The 2020 Fritz London Memorial Prize Winners

Valerii Vinokur
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https://www.anl.gov/profile/valerii-vinokour

Citation: *"The Fritz London Memorial Prize is awarded to V. Vinokur in recognition of his pioneering work on the theoretical investigation of superconductivity in disordered materials and type II superconductivity."*

Valerii Vinokur is a Senior Scientist and Argonne Distinguished Fellow at Argonne National Laboratory. He is a Foreign Member of the National Norwegian Academy of Science and Letters and Fellow of the American Physical Society.

He finished his BSc in Physics of Metals at Moscow Institute of Steel and Alloys in 1972 and moved to the Institute of Solid State Physics, Chernogolovka, Russia, where he

received a Ph.D. in physics in 1979, working with Vladimir Kravchenko. He continued research there on dislocation physics, charge density waves, and vortices in high-temperature superconductors until 1990.

In 1990 Vinokur accepted his current appointment at Argonne National Laboratory. He has also held appointments as Visiting Scientist at CNRS, Grenoble (1987), Visiting Scientist at Leiden University (1989), Visiting Scientist at ETH-Zürich (1990), and as Visiting Director of Research at Ecole Normale Superieure, Paris (1996).

Vinokur has made foundational contributions in enriching our understanding of the vortex state in type II superconductors. With Lev Ioffe he developed a theory of glassy dynamics of extended topological defects (1987), laying the foundation for a theory of glassy vortex dynamics (developed with Dima Geshkenbein, Mikhail Feigelman, and Anatoly Larkin, 1989). In 1994 Vinokur put forth a theory of the dynamic melting (with Alexey Koshelev), which in 1998, enabled him to introduce a concept of the disorder-induced melting of the vortex lattice. With David Nelson he constructed a theory of the vortex Bose glass and predicted vortex Mott insulator (1993). In 2015 in collaboration with experimental group from Twente University, using a non-Hermitian Hamiltonian approach to non-equilibrium physics in dissipative systems, he constructed a theory of the dynamic vortex Mott transition. In 2008 with Tatyana Baturina and experimentalists, Alexey Mironov and Christoph Strunk, he discovered and explained the new state of matter, superinsulator, the mirror dual to superconductivity, in disordered superconducting films.

In 2018 Vinokur (with Christina Diamantini and Carlo Trugenberger) constructed the topological gauge theory of the superconductor-insulator transition and the gauge theory of confinement in the superinsulating state and established the mapping of quarks in hadrons onto Cooper pairs. This mapping revealed that the mechanism of superinsulation is the linear binding of Cooper pairs into neutral “mesons” by electric strings, in the same way as quarks are confined within hadrons.

In 2003 Vinokur shared the International John Bardeen Prize for contribution to physics of the vortex matter and also received the Alexander von Humboldt Research Award. In 2017 Vinokur shared the International Abrikosov Prize for the development of pioneering concepts describing vortex matter in type II superconductors.