

Curriculum vitae

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Personal details

Name:	Lev Kantorovich	Date of birth:	8 Aug 1957
Present address:	Physics, King's College London, The Strand, London, WC2R 2LS	Nationality:	British
Telephone/FAX web	(0)20-78482160 / 020-78482420 www.kcl.ac.uk/nms/depts/physics/ people/Academic/Kantorovich	Sex:	male
e-mail	lev.kantorovtich@kcl.ac.uk	Marital status:	married (two children)

Education

1964-1972 *Riga 8-th Comprehensive School, Latvia, USSR*
1972 A number of GCSEs (equiv.) including: Mathematics (mark 5), Physics (5), Chemistry (5), English Language (5) .

1972-1974 *Riga 10-th Comprehensive School, Latvia, USSR* (advanced in physics and math)
1973, 1974 **1, 2 places** in Latvian olympiads in physics & math amongst schools
1974 particip. in the Soviet olympiad in physics amongst Soviet Republics
1974 Three A-levels (equiv.) in Math, Physics and Chemistry

1972-1974 *School of Physics & Mathem. at Moscow Physical & Technical Institute* (part-time)

1974-1979 *Dept. of Physics & Mathematics, Latvian University, Riga, Latvia, USSR*
1979 **MSi** equiv. (with excellence): **theoretical physics**.
Other relevant courses taken: computing, teaching physics, English

1982-1985 *Institute of Physics, The Latvian Academy of Sciences, Latvia, USSR*
1985 **Ph.D.** in **solid state physics** on “The influence of the insulating crystals polaris. on the struct. and tunnel recomb. of radiative defects”

Academic and professional experience

I have extensive scientific experience in **theoretical condensed matter quantum physics** and **chemistry**.

- Sept. **2002** -Aug. **2005** a **lecturer** at the Dept. of Physics, King's College London, London, UK; a **Reader** in Physics from Sept. **2005**; a **Professor** from Sept. **2009**.
(*atomic-scale dissipation in AFM; virtual AFM; AFM imaging of Si(001) surface at different temperatures; surface processes using ab initio DFT based methods; manipulation*)

of atoms and molecules on crystal surfaces using AFM/STM; embedding techniques based on localisation methods; group function theory; electronic and vibrational properties of point defects in Si-Ge alloys; Kinetic Monte-Carlo; super-structures of DNA/RNA base molecules on crystal surfaces; general non-equilibrium statistical mechanics; quantum transport; fragmentation methods)

- **1996 - Dec. 2000** a Research Fellow and then a Research Assistant, and between Dec. **2000** and Aug. **2002** - a temporary lecturer at the Dept. of Physics and Astronomy, University College London, London, UK
(influence of the AFM tip on electronic structure of surface defects; role of electrostatics in AFM imaging; dissipation force microscopy; processes at close contact in AFM experiments; non-radiative transitions (semi-classical approach based on frozen Gaussians); embedding techniques; spectroscopy of low-coordinated surface sites of MgO; interpretation of the surface-sensitive MIES experiments)
- **1994-1996** Research Fellow at the Physics Dept. (Prof. M. J. Gillan), University of Keele, Keele, Staffordshire, UK
(surface F-center in MgO, steps and corners at MgO (001) surface, adsorption of atomic and molecular oxygen at MgO and CaO surfaces, N₂O dissociation at CaO surface - all using first-principle plane-wave pseudopotential DFT calculations)
- **1992-1996** Programmer at the Dept. of Chemical Physics of Condensed Matter (Dr. A. L. Shluger) in Latvian University, Riga, Latvia
(SYM-SYM computer code, further development of the EMC method; Model Hamiltonian approach; theory of self-trapped phenomena)
- **1979-1992** Engineer, research associate and leading research associate at the Latvian Medical Academy (LMA), Riga, Latvia (USSR)
(quantum chemistry of defects in crystals, polarisation effects, theory of solvated electrons in water; absorption of water molecules on alkali halides, theory of heating contact between two solids; polarisation effects, group theory, embedding schemes (EMC method), Excitonic Hamiltonians, Green's function method in the theory of defects in solids, thermo-luminescent (TL) kinetics and dosimetry, TL of beta radiation; theory of group functions; method of functional derivatives (GW for defects); theory of self-trapped phenomena; Model Hamiltonian approach)

Professional activities, fellowships

- Feb. 1991: Taken a course on “*Multilevel technique in Physics*” at ICTP, Trieste, Italy;
- Feb. 1991: Visiting Scientist, University of Turin, Dept. of Chem. (Prof. C. Pisani), Turin, Italy (*the Green's function method*);

- Aug. 1991: Visiting Scientist, University of Ottawa, Dept. of Physics (Prof. K. S. Song), Ottawa, Canada (*the SYM-SYM computer code*);
- Nov./Dec. 1991 and May 1992: Visiting Scientist, Max-Planck Institute für Festkörperforschung (Dr. G. Stollhoff), Stuttgart, Germany (*correlation effects in AgCl using Local Ansatz method*);
- Feb. 1993 - Feb. 1994: Invited Scientist to the University of Oviedo (Prof. L. Pueyo), Oviedo (Spain) on Sabbatical stay financed by the D.G.I.C.T. (Spain) (*phase transitions in alkali halides and thermoelastic and dielectric properties of perfect crystals studied using quasi-harmonic approximation*);

Awards and assessments

- **1991** awarded the highest mark (*excellent*) in the survey of the Latvian science by a *EU panel*.
- **1991** awarded \$500 for scientific achievements by *The Soros Foundation* (plus \$500 went to my student).
- **2005**: a winner of a Teaching Excellence Award at King's (following student's nomination).
- **2007**: a winner of the Distinguished Supervisor Award in the School and then at King's.
- **2010**: a winner of a Teaching Excellence Award at King's (following student's nomination).
- Over the years at KCL three of my PhD students were awarded Tadion Rideal prizes (1000 pounds) for their PhDs; my latest student Manuela Mura was also awarded a Springer Thesis price in 2011, her Thesis will also be published by Springer in a Thesis series.

Publications

- **2 books**:
 - “Models of processes in wide-gap solids with defects” (Yu.Zakis, L.Kantorovich, E.Kotomin, V.Kuzovkov, I.Tale, A.Shluger, Zinatne Publishing House: Riga, 1991, 320p.)
 - “Quantum theory of the solid state: an introduction”, in the series “Fundamental theories of physics”, Kluwer, 2004 (640 pages).
- Over **10 Reviews** and **chapters** in books.
- **155 papers** in refereed International physical and chemical journals, including Science, Angew. Chemie Intern. Ed., JACS, PRL, etc.

Invited talks

- ICDIM-2004, Riga (Latvia), 2004
- 2 lectures at the Fock school, Novgorod the Great (Russia), May 2005
- STM-05 conference in Sapporo (Japan), July 3-8, 2005
- 43rd IUVESTA Workshop on "Chemical Sensitivity in SPM", Zakopane (Poland), Nov. 29-Dec. 3, 2005
- CECAM workshop "Hybrid Atomistic Methods for Materials and Biological Systems", 10-13 July 2006 in Lyon, France
- Symposium on Dynamics and Reactivity of Individual Molecules/Clusters at the ACS Fall 2006 National Meeting in San Francisco, USA, Sept. 10-14th 2006
- International Workshop on "Energy Dissipation on Surfaces", Sept. 24-28 2006, Wesseling, Germany
- "Towards Reality in Nanoscale Materials", December 10th - 12th 2007 in Levi, Finland
- "FM & NT", Riga, 1-4 April 2008 (it was an opening/plenary talk)
- CECAM meeting, "Accurate energetics of condensed matter with quantum chemistry", Lyon (France), May 2008
- A satellite meeting "Kelvin Probe Microscopy" at NC-AFGM 2008 conference in Madrid, September 2008
- IoP meeting "Molecular Dynamics for Non-adiabatic processes", July 2008, London
- WG4 workshop "AFM/STM imaging and manipulation of insulating surfaces and films", April 2008
- "International workshop on computational material science", Cairo (Egypt), 17-20 November 2008
- "Technical workshop on KPFM", a satellite meeting within the 11th International Conference on NC-AFM, Madrid, 2008
- "Towards Reality in Nanoscale Materials", December 3-5.12.2008 in Levi, Finland
- 2009 Materials Simulation Laboratory workshop "Accessing large length and time scales with accurate quantum methods, in honour of Mike Gillan's 65th birthday, London, 12-13 January 2009
- "Structure prediction", CCP5 Annual Meeting, London, 7-9 September 2009 Aarhus school009.

- 2009: Dublin, Nanoscale friction workshop
- 2010: Oviedo, VII Electronic Structure, Principles and Applications (ESPA2010), plenary lecture
- 2010: Liverpool, Workshop on Dynamics, reactions, and manipulations at surfaces
- 2010: Berlin, The big Psi-k conference
- 2010: INANO-NCNST summer school on molecular self-assembly (August)

Grant applications

- **2002:** Fast stream research proposal to EPSRC on “Theoretical study of atomic scale dissipation in Scanning Force Microscopy” (55K pounds, awarded in March 2002)
- **2002:** Research proposal to the Leverhulme Trust on “Consistent embedding and its application in physics, chemistry and biology” (102K pounds awarded in March 2002)
- **2004:** FP6 STREP proposal within the NANOMAN consortium on molecular manipulation (113K pounds, March 2004)
- **2005:** FP6 IP proposal within the PICO-Inside consortium on molecular computer (204K pounds, Sept. 2005)
- **2006:** RCUK Basic Technology grant from EPSRC, on hydrogen-bonded supramolecular self-assembly (206K pounds, 2006)
- **2010:** Royal Society on “Towards understanding of atomic scale KPFM imaging”, travel grant (633 pounds)

Supervision

- Tom Trevethan - awarded PhD in 2006; Tom was also awarded Tadion Rideal Prize in 2006 from the School of Physical Science and Engineering for the doctoral thesis.
- Yu Wang - awarded PhD in 2006
- Chris Hobbs - awarded PhD in 2006, a runner up for the Tadion Rideal Prize
- Ross Kelly - awarded PhD in 2007, awarded the Tadion Rideal Prize
- Manuela Mura - awarded PhD in 2010, awarded Tadion Rideal Prize and the Springer Thesis Prize
- Dawid Totton, Joseph Bamidele - current PhD students

Examining

Served as an external examiner for several students in the UK and 1 in Finland.

Teaching experience

- **2011:** Gave a course on Non-Equilibrium Green's Functions for Thomas Young Centre (TYC) in London
- from **2005:** Mathematical methods in physics I (2nd year day time KCL students)
- from **2003:** Mathematical methods in physics II (2nd year day time KCL students)
- from **2003:** 3rd year research project (3rd year day time KCL students)
- **2001-2002:** a practical course on Mathematica (2nd year day time UCL students)
- **2000-2001:** Advanced Solid State Physics course (4th year evening UCL students)
- **2000-2002:** a summer project student and two-three 4-year project students each year at UCL
- supervised a number of post-graduates in Riga and at UCL, have tuition experience
- since **1999:** tutor of the 1st year undergraduates at UCL (normally 4 students in the group).
- **2000:** successfully prepared a 3rd year student for two Condensed Matter exams in Bristol
- since **1997:** problem solving classes for the 1st year students at UCL.
- gave a number of courses for undergraduate and graduate students in Riga (Latvia), Oviedo (Spain) and London (U.K.):
 - theory of small-radius polaron; self-trapping phenomena;
 - theoretical quantum chemistry; method of group functions;
 - implementation of group theory in quantum chemistry of solids;
 - many-particle theory of solids, Green's functions, functional derivatives (including GW-method);
 - embedding techniques for defects in solids;
 - **1997-1998:** Density Functional Theory (for post-graduates at UCL)
- at various times helped a number of pupils to prepare for exams in a school in physics and math

Other experience

- Driving licence
- Spoken languages: Russian (native), Spanish (conversational), Latvian (conversational).

Interests and Activities

- Two months each summer during University years worked long hours in a 30-strong team of students in remote areas of the USSR (Karelia, Kazahstan and Kamchatka) in a Student Camp (general building work).
- During student time a member of a Student Dramatic & Musical Club at the Latvian University (acting, conducting, writing songs for guitar and performing).
- Organised a musical play group at LMA (+ acting, conducting, writing).
- As a voluntary swimming coach at LMA, was responsible for a group of employees.
- A keen badminton player at Keele and U.C.L.
- Trying to maintain conversational skills in Spanish language while visiting Spain for holidays with the family.
- I also like spending free time with my family (playing, reading, cycling, visiting exhibitions).
- I like listening and playing jazz on piano for myself, reading science fiction and fantasy.