

**Alexandre Sergeevich Alexandrov, CPhys, FInstP, FAPS, PhD, ScD**  
**Professor of Theoretical Physics**

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Marital Status: married with one son.  
Nationality: British  
Date of birth: 30/07/1946

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**EDUCATION**

1984 **Doctor of Sciences., Theoretical Physics** *Moscow Engineering Physics Institute, Moscow, Russia*  
1973 **Ph.D., Theoretical Physics** *Moscow Engineering Physics Institute, Moscow, Russia*  
1970 **M.S., Theoretical Physics ( 1<sup>st</sup> class honor)** *Moscow Engineering Physics Institute, Moscow, Russia*  
1964 **Secondary School Certificate Gold Medal** *Novgorod, Russia*

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**PRESENT POSITION**

**Professor of Theoretical Physics, *Loughborough University, United Kingdom***

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**PREVIOUS POSITIONS**

1973-1990 Lecturer, associate professor, full professor, Dean of Theoretical and Experimental Physics Faculty, Head of General Physics Department, Director of Superconductivity Research Laboratory, Vice Rector of *Moscow Engineering Physics Institute, Moscow, Russia*  
1990-1992 Visiting Professor, *Rhein –Westfälische Technische Hochschule (RWTH) Aachen, Germany*  
1992-1995 Research Professor, *IRC in Superconductivity, University of Cambridge, United Kingdom*  
1995-1998 Chair in Theoretical Physics, *Department of Physics, Loughborough University, United Kingdom*  
1998-2001 Head of Physics Department, *Loughborough University, United Kingdom*  
2001-to date Professor of Theoretical Physics, *Loughborough University, United Kingdom*

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**VISITING POSITIONS**

1996-1999 Visiting Professor at *IRC in Superconductivity, University of Cambridge, United Kingdom*  
Since 1998 External Consultant and Visiting Professor at *Hewlett Packard Research Laboratories, Palo Alto, California, United States*  
Since 2008 Visiting Professor at *Josef Stefan Institute, Ljubljana, Slovenia*

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**FIELDS OF RESEARCH INTEREST**

Theory of superconductivity, strongly correlated electrons and phonons, polarons and bipolarons, molecular electronics, quantum phenomena in low-dimensional systems, Bose liquids

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**SUMMARY OF MAJOR SCIENTIFIC ACHIEVEMENTS**

- ◆ Extended the conventional (BCS) theory of superconductivity towards the strong-coupling regime, now known as the bipolaronic superconductivity
  - ◆ Developed the small polaron theory
  - ◆ Proposed a theory of colossal magnetoresistance explaining unusual properties of ferromagnetic oxides
  - ◆ Proposed a mechanism of molecular switching, and developed a theory of correlated transport through molecular nanowires
  - ◆ Developed the theory of charged Bose liquids
  - ◆ Predicted new quantum oscillations in multi-band metals, confirmed experimentally, and novel magnetic quantum oscillations in nanowires
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## HONOURS

- 1983-1989 Moscow Engineering Physics Institute Prizes, Ministry of Atomic Energy Prizes (USSR) for achievements in research
- 1992 Mott Bye-Fellow (Gonville and Caius College, Cambridge, UK) (first awarded)
- 1996 Fellow of IoP (London)
- 2003 NATO-country co-director of the Advanced Research Workshop "Molecular Nanowires"
- 2004 Guest Editor of the special volume of Physica C Superconductivity (The Netherlands)
- 2005 Scientific Convenor of the European Science Foundation Workshop "Mott's Physics in Nanowires and Quantum Dots"
- 2007 Guest Editor of the special volume of Journal of Physics: Condens. Matter
- 2008 Fellowship of the American Physical Society for "important and broad-ranging contributions to the theory of correlated electron systems".
- 2009 Lead Guest Editor of Advances in Condensed Matter Physics

## NAMED LECTURES:

- 1997 "Enrico Fermi" lecture (International School of Physics, Course CXXXVI, Varenna, Italy)
- 2000 "Mott Lecture" (Florida State University and MARTECH, (Tallahassee, Florida, US) (1<sup>st</sup> Annual lecture)

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## INVITED SPEAKER at the international conferences and workshops:

- IOP Condensed Matter and Material Physics, Sheffield, UK, December 1992
- Physics and Chemistry of Molecular and Oxide Superconductors, Eugene, Oregon, US, July 1993
- Superconductivity and Strongly Correlated Electron Systems, Amalfi, Italy, October 1993
- Polarons and Bipolarons in high-T<sub>c</sub> Superconductors and Related Materials, Cambridge, UK, April 1994
- Anharmonic Properties of High-T<sub>c</sub> Cuprates, Bled, Slovenia, September 1994
- Electrons and Phonons, Warwick, UK, September 1994
- Cross-over Phenomenon in Solid State Physics Euroconference, Torino, Italy, October 1994
- Dynamical Properties of Solids DYPROSO XXV Euroconference, Haro, Spain, September 1995
- Physics and Chemistry of Molecular and Oxide Superconductors, Karlsruhe, Germany, August 1996
- Materials and Mechanisms of Superconductivity (M2S-HTSC-V) Beijing, China, February-March 1997
- The Royal Society Discussion Meeting on The Metal-Non-Metal Transition, London, UK, March 1997
- Strongly Correlated Electrons, Tallahassee, US, March 1998
- Stripes and High T<sub>c</sub> Superconductivity, Rome, Italy, June 1998
- Polarons and their Condensation, Erice, Italy, June 1998
- Rinberg Workshop on Manganites, Rinberg Castle, Germany, April 1999
- Materials and Mechanisms of Superconductivity (M2S-HTSC- V1), Houston, US, February 2000
- Major Trends in Superconductivity in the New Millennium, Klosters, Switzerland, April 2000
- Stripes and High T<sub>c</sub> Superconductivity, Rome, Italy, September 2000
- New Theories of High T<sub>c</sub> Superconductivity, Honolulu, US, January 2001
- Superconductivity, CMR and Related Materials: Novel Trends, Giens, France, June 2002
- New Theories of High T<sub>c</sub> Superconductivity, San-Diego, US, January 2003.
- Highlights in Condensed Matter Physics, Salerno, Italy, May 2003
- Dynamic inhomogeneities in complex oxides, Bled, Slovenia, June 2003
- Vortex III, Crete, Greece, September 2003
- NATO ARW Molecular nanowires and other quantum objects, Bled, Slovenia, September 2003 (NATO-country co-director)
- Nano and Giga Challenges in Microelectronics, Krakow, Poland, September 2004
- Nanoscale heterogeneity in condensed matter, Rome, Italy, September 2004
- NATO ARW Nanoscale devices- Fundamentals and Application, Kishinev, Moldova, September, 2004
- Fundamentals of Superconductivity, Moscow, Russia, October 2004 (plenary speaker)
- Quantum transport-2005, Bologna, Italy, July 2005
- Nonlinear Physics: Condensed Matter, Dynamical Systems and Biophysics, Paris, France, May 2005
- Strongly-correlated electron materials, San Diego, US, August 2005
- IoP CMMP Conference, Exeter, UK, April 2006,
- CMT-30 international Workshop, Dresden, Germany, June 2006
- ESF international workshop, Cambridge, UK, July 2006 (scientific convenor)
- Fundamentals of Superconductivity, Moscow, Russia, October 2006 (plenary speaker)
- International Conference Stripes 2006 , Rome, Italy, December, 2006
- International Conference New3SC-6 , Sydney, Australia, January, 2007
- NATO ARW Electron Transport In Nanosystems (ETN-2007), Yalta, Ukraine, September 2007
- International Conference Stripes 2008, Erice, Italy, July, 2008
- Fundamentals of Superconductivity, Moscow, Russia, October 2008

17th Annual Meeting of the German Crystallographic Society, Hannover, Germany. March 2009 (plenary speaker)  
Workshop on Routes to Superconductivity at Ambient Conditions, International Centre for Condensed Matter  
Physics, Brasilia, Brazil, April 2009  
APS March Meeting, Portland, US 2010  
International Conference on Superconductivity and Magnetism, Antalya, Turkey, April 2010  
International Conference Stripes 2011, Rome, Italy, July 2011  
E-MRS Fall Meeting, Warsaw, Poland, September 2011  
Fundamentals of Superconductivity, Moscow, Russia, October 2011

## INVITED LECTURES AND COLLOQUIA

University of Tübingen (Germany, 1994)  
University of Warwick (UK, 1994)  
University College Cork (Ireland, 1995)  
International School in 'Superconductivity' (Ameland, the Netherlands, 1996)  
International School on Strongly Correlated Electrons (Debrecen, Hungary 1996)  
University Paris-VII (Orsay, France, 1996)  
International Summer School of Condensed Matter Physics (Białowieża, Poland, 1997)  
University of Antwerp (Belgium, 1998)  
Winter School in Superconductivity (Cambridge, UK, 1998, 1999)  
University of Zurich (Switzerland, 1999)  
University of Exeter (UK, 2000)  
International School on Strongly Correlated Electrons (Debrecen, Hungary, 2000)  
5-th Training Course in the Physics of Correlated Electron (Vietri sur Mare, Italy, 2000)  
University of Cambridge (Cambridge, UK, 2001)  
UCL (London, UK, 2001)  
LANL (Los Alamos, US, 2002)  
University of California San Diego (San Diego, US, 2002, 2004)  
Stanford University (US, 2002)  
Moscow Physical Engineering Institute (Russia, 2005)  
University of Warwick (UK, 2005)  
UCL (London, UK, 2006)  
Josef Stefan Institute (Ljubljana, Slovenia, 2006)  
University of Salerno (Italy, 2007)  
University of Ljubljana (Slovenia, 2008)  
Antwerp University (Belgium, 2009)  
Josef Stefan Institute (Ljubljana, Slovenia, 2010)

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## PUBLICATIONS:

**207 publications** in refereed international journals including 27 Physical Review Letters and 54 Physical Review papers, books:

*Influence of radiation on physical properties of superconductors* (Energoatomizdat Moscow 1989) (With V.E. Arkhipov, B.N. Gozhitskii, and V.F. Elesin)

*High Temperature Superconductors and Other Superfluids* (Taylor and Francis 1994) (with N.F. Mott)

*Polarons and Bipolarons* (World Scientific 1995) (with N.F. Mott)

*Sir Nevill Mott-65 Years in Physics* (World Scientific 1995) (with N.F. Mott)

*Theory of Superconductivity: from Weak to Strong Coupling* (IOP Publishing 2003)

*Polarons in Advanced Materials* (Springer, 2007) (editor)

*Advances in Polaron Physics* (Springer 2009) (with J.T. Devreese)

and invited review papers:

*Polaron theory of strongly-coupled high-T<sub>c</sub> superconductors*, in *Studies of High-Temperature Superconductors*, ed. A. Narlikar (Nova, NY) **6** (1990) 195

*Polarons in high temperature superconductors*, *Usp. Fiz. Nauk* **162** (1992) 1 (with A.B. Krebs)

*Bipolarons*, *Reports on Progress in Physics* **57** (1994) 1197 (with N.F. Mott)

*Schrieffer's Work on the theory of electrons and phonons*, *Selected Papers of J. Robert Schrieffer*, eds. N.E. Bonesteel, L.P. Gor'kov (World Scientific, 2002)

*Strong-coupling theory of high-temperature superconductivity*, in *Studies of High-Temperature Superconductors*, ed. A. Narlikar (Nova, NY) **50** (2007)

*Bose-Einstein condensation of strongly correlated electrons and phonons in cuprate superconductors*, *Journal of Physics: Condens. Matter* **19**, 125216 (2007)

**Citation index:** more than 4000 citations in international journals, h-index 33

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#### **OTHER ACTIVITIES**

Received research grants:

1992-95 -Leverhulme Trust, 1997 - Royal Society, 1997 – EPSRC, 1999 - Hewlett Packard, 1999 - Leverhulme Trust, 2000 - Royal Society, 2001 - EPSRC , 2001-04 - Leverhulme Trust, 2001-02 - Hewlett Packard, 2002-03- Royal Society, 2003 - NATO, 2004 - Royal Society, 2005- 2008- EPSRC, 2006- 2009- EPSRC, 2006-ESF, 2006- EPSRC, 2009-11 – Royal Societe, 2009-EPSRC, 2010- Leverhulme Trust.

Referee for *Physical Review Letters*, *Physical Review*, *Journal of Physics: Condensed Matter*, *EuroPhys.Letters*, *European Physical Journal*, *Physica Status Solidi*, *Solid State Communications*, *Journal of Physics and Chemistry of Solids*, *ESF (European Science Foundation)*. Panel member of *IoP*, *EPSRC (UK)*, *Fellow of APS* and program/organizing committees of various international conferences and workshops. 38 years of university teaching in Russia, Germany and UK, supervision of research students and post-doctoral research assistants, administrative work as the Head of Physics, Dean and Vice-Rector of *Moscow Engineering Physics Institute (1973-1990)* and Head of Physics at *Loughborough University (1998-2001)*