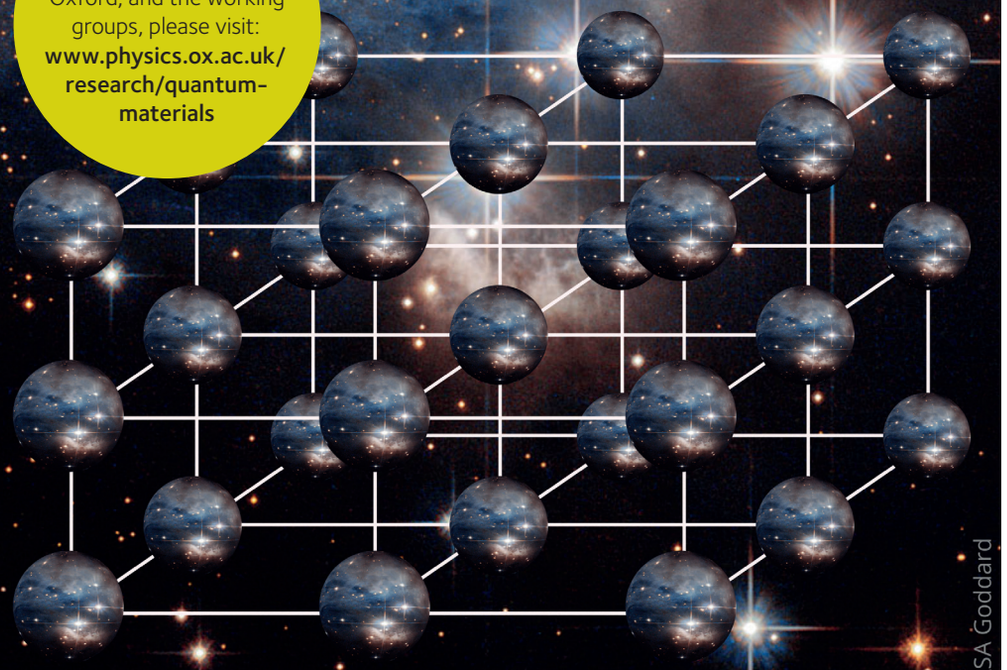
The 2019 Quantum Materials Public Lecture

The Many Universes of Quantum Materials

Prof Stephen Blundell

To find out more about Quantum Materials at Oxford, and the working groups, please visit: **www.physics.ox.ac.uk/research/quantum-materials**



19:30, 23rd September, Oxford Physics
More info & free tickets: bit.ly/qmpl2019

Credit: NASA Goddard

QUANTUM MATERIALS SYMPOSIUM 2019

OXFORD

23–25 SEPTEMBER

Superconductivity | Topology | Magnetism
Synthesis Devices | Interface Phenomena | Dynamics

qms.web.ox.ac.uk

QUANTUM MATERIALS SYMPOSIUM TALKS

Monday 23 September 2019

08:15-08:45 **Registration, posters displayed**

08:45-09:00 **Paolo Radaelli, Oxford Physics** *Welcome and updates on Oxford Quantum Materials*

A. MAGNETISM AND MODEL SYSTEMS (CHAIR: LEON BALENS)

09:00-09:05 **Leon Balents, KITP, UCSB** *Introduction to the session "Magnetism and Model Systems"*

09:05-09:30 **Hide Takagi, Max Planck Institute Stuttgart** *Exotic spin-orbital entangled phases in 5d and 4d transition metal oxides*

09:30-09:55 **Roser Valenti, Goethe University Frankfurt** *Recent progress on field- and pressure-induced phases in spin-orbit-coupled frustrated models and materials*

09:55-10:20 **Chris Stock, University of Edinburgh** *Spin-wave directional anisotropies in langasite without antisymmetric exchange*

10:20-10:50 **Coffee break**

10:50-11:15 **Chris Wiebe University of Winnipeg, University of Edinburgh** *High pressure routes to new pyrochlores and exotic magnetism*

11:15-11:40 **Lucile Savary, CNRS, ENS Lyon** *SU(4) antiferromagnetism and dimers*

11:40-12:10 **Leon Balents, KITP, UCSB** *Discussion leader*

12:30-13:30 **Lunch** *Somerville College* **/ Posters** *Martin Wood and Beecroft foyer* **/ Group Photo**

B. STRUCTURE AND DYNAMICS (CHAIR: SIMON WALL)

13:40-14:45 **Simon Wall, ICFO** *Introduction to the session "Structure and Dynamics"*

14:45-14:10 **Peter Abbamonte, University of Illinois, Urbana-Champaign** *Universal CDW dynamics in $La_{2-x}Ba_xCuO_4$ measured with time-resolved RIXS*

14:10-14:35 **Lara Benfatto, ISC-CNR and Sapienza University of Rome, Italy** *Unconventional spectroscopies of superconducting collective modes*

14:35-15:00 **Giacomo Ghiringhelli, Politecnico di Milano** *Charge density waves and charge density fluctuations in cuprates*

15:00-15:25 **Coffee break**

15:25-15:50 **Silke Bierman, Ecole Polytechnique Paris** *Electronic structure of Sr_2IrO_4: a dynamical mean field view*

15:50-16:15 **James McIver, Max Planck Institute for the Structure and Dynamics of Matter** *Femtosecond science on-chip: Capturing light-induced anomalous Hall currents in graphene*

16:15-16:45 **Simon Wall, ICFO** *Disorder in the ultrafast phase transition in VO_2 and Discussion Leader*

16:45-18:00 **Poster session and Drinks**

18:00-19:00 **Dinner** *Somerville College*

19:30–20:30 **Public Lecture: Stephen Blundell, University of Oxford** *The Many Universes of Quantum Materials. Book your tickets at: bit.ly/qmpl2019*

Tuesday 24 September 2019

C. DEVICES AND INTERFACE PHENOMENA (CHAIR: RAMAMOORTHY RAMESH)

08:45 **Posters displayed**

09:00-09:05 **Ramamoorthy Ramesh, University of California, Berkeley** *Introduction to the session "Devices and Interface Phenomena"*

09:05-09:30 **Stuart Parkin, Max Planck Institute Halle** *TBA*

09:30-09:55 **Jian Shen, Fudan University** *Complex Magnetic Domain Structures in Oxides: Physical Origin and Device Applications*

09:55-10:20 **Jochen Manhart, Max Planck Institute for Solid State** *Dissipationless Charge Transport without Superconductivity?*

10:20-10:50 **Coffee break**

10:50-11:15 **Sasi Manipatruni, Kepler Computing** *Building the next ubiquitous computing with quantum materials*

11:15-11:40 **Felix Casanova, CIC nanoGUNE** *Spin-to-charge current conversion for logic devices*

11:40-12:10 **Ramamoorthy Ramesh, University of California, Berkeley** *Discussion Leader*

12:30-13:30 **Lunch** *Somerville College* **/ Posters** *Martin Wood and Beecroft foyer*

D. TOPOLOGY (CHAIR: CLAUDIA FELSER)

13:40-13:45 **Claudia Felser, Max Planck Institute for Chemical Physics of Solids** *Introduction to the session "Topology"*

13:45-14:10 **Andrei Bernevig, Freie Universität Berlin Princeton University** *Hinge Arcs and Dirac Semimetals: the first spectroscopic consequence of Dirac crossings*

14:10-14:35 **Ashvin Vishwanath, Harvard University** *Superconductivity and Topology in Moire Materials*

14:35-15:00 **Sang Cheong, Rutgers University** *Topological vortex domains in quantum materials*

15:00-15:25 **Coffee break**

15:25-16:50 **Radu Coldea, University of Oxford** *Inelastic neutron scattering studies of touching points in magnon bands*

16:50-16:15 **Charles Tschirhart, University of California Santa Barbara** *Intrinsic quantized anomalous Hall effect in twisted bilayer graphene*

16:15-16:45 **Claudia Felser, Max Planck Institute for Chemical Physics of Solids** *Discussion leader / Topological materials science*

16:45-18:30 **Poster session and Drinks**

18:30–21:30 **Conference Dinner** *Wadham College*

Wednesday 25 September 2019

E. SUPERCONDUCTIVITY (CHAIR: SÉAMUS DAVIS)

09:00-09:05 **Séamus Davis, University of Oxford** *Introduction to the session "Superconductivity"*

09:05-09:30 **Andrey Chubukov, University of Minnesota** *Feedbacks from nematic order in FeSe*

09:30-09:55 **Stephen Hayden, Bristol University** *Spin and charge correlations in superconductors*

09:55-10:20 **Tom Devereaux, Stanford University** *Bad Metallic Transport, CDWs, and Superconducting Pairing in the Hubbard Model*

10:20-10:50 **Coffee break**

10:50-11:15 **Suchitra Sebastian, University of Cambridge** *Unconventional superconductivity in high magnetic fields*

11:15-11:40 **Peter Hirschfeld, University of Florida** *Knight Shift and Leading Superconducting Instability From Spin Fluctuations in Sr_2RuO_4*

11:40-12:10 **Séamus Davis, University of Oxford** *Discussion leader*

12:30-13:30 **Lunch** *Somerville College*

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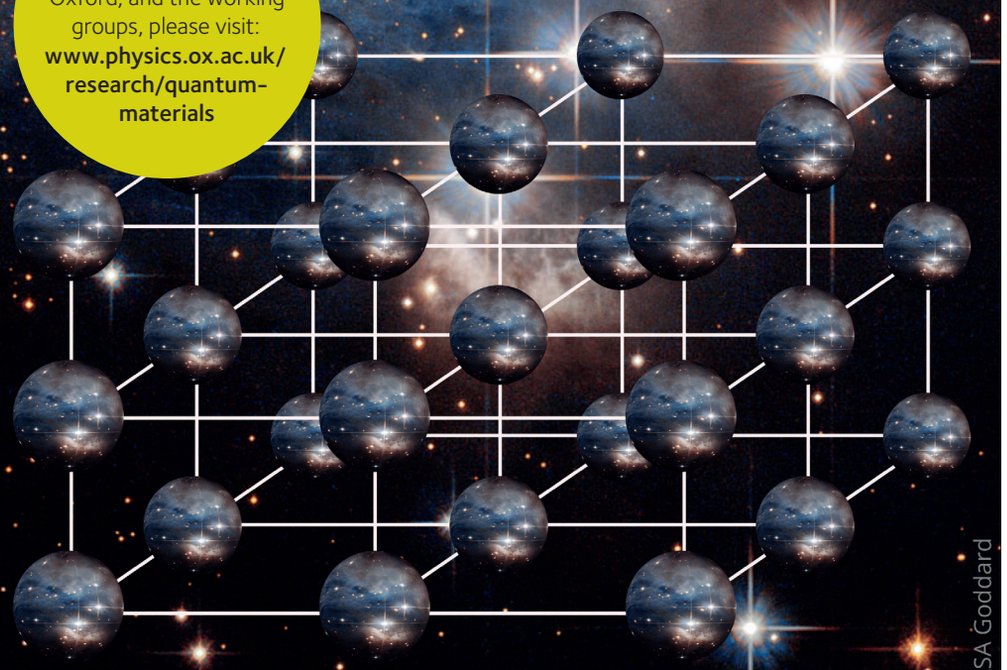

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QUANTUM MATERIALS SYMPOSIUM POSTER PRESENTATIONS

Monday 23 September 2019

1. **Alessandro Lodi, University of Oxford** *Devices / Chemical Tuning of Graphene Nanoribbon FETs*
2. **Marein Rahn, TU Dresden** *Dynamics / Resonant inelastic x-ray scattering as a probe of coherent valence dynamics*
3. **Anuradha Vibhakar, University of Oxford** *Magnetism / The magnetic structure and spin-flop transition in the A-site columnar-ordered quadruple perovskite $TmMn_3O_6$*
4. **Sam Garratt, University of Oxford** *Magnetism / Goldstone Modes in the Emergent Gauge Fields of a Frustrated Magnet*
5. **Shivani Sharma, STFC-RAL** *Magnetism / Quadrupole ordering, structural phase transition, and crystal field excitations of $YbRu_2Ge_2$*
6. **Hwanbeom Cho, University of Oxford** *Magnetism / Emergence of Spin-Orbital Entangled Jeff=1/2 State in $CuAl_2O_4$*
7. **Simon Clarke, University of Oxford** *Magnetism / Structures, magnetism and Chemistry of Layered oxide chalcogenides*
8. **Sven Friedemann, University of Bristol** *Magnetism / Quantum Tricriticality in Ferromagnets*
9. **Pascal Manuel, ISIS Pulsed Neutron Source** *Magnetism / Gapless spin-liquid state in the structurally disorder-free triangular antiferromagnet $NaYbO_2$*
10. **Simen Sopp, University of Oxford** *Magnetism / Millikelvin Torque Magnetometry of Molecular Magnets*
11. **Miska Elliot, University of Oxford** *Magnetism Experimental exploration of Dirac magnons in honeycomb magnets*
12. **Jhuma Sannigrahi, Loughborough University** *Magnetism / Commensurate to incommensurate magnetic phase transition in Honeycomb-lattice pyrovanadate $Mn_2V_2O_7$*
13. **Hangwen Guo, Fudan University** *Magnetism / Designing emergent functionalities in complex oxides*
14. **Aleksandra Krajewska, Max Planck Institute for Solid State Research** *Magnetism / Multiple spin and orbital transitions in new pyrochlore ruthenate $In_2Ru_2O_7$*
15. **Amir Haghighirad, Karlsruhe Institute of Technology** *Magnetism / Lattice and spin dynamics in CrAs*
16. **Timothy Ziman, Institut Laue Langevin and CNRS** *Magnetism / Enhanced thermopower and critical fluctuations in antiferromagnetic films*
17. **Michael Slota, University of Oxford** *Magnetism / Coherence transfer in magnetic graphene nanoribbons*
18. **Elliot Christou, University College London** *Model Systems / Lattice symmetry breaking and Dirac fermion quantum criticality*
19. **Mikolaj Uryszek, UCL** *Model Systems / Fermionic quantum criticality in two dimensional topological phase transitions*
20. **Matthew Trott, University of St Andrews** *Model Systems / Topological superconductivity near Lifshitz transitions in strongly spin- orbit-coupled metals*
21. **Attila Szabó, University of Cambridge** *Model Systems / Seeing beyond the light: Semiclassical simulation of visons and photons in quantum spin ice*
22. **Kathryn Boast, University of Oxford** *Other / Outreach and Public Engagement with Quantum Materials Research*
23. **Matthias Gutmann, Rutherford Appleton Laboratory** *Model Systems / Crystal structure of $CaBaFe_4O_7$*
24. **Xiaodong Zhou, Fudan University** *Other / Imaging the nanoscale phase separation in V2O3 with scanning Microwave Impedance Microscope (sMIM)*
25. **Rocco Vitalone, Columbia University** *Dynamics / Near-Field Pump Probe Spectroscopy of Mott Insulating Ca_2RuO_4*

Tuesday 24 September 2019

1. **Mark Senn, University of Warwick** *Superconductivity / Improper Ferroelectric Polarisation in a Perovskite driven by Inter-site Charge Transfer and Ordering*
2. **Pascal Reiss, University of Oxford** *Superconductivity / Finite electronic correlations and two-dome superconductivity across a clean nematic quantum phase transition*
3. **Zachary Zajicek, University of Oxford** *Superconductivity / Evolution of the Fermi surfaces and electronic correlations in the high pressure phase of $FeSe_{1-x}S_x$*
4. **Machteld Kamminga, University of Oxford** *Superconductivity / Tailoring superconducting properties in intercalated layered chalcogenides*
5. **Shiv J Singh, University of Oxford** *Superconductivity / Superconductivity dependence on the growth conditions in the stoichiometric $CaKFe_4As_4$*
6. **Deepark Singh, STFC RAL** *Superconductivity / Probing the superconducting ground state of noncentrosymmetric superconductors using muon spectroscopy*
7. **Ke Zou, University of British Columbia** *Superconductivity / Superconducting FeSe monolayer on different oxide substrates*
8. **Matthew Bristow, University of Oxford** *Superconductivity / Upper critical fields in the nematic superconductor $FeSe_{1-x}S_x$*
9. **Miguel Antonio Sulangi, University of Florida** *Superconductivity / Phase Fluctuations and Disorder in the Superconducting Cuprates*
10. **Liam Farrar, University of Bath** *Superconductivity / Suppression of superconductivity and enhancement of anisotropy in ultra-thin flakes of FeSe*
11. **Kai Liu, Renmin University of China** *Superconductivity / Electronic structures of quasi-one-dimensional cuprate superconductors $Ba_2CuO_{3+\delta}$*
12. **Dimitrios Alexandropoulos, University of Oxford** *Synthesis / Integrating multiple spintronic functionalities into single molecules*
13. **Andrew Boothroyd, University of Oxford** *Topology / Evidence for a magnetically-induced Weyl semimetal with a single pair of Weyl nodes*
14. **Lapo Bogani, University of Oxford** *Topology / Quantum effects in molecularly-tailored graphene*
15. **Cephise Cacho, Diamond Light Source** *Topology / ARPES on microscopic structures at Diamond beamline I05*
16. **Kylie MacFarquharson, University of Oxford** *Superconductivity / The effect of K dosing on the electronic structure of superconducting $FeSe_{1-x}S_x$*
17. **Peayush Kumar Choubey, Ruhr-University Bochum** *Superconductivity / Coexisting pair density wave and superconducting order in underdoped cuprates*
18. **Roemer Hinlopen, University of Oxford** *Superconductivity / Fermi surface topography of a nematic superconductor FeSe*
19. **Y H Kwan, University Of Oxford** *Topology / Quantum oscillations probe the Fermi surface topology of the nodal-line semimetal CaAgAs*
20. **Oliver Squire, University of Oxford** *Superconductivity / The effects of Co-doping on superconductivity and nematicity in FeSe*
21. **Hechang Lei, Renmin University of China** *Topology / Magnetic Topological Semimetals with Kagome Lattices*
22. **Glenn Wagner, University of Oxford** *Other / Quantum transport in bilayer graphene near charge neutrality beyond hydrodynamics*