

CURRICULUM VITAE

Personal

Born: January 1, 1947, Moscow, Russia
Citizenship: Russia
Marital status: Married, 2 sons
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 Electrodynamics (ITAE),
 Russian Academy of Sciences,
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Education

January 27, 1970: Physicist (M.Sc.), Physics Department, Moscow State University
Thesis title "Threshold phenomena in classical electrodynamics"
 November 28, 1977: Candidate of Physics and Mathematics (Ph.D.)
 P.N. Lebedev Physics Institute, USSR Acad. Sci., Moscow
Thesis title "Orbital degeneracy in magnetic insulators"

Experience

April 1970- April 1973: Post-graduate student, Theoretical Physics Department
 P.N. Lebedev Physics Institute, USSR Acad. Sci., Moscow
 1973-1980: Junior researcher, Solid State Thermophysics Department,
 Institute for High Temperatures, Russian Acad. Sci. (IVTAN),
 Moscow
 1980-1987: Research scientist
 Solid State Thermophysics Department, IVTAN
 1987-1989: Senior researcher
 Solid State Thermophysics Department, IVTAN
 1989-1993: Senior researcher
 Solid State Theory Division, IVTAN
 1993- present time: Senior researcher and then Leading researcher
 Institute for Theoretical and Applied Electrodynamics (ITAE),
 Russian Acad. Sci., Moscow

Research interests and achievements

Theory of condensed matter: electronic structure of metals, magnetism, superconductivity, electrodynamics of composites. The main field of research during last 5 years is the phase separation phenomena and superstructure formation in strongly correlated electron systems, such as manganites, cobaltites, cuprates, and graphene.

A short summary the main achievements:

1) The theory of magnetic and crystal structure in magnetic oxides with orbital degeneracy, the Kugel-Khomskii model, (1972-1985); 2) the theory of quantum phase transitions in neutron stars (1973-1978); 3) the calculation method for electronic structure and electrical properties of refractory metals and composite materials (1978-1985); 4) the theory of phase transition in liquid sulfur and other inorganic polymer materials (1982-1989); 5) the description of electrodynamics of type-II superconductors with systems of planar and point defects (1992-2000); 6) the theoretical description of magnetoresistance, $1/f$ noise, and magnetic susceptibility in nanoscale metal-insulator mixtures, including phase-separated

materials with colossal magnetoresistance (2000-2004); 7) the theoretical analysis of phase separation and superstructures in magnetic oxides (1997-2012); 8) the explanation of the giant isotope effect in phase-separated manganites and cobaltites (1998-2013), 9) analysis of inhomogeneous states in heterostructures based on dilute magnetic semiconductors (2011-2013), 10) theoretical description of structural distortions and related phenomena in graphene, as well as the behavior of graphene in strong electromagnetic field (2010-2013); 11) Analysis of inhomogeneous structures and the possible mechanisms of the phase separation in iron pnictides and other iron-based superconductors (2012-2013).

Publications

A total about 350, including several highly cited review articles

Participation in national and international scientific meetings

A total about 200, including a large number of invited and plenary talks. A member of the Organizing Committee of about ten International Conferences during the last five years.

Citations

More than 2000 citations of the published papers, enters the list of the most highly cited scientists of the Russian Federation

Recent grants (2003-2012)

Grant RP2-2355-MO-02 of the U.S. Civilian Research & Development Foundation
Grants 01-2282 and 01-2008 of INTAS, the International Association for the promotion of cooperation with scientists from the New Independent States
Grant 047-008-017 of the Russian-Dutch Collaboration Program
Grants 02-02-16708, 03-02-16626, 05-02-17600, 08-02-00212, 11-02-00708, 11-02-00741, 12-02-00339 of the Russian Foundation for Basic Research
Grant SSc-1694.2003.2 of President of Russian Federation for Leading Scientific Schools
Grant ISVi - 2004/R2-FS of the Royal Society (London)
Grant G1335 of the International Science and Technology Center
Grants 06-02-91200-JaF, 09-02-92114-JaF, 12-02-92100-JaF of the Russian-Japanese collaboration Program
Grant NMP4-CT-2005-517039 under European project "Controlling Mesoscopic Phase Separation" (CoMePhS)
Grants 07-02-91567-DFG, 11-02-91335-DFG of the Russian-German collaboration Program
Grant 09-02-92675-Ind of the Russian-Indian collaboration Program
Grant 10-02-92600-RSoc of the Russian-British collaboration Program

Residence in Foreign Centers (2001-2012)

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| 2001 | Visiting Scientist , Newton Institute of Mathematical Sciences, University of Cambridge, UK |
| 2001, 2002 | Visiting Scientist , Materials Science Center, University of Groningen, The Netherlands |
| 2002, 2003, 2004, 2005, 2007, 2008, 2009, 2011, 2012 | Visiting Scientist , Department of Physics, Loughborough University, UK |
| 2007, 2008, 2009, 2011, 2012, 2013 | Visiting Scientist , Institute of Physics, University of Cologne, Germany |
| 2004 | Visiting Professor , Department of Applied Physics, University of Santiago de Compostela, Spain |
| 2009, 2010 | Visiting Scientist , Tata Institute for Fundamental Research, Mumbai, India |
| 2010 | Visiting Scientist , California State University, Los Angeles, USA |
| 2012, 2013 | Visiting Scientist , RIKEN, Advanced Science Institute, Japan |

Publications in refereed journals and books during last years (2007-2013)

1. K.I. Kugel, A.L. Rakhmanov, A.O. Sboychakov, "Electronic phase separation in magnetic oxides with Jahn-Teller ions", *Journal of Magnetism and Magnetic Materials*, 2007, v. 310, no. 2, pt. II, pp. 1024-1026.
2. A. O'Hare, F.V. Kusmartsev, K.I. Kugel, M.S. Laad, "Two-dimensional Ising model with competing interactions and its application to clusters and arrays of π -rings and adiabatic quantum computing", *Physical Review B*, 2007, v. 76, no. 6, id. 064528, 14 pages; arXiv:0705.1643.
3. A.O. Sboychakov, K.I. Kugel, and A.L. Rakhmanov, "Phase separation in a two-band model for strongly correlated electrons", *Physical Review B*, 2007, v. 76, no. 19, id. 195113 (6 pages).
4. K.I. Kugel, A.L. Rakhmanov, A.O. Sboychakov, M.Yu. Kagan, S.L. Ogarkov, "The structure of magnetic polarons in doped antiferromagnetic insulators", *Physica B: Condensed Matter*, 2008, v. 403, nos. 5-9, pp. 1353-1355.
5. K.I. Kugel, A.L. Rakhmanov, A.O. Sboychakov, "Phase separation in strongly correlated electron systems with two types of charge carriers", *Physica B: Condensed Matter*, 2008, v. 403, nos. 5-9, pp. 1616-1618.
6. A.O. Sboychakov, Sergey Savel'ev, A.L. Rakhmanov, K.I. Kugel, and Franco Nori, "A mechanism for phase separation in cuprates and related multiband systems", *Physical Review B* 2008, v. 77, no. 22, id. 224504 (6 pages).
7. M.Yu. Kagan, S.L. Ogarkov, K.I. Kugel, A.O. Sboychakov, A.L. Rakhmanov, "Bound magnetic polarons with extended spin distortions on frustrated lattices", *Journal of Physics: Condensed Matter* 2008, v. 20, no. 42, id. 425214 (6 pages).
8. K.I. Kugel, A.L. Rakhmanov, A.O. Sboychakov, Nicola Poccia, Antonio Bianconi, "Model for phase separation controlled by doping and the internal chemical pressure in different cuprate superconductors", *Physical Review B* 2008, v 78, no. 16, id.165124 (7 pages).
9. K.I. Kugel, A.L. Rakhmanov, A.O. Sboychakov, D.I. Khomskii, "Doped orbitally ordered systems: Another case of phase separation", *Physical Review B* 2008, v. 78, no. 15, id. 155113 (7 pages).
10. N.A. Babushkina, A.N. Taldenkov, A.V. Inyushkin, A. Maignan, D.I. Khomskii, K.I. Kugel, "Effect of oxygen isotope substitution on charge ordering, magnetic and transport properties in $\text{Pr}_{0.5}\text{Ca}_{0.5}\text{MnO}_3$ doped by chromium and ruthenium", *Physical Review B* 2008, v 78, no. 21, id. 214432 (9 pages).
11. K.I. Kugel, A.L. Rakhmanov, A.O. Sboychakov, F.V. Kusmartsev, Nicola Poccia, and Antonio Bianconi, "A two-band model for the phase separation induced by the chemical mismatch pressure in different cuprate superconductors", *Superconductor Science and Technology* 2009, v. 22, no. 1, id. 014007 (7 pages).
12. A. O'Hare, F.V. Kusmartsev, K.I. Kugel "Two-dimensional Ising model with competing interactions as a model for interacting π -rings", *Acta Physica Polonica A* 2009, v. 115, no. 1, pp. 7-9.
13. K.I. Kugel, A.O. Sboychakov, and D.I. Khomskii, "Inhomogeneous states in strongly correlated electron systems with orbital degrees of freedom", *Journal of Superconductivity and Novel Magnetism* 2009, v. 22, no. 2, pp. 147-153.
14. A. O'Hare, F.V. Kusmartsev, K.I. Kugel, "Two-dimensional Ising model with competing interactions: Phase diagram and low-temperature remanent disorder", *Physical Review B* 2009, v. 79, no. 1, id. 014439 (8 pages).
15. N.A. Babushkina, A.N. Taldenkov, A.V. Inyushkin, A. Maignan, D.I. Khomskii, K.I. Kugel, "Oxygen isotope effect in Cr- and Ru-doped $\text{Pr}_{0.5}\text{Ca}_{0.5}\text{MnO}_3$ manganites", *Solid State Phenomena* 2009, v. 152-153, pp. 127-130.
16. A.O. Sboychakov, A.L. Rakhmanov, K.I. Kugel, D.I. Khomskii, "A model for phase separation in systems with orbital ordering", *Journal of Magnetism and Magnetic Materials* 2009, v. 321, no. 2, pp. 706-708.

17. A.O. Sboychakov, K.I. Kugel, A.L. Rakhmanov, D.I. Khomskii, "Phase separation in doped systems with spin-state transitions", *Physical Review B* 2009, v. 80, no. 2, id. 024423 (9 pages).
18. Anthony O'Hare, F.V. Kusmartsev, K.I. Kugel, "2D Ising model with competing interactions and its application to clusters and arrays of π -rings, grapheme, and adiabatic quantum computing", *International Journal of Modern Physics B* 2009, v. 23, no. 20-21. pp. 3951-3967.
19. N.A. Buznikov, I.T. Iakubov, A.L. Rakhmanov, K.I. Kugel, A.O. Sboychakov, "High-frequency response and voltage noise in magnetic nanocomposites", *International Journal of Modern Physics B* 2009, v. 23, no. 20-21. pp. 4216-4233.
21. A.O. Sboychakov, K.I. Kugel, A.L. Rakhmanov, D.I. Khomskii, "Phase separation in strongly correlated electron systems with spin-state transitions", *Journal of Physics: Conference Series* 2010, v. 200, no. 1, id 012174 (4 pages).
22. A.V. Kalinov, O.Yu. Gorbenko, A.N. Taldenkov, J. Rohrkamp, O. Heyer, S. Jodlauk, N.A. Babushkina, L.M. Fisher, A.R. Kaul, A.A. Kamenev, T.G. Kuzmova, D.I. Khomskii, K.I. Kugel, T. Lorenz, "Phase diagram and isotope effect in $(\text{Pr}_{1-y}\text{Eu}_y)_{0.7}\text{Ca}_{0.3}\text{CoO}_3$ cobaltites exhibiting spin-state transitions", *Physical Review B* 2010, v. 81, no. 13, id. 134427 (12 pages).
23. N.A. Babushkina, A.N. Taldenkov, A.V. Kalinov, L.M. Fisher, O.Yu. Gorbenko, T. Lorenz, D.I. Khomskii, K.I. Kugel, "Isotope effect and characteristic features of the phase diagram for cobaltites with spin-state transitions", *Zh. Eksp. Teor Fiz.* 2010, v. 138, no. 2, pp. 215-220. [*JETP*, 2010, v. 111, no. 2].
24. A.O. Sboychakov, A.L. Rakhmanov, K.I. Kugel, "Effect of electron-lattice interaction on the phase separation in strongly correlated electron systems with two types of charge carriers", *Journal of Physics: Condensed Matter*, 2010, v. 22, no. 41, id. 415601 (7 pages); arXiv:0911.4401.
25. N.A. Babushkina, A.N. Taldenkov, A.V. Kalinov, L.M. Fisher, O.Yu. Gorbenko, J. Rohrkamp, T. Lorenz, D.I. Khomskii, K.I. Kugel, "Phase diagram and isotope effect in cobaltites with spin-state transitions", *Izvestiya Rossiiskoi Akademii Nauk. Seriya Fizicheskaya*, 2010, v. 74, no. 10, pp. 1406–1408 [*Bulletin of the Russian Academy of Sciences: Physics*, 2010, v. 74, no. 10, pp. 1345–1347].
26. A.V. Kalinov, O.Yu. Gorbenko, A.N. Taldenkov, J. Rohrkamp, O. Heyer, S. Jodlauk, N.A. Babushkina, L.M. Fisher, A.R. Kaul, D.I. Khomskii, K.I. Kugel, T. Lorenz, "Phase diagram of spin states and magnetic interactions in isotope substituted $(\text{Pr},\text{Eu})_{0.7}\text{Ca}_{0.3}\text{CoO}_3$ ", *Solid State Phenomena* 2011, vol. 168-169, pp. 465-468.
27. A.O. Sboychakov, K. I. Kugel, A.L. Rakhmanov, D.I. Khomskii, "Relationship between orbital structure and lattice distortions in Jahn-Teller systems", *Physical Review B* 2011, v. 83, no. 20, id. 205123 (9 pages); arXiv: 1007.4814.
28. Vikram Tripathi, Kusum Dhochak, B.A. Aronzon, V.V. Rylkov, A.B. Davydov, Bertrand Raquet, Michel Goiran, K.I. Kugel, "Charge inhomogeneities and transport in semiconductor heterostructures with a Mn δ -layer", *Physical Review B* 2011, v. 84, no. 27, id. 075305 (13 pages); arXiv:1012.5456.
29. A.K. Sarychev, S.O. Boyarintsev, A.L. Rakhmanov, K.I. Kugel, Yu.P. Sukhorukov, "Collective volume plasmons in manganites with nanoscale phase separation: Simulation of the measured infrared spectra of $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ ", *Physical Review Letters* 2011, v. 107, no. 26, id. 267401 (4 pages).
30. A. O'Hare, F.V. Kusmartsev, K.I. Kugel, "A stable "flat" form of two-dimensional crystals: could graphene, silicene, germanene be minigap semiconductors?", *Nano Letters* 2012, v. 12, no. 2, pp. 1045-1052.
31. A. O'Hare, F.V. Kusmartsev, K.I. Kugel, "Stable forms of two-dimensional crystals and graphene", *Physica B* 2012, v. 407, no. 11, pp. 1964-1968.

32. Vikram Tripathi, Kusum Dhochak, B.A. Aronzon, Bertrand Raquet, V.V. Tugushev, K.I. Kugel, "Noise studies of magnetization dynamics in dilute magnetic semiconductor heterostructures", *Physical Review B* 2012, v. 85, no. 21, id. 214401 (13 pages).
33. N.N. Kovaleva, K.I. Kugel, A.V. Bazhenov, T.N. Fursova, W. Löser, Y. Xu, G. Behr, F.V. Kusmartsev, "Formation of metallic magnetic clusters in a Kondo-lattice metal: Evidence from an optical study", *Scientific Reports* 2012, v. 2, id. 890 (7 pages).
34. N.N. Kovaleva, O.E. Kusmartseva, K.I. Kugel, A.A. Maksimov, D. Nuzhnyy, A.M. Balbashov, E.I. Demikhov, A. Dejneka, V.A. Trepakov, F.V. Kusmartsev, A.M. Stoneham, "Anomalous multi-order Raman scattering in LaMnO_3 : a signature of quantum lattice effects in a Jahn–Teller crystal", *Journal of Physics: Condensed Matter* 2013, v. 25, no. 15, id. 155602 (8 pages).
35. A.O. Sboychakov, A.V. Rozhkov, K.I. Kugel, A.L. Rakhmanov, Franco Nori, "Electronic phase separation in iron pnictides", 2013, arXiv:1304.2175; *Physical Review B*, in press.