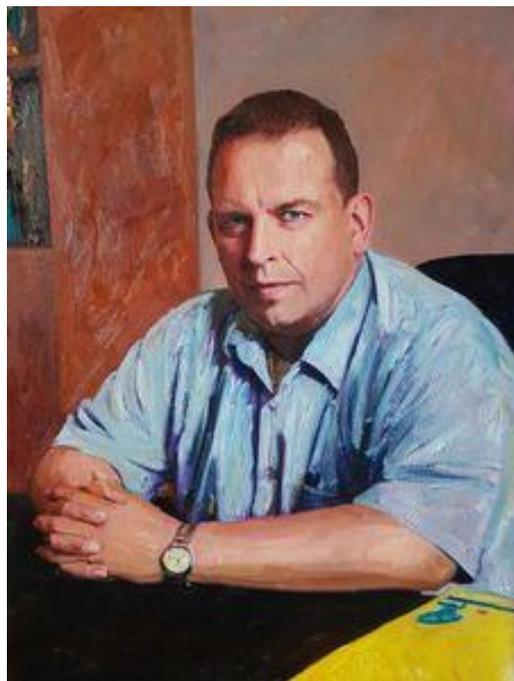


Academician of the National Academy of Sciences of Ukraine
Ruslan Vovk
(to the 60th birthday)



The Special Issue of the journal is dedicated to the 60th anniversary of the birth of the famous Ukrainian physicist, Academician of the National Academy of Sciences of Ukraine Ruslan Volodymyrovych Vovk, a representative of the world-famous Kharkiv school of low-temperature physics. At one time, the founding fathers of this scientific school were such prominent scientists as L. V. Shubnikov, B. G. Lazarev, B. I. Verkin, and V. G. Khotkevych.

Ruslan Volodymyrovych Vovk was born in 1966 in the city of Zmiiv, Kharkiv region, into a family of artists. In 1983, he graduated from the 10th grade of Zmiiv Secondary School No. 2 with a gold medal and entered the Faculty of Physics of Kharkiv National University (KhNU), with which his whole life was later connected. After completing his military service, he resumed his studies at the Faculty of Physics. In his third year, he was invited by his first scientific supervisor, Associate Professor Balla Dionysii Dionysievich, to work at the Department of Low Temperature Physics (DLTP), where he went all the way from engineer to professor, dean of the Faculty of Physics.

The beginning of R. V. Vovk's scientific activity practically coincided with the discovery of the unique phenomenon of high-temperature superconductivity (HTSC). At the DLTP of KhNU, high-quality single crystals of the HTSC compound (or cuprates) $\text{Re}_1\text{Ba}_2\text{Cu}_3\text{O}_{7-\delta}$ (Re = Y or other lanthanides) were synthesized for the first time in Ukraine and one of the first in the world, which, with its critical temperature $T_c = 90$ K, first exceeded the boiling point of liquid nitrogen (77.4 K). R. V. Vovk, as part of a scientific group led by professors O. V. Bondarenko and M. O. Obolensky, actively participated in the study of the processes of transfer and dynamics of magnetic flux in HTSC compounds with different morphologies of the defect structure. He participated in two special NATO

projects (1995–1999). He was twice a laureate of the personal scholarship of the Cabinet of Ministers of Ukraine for young scientists (1994–1996 and 1998–2000). He obtained many outstanding scientific results, in particular, he first discovered the phenomenon of upward diffusion in HTSC materials under the action of high pressure, studied the influence of several extreme external factors on pseudogap and fluctuation anomalies, as well as incoherent electrical transport in non-stoichiometric cuprates. In 1998, he defended his dissertation for the degree of Candidate of Physical and Mathematical Sciences in the specialty “superconductivity” at the B. I. Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine.

From 2002 to 2004, R. V. Vovk underwent a scientific internship in the world-famous Quantum Liquids group at the University of Exeter (Great Britain) under the leadership of Royal Academician A. F. J. Wiatt, who closely collaborated with the Kharkiv group of theoretical physicists under the leadership of Prof. I. M. Adamenko.

During his internship, he managed to develop the scientific foundations of a new direction in low and ultralow temperature physics: the dynamics of subsystems of quasiparticle excitations under conditions of kinematic anisotropy. He was the first in the world to develop an experimental technology for the separate detection of high- and low-energy phonons in superfluid quantum liquids. He established the regularities of the generation of “hot” h -phonons. He proposed and implemented for the first time a method for studying the processes of interaction of several independent phonon beams during their collision in superfluid ^4He (including at elevated pressure). He discovered the phenomenon of “hot line” generation at ultralow temperatures. For a series of works on this topic, the “Quantum Liquids” group was awarded the Holweck Gold Medal in 2004.

After returning from the UK, he continued his scientific work in close collaboration with leading European scientific teams. In 2014, a group of British and Ukrainian scientists proposed the idea of modulating spin waves in ferromagnets by the subsystem of Abrikosov vortices, and vice versa, regulating the dynamics of the magnetic flux in superconductors by a “magnon coat” within the framework of the “NoWaFen” project (“Novel wave phenomena in magnetic micro- and nanostructures”), the head of which, from the Ukrainian side, was Professor R. V. Vovk. This idea received its experimental embodiment in Ukrainian-German experiments in the study of unique metamaterials with a given pinning potential in the form of a “washboard” created by nanomilling of samples in a scanning tunneling microscope. In the same year, V. N. Karazin Kharkiv National University was awarded a grant in the International Research Academic Exchange Program (IRSES) Horizon 2020 within the framework of the “MagIC” project, the coordinator of which from the Kharkiv region was Prof. R. V. Vovk. As a result of fruitful cooperation with European scientists, he laid the foundations of one of the most promising new directions in modern solid-state physics, i.e., the physics of fluxon-magnon heterostructures. Based on the results of the experiments, a series of pioneering works was published in the leading publishing house Nature, co-authored by Professor R. V. Vovk. The discovery of a magnon superconducting crystal was especially notable. The corresponding report, which was presented by Professor R. V. Vovk and co-authors at the international conference on magnetism held in August 2017 at St. Magdalene College, Oxford University (Great Britain), caused great resonance among the world scientific community.

It is worth noting the work in the field of materials science, carried out by R.V. Vovk in close cooperation with the group of Professor E. S. Hevorkian. In particular, they obtained unique materials for orthopedics based on MAX-phases with a hydroxylapatite coating, which are distinguished by excellent performance characteristics, high resistance to bacteria, and many times lower cost compared to foreign analogues.

Prediction of structural and a number of other physical characteristics of new materials of multifunctional purpose is carried out by the scientific group of R. V. Vovk in close collaboration with the scientific group of Professor Alex Chroneos from Imperial College (Great Britain) and the University of Volos (Greece). Based on the results of these studies, they have published about 50 scientific papers in leading international scientific publications.

It should also be noted that Professor R. V. Vovk has been working part-time at the Department of Physics of the Ukrainian State Railway Transport (UkrSRT) for more than 25 years. During these years, he was the founder and first head of the Department of “General Technical Disciplines” of the Krasnolymansk branch of UkrSRT, and also for ten years, the head of the Department of Physics. Under his leadership, several applied and fundamental research works were carried out at the department. The obtained scientific results have undoubted practical value and can be used in optimizing the defect structure of high-current HTSC devices, providing components for manufacturing and testing memory cells, ultrasensitive reading elements, and ultra-high-speed communication lines based on HTSC, which allow for increasing

the speed and degree of integration of computing equipment many times and significantly reducing energy consumption compared to semiconductor analogues. Practical recommendations were also developed for using the obtained scientific results in creating the latest models of electrical equipment for railway transport.

After returning from the UK and defending his doctoral dissertation in 2008 (scientific consultant M. O. Obolensky) in the specialty “low temperature physics” at the B. I. Verkin Institute for Low Temperature Physics and Engineering of the NAS of Ukraine, R. V. Vovk founded a scientific school in high-pressure physics and extreme states of matter, which has been fruitfully working at the Faculty of Physics of the V. N. Karazin KhNU to this day. The main areas of scientific research of this school are: study of the topological features of the Fermi surface of transition metal dichalcogenides under the action of high uniaxial pressure (up to 8 kbar); study of the influence of high hydrostatic pressure (up to 25 kbar) on pseudogap and fluctuation anomalies, as well as incoherent electrical transport in non-stoichiometric HTSC cuprates; study of the effect of radiation exposure on topological phase transitions in the latest multifunctional materials; study of the extreme state of matter, in particular superconductivity and superfluidity at low and ultralow temperatures, as well as the influence of structural and kinematic anisotropy on the evolution of quasiparticle subsystems in quantum environments of various morphology under the action of extreme external factors.

Under his scientific supervision, more than 20 doctoral and candidate theses have been defended and are at various stages of preparation for defense, including citizens of the European Community (Greece) and the People’s Republic of China.

Over the years of his scientific work, he has published more than 500 scientific articles, of which about 400 are included in the Scopus scientometric database with over 5,000 citations. He is also the co-author of over 30 patents, three monographs, and several teaching, methodological, and educational manuals, including the four-part “General Course of Physics”. He is the editor-in-chief of 2 scientific journals and a member of the editorial board of 4 international physics publications. In 2017 and 2021, R. V. Vovk was unanimously elected as a member of the scientific committee from Ukraine in the European Organization for Cooperation in Science and Technology (COST). He has been a member of the Scientific Committee of the National Council for the Development of Science and Technology of Ukraine since 2023. In 2021, he was elected a corresponding member of the NAS of Ukraine. In 2024, Ruslan Volodymyrovych became an academician of the NAS of Ukraine.

For his outstanding achievements in scientific and pedagogical work, he has received numerous state and industry awards, among which it is worth noting the V. N. Karazin Medal, the Order of Merit of the III degree, as well as the L. V. Shubnikov Prize and the B. I. Verkin Prize of the NAS of Ukraine.

We congratulate Academician Ruslan Vovk on his anniversary and wish him good health, tirelessness, inspiration, and continued creative success.

*G. Ya. Khadjai
A. L. Solovjov
V. F. Korshak*