

In memory of Vladimir Ivanovich Mel'nikov

Russian physics has borne a heavy loss. The life of Vladimir Ivanovich Mel'nikov, a talented theoretician of physics and a magnificent man, was tragically cut short on January 11, 1996. Nearly 30 years of his life were associated with the L D Landau Institute for Theoretical Physics, where he performed his finest works, which received international fame and recognition.

V I Mel'nikov was born on February 20, 1941 in the city of Morozovsk, in the Rostov region, to a family of teachers. His father taught history, while his mother taught physics and mathematics. This last circumstance seems to have made an impact, that V I Mel'nikov entered the Faculty of Physics at the Rostov State University after graduating from High School in 1959. He displayed interest in theoretical physics at the Kiev State University, where he transferred after completing his fourth year of college study. V I Mel'nikov graduated from the Kiev State University in 1964 with a major in 'theoretical physics' and began to work at the Institute of Semiconductors of the Ukrainian Academy of Sciences. Doctor Z S Gribnikov exerted a great influence in the man's path towards becoming a scientist. In 1967, V I Mel'nikov successfully defended his candidate's dissertation and was invited to Chernogolovka, to the recently established Institute for Theoretical Physics of the Academy of Sciences of the USSR. Thus a new period began which was to be the most important and productive of his entire life.

During those years the Institute for Theoretical Physics was truly unique. It had maintained the traditions of the well-known theoretical department of L D Landau at the Institute of Physical Problems, specifically the high level of demands for the quality of works. Already the first researches undertaken by V I Mel'nikov in this institute won him the reputation of a profound and original theoretician of physics. There were many gifted physicists at the Institute for Theoretical Physics at that time and V I Mel'nikov rightfully took his place amongst them. In 1978 he brilliantly defended his doctoral dissertation entitled "The Non-Standard Kinetics of Electrons — Effects of Localization and Auto-localization".

During his lifetime V I Mel'nikov wrote over 70 scientific publications. It would be difficult to give the full overview of his scientific activity due to the great breadth and variety of his scientific interests. Thus, for the sake of convenience, it is advisable to divide all his papers into cycles which are linked by a common topics. There are more than 10 such cycles. The most interesting of them will now be outlined.

V I Mel'nikov began his scientific investigations with papers about the properties of hot electrons injected into



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heterojunctions. These researches formed the basis of his candidate's dissertation. They were continued by investigations performed at the Institute for Theoretical Physics on the theory of the Gunn effect in semiconductors and on electron kinetics in a high-frequency field. This latter topic was very much in vogue at the time due to researches on the interaction of high-power laser radiation with matter. V I Mel'nikov derived a quantum kinetic equation which describes the interaction of an electron with a high-frequency external field. This equation (discussed later by other authors) was used by him in researches on the interaction of electrons with hypersound, for description of the distribution of photoelectrons, for account of the influence of impurities and the effects of localization on combined resonance in semiconductors.

The third research cycle is devoted to energy spectrum and particle mobility in autolocalized states. It includes articles on polaron-phonon and exciton-phonon complexes, well-known papers on polaron mobility in strong coupling limit and publications on the mobility of a negative ion in ^3He .

One of the most important achievements of V I Mel'nikov was a set of publications on the generalization of the theory of one-dimensional localization of electrons in disordered systems on the case of finite temperatures, taking into account the interaction of carriers both with impurities and real phonons. Developed theory made it possible to understand anomalies of conductivity in organic conductors such as TCNQ. This cycle also includes researches on the influence of impurities on the phase transitions in quasi-one-dimensional conductors. These works formed the core of his doctoral dissertation. After defending the dissertation he continued researches into the finite disordered systems, where he managed to find an exact solution to the task of statistical distribution of resistances.

Special mention should also be made of research by V I Mel'nikov on stability of the charged surface of liquid helium, in which he has showed that this surface is unstable in relation to formation of hexagonal moon-shaped structures.

Another research cycle involves studying the role of magnetic impurities in quasi-magnetic metals and the contribution of paramagnons in ^3He free energy. Specifically, he found an original approach and solved a system of nonlinear integral equations derived in the framework of the Bethe's ansatz and which describes the thermodynamics of the Kondo model. This solution was later reproduced in a set of publications using powerful computers.

Also noteworthy is a series of elegant writings by V I Mel'nikov in which he obtained an exact solution of the Kramers well-known problem about the influence of viscosity and temperature on quantum tunnelling. They are supplemented by research concerning a resonance amplification of quantum tunnelling by an external high-frequency field. He also solved the important task of selecting the growth speeds of needle-shaped dendrites. In his later years V I Mel'nikov worked intensively on tasks relating to mesoscopy, especially the properties of electrons in quantum drops.

V I Mel'nikov was bright and active and successfully co-authored many publications. He devoted much time to his young colleagues, helping them find their way in science. Acknowledged as a specialist in the field of solid state theory, he was a de facto unlisted associate of the Institute of Solid State Physics in Chernogolovka, where he was actively engaged in the theory department. He wrote a great deal papers with the young researchers at the Institute of Solid State Physics and this collaboration turned out to be an excellent scientific workshop for them.

V I Mel'nikov made great demands of himself. He used to say that a Master is one whose works are so perfect that there is no room for their improvement. He strove for this ideal in his writings and this is why they are distinguished by such clarity of intent, unorthodox approach and completeness of solution. He had good taste and only tackled intellectually challenging problems.

His personal life was no less intense or multi-faceted. It would be difficult to find such area of interests which did not elicit the attention of V I Mel'nikov. He was fond of literature and poetry, enjoyed studying European languages (English, German, French, Italian, Polish, Hungarian) and even Japanese and was able to write and speak these languages (he was the scientific editor of a Japanese-Russian Physics dictionary). He was responsive and reliable, always willing to

answer any call for help. V I Mel'nikov possessed a natural talent in communicating with people and had many friends. He raised two children by whom he was greatly loved.

We, his colleagues and friends will sorely miss him. His shining memory will remain with us forever.

*S I Anisimov, S A Bulgadaev, G E Volovik,
V E Zakharov, A I Larkin, V I Marchenko,
V P Mineev, Yu N Ovchinnikov,
Yu A Osip'yan, L P Pitaevskii,
É I Rashba, L A Fal'kovskii, I M Khalatnikov*