

Ryan Barnett

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EMPLOYMENT

2021–present	Reader	Imperial College London Dept of Mathematics
2015–2021	Senior Lecturer	Imperial College London Dept of Mathematics
2012–2015	Lecturer	Imperial College London Dept of Mathematics
2009–2012	Joint Quantum Institute Postdoctoral Fellow	University of Maryland Dept of Physics
2006–2009	Sherman Fairchild Postdoctoral Fellow	Caltech Dept of Physics

EDUCATION

2006	Ph.D. in Physics	Harvard University	Advisors: E. Demler, E. Kaxiras
2003	A.M. in Physics	Harvard University	
2000	B.S. in Mathematics (Summa Cum Laude)	Ohio State University	
2000	B.S. in Physics (Summa Cum Laude)	Ohio State University	

LEADERSHIP ROLES

- Chair of IOP Theory of Condensed Matter Group, 2021–present
- ICL Dept of Mathematics Director of Postgraduate Studies, 2019–2024
- ICL Dept of Mathematics Director of Applied Mathematics MSc programme, 2014–2019
- Imperial Mathematics Postgraduate Representative, Natural Sciences Education Committee (NSEC) and NSEC Master’s Subcommittee, 2017–2019

AWARDS, FELLOWSHIPS, GRANTS

- Marie Curie Career Integration Grant, 2014-2018
Project title: *Quantum gases in synthetic gauge fields*
- JQI Postdoctoral Fellowship in Theoretical Physics, 2009-2012
- Caltech Postdoctoral Prize Fellowship in Theoretical Physics, 2006-2009
- Harvard Wallace-Noyes Fellowship, 2004
- National Science Foundation Graduate Research Fellowship, 2000-2004
- Ohio State Physics Department Senior Alumni Award, 2000
- Phi Beta Kappa, 1999

TEACHING

- Lecturer, *Quantum Mechanics II*, Imperial College London, Spring term 2018–present
- Lecturer, *Tensor Calculus and General Relativity*, Imperial College London, Spring term 2013–2017

- Personal tutor for undergraduate and MSc students, Imperial College London, 2012–present

SERVICE, EXTERNAL ACTIVITIES

- Referee for Physical Review Letters, Physical Review A, Physical Review B, New Journal of Physics, Nature, Europhysics Letters, Reports on Progress in Physics, Annals of Physics, Journal of Physics A, Journal of Physics B
- IOP Theory of Condensed Matter Group committee, 2016–present
- Organiser, *Theory of Condensed Matter Group Annual Meeting* June 2015 and June 2019, University of Warwick
- Hubbard Theory Consortium member / co-organisation of annual event: *Condensed Matter Physics in the City* 2018–present
- Organiser, Imperial College London Mathematical Physics Seminar, 2013–2015
- External PhD examiner: Cambridge (2019), Lancaster (2018), Southampton (2017), KCL (2017), Oxford (2015)

SUPERVISION

Postdoctoral Fellow Mentor

- Dr Sania Jevtic (Imperial College Junior Research Fellow), 2015–2018

PhD Student Supervision

- Ms Maria Belota, 2023–present
- Mr Thivan Gunawardana, 2021–present
Co-supervisor: Ari Turner
- Dr Peru d'Ornellas, 2019–2024
Thesis title: *Topology on almost any lattice*
Primary supervisor: Derek Lee
- Dr Jonas Jager, 2018–2021
Thesis title: *Impurities in ultracold quantum gases: from polaron formation to mediated interactions*
- Dr Joseph Sykes, 2018–2021
Thesis title: *Topological Insulators and their Topological Markers*
- Dr Luca Mingarelli, ICL Mathematics, 2014–2018
Thesis title: *Simulating infinite vortex lattices in superfluids: a novel scheme and its applications*
Co-supervisor: Eric Keaveny
- Dr Bogdan Galilo, 2013–2017
Thesis title: *Topological spin dynamics in 2D Bose Lattices*
Co-supervisor: Derek Lee
- Dr Matjaž Payrits, 2012–2016
Thesis title: *Order-by-disorder phenomena in cold atomic gases*

Masters Student Supervision

I regularly supervise projects at the Masters level.

PUBLICATIONS

Total Citations: 2042 (Google Scholar)

Preprints

1. Roy Rabaglia, Ryan Barnett, and Ari M. Turner, Unvortex Lattice and Topological Defects in Rigidly Rotating Multicomponent Superfluids, arXiv:2404.05857

Refereed Publications

2. Thivan M. Gunawardana, Ari M. Turner, and Ryan Barnett, Optimally localized single-band Wannier functions for two-dimensional Chern insulators, *Physical Review Research* **6** 023046 (2024).
3. Jonas Jager and Ryan Barnett, The effect of boson–boson interaction on the bipolaron formation, *New Journal of Physics* **24**, 103032 (2022).
4. Peru d’Ornellas, Ryan Barnett, and Derek K. K. Lee, Quantized bulk conductivity as a local Chern marker, *Physical Review B* **106**, 155124 (2022).
5. Joseph Sykes and Ryan Barnett, 1D quasicrystals and topological markers, *Materials for Quantum Technology* **2** 025005 (2022).
6. Jonas Jager and Ryan Barnett, Stochastic-field approach to the quench dynamics of the one-dimensional Bose polaron, *Physical Review Research* **3**, 033212 (2021).
7. Joseph Sykes and Ryan Barnett, Local topological markers in odd dimensions, *Physical Review B* **103**, 155134 (2021).
8. Jonas Jager, Ryan Barnett, Martin Will, and Michael Fleischhauer, Strong-coupling Bose polarons in 1D: Condensate depletion and deformed Bogoliubov phonons, *Physical Review Research* **2**, 033142 (2020).
9. Luca Mingarelli and Ryan Barnett, Exotic vortex lattices in binary repulsive superfluids, *Physical Review Letters* **122**, 045301 (2019).
10. J. P. Wrubel, A. Schwettmann, D. P. Fahey, Z. Glassman, H. K. Pechkis, P. F. Griffin, R. Barnett, E. Tiesinga, and P. D. Lett, Spinor Bose-Einstein-condensate phase-sensitive amplifier for SU(1,1) interferometry, *Physical Review A* **98**, 023620 (2018).
11. Luca Mingarelli, Eric E Keaveny, and Ryan Barnett, Vortex lattices in binary mixtures of repulsive superfluids, *Physical Review A* **97**, 043622 (2018).
12. Bogdan Galilo, Derek K. K. Lee, and Ryan Barnett, Topological edge-state manifestation of interacting 2D condensed Boson-lattice systems in a harmonic trap, *Physical Review Letters* **119**, 203204 (2017).
13. Sania Jevtic and Ryan Barnett, Frustration-free Hamiltonians supporting Majorana zero edge modes, *New Journal of Physics* **19**, 103034 (2017).
14. Matjaž Payrits and Ryan Barnett, Quantum rotor theory of systems of spin-2 Bosons, *Physical Review A* **94**, 023605 (2016).
15. Luca Mingarelli, Eric E Keaveny, and Ryan Barnett, Simulating infinite vortex lattices in superfluids, *Journal of Physics: Condensed Matter* **28**, 285201 (2016).
16. Bogdan Galilo, Derek K. K. Lee, and Ryan Barnett, Selective population of edge states in a 2D topological band system, *Physical Review Letters* **115**, 245302 (2015).
17. Matjaž Payrits and Ryan Barnett, Order-by-disorder degeneracy lifting of interacting bosons on the dice lattice, *Physical Review A* **90**, 013608 (2014).
18. Ryan Barnett, Edge-state instabilities of bosons in a topological band, *Physical Review A* **88**, 063631 (2013).
19. Hyewon K. Pechkis, Jonathan P. Wrubel, Arne Schwettmann, Paul F. Griffin, Ryan Barnett, Eite

- Tiesinga, Paul D. Lett, Spinor dynamics in an antiferromagnetic spin-1 thermal Bose gas, *Physical Review Letters* **111**, 025301 (2013).
20. Hoi-Yin Hui, Ryan Barnett, J. V. Porto, and S. Das Sarma, Loop structure stability of a double-well-lattice BEC, *Physical Review A* **86**, 063636 (2012).
 21. Ryan Barnett, G. R. Boyd, and Victor Galitski, SU(3) spin-orbit coupling in systems of ultracold atoms, *Physical Review Letters* **109**, 235308 (2012).
 22. Ryan Barnett, Stephen Powell, Tobias Graß, Maciej Lewenstein, and S. Das Sarma, Order by disorder in spin-orbit coupled Bose-Einstein Condensates, *Physical Review A* **85**, 023615 (2012).
 23. Hoi-Yin Hui, Ryan Barnett, Rajdeep Sensarma, S. Das Sarma, Instabilities of bosonic spin currents in optical lattices, *Physical Review A* **84**, 043615 (2011).
 24. Ryan Barnett, Anatoli Polkovnikov, and Mukund Vengalattore, Prethermalization in quenched spinor condensates, *Physical Review A* **84**, 023606 (2011).
 25. Ryan Barnett, Hoi-Yin Hui, Chien-Hung Lin, Jay D. Sau, and S. Das Sarma, Quantum rotor theory of spinor condensates in tight traps, *Physical Review A* **83**, 023613 (2011).
 26. Stephen Powell, Ryan Barnett, Rajdeep Sensarma, and S. Das Sarma, Bogoliubov theory of interacting bosons on a lattice in a synthetic magnetic field, *Physical Review A* **83**, 013612 (2011).
 27. Yue Zou, Ryan Barnett, and Gil Refael, Particle-hole symmetric localization in optical lattices using time modulated random on-site potentials, *Physical Review B* **82**, 224205 (2010).
 28. Ryan Barnett, Jay D. Sau, and S. Das Sarma, Antiferromagnetic spinor condensates are quantum rotors, Rapid Communication in *Physical Review A* **82**, 031602(R) (2010).
 29. Stephen Powell, Ryan Barnett, Rajdeep Sensarma, and S. Das Sarma, Interacting Hofstadter spectrum of bosons in an artificial gauge field, *Physical Review Letters* **104**, 255303 (2010).
 30. Ryan Barnett, Edward Chen, and Gil Refael, Vortex synchronization in Bose-Einstein condensates: A time-dependent Gross-Pitaevskii equation approach, *New Journal of Physics* **12**, 043004 (2010).
 31. Ryan Barnett, Daniel Podolsky, and Gil Refael, A geometrical approach to the hydrodynamics and low-energy excitations of spinor condensates, *Physical Review B* **80**, 024420 (2009).
 32. Ryan Barnett, Subroto Mukerjee, and Joel Moore, Vortex lattice transitions in cyclic spinor condensates, *Physical Review Letters* **100**, 240405 (2008).
 33. Ryan Barnett, Gil Refael, Mason Porter, and Hans Peter Büchler, Vortex lattice locking in rotating two-component Bose-Einstein condensates, *New Journal of Physics* **10**, 043030 (2008).
 34. Ryan Barnett, Ari Turner, and Eugene Demler, Classifying vortices in $S = 3$ Bose-Einstein condensates, *Physical Review A* **76**, 013605 (2007).
 35. Ari Turner, Ryan Barnett, Eugene Demler, and Ashvin Vishwanath, Nematic order by disorder in spin-2 BECs, *Physical Review Letters* **98**, 190404 (2007).
 36. Ryan Barnett, Paul Maragakis, Ari Turner, Maria Fyta, and Efthimios Kaxiras, Multiscale model of electronic behavior and localization in stretched dry DNA, *Journal Materials Science* **42**, 8894 (2007).
 37. Ryan Barnett, Ari Turner, and Eugene Demler, Classifying novel phases of spinor atoms, *Physical Review Letters* **97**, 180412 (2006).
 38. Ryan Barnett, Dmitry Petrov, Eugene Demler, and Mikhail Lukin, Quantum magnetism with multi-component dipolar molecules in an optical lattice, *Physical Review Letters* **96**, 190401 (2006).
 39. Ryan Barnett, Anatoli Polkovnikov, Eugene Demler, Wei-Guo Yin, and Wei Ku, Coexistence of gapless excitations and commensurate charge-density wave in the 2H-transition metal dichalcogenides, *Physical Review Letters* **96**, 026406 (2006).
 40. Ryan Barnett, Eugene Demler, and Efthimios Kaxiras, Superconducting and charge-density wave instabilities in ultrasmall-radius carbon nanotubes, *Solid State Communications* **135**, 335 (2005).

41. Ryan Barnett, Eugene Demler, and Efthimios Kaxiras, Electron-phonon interaction in ultrasmall-radius carbon nanotubes, *Physical Review B* **71**, 035429 (2005).
42. S. B. Cronin, R. Barnett, S. G. Chou, O. Rabin, A. K. Swan, S. Unlu, B. B. Goldberg, M. S. Dresselhaus, and M. Tinkham, Electrochemical gating of individual carbon SWNTs observed by transport measurements and resonant confocal micro-Raman spectroscopy, *Applied Physics Letters* **84**, 2052 (2004).
43. Adam Hartman, Maryam Jouzi, Ryan Barnett, and J. M. Xu, Theoretical and experimental studies of carbon nanotube electro-mechanical coupling, *Physical Review Letters* **92**, 236804 (2004).
44. Paul Maragakis, Ryan Barnett, Efthimios Kaxiras, Marcus Elstner, and Thomas Frauenheim, Electronic structure of overstretched DNA, Rapid Communication in *Physical Review B* **66**, 241104(R) (2002).
45. Ryan Barnett and George Gibson, Static field tunneling ionization of H_2^+ , *Physical Review A* **59**, 4843 (1999).

EXTERNAL TALKS AND EXTENDED ACADEMIC VISITS

- University of Cambridge Theory of Condensed Matter Seminar, Cambridge, UK, 30 Jan 2025 [planned]
- IOP conference: *Progress in Physics: Condensed Matter, Celebrating 90 years of Reports on Progress in Physics*, London, UK (talk on 9 Oct 2024) [planned]
- Open University School of Physical Sciences Seminar, Milton Keynes, UK, 9 Nov 2023
- Aspen Center for Physics workshop on *New Frontiers for Quantum Dynamics* Aspen, CO, USA, 13-27 Aug 2023
- University of Maryland Condensed Matter Theory Center Seminar, College Park, MD, USA, 16 Dec 2021
- Kavli Institute for Theoretical Physics program on *Interacting Topological Matter: Atomic, Molecular and Optical Systems* Santa Barbara, CA, USA, 12-30 July 2021 (virtual participation)
- Aspen Center for Physics workshop on *Realizations and Applications of Quantum Coherence in Non-Equilibrium Systems* Aspen, CO, US, 14–27 July 2019 (talk on 23 July)
- University of Lancaster Condensed Matter Seminar, Lancaster, UK, 8 Nov 2018
- UK Fluids Network *Workshop on Unconventional Superfluids*, University of Lancaster, talk on 13 Sept 2018
- Aspen Center for Physics workshop on *Topological Phases and Excitations of Quantum Matter* Aspen, CO, USA, 9–21 July 2018
- Aspen Center for Physics workshop on *Correlations and Entanglement in and out of Equilibrium: From Cold Atoms to Electrons*, Aspen, CO, USA, 10–23 July 2017
- Galileo Galilei Institute workshop *From Static to Dynamical Gauge Fields with Ultracold Atoms*, Florence, IT, 22–26 May 2017 (talk on 23 May)
- Kavli Institute for Theoretical Physics program on *Synthetic Quantum Matter*, Santa Barbara, CA, USA, 14–25 Nov 2016
- University of Nottingham Theoretical Condensed Matter Seminar, Nottingham, UK, 6 June 2016
- University of Cambridge AMOP Seminar, Cambridge, UK, 23 May 2016
- University of Sussex AMO Seminar, Brighton, UK, 12 Nov 2015
- Aspen Center for Physics workshop on *Ultra-Cold Quantum Matter with Atoms and Molecules*, Aspen, CO, USA, 19 Jul–2 Aug 2015 (talk on 28 July)
- Aspen Center for Physics workshop on *Gauge Fields in Condensed Matter, Ultracold Atoms, and*

Beyond, Aspen, CO, USA, 10–31 Aug 2014 (talk on 14 Aug)

- Ohio State University Condensed Matter Theory Seminar, Columbus, OH, USA, 18 Jul 2014
- Imperial College Quantum Optics and Laser Science Seminar, London, UK, 24 Jan 2014
- Harvard University Condensed Matter Physics Seminar, Cambridge, MA, USA, 12 Dec 2013
- University of Cambridge Theory of Condensed Matter Seminar, Cambridge, UK, 7 Nov 2013
- University of Southampton Dept of Mathematical Sciences Seminar, Southampton, UK, 22 Oct 2013
- Harvard Physics Dept workshop on *Quantum Dynamics of Low-Dimensional Systems*, Cambridge, MA, USA, 21–22 Sept 2013 (talk on 22 Sept)
- Aspen Center for Physics workshop on *Multi-Component Many-Body Systems*, Aspen, OC, USA, 25 Aug–15 Sept 2013 (talk on 29 Aug)
- Hubbard Theory Consortium workshop *Condensed Matter Physics in the City*, London, UK, 10 Jun 2013
- Nordic Institute for Theoretical Physics Seminar, Stockholm, SE, 29 Apr 2013
- Oxford University Rudolf Peierls Centre for Theoretical Physics, Oxford, UK, 24 Apr 2013
- Royal Holloway Condensed Matter Seminar, Egham, UK, 15 Feb 2013
- University of Birmingham Dept of Physics Theory Seminar, Birmingham, UK, 6 Dec 2012
- Imperial College London Dept of Physics CMTM Seminar, London, UK, 21 Nov 2012
- Oxford University Industrial and Applied Mathematics Seminar, Oxford, UK, 15 Nov 2012
- Virginia Tech Dept of Physics Seminar, Blacksburg, VA, USA, 20 Mar 2012
- University of Maryland Dept of Mathematics RIT Seminar, College Park, MD, USA, 12 Mar 2012
- Imperial College London Dept of Mathematics Seminar, London, UK, 29 Feb 2012
- Utrecht University Institute for Theoretical Physics Seminar, Utrecht, NL, 21 Nov 2011
- Institute for Quantum Optics and Quantum Information Seminar, Innsbruck, AT, 14 Nov 2011
- Joint Quantum Institute Seminar, College Park, MD, USA, 24 Oct 2011
- Lewiner Institute for Theoretical Physics workshop on *Quantum Magnetism in Ultracold Atoms*, Haifa, IL, 13–20 May 2011 (talk on 15 May)
- University of California Irvine Dept of Physics Condensed Matter Seminar, Irvine, CA, USA, 20 Apr 2011
- Naval Research Laboratory Electronic Materials Branch, Washington DC, USA, 6 Apr 2011
- APS March Meeting Talk, Dallas, TX, USA, 23 Mar 2011
- University of Amsterdam Institute for Theoretical Physics Seminar, Amsterdam, NL, 11 Mar 2011
- Kavli Institute for Theoretical Physics program on *Beyond Standard Optical Lattices*, Santa Barbara, CA, USA, 13 Sept–16 Oct 2010 (talk on 5 Oct)
- Nordita program on *Quantum Solids, Liquids, and Gases*, Stockholm, SE, 8–18 Aug 2010 (Seminar on 9 Aug)
- APS March Meeting Talk, Portland, OR, USA, 18 Mar 2010
- Georgetown University Condensed Matter Theory Seminar, Washington DC, USA, 23 Nov 2009
- University of Virginia Condensed Matter Seminar, Charlottesville, VA, USA, 12 Nov 2009
- Aspen Center for Physics workshop on *Quantum Simulation and Computation with Cold Atoms and Molecules*, Aspen, CO, USA, 7–21 Jun 2009 (talk on 12 Jun)
- Cal State University Long Beach Dept of Physics, Long Beach, CA, USA, 25 Mar 2009

- APS March Meeting Talk, Pittsburgh, PA, USA, 17 Mar 2009
- University of Cincinnati Dept of Physics Colloquium, Cincinnati, OH, USA, 3 Mar 2009
- University of Toronto Condensed Matter Physics Seminar, Toronto, ON, CA, 12 Feb 2009
- Argonne National Lab Seminar, Chicago, IL, USA, 9 Feb 2009
- National Institute of Standards and Technology Seminar, Gaithersburg, MD, USA, 3 Feb 2009
- George Mason University Dept of Physics Colloquium, Fairfax, VA, USA, 2 Feb 2009
- Naval Research Laboratory Center for Computational Materials Science Seminar, Washington DC, USA, 20 Nov 2008
- University of California Riverside Dept of Physics, Riverside, CA, USA, 2 Nov 2008
- APS March Meeting Talk, New Orleans, LA, USA, 14 Mar 2008
- Aspen Center for Physics conference *New Horizons in Condensed Matter Physics*, Aspen, CO, USA, 3–9 Feb 2008
- University of California Santa Cruz Dept Condensed Matter Seminar, Santa Cruz, CA, USA, 30 Nov 2007
- Lorentz Center workshop on *Disorder in Condensed Matter and Cold Atoms*, Leiden, NL, 24–28 Sep 2007
- University of California Berkeley Dept of Physics 290F Seminar, Berkeley, CA, USA, 29 Aug 2007
- Kavli Institute for Theoretical Physics program on *Strongly Correlated Phases in Condensed Matter and Degenerate Atomic Systems*, Santa Barbara, CA, USA, 29 Jan–16 Feb and 29 May–16 Jun 2007
- Cal State University Northridge Dept of Physics Seminar, Northridge, CA, USA, 12 Dec 2006
- Ohio State University Dept of Physics Cold Atoms Seminar, Columbus, OH, USA, 27 Sep 2006
- APS March Meeting Talk, Baltimore, MD, USA, 15 Mar 2006
- Caltech Condensed Matter Theory Seminar, Pasadena, CA, USA, 7 Feb 2006
- Rutgers University Dept of Physics Seminar, Piscataway, NJ, USA, 21 Nov 2005
- MIT Dept of Physics Condensed Matter Seminar, Cambridge, MA, USA, 29 Sep 2005
- APS March Meeting Talk, Los Angeles, CA, USA, 23 Mar 2005
- Boulder Summer School on *Quantum Coherence in Atomic and Condensed Matter Systems*, Boulder, CO, USA, 5–30 Jul 2004
- APS March Meeting Talk, Montreal, CA, 26 Mar 2004
- University of Salerno *Training Course in the Physics of Correlated Electron Systems*, Salerno, IT, 6–17 Oct 2003

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