PETRO MYKHAILOVYCH TOMCHUK
(to the 80th Anniversary of His Birthday)

On January 2, 2014, an outstanding scientist and expert in theoretical physics, Corresponding Member of the National Academy of Sciences of Ukraine (NASU) Petro Mykhailovych Tomchuk was 80 years of age.

P.M. Tomchuk was born in the village of Kotsyubyntsi (the Kopychyntsi district of the Ternopil province) in a peasant family. Besides Petro, the family included one more son and a daughter. Petro Mykhailovych' father, after returning home from the war, worked at the local collective farm, but soon died in 1950. Petro's mother, brother, and sister also worked at the collective farm.

In 1941, the boy began to study at the Kotsyubyntsi seven-year school. After its leaving in 1949, he entered the eighth class of the Kotsyubyntsi secondary school. After finishing the school in 1952, Petro Mykhailovych successfully passed entrance examinations to the physical branch of the Faculty of Physics and Mathematics at the Chernivitsi State University, which he graduated from in 1957 with honors. The same year, P.M. Tomchuk became a postgraduate student on the speciality "theoretical physics" at the Institute of Physics (IP) of the NASU. In 1962, he defended his Ph.D. dissertation and, in 1972, the doctoral one. Petro Mykhailovych has been the Head of the Department of Theoretical Physics at the IP NASU since 1973.

In 1973, P.M. Tomchuk married Leonida Vasylivna Levchuk, a research worker at the Institute for Nuclear Research of the NASU. In 1974, a son, Bogdan, was born. Unfortunately, in 1980, the wife of Petro Mykhailovych died, and he started to bring up his six-year-old son alone.

In 1980, P.M. Tomchuk was awarded the rank of professor and, in 1997, the title "Honored worker of science and engineering of Ukraine". In 2000, he was elected the corresponding member of the NASU. P.M. Tomchuk is the winner of the State Prizes of Ukraine in science and engineering (in 1986 and 1995). In addition, he was awarded the honorary degree Doctor Honoris Causa by Yu. Fed'kovich National University of Chernivtsi (in 2009) and M.M. Bogolyubov Institute for Theoretical Physics of the NASU (Kyiv, in 2013).

P.M. Tomchuk is a physicist-theorist with a very broad scope of interest. His works span a number of different scientific directions such as the physics of semiconductors, metals, liquid crystals, and biological molecular structures. The main scientific achievements of Petro Mykhailovych can be grouped into the following four directions.

1. Metal nanoparticles and their ensembles. The concept of hot electrons in metal nanoparticles was proposed, substantiated, and applied for the explanation of specific effects. It was used as a basis to develop the theory of nonlinear current-voltage char-

acteristics, as well as the theory of electron and photon emission from island metal films at the current- or laser-induced electron heating (the State Prize in 1986).

The theory of optical absorption by small metal particles was elaborated. An abnormally high sensitivity of absorption by metal nanoparticles in the infra-red frequency range to their shape was demonstrated. The dependence of the plasma resonance width on the shape of metal nanoparticles, as well as the character of forces acting on those particles in a laser beam, was established, which composed the essence of the theory of electron–lattice energy exchange in metal nanoparticles. The theory was developed for the electron–lattice energy exchange both in the bulk and on the surface of nanoparticles. Specific features of the energy exchange were revealed for nanoparticles with dimensions smaller than the mean free path of electron in the bulk metal.

The results obtained by P.M. Tomchuk in the nanophysics domain attracted large attention and are widely cited in the international scientific literature.

2. Semiconductors. The theory of nonequilibrium transport and fluctuation processes in semiconductors with different band structures, in which electron-electron (hole-hole) collisions dominate, was developed. The theory of superlattices on hot electrons in multivalley semiconductors and hot magnons in ferromagnetic semiconductors was built. An analytical method for the calculation of fluctuations and the intensity of wave scattering by fluctuations in nonequilibrium electron-phonon systems was elaborated. A new method was proposed to determine the light absorption (emission) by free electrons in multivalley semiconductors; the method is based on the application of the derived kinetic equation, in which the influence of an electromagnetic wave on the scattering event is considered in the collision integral. The method was used as a basis to construct the theory of polarization dependences for the spontaneous radiation emitted by hot electrons in semiconductors of the n-Ge and n-Si types.

A physical model was proposed and the corresponding theory was developed to describe the degradation in photodiodes (the State Prize in 1995).

The theory of opto-acoustic effect in transparent matrices with opaque clusters was elaborated.

3. Liquid crystals. A new method was proposed and, on its basis, the theory of dissipative structures in liquid crystals (the theory of a liquid crystal containing macroclusters) was developed. The theory allowed known supermolecular structures induced in the liquid crystal by introduced macroclusters to be explained and new ones to be predicted. A number of novel physical effects were predicted, which were afterward confirmed experimentally; in particular, these are the "orientation" mechanism of effective ion mass formation in the liquid crystal and the anomalously high quantum yield of photo-ionization of an impurity in the liquid crystal.

4. Chain molecular structures with hydrogen bonds. The model of protonic polaron was proposed, and the theory of proton conductivity along molecular chains with hydrogen bonds was built (the theory of coherent tunnel repolarization in those chain structures). The theory of transmembrane proton transfer in biological membranes was proposed.

P.M. Tomchuk carries out a large work dealing with scientific training and scientific management. In particular, 16 of his disciples defended their Ph.D. theses, in which he was a supervisor, and seven of them became Doctors of Science. Petro Mykhailovych made a large contribution to the certification of a highly skilled scientific staff. From 1993 till 1996 and from 2002 till 2005, P.M. Tomchuk was the Head of the Expert council in physics at the Higher Attestation Commission of Ukraine.

The characteristic feature of P.M. Tomchuk as a theorist is to jointly work with experimenters. A considerable number of his works were executed in the coauthorship with physicists-experimenters. P.M. Tomchuk published three monographs and more than 230 articles in the scientific domestic and international journals.

Petro Mykhailovych is a person with a high sense of civic responsibility. The human values that are highly appreciated by everybody are inherent to him.

We congratulate Petro Mykhailovych Tomchuk on the occasion of the 80-th anniversary of his birthday and sincerely wish him a strong health, creative inspiration, and well-being.

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