

The first works of Viktor Grygorovych Bar'yakhtar were devoted to calculations of the processes of radiation of γ-quanta created at the collisions of atomic nuclei with one another and electrons with nuclei, as well as to the problems related to the polarization of vacuum. At that time, these problems were the most important problems of quantum electrodynamics. At the end of the 1950s, V.G. Bar'yakhtar together with O.I. Akhiezer and S.V. Peletminsky began to study the spectra of collectively coupled magnetoelastic waves in ferromagnetics and obtained world-class results. In particular, it was shown that the phonon and magnon branches of the spectrum are significantly modified in a vicinity of the magnetoacoustic resonance, where the frequencies of nonperturbed spectra of magnon and phonon oscillations coincide, as well as their wave vectors. The subsequent development of these studies stimulated the authors to create the corresponding phenomenological theory with the use of the notions of strain tensor and magnetization density. Their theory provided a generalization of the well-known Landau–Lifshitz phenomenological theory of the magnetism of magnetically ordered crystals. The foundations of this theory were presented in the monograph "Spin Waves" by O.I. Akhiezer, V.G. Bar'yakhtar, and S.V. Peletminsky. It became a classical book in the theory of magnetic phenomena, which is well-known in Ukraine and over the world. The citation of this monograph can be found in hundreds of scientific articles published in the prestigious physical journals.

In the course of his life, Viktor Grygorovych has retained the love to magnetic phenomena in general and magnetoelastic processes and phenomena in particular. He showed, together with his disciple D.A. Yablons'kyi, that the appearance of the magnetoelastic gap is related to the spontaneous symmetry breaking. V.G. Bar'yakhtar, V.M. Loktev, and S.M. Ryabchenko proved that the magnetoelastic interaction can essentially modify the spectra of oscillations of thin magnetic films and rods. Viktor Grygorovych and his disciples I.M. Vitebskyi, Yu.G. Pashkevych, V.L. Sobolev, and V.V. Tarasenko developed the theory of coupled magnetoelastic oscillations in a vicinity of magnetic spin-orientational phase transitions. For example, they described both the "softening" of the moduli of elasticity and the origin of a magnetoelastic gap in certain cases due to the coupling between magnetic and elastic oscillations. At the beginning of the 1970s, V.G. Bar'yakhtar and V.P. Semynozhenko made a series of works on the theory of the processes of relaxation in semiconductors. For the first time, they de-

rived a system of coupled kinetic equations for electrons and phonons and showed that the main process in the establishment of an equilibrium in a system of Bogolyubov's quasiparticles at low temperatures is their scattering by phonons. Moreover, they proved that the thermal equilibrium in a system of phonons is formed much faster than in a system of Bogolyubov's quasiparticles. These kinetic equations served as a foundation for the theory of the generation of phonons in the processes of merging of two quasiparticles into a phonon. In the 1960s, Viktor Grygorovych with his teacher O.I. Akhiezer and with S.V. Peletminsky developed the microscopic theory of relaxation of a magnetic moment in ferromagnetics. In the 1980s, he formulated a general approach to the construction of relaxation terms in the Landau–Lifshitz equation describing a motion of the magnetization in ferromagnetics with allowance for the spin-spin and spin-lattice interactions. Within this approach, he derived the exchange relaxation term which is named "V.G. Bar'yakhtar's relaxation term" by experts dealing with magnetic fields. These results allow one to explain the reason for a significant difference in experimental data obtained by different methods on the relaxation of the magnetization in thin ferromagnetic films with domain structure, in particular, by the methods involving the ferromagnetic resonance and the mobility of domain boundaries.

It is worth noting a particular attention given by Viktor Grygorovych to the physics of static and dynamic phenomena in spatially inhomogeneous ferro-, ferri-, and antiferromagnetics. These studies have led, first of all, to the classical results on the so-called intermediate state of antiferromagnetics in a vicinity of first-order phase transitions (a large series of works by V.G. Bar'yakhtar, O.O. Galkin, V.V. Eremenko, A.E. Borovyk, V.O. Popov, E.P. Stefanos'kyi, and others).

V.G. Bar'yakhtar in collaboration with Yu.I. Gorobets investigated thin magnetic films with perpendicular anisotropy. In such films, there can exist cylindrical magnetic domains (CMDs) which are similar to two-dimensional interacting particles in many aspects. These domains can move along a magnetic film, are characterized by the effective mass, and can be created and annihilated at the given places on the film. These specific features of CMDs are used for the data recording and the reading in informational systems and in the contemporary optoelectronics for the control over light beams. In the city of Donetsk, Viktor Grygorovych gathered a group of experts-enthusiasts who carried out a lot of studies under his leadership and with his direct participation in the fields of the physics of the abovementioned magnetic structures and applications of films with CMDs.

Viktor Grygorovych and B.O. Ivanov were pathfinders in the studies of properties of magnetic solitons. As the most significant result, we mention the elaboration of the theory of the Cerenkov radiation of sound by moving domain boundaries at sufficiently high velocities of motion.

Viktor Grygorovych with his son Igor were the first who formulated the idea to describe the gas of domain boundaries in magnetics with the help of nonequilibrium thermodynamics. They also constructed the kinetic theory of a gas of solitons, which is undoubtedly a remarkable world-class foreground scientific achievement in the field of nonlinear physics.

The scientific activity of Viktor Grygorovych is characterized by the breadth, encyclopaedic scale, versatility, searching, and efficient use of analogies in the study of physical phenomena. The scientist made a significant contribution to the development of many trends of physics personally and together with his teacher O.I. Akhiezer and his colleagues. To make it more clear, we mention only some of many outstanding world-class results. They include the method of calculation of the collision integral for plasma in a strong magnetic field; microscopic theory of thermogalvanomagnetic phenomena in metals and semiconductors; thermodynamic properties of superconductors (thallium, indium, rhenium) at a $2^1/_2$-order phase transition; peculiarities of the density of electron states at a change in the Fermi surface topology; further development of the conception of pseudopotential for normal and superconducting metals; relaxation processes in superconductors; and theory of cylindrical domains in films of ferrofluids. This list of the trends in physics and the prominent scientific results obtained by Viktor Grygorovych is far from being complete. It would be worth to mention the results concerning the field of ecological problems of the Chornobyl zone, as well as the studies of the corrosion of metals in electrolytes in a magnetic field performed jointly with O.Yu. Gorobets. The transparent statement of problems and the choice and the application of modern theoretical and mathematical approaches and models adequate to a specific problem undoubtedly characterize him as an outstanding scientist.

While speaking about such a personality as Viktor Grygorovych Bar'yakhtar, we cannot discuss his scientific activity apart from the pedagogical one. All his life is the union of scientific studies and the pedagogical work

at universities: firstly in Kharkiv and then in Donetsk and Kyiv. He elaborated the efficient system of selection of talented students, with whom he began to work while they had still been on their university study. Starting from the third year, the students were proposed "to overcome" the Candidate's minimum within the scope of the Landau–Lifshitz course in theoretical physics and to solve a real problem existing in some branch of physics. Of course, this required somewhat more knowledge than that of an average student. Such an approach always gave to Viktor Grygorovych a possibility to arouse students' interest and to attract them to a serious scientific work for a short time interval. The efficiency of this approach has been proved by the fact that many researchers of his scientific school (they include several tens of Doctors, about fifty Candidates of Sci., and a number of Academicians and Corresponding members of the Academy) obtained significant scientific results in a very young age. This was favored by the atmosphere of kindness, humanity, and creativity which always surrounded the scientists who worked and are working with Viktor Grygorovych Bar'yakhtar.

Viktor Grygorovych always united his fruitful scientific work with the scientific management activity. He headed the Donetsk scientific center of the Academy of Sciences of the UkrSSR from 1978 to 1982. In 1985–1989, he was the Director of the Institute of Metal Physics of the Academy of Sciences of Ukraine. Since 1995, V.G. Bar'yakhtar has been the Director of the Institute of Magnetism established by him under the authority of the NAS of Ukraine and the Ministry of Education and Science of Ukraine. In 1982–1989, he was the Academician-Secretary of the Division of Physics and Astronomy of the Academy of Sciences of Ukraine; and he occupied the position of the Dean of the Physics and Mathematics Faculty of the National Technical University "Kyiv Polytechnical Institute" in 1996-2007. Viktor Grygorovych was the First Vice-President of the NAS of Ukraine from 1993 to 1998.

The multidisciplinary, active, and fruitful activity of V.G. Bar'yakhtar is generally recognized. In 1978, he was elected Academician of the Academy of Sciences of the UkrSSR; he was twice awarded with State Prizes of Ukraine: in the field of science and technology in 1972 and 1986 and in the field of ecology in 1999. V.G. Bar'yakhtar is the Honored Science and Technology Worker of Ukraine and the Laureate of K.D. Synel'nykov's, N.M. Krylov's, M.M. Bogolyubov's, and S.I. Pekar's Prizes of the NAS of Ukraine. Viktor Grygorovych is decorated with the Labor Red Banner Order, Lenin Order, Yaroslav Mudryi Order of the fifth degree, V.I. Vernadskyi Gold Medal of the NAS of Ukraine, K.D. Ushynskyi Gold Medal of the National Academy of Pedagogical Sciences of Ukraine, and he is the full folder of the Order for Merits. V.G. Bar'yakhtar is one of the founders and the first President of the Ukrainian Physical Society, the Head of the permanently acting commission of the Presidium of the NAS of Ukraine on the problems of the Chornobyl disaster for many years, and an advicer of the President of Ukraine on the problems of nuclear power industry. In 2000, he was awarded with the International Prize of St. Valentine's Scientific and Cultural Fund. In 2003, Viktor Grygorovych Bar'yakhtar was elected Honorary Academician of the National Academy of Pedagogical Sciences of Ukraine. He is Honorary Doctor of Taras Shevchenko National University of Kyiv, National Technical University of Ukraine "KPI", V.N. Karazin Kharkiv National University, M.P. Dragomanov National Pedagogical University, V.I. Dal' East-Ukrainian National University, Vasyl Stefanyk Cis-Carpathian National University, and I.I. Mechnikov Odesa National University.

B.E. Paton, A.P. Shpak, A.G. Naumovets, V.P. Semynozhenko, A.G. Zagorodny, V.M. Loktev, V.F. Machulin, I.M. Neklyudov, I.R. Yukhnovs'kyi, Ya.S. Yatskiv, M.S. Brodyn, I.M. Vyshnevs'kyi, V.V. Eremenko, L.M. Lytvynenko, S.V. Peletminsky, E.V. Sobotovych, O.B. Shpenyk, V.M. Yakovenko, A.D. Alekseev, V.M. Varyukhin, S.L. Hnatchenko, B.O. Ivanov, V.F. Klepikov, V.G. Litovchenko, L.P. Yatsenko, Yu.I. Gorobets