

Alexey Kavokin

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(work)

Languages:

Russian: mother tongue

French, English, Italian: fluent

Spanish: good

EXPERIENCE:

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| 2005 – present | Chair of Nanoscience and Photonics, Full Professor
<i>Physics and Astronomy School, University of Southampton, UK</i> |
| 2006 - 2009 | Chairholder, Marie Curie Chair of Excellence “Polariton devices” <i>Universita di Roma II “Tor Vergata”, Rome, Italy</i> |
| 1998 - 2005 | University Professor
<i>Université “Blaise Pascal” Clermont-Ferrand II, France</i> |
| 1997 - 1998 | Professeur Associé (PAST)
Groupe d'Etude des Semiconducteurs, Université Montpellier II, France |
| 1997 – 1998 | Postdoctoral Research Fellow
<i>Università degli Studi di Roma II “Tor Vergata”, Italie Dipartimento di Ingegneria Elettronica</i> |
| 1993 – 1994 | Chercheur Associé au CNRS |
| 1992 – 1993 | <i>Groupe d'Etude des Semiconducteurs, Université Montpellier II, France</i> |
| 1992 – present | Member of the A.F. Ioffe Physico-Technical Institute of Russian Academy of Sciences
<i>From 2000: Associated Member of the Institute;
1993 – 2000: Researcher; 1992 – 1993: Junior researcher</i> |
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EDUCATION:

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| 1991-1993 | <i>PhD in Physical and Mathematical Sciences</i>
at A.F. Ioffe Institute, Russian Academy of Sciences, St Petersburg,
<i>Thesis title: “ Excitons in low-dimensional heterostructures with non-magnetic and semi-magnetic barriers ” Supervisor: Prof. Dr. E. L. Ivchenko</i> |
| 1986-1991 | <i>Master degree in Physics with Honor</i>
St-Petersburg State Technical University; “ <i>Lenin fellowship</i> ” winner |
| 1990 | <i>Landau-minimum (test in theoretical physics obligatory for Landau school theorists)</i> |
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RESEARCH SUBJECTS DEVELOPED:

- Theory of light-matter coupling in semiconductor heterostructures: exciton-polaritons.
 - Spin dynamics and spin transport of excitons.
 - Optics of quantum dots. Cavity quantum electrodynamics.
 - Microcavities, theory of polariton lasers. Bose-Einstein condensation and superfluidity.
 - Partially disordered semiconductor systems. Rayleigh scattering. Weak localization.
 - Photonic crystals: negative refraction, Bloch oscillations of light.
 - Magnetic polarons. Bi-polarons and collective magnetic polarons.
 - Superconductivity. Concept of light-mediated superconductivity.
 - Plasmons. Concept of Tamm surface plasmons.
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SCIENTIFIC OUTPUT:

264 publications in international scientific journals and conference proceedings, 1 in Science, 1 in Nano Letters, 20 in Physical Review Letters; 2 in Nature Physics and Nature Photonics, 71 in Physical Review B, 6 in Applied Physics Letters, 2 Topical Reviews in Semiconductor Science and Technology.

Monograph CAVITY POLARITONS, 2003 Co-author G. Malpuech.

Monograph MICROCAVITIES, 2007 Co-authors: J.J. Baumberg, G. Malpuech, F. Laussy Chapter "Low dimensional nitrides, a laboratory for ultrafast physics", in *Low-dimensional semiconductor compounds*, edited by B. Gil, Clarendon Press, Oxford, ISBN 019850974X. (2002), Co-author G. Malpuech

Chapter "Polariton lasers" in *Radiation-matter interaction in confined systems* edited by L.C. Andreani, G. Benedek, E. Molinari, Società Italiana di Fisica, Bologna, ISBN 88-7438-004-6 (2002), Co-author G. Malpuech

Major scientific contributions.

In 1991-1995 AK developed a theory of exciton magnetic polaritons in semiconductor quantum wells (Sov. Phys. Semicond., 1991), predicted the anisotropic magnetic field effect (SST, 1993) and collective magnetic polaron formation (PRB-RC, 1996), later observed experimentally. Since 1995 he works on theory of exciton-polaritons in semiconductor microcavities, a field where he gave key contributions. He predicted the Optical Spin Hall effect (PRL, 2007) and helped its experimental observation (Nature Physics, 2007). AK initiated the research in EU on nitride-based microcavities (APL, 1998) which he showed to be the best candidates for realisation of polariton lasers. He developed a quantum theory of polariton lasers (PRL, 2003, 2004) and the theory of spin dynamics of exciton polaritons (PRL 2004). He has built a theory of spinor superfluids (PRL, 2006) and explained pinning of polariton polarisation (PRB 2006). In parallel, he obtained several important results in the neighbouring field of photonics. Namely, he

predicted the photonic Bloch oscillations (PRB, 1999) which were later on observed experimentally (PRL 2004), formulated the new concepts of the perfect lens (PLA, 2005), proposed Tamm plasmons for applications in data storage devices (APL, 2007). The theoretical works of AK had a huge impact on the experimental research in physics of microcavities and photonics. AK coordinated three successful EU networks focussed on physics of exciton-polaritons. Within these projects CRHEA (CNRS-Nice), Strathclyde and Sheffield universities and recently EPFL have grown a number of GaN-microcavities to observe room temperature polariton lasing predicted by AK. This observation by Southampton university (PRL, 2007) has been a decisive step forward toward realisation of polariton devices. UNAM (Mexico) has produced multiple microcavity samples to observe photon Bloch oscillations predicted by AK, the observation has been done in Montpellier (PRL, 2004). EPFL (Lausanne) has realised the experiment proposed by AK to observe for the first time Half-quantum vortices (Science, 2009). Very recently, AK proposed a new effect of light-induced superconductivity (PRL, 2010).

TEACHING AND POST-GRADUATE SUPERVISION:

AK has 12 years of teaching experience in English, French, Russian and Italian (total of about 1800 hours). He developed 3 original lecture courses and supervised 9 PhD students: S. Goupalov, M. Vladimirova, G. Malpuech, M. Zamfirescu, F. Laussy, T.C.H. Liew, P. Membry, D. Read, T. Taylor.

OTHER RESPONSIBILITIES:

Expert of the European "Marie-Curie" program: 9 projects evaluated in 2004-2005.

Expert of the INTAS program: 14 projects evaluated in 2002-2003

Expert of the French ANR program: 1 project evaluated in 2009.

Member of Material Science Panel for evaluation of CNR Laboratories (Italy), 27 Laboratories evaluated in 2009.

Referee for the journals: Nature, Physical Review Letters, Physical Review B, European Journal of Physics: Condensed Matter, Solid State Communications, Journal of Applied Physics, Applied Physics Letters, Semiconductor Science and Technology, Physica Status Solidi (a,b,c)

Organisation of International conferences (membership in the steering and/or organising committee)

1. **Founder** and permanent **Member of the Program Committee** of the series of International Conferences on Physics of Light-Matter Coupling in Nanostructures (PLMCN) organised every year since 2000.
2. **Chairman** of the Organising Committee of the PLMCN0 (Clermont-Ferrand, France 2000), PLMCN2 (Rythimnon, Greece 2002), PLMCN3 (Acireale, Italy, 2003), PLMCN7 (Havana, Cuba, 2007).

3. **Founder and Co-Chairman** of the series of International Schools on Nanophotonics (Maratea, Italy, 2005, 2007, 2009, Santiago de Cuba, Cuba, 2009).
4. **Member of the Advisory Committee** of the 7th OECS (Montpellier, 2001).
5. **Co-Chairman** of the International Workshop on Advances in Physics and Applications of Low-Dimensional Systems, Brasilia 2007.
6. **Member of the Program Committee** of the 2nd and 3rd International conferences on Spontaneous Coherence in Excitonic Systems (Les Houches, 2007, and Cambridge, 2008).
7. **Chairman** of the series of Italo-Franco-Russian meetings on Solid State Theory organized in Clermont-Ferrand (France) in 2002, 2003, 2004, 2005, 2006 and Rome (Italy) in 2007, 2008, 2009.

FUNDING ID:

Source of funding	Identification	Duration (years)	Budget (euro)	Role of AK
EC, FP7	CLERMONT4	2009-2013	4.300.000	Coordinator
EC, FP7	ROBOCON	2009-2013	459.000	Partner
EC, FP7	POLALAS	2009-2013	322.200	Partner
EPSRC, UK	EP/F011393/1	2008-2011	720.000	PI
EPSRC, UK	EP/F026455/1	2008-2011	705.000	Co-investigator
EC, FP6	POLAROMA	2006-2009	540.000	Chairholder
EC, FP6	STIMSCAT	2005-2008	2.540.000	Partner
EC, FP6	CLERMONT2	2004-2008	2.700.000	Coordinator
CNRS, France	Microcavite	2002-2005	420.000	Coordinator
EC, INTAS	Quantum dots	2002-2004	110.000	Coordinator
Alliance, FR-UK	Egide Polariton	2001-2004	66.000	Coordinator
EC, FP5	Euroconference	2001-2002	70.000	Coordinator
EC, FP5	MC Clermont	2000-2004	182.000	Coordinator
EC, FP5	CLERMONT	2000-2003	1.500.000	Coordinator
Total		2000-2010	14.630.200	

Invited presentations to peer-reviewed, internationally established conferences and/or international advanced schools. 20 most important presentations out of totally 30 since 2000:

1. *“Superconductivity induced by a Bose-Einstein Condensate of Exciton-Polaritons”*, Int. Conf. on Physics of Quantum Electronics, Snowbird, USA, (January 2010).
2. *“Exciton-polariton lasers”*, Int. Conf. LASER-2009, Erevan, Armenia, (October 2009).
3. *“Light-mediated superconductivity”*, ITAP-Cambridge workshop, Turunc, Turkey, (September 2009).

4. *"Polariton lasers and Bose-Einstein condensation"*, Int. conf. on Optics of Surface and Interfaces 8, Ischia, Italy, (September 2009).
5. *"Light-induced superconductivity"*, Nanoscience, Engineering in Superconductivity, Capri, Italy, (June 2009).
6. *"Theory of the Bose-Einstein condensation of exciton polaritons"*, March meeting of the American Physical Society, Pittsburgh, USA, (March 2009).
7. *"Room temperature Bose-Einstein condensation of exciton-polaritons in microcavities"*, Plenary invited talk at 8th Int. Conf. on Physics of Light-Matter Coupling in Nanostructures, Tokyo, Japan, (April 2008).
8. *"Bose-Einstein condensation of exciton-polaritons"*, NATO Advanced Research Workshop: Smart Materials for Energy, Communications and Security, Marrakech, Morocco (December, 2007).
9. *"Polariton lasing and superfluidity"* Int. School on Complex Systems, Erice, Italy (July, 2007).
10. *"New discoveries in physics of exciton-polaritons"*, International Workshop "Plasmonics and Applications for Nanotechnologies, Singapore, (December 2006).
11. *"Polariton lasers in widegap semiconductors"*, European MRS Spring meeting, Strasbourg, France, (May 2005).
12. *"Bose-Einstein Condensation of Exciton-Polaritons in Microcavities"*, International Workshop on Bose-Einstein Condensation of Excitons, Cambridge, UK (April, 2005).
13. *"Strong Rabi Splitting and Polariton Lasers in Nitride-Based Microcavities"* Material Research Society (MRS), Fall Meeting, Boston, USA (November, 2004).
14. *"Exciton-polariton lasers"*, 12th Int. Conf. on Exciton Processes in Condensed Matter, Krakow, Poland, (July, 2004).
15. *"Polariton lasers: dynamical theory"*, International Workshop on Cooperative Phenomena in Optics and Transport in Nanostructures, Dresden, Germany (May, 2004).
16. *"Polariton lasers on GaN microcavities"*, 5th Int. Conf. on Nitride Semiconductors, Nara, Japan (June, 2003).
17. *"Exciton-electron scattering in semiconductor microcavities: Tool for polariton lasing"* 4th International Conference on Nitride Semiconductors, Aachen, Germany (July, 2002).
18. *"Excitons in GaN/GaN quantum wells: Optical pumping and temperature effect"*, International Workshop on Nitride Semiconductors, Nagoya, Japan (July, 2000).
19. *"Resonant Rayleigh Scattering of Exciton-Polaritons in Nitride Based Multiple Quantum Wells"* European Material Research Society Spring Meeting, Strasbourg, France (May, 2000).
20. *"Exciton-polaritons in confined structures"*, Winter School on Nitrides (Orsierre-Merlette, France, 2000).

Publications outside physics : « Saladin the Cat », novel, 3 volumes, ERA, Moscow, 2006.

Personal details: married, 3 children.