

## Igor Mikhailovich Dmitrenko (1928–2009): On the 90th anniversary of his birth

Fiz. Nizk. Temp. **44**, 219–220 (March 2018)

<https://doi.org/10.1063/1.5024530>



This special issue of the *Journal of Low Temperature Physics* is dedicated to the memory of a well-known scientist in the area of experimental physics and Academician of the National Academy of Sciences of Ukraine: Igor Mikhailovich Dmitrenko, on the 90th anniversary of his birth. I. M. Dmitrenko made significant achievements in the fields of solid-state physics, low-temperature electronics, and superconductivity throughout his career.

I. M. Dmitrenko began his scientific studies in the area of solid-state physics at low temperatures under the supervision of Academician B. G. Lazarev (in 1953–1960) at the world-famous Ukrainian Institute of Physics and Technology (UIPT). In 1958, I. M. Dmitrenko defended his Ph.D. thesis “Effect of triaxial compression on magnetic properties of metals at low temperatures”. In 1959, together with B. I. Verkin and A. A. Galkin, he joined the initiative group for establishment of the Institute of Low Temperature Physics and Technology of the Academy of Sciences of the Ukrainian Soviet Socialist Republic (ILTPT). One year later, Igor Mikhailovich headed the Department of Superconducting Electronics (later renamed the Department of Superconducting and Mesoscopic Structures) in the created Institute. During the formative years of the Institute and Department (1960–1966), I. M. Dmitrenko organized and supervised research in a number of novel scientific fields: low superconductivity including Josephson tunneling and quantum interference, superconducting detectors of infrared radiation (bolometers), super-high frequency studies of superconductors, and cryogenic thermometry. He identified and engaged talented research leaders for groups working in these fields to achieve significant results. The nonstationary Josephson effect (group headed by I. K. Yanson) and a new type of quantum interference without direct current through an interferometer, caused by the detection of external electromagnetic field (group headed by S. I. Bondarenko), were discovered, and an increase in the critical current of the superconducting weak coupling under the effect of external

super-high frequency radiation (team headed by V. M. Dmitriev) was reported. Highly sensitive bolometers (group headed by V. A. Konovodchenko) and small cryogenic thermometers (group headed by S. P. Logvinenko) were developed for the first time. Visits from well-known foreign scientists such as B. Taylor and D. Langenberg from the USA and G. Albrecht and V. Richter from the German Democratic Republic to the Department, as well as the invitation of I. M. Dmitrenko to Leiden by the famous Dutch scientist B. Oboter, and participation of scientists of the Department in numerous international conferences on superconductivity and cryogenics are considered an international acknowledgement of the achievements of the Department under the leadership of I. M. Dmitrenko.

Further, scientists from the nation’s leading institutions were frequent guests of the department.

In 2000, a research group under the supervision of Professor I. M. Dmitrenko was awarded the State Prize of Ukraine for the series of scientific works “Superconductivity induced by alternating magnetic field and phase slip processes in thin films of superconductors including high-temperature superconductors”.

I. M. Dmitrenko focused on the application of research findings obtained by scientists of the Department to the real-life problems of modern technology. In 1971, departments of applied research in the fields of superconducting bolometric systems, quantum magnetometry based on superconducting interferometers, super-high frequency superconducting resonance systems, and cryogenic thermometers were created via his collaboration with several scientific groups of the department in the Special Design and Technology Bureau (SDTB) of the ILTPT. The research carried out by these departments made a significant contribution to the national economy and defense.

In addition to playing an active role in the development of low-temperature science and technology at the ILTPT, I. M. Dmitrenko, as a well-known specialist in the field of low-temperature electronics, participated in the establishment of the Industrial Low-Temperature Scientific Research Institute “Saturn” (Kiev), which is the only one of its kind in the country.

During his fruitful scientific career (1960–1991), he became a Doctor of Physical and Mathematical Sciences (1970), Corresponding Member (1978) and then an Academician (1988) of the Academy of Sciences of Ukraine, as well as an honored worker in science and technology of Ukraine.

An important area of his research interests was physical processes occurring in weak superconducting contacts with metallic conductivity, and in superconducting films upon their transition from the superconducting state to the general state (resistive transition region). I. M. Dmitrenko, together with collaborators of the Department, made a significant

contribution towards understanding the resistive state in superconductors. Novel physical concepts such as phase slip centers and lines and flow of individual Abrikosov vortices through weak superconducting contacts were added to the lexicon as a result of their efforts and experimental skills. Significant scientific achievements in the field of classical and quantum dynamics of superconducting interferometers, which form the basis of SQUIDs, were made under his supervision.

I. M. Dmitrenko initiated new directions of research in the field of biomagnetism using highly sensitive magnetometric devices known as SQUIDs. The design and production of radio-transparent fiberglass thermostatic coolers for investigation of the magnetic activity of the human heart and brain were carried out at the ILTPT under his leadership.

With the advent of high-temperature superconductors (HTS), I. M. Dmitrenko actively began investigation in this area, and made significant attempts to equip the institute and department with most recent technology for the diagnostics and manufacturing of HTS film structures.

Professor I. M. Dmitrenko significantly contributed to the promotion of science of superconductivity and cryo-

genics, and published a number of papers on various aspects of superconductivity and its application. In 1975, upon his initiative, the Department of Physics and Technology, with the basic division "Technical cryophysics" and its branch in the ILTPT were created at the Kharkiv Polytechnic Institute.

Until late in life, I. M. Dmitrenko showed a keen interest in scientific achievements in the field of physics and, in particular, superconductivity. More than two hundred specialists of various backgrounds worked under his supervision over the course of his scientific career: 16 Ph.D. and 8 D.Sci. thesis were defended, and his students continue to expand and develop his ideas.

The special issue includes results of studies in scientific areas associated with the field of superconductivity, to which I. M. Dmitrenko successfully contributed for many years.

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Translated by CWG