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Professor Igor Lerner MSc, PhD, FInstP

Professor of Theoretical Physics

School of Physics and Astronomy (/schools/physics/index.aspx)

Contact details

Telephone +44 (0) 414 4574 (tel:+44 414 4574)

Fax +44 (0) 121 414 4693

Email i.v.lerner@bham.ac.uk (mailto:i.v.lerner@bham.ac.uk)

School of Physics and Astronomy
University of Birmingham
Edgbaston
Birmingham
B15 2TT
UK

About

Igor Lerner has published about 100 research papers in scientific journals, as well as reviews and book chapters, mostly in theory of interacting electrons in mesoscopic and nanoscale systems. His current research activity includes applications of methods developed in condensed matter theory to other fields (e.g., statistical physics of complex networks, including the Internet; quantum optics, etc).

Qualifications

- Fellow of Institute of Physics, London, 2003
- PhD in theoretical physics, Levedev's Institute of Physics, USSR Academy of Sciences, Moscow, 1981
- MSc Cum Laude in physics, Moscow Institute of Physics and Technology, 1977

Biography

Igor Lerner obtained his PhD in Moscow, from Levedev's Institute of Physics, USSR Academy of Sciences, in 1981, on physics of two-dimensional electron systems in strong magnetic fields – with results published over 1977-81 in more than a dozen papers in leading scientific journals (which are still widely cited). Although this subject became extremely topical after a celebrated discovery of the Quantum Hall Effect in 1980 (too late to bear any impact on Igor's PhD), Igor's research interests shifted to another newly emerged area – physics of electrons in mesoscopic (and later nanoscale) systems.

After enjoying 14 fruitful years as a research fellow at the Institute of Spectroscopy (USSR Academy of Sciences) and a year-long spell as a Humboldt fellow at the Max-Planck Institute in Heidelberg (Germany), Igor became a member of the permanent academic staff in the School of Physics and Astronomy at the University of Birmingham.

While continuing research in the physics of strongly correlated electrons in meso- and nanoscopic systems, Prof Lerner became interested in applying field-theoretical methods developed in that context to other area of research, such as physics of complex networks, quantum optics, physics of cold atoms. His research was supported by numerous grants, including six major grants from the EPSRC and one from the Leverhulme trust.

Teaching

- Teaching Programmes
- Y3 Quantum Mechanics 3
- Y4 General Theory of Relativity
- Y4 Phase Transitions and Critical Phenomena
- Y4 Project Supervision

Postgraduate supervision

- After joining the University of Birmingham, Prof Lerner has supervised about 20 PhD students, with projects in different areas of condensed matter theory.
- For currently offered projects, visit the Theoretical Physics home page

Research

RESEARCH THEMES

Interacting electrons in meso- and nanoscopic systems; strongly correlated systems; classical and quantum models of disorder; quantum chaos and level statistics; carbon-based nanoelectronics (nanotubes and graphene); traffic in complex networks; quantum entanglement in electronics and optics

RESEARCH ACTIVITY

- Invited talks and lectures at more than 70 International conferences and workshops.
- Senior visiting fellowships at and extended research visits to numerous leading universities and research centres, including Princeton University, Columbia University

(NY), University of Minnesota, Argonne National Laboratory (USA); Institute for Advanced studies (Wissenschaftskolleg), Berlin, Max-Planck Institutes in Heidelberg and Dresden (Germany); International Centre for Theoretical Physics,Trieste, and Scuola Normale, Pisa (Italy); Weizmann Institute .of Science, Rehovot, (Israel); Ecoles Normale Superiore, Paris; and many others.

- Participation in numerous extended research programmes, including those conducted at the KITP, Santa Barbara; Institute of Nuclear Theory, University of Washington; ICTP, Trieste; Max-Planck Institute, Dresden; Newton Institute, Cambridge.
- Organisation (as a chairperson or co-organiser) of about 20 international conferences or workshops.

Publications

- Galda, A., Yurkevich, I.V., Lerner, I.V. (2011). Impurity Scattering in Luttinger Liquid with Electron-Phonon Coupling, Phys. Rev. B 83, 041106(R)
- Baldwin, J., Yurkevich, I.V., Lerner, I.V., Altshuler, B.L. (2010). Decoherence of charge qubit coupled to interacting background charges, Phys. Rev. B 82, 030103(R)
- Altshuler, B.L., Kravtsov, V.E., Lerner, I.V., Aleiner, I.L. (2009). Jumps in current-voltage characteristics in disordered films, Phys. Rev. Lett. 102, 176803
- Kechedzhi, K., Horsell, D. W., Tikhonenko, F. V., Savchenko, A. K., Gorbachev, R. V., Lerner, Fal'ko, V. I. (2009) Quantum Transport Thermometry for Electrons in Graphene, Phys. Rev. Lett. 102, 066801
- Lerner, I. V., Yudson, V. I., Yurkevich, I. V. (2008) Quantum wire hybridized with a single-level impurity, Phys. Rev. Lett. 100, 256805
- Lerner, I.V., Varlamov, A. A., Vinokur, V. M. (2008) Fluctuation spectroscopy of granularity in superconducting structures, Phys. Rev. Lett.100, 117003
- Stepanenko, A.S., Constantinou, C.C., Yurkevich, I.V., Lerner, I.V. Temporal correlations of local network losses, Phys. Rev. E 77, 046115
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