Alexander F. Ritter ritter@maths.ox.ac.uk

Research field: Pure Mathematics → Geometry → Symplectic Topology
Interests: Homological Mirror Symmetry, Gromov-Witten theory, Floer theory

Mathematical Institute
Woodstock Road
Oxford, OX2 6GG, U.K.

Positions

- ◇ Associate Professor in Geometry, Mathematical Institute, **University of Oxford**. 01/2014 – ongoing. Tenure awarded 12/2017.
- ◇ The Roger Penrose Fellow and Tutor in Mathematics, **Wadham College, Oxford**. 12/2012 – ongoing. Senior Mathematics Tutor 2019 – ongoing.
- ◇ University Lecturer in Geometry, Mathematical Institute, **University of Oxford**, 12/2012 – 12/2013.
- ◇ Junior Research Fellow of **Trinity College, Cambridge**, 10/2009 – 09/2013.

Visiting positions

- ◇ Visiting Associate Professor of Mathematics, **Stanford University**, 08/2022 – 06/2023. (Sabbatical leave)
- ◇ Member of the **Isaac Newton Institute, Cambridge**, 01/2011 – 07/2011.

Education

- ◇ Ph.D. in Mathematics, 2009, **Massachusetts Institute of Technology** (MIT). GPA 5.0/5.0. Advisor: Prof. Paul Seidel. Thesis defence committee: Denis Auroux, Tom Mrowka, Paul Seidel. Thesis: *The Novikov theory for symplectic cohomology and exact Lagrangian embeddings.*
- ◇ MSc, 2005, **University of Chicago**. Top of class. Director of graduate studies: Prof. Peter May. (2003 GRE Math Subject Test: 98 percentile)
- ◇ MMath, 2004, Trinity College, **University of Cambridge** (Part III of the Mathematical Tripos) Distinction. Ranked 6^{th} place out of approximately 200 students.
- ◇ B.A. in Mathematics, 2000-2003, Trinity College, **University of Cambridge** . First class honours each year. Director of studies: Prof. Imre Leader.

Grants, distinctions and awards

- ◇ Principal Investigator, **EPSRC grant** EP/Z535977/1, *Orbifold Floer cohomology and birational geometry*, **3-years, £806,058**, one Postdoctoral research associate. 2025 – 2028.
- ◇ Co-Investigator, **EPSRC grant** EP/T012749/1, *Bridgeland stability on Fukaya categories of Calabi–Yau 2–folds*, **3-years, £653,181**, PI: Dominic Joyce, Co-Investigator: Jason Lotay, and a Postdoctoral research associate: Dr Guillem Cazassus. 09/2020 – 08/2023.
- ◇ International associate partner in a large grant of the *Centre for Quantum Geometry of Moduli Spaces,* **Aarhus**, ca. **£180** (36K/year) supporting DPhil students in Geometry at Oxford. Exchange programs of students/postdocs with Berkeley, Caltech, IHES. Sep 2014 – 12/2019.
- ◇ Distinguished lectures:

  Floer Lectures, Floer Centre of Geometry, Bochum, Germany, 19/20 April 2013. (Held annually)

- ◇ Awards:

Junior Research Fellowship, Trinity College. Stipendiary non-teaching Postdoc position.	2009-13
Teaching Assistantship, MIT.	2008-09
Research Fellowship, MIT.	2007-08
McCormick Fellowship, for highest rated graduate applicants, University of Chicago.	2004-06
Rouse Ball Prize, Mathematics essay prize, Trinity College.	2003
Heilbronn Prize for outstanding academic performance, Trinity College.	2003
Senior Scholarship for outstanding academic performance, Trinity College.	2002 & 2003
Junior Scholarship for outstanding academic performance, Trinity College.	2001

List of Publications

◇ joint with Filip Živanović, *Quantum cohomology and Floer invariants of semiprojective toric manifolds.* **arXiv:2501.09011**, 38pp, 2025.

◇ joint with Filip Živanović, *Filtrations on equivariant quantum cohomology and Hilbert-Poincaré series.* **arXiv:2410.17237**, 71pp, 2024.

◇ joint with Filip Živanović, *Filtrations on quantum cohomology via Morse-Bott-Floer Spectral Sequences.* **arXiv:2304.14384v3**, 90pp, 2023.

◇ joint with Filip Živanović, *Filtrations on quantum cohomology from the Floer theory of $\mathbb{C}^*$-actions.* **arXiv:2304.13026v4**, 72pp, 2023.

◇ joint with Mark McLean, *The McKay correspondence for isolated singularities via Floer theory.* **Journal of Differential Geometry**, 124(1), 113–168, 56pp., 2023.

◇ joint with G. Benedetti, *Invariance of symplectic cohomology and twisted cotangent bundles over surfaces*, **International Journal of Mathematics**, 31, no.9, 1–56, 56pp, 2020.

◇ joint with Ivan Smith, *The monotone wrapped Fukaya category and the open-closed string map*, **Selecta Mathematica**, Volume 23, 533–642, 110pp, 2017.

◇ *Circle-actions, quantum cohomology, and the Fukaya category of Fano toric varieties*, **Geometry & Topology** 20, 1941–2052, 112pp, 2016.

◇ *Floer theory for negative line bundles via Gromov-Witten invariants*, **Advances in Mathematics**, Volume 262, 1035–1106, 72pp, 2014.

◇ *Topological quantum field theory structure on symplectic cohomology*, **Journal of Topology**, Volume 6, Number 2, 391–489, 99pp, 2013.

◇ *Deformations of symplectic cohomology and exact Lagrangians in ALE spaces*, **Geometric And Functional Analysis (GAFA)**, Volume 20, Number 3, 779–816, 38pp, 2010.

◇ *Novikov-symplectic cohomology and exact Lagrangian embeddings*, **Geometry & Topology** 13, 943–978, 36pp, 2009.

Research projects in progress

◇ joint with Filip Živanović, *Quantum cohomology and Floer invariants of semiprojective toric varieties*, due end 2024/start 2025, 42pp.+preprint.

◇ joint with G. Cazassus and D. Joyce, *A new construction of Fukaya categories for semipositive symplectic manifolds*, EPSRC project paper 1, 100+pp. preprint, to appear in 2025.

◇ joint with G. Cazassus, D. Joyce, and J. Lotay, *Elliptic Flow for Special Lagrangians in Calabi–Yau 2–folds*, EPSRC project paper 2, to appear in 2025.

◇ joint with Mark McLean, *Gromov-Witten theory for orbifolds via a global Kuranishi chart*, to appear in 2024, and *The Crepant Resolution Conjecture via Floer theory*, to appear in 2025.

◇ *Morse Homology, with a view towards Floer homology.* Book under contract with Cambridge University Press, to appear in the series: *Cambridge Studies in Advanced Mathematics.*

Doctoral Students

Dr Nicholas Wilkins, Oct 2015 – Jan 2019. (EPSRC Doctoral Training)
Thesis: *Quantum Steenrod squares, related operations, and their properties.*
Thesis published in: *A construction of the quantum Steenrod squares and their algebraic relations*, Geom. Topol. 24, no. 2, 885–970, 2020.
Subsequent positions: **Heilbronn Institute** (2-year Postdoc), **MIT** (3-year Simons Collaboration)

Dr Filip Živanović, 2016 – 2021 (Ursell Award (Oxford Univ.), Alan Tayler Scholarship (St Catz)).
Thesis: *Symplectic Geometry of Conical Symplectic Resolutions.*
Subsequent position: **University of Edinburgh** (3-year Postdoc via ERC Grant, PI: N.Sheridan).

Dr Todd Liebenschutz-Jones, 2017 – 2021. (EPSRC Studentship)
Thesis: *Equivariant Seidel maps and a flat connection on equivariant symplectic cohomology.*

Dr Roland Grinis, (coadvised with Prof. Joyce) 2013 – 2017. (EPSRC Research Studentship)
Thesis: *On the soliton resolution conjecture for wave maps.* Thesis published in: *Quantization of time-like energy for wave maps into spheres*,Comm.Math.Phys. 352, no.2, 641–702, 2017.

George Cooper, (coadvised w/Prof.Kirwan,Prof.Lotay), 2020–2024. (EPSRC Doctoral Scholarship)
Thesis topic: *Universal Moduli of Sheaves over Curves and Moduli of Flags of Varieties via Geometric Invariant Theory.*

Nicholas Campen, 2024 – ongoing. (Martingale Scholarship)
Thesis topic: equivariant Floer theory for toric varieties.

Undergraduate research students

Masters dissertation supervisor at Oxford

Jiasheng Teh, 2015/2016, *Floer Homology* (MTP Masters course).
Todd Liebenschutz-Jones, 2016/2017, *Moduli space of curves, and enumerative geometry.*

Research mentor at MIT

Project Laboratory in Mathematics, MIT, Spring 2009. Guided 9 undergraduate students in doing research projects, preparing oral and written presentations.

Invited Talks

(Selected: **over 40 talks, in 13 different countries**)

Oxford, Algebraic and Symplectic Geometry Seminar, Feb 2025.
Belgrade, Workshop on Symplectic Topology, University of Belgrade, Aug 2024.
Vienna, Mathematics and CS Seminar, Institute of Science and Technology Austria (IST), Jan 2024.
Southampton, Pure Mathematics Colloquium, Oct 2022.
Stanford, Symplectic Geometry Seminar, Oct 2022.
Lisbon, Workshop on Symplectic Dynamics, Instituto Superior Tecnico, June 30, 2022.
Seoul National University, QSMS, Winter School on Mirror Symmetry, 3 lectures, Feb 2021.
Lisbon, Geometry Seminar, Instituto Superior Tecnico, May 2020.
Rio de Janeiro, IMPA, Workshop on Conservative Dynamics and Sympl. Geometry, Aug 2019.
Paris, Institut Henri Poincaré, Symplectic Seminar "Symplectix", Mar 2019.
Heidelberg, Germany, Symplectic Geometry Seminar, 2 talks, June 2018.
Cambridge, Differential Geometry and Topology Seminar, Feb 2017.
London, 18th UK-Japan Winter School in Maths: Singularities, Symmetries and Submanifolds, Jan 2017.
Oxford, Geometry and Analysis Seminar, Oct 2016.
Amsterdam, Mini-Workshop on Symplectic Geometry, Sep 2016 (jointly Amsterdam & Utrecht).
Oxford, Algebraic and Symplectic Geometry Seminar, May 2016.
Hamburg, Germany, Siebert's Research Seminar in Complex Geometry, Jan 2015.
Münster, Germany, Symplectic Geometry Seminar, Jan 2015.
ETH Zürich, Geometry Seminar, May 2014.

Oxford, Algebraic and Symplectic Geometry Seminar, Feb 2014.
Leeds, U.K., Yorkshire-Durham Geometry Day, 24 January 2014.
Paris VI Jussieu, Symplectic Seminar "Symplectix", Dec 2013.
Bochum, Germany, *Floer Lectures*, Floer Centre of Geometry, 19/20 April 2013. (Held annually)
Les Diablerets, Switzerland, Workshop on Symplectic Geometry, Jan 2013.
Oxford, Geometry and Analysis Seminar, Nov 2012.
Pavia, Italy, "Giornate di Geometria" (Italian national conference in geometry), Mar 2012.
Bonn, Hausdorff Institute Seminar joint with Algebraic Geometry Seminar of Bonn, Nov 2011.
Rio de Janeiro, IMPA, Workshop on Conservative Dynamics and Sympl. Geometry, Aug 2011.
Cambridge, Geometry Seminar (special 2-hour summer seminar), July 2011.
Strasbourg, Symplectic Geometry Seminar, Mar 2011.
Aberdeen, Geometry Seminar, Mar 2011.
Oxford, Algebraic and Symplectic Geometry Seminar, Oct 2010.
ETH Zürich, Geometry Seminar, Mar 2010.
Cambridge, Differential Geometry Seminar, Mar 2010.
Bruxelles, joint with **Köln** University, Seminar on Symplectic and Contact Geometry, Nov 2009.
Columbia University, New York, Symplectic Geometry and Gauge Theory Seminar, Mar 2009.
Paris, Institut Henri Poincaré, Seminar in Symplectic and Real Algebraic Geometry, Jul 2008.
Northwestern University, Chicago, Geometry/Physics Seminar, Mar 2008.

Workshops (Selected)

LMS Lecture Series 2024: Logs and stacks in birational geometry and moduli, Imperial College, July 2024.
Workshop on Symplectic Topology, University of Belgrade, Aug 2024.
MSRI, Berkeley, *Floer Homotopical Methods in Low Dimensional and Symplectic Topology*, Nov 2022.
MSRI, Berkeley, *Introductory Workshop: Floer Homotopy Theory*, Sep 2022.
Lisbon, Workshop on Symplectic Dynamics, Instituto Superior Tecnico, June 2022.
Cambridge, *Categorical Symplectic Topology Conference*, Mar 2019.
Oxford, *CMI at 20*, 20th Anniversary Conference, Clay Mathematics Institute, Sep 2018.
Oxford, *Modern Moduli Theory*, CMI Workshop, Clay Mathematics Institute, Sep 2017.
Oxford, *Modern Moduli Theory Graduate School*, Sep 2017.
UCL, *18th UK-Japan Winter School in Maths: Singularities, Symmetries and Submanifolds*, Jan 2017.
Amsterdam, Mini-Workshop on Symplectic Geometry, Sep 2016 (jointly Amsterdam & Utrecht).
Clay Mathematics Institute, Oxford, Conference on Symplectic Topology, Sep 2014.
Les Diablerets, Workshop on Symplectic Geometry, Contact Geometry and Interactions, Jan 2013.
Oxford, *Aspects of Topology*, organized by Prof. Ulrike Tillmann, Dec 2012.
Hamburg University, Workshop on Lagrangian Floer Homology (SFT V, Fukaya), Aug 2011.
IMPA, Rio de Janeiro, Workshop on Conservative Dynamics and Symplectic Geometry, Aug 2011.
Isaac Newton Institute, Cambridge, Moduli Spaces Workshop, Jan 2011 - July 2011.
Institut Henri Poincaré, Paris, Workshop on Symplectic and Contact Geometry, Jan 2010.
LMU University of Munich, Workshop on Homological Mirror Symmetry (SFT IV, Seidel), July 2009.
Humboldt University Berlin, Workshop on Gromov-Witten theory (SFT III, Givental), July 2008.
Institut Henri Poincaré, Paris, Summer School in Symplectic & Real Algebraic Geometry, July 2008.
MIT, Workshop on Mirror Symmetry and Symplectic Geometry, May 2008.
Université de Montréal (Canada), Workshop on Floer Theory and Symplectic Dynamics, May 2008.
Stanford University, New Perspectives and Challenges in Symplectic Field Theory, Aug 2007.
Clay Mathematics Institute (Cambridge, U.S.A.), Workshop on Symplectic Topology, Apr 2007.
Leipzig University, Workshop on Symplectic Field Theory (SFT II, Eliashberg), Aug 2006.
Oberwolfach Institute, Workshop, *Differentialgeometrie im Grossen*, Aug 2005.

Academic leadership roles

Editorial Work

Editor in Geometry for *The Quarterly Journal of Mathematics*, Oxford University Press, 2018 – 2023.
(Editor in charge for over 60 (not desk rejected) papers submitted to QJM.)

International Conference Organizer

Clay Mathematics Institute conference *Symplectic Topology*,
29/9/2014 – 3/10/2014 [1 week, 16 speakers]. Co-organizers: Dominic Joyce and Ivan Smith.

Journal Referee for *Duke Mathematical Journal* (Duke Univ. Press); *Math. Ann.* (Springer);
Selecta Mathematica (Birkhäuser); *Journal of Symplectic Geometry* (International Press);
IMRN - International Math. Research Notices (OUP); *Compositio Math.* (CUP);
Bulletin of of the London Mathematical Society (LMS); *Astérisque* (SMF France).

Administrative roles

Departmental Seminar Organizer

Organizer *Symplectic Geometry Seminar* 2022 – 2023 (ca. 20 talks/year), Stanford.
Co-organizer *Geometry and Analysis Seminar* 2017 – ongoing (24 talks/year), Oxford.
Co-organizer *Algebraic and Symplectic Geometry Seminar* 2013–17, 2025–ongoing (24 talks/year), Oxford.

Departmental Committees

Part A Examiner, 2023 – 2026.
Projects Committee, 2023 Michaelmas Term.
Part C Examiner, 2015 – 2018.
Selection Committee for Postdoctoral Research Associates, 2018, 2020, 2025.

EDI Departmental Committees

Equality, Diversity and Inclusion Committee (EDIC), 2019 – 2022.
Good Practice Committee (GPC), 2018 – 2019.
Good Practice Working Group, 2018 – 2019.

College Committees

EJRA Panel, 2023 – ongoing (till 2026).
Finance Committee, 2019 – 2022.
Remuneration Committee, 2016 – 2019.
Graduate Liaison Committee, 2013 – 2016.
Academic Panel, 2014 – 2017.
Governing Body, 2012 – ongoing.
Tutorial Board, 2012 – ongoing.
Selection Committee for an Associate Professorship in Mathematical Physics, 2016.
Selection Committee for Stipendiary Lectureships in Mathematics, 2014, 2016, 2017, 2018, 2019, 2021, 2022.

Examination

Part C Examiner, 2015 – 2018.
PhD External Examiner for T. Sodoge at UCL, 2017.
DPhil Internal Examiner for C.L. Chong (2022), S. Kang (2019), B. Volk (2014).
DPhil Confirmation of Status, A. Holmes (2024), R. Savage (2024), E.G. Marmolejo (2021), Y. Wang (2018), S. Kang (2017), B. Volk (2014).
DPhil Transfer of Status for J. Davies (2025), C. Ochoa (2024), Y. Wang (2017), S. Kang (2016).
Assessor for: C3.5 Lie groups (2013–15), B3.2 Geometry of Surfaces (2015–19), C3.4 Algebraic Geometry (2016 – 2019), C3.1 Algebraic Topology (2020–22), C2.6 Introduction to Schemes (2020–22).
Oxford DPhil Admissions Interviewer: for the Mathematical Institute. Interview numbers:
2014: 2, *2015*: 7, *2016*: 10, *2017*: 4, *2018*: 6, *2019*: 5, *2020*: 5, *2021*: 4, *2022*: 6, *2024*: 9.
Oxford Admissions Interviewer: for Wadham College undergrad Mathematics. Interview numbers:
2012:20, *2013*:22,*2014*:27,*2015*:28,*2016*:38,*2017*:34,*2018*:28,*2019*:29,*2020*:33,*2021*:30,*2023*:24,*2024*:20.
Cambridge Admissions Interviewer: for Trinity College (Cambridge) undergraduate Mathematics.
Dec 2009: 6 interviews. *Dec 2010*: 16 interviews. *Dec 2011*: 18 interviews.

Outreach activities

CMI-PROMYS International Alliance, Oxford Masterclasses in Geometry
Wadham College, Oxford, August 10 – 16, 2014. Director and lecturer (10 two-hour lectures).
Lectures on Geometry, Topology, and Penrose tilings. (Funded by the Clay Mathematics Institute, 19 European students, Summer program for ambitious high school students to explore mathematics.)

Teaching Experience

Lecturer for Oxford courses:

2024 in Michaelmas Term:
Linear Algebra (second year course), 16 Lectures (ca. 200 students)
2024, 2023 in Michaelmas Term:
Analysis I, 15 Lectures (ca. 200 students)
2022, 2021, 2020 in Hilary Term:
Introduction to Schemes, 16 Lectures + 4 Hwk sessions (average: 20 students, 5 PhD students)
2021, 2020, 2019, in Michaelmas Term:
Algebraic Topology, 16 Lectures (average: 25 students, 5 PhD students)
2018, 2017, 2016, 2015, in Michaelmas Term:
Algebraic Geometry, 16 Lectures + 4 Hwk sessions (average: 30 students, 5 PhD students)
2018, 2017, 2016, 2015, 2014, in Michaelmas Term:
Geometry of Surfaces, 16 Lectures + 4 Hwk sessions (average: 25 students)
2015, 2014, 2013, in Hilary Term:
Lie Groups, 16 Lectures + 4 Hwk sessions (average: 10 students, 2 PhD students)
2013 in Michaelmas Term:
Morse Homology, Graduate course, 16 Lectures. (6 PhD students)

Tutorial teaching at Oxford. Usually 4 tutorial hours/student. Student numbers:

Michaelmas Term	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1^{st} year **Algebra**	10	7	10	8	9	10	9	10	10		10	9
2^{nd} year **Algebra**	8	10	7	7	9	9	10	9			7	10
Metric Spaces									9			
Complex Analysis									9			
Hilary Term	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1^{st} year **Linear Algebra**	8	10	7	10	8	9	10	9	10	10		10
Groups & Group Actions	8	10	7	10	8	9	10	9	10	10		10
Topology	10	5	4	4	2	4	5	5	4	7		4
Rings and Modules		3	7	4	4	5	2	5	2	6		7
Numerical Analysis					3	1						
Integration								4				
Integral Transforms									5			
Multidimensional Analysis										2		1
Trinity Term	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Groups & Group Actions	8	10	7	10	8	9	10	9	10	10		10
Constructive Mathematics					9	5						
Group Theory	5	3	5		2	2	2	3	1	5		6
Number Theory								2				
Projective Geometry		1			1	2			1	2		1
Introduction to Manifolds			5		2	1			1			
Calculus of Variations							4		3			
Statistics									10			

Lecturer for Cambridge courses:

Lecturer, **Morse Homology**, examinable **Part III course**, Cambridge University, Lent 2011.
24 Lectures + 4 exercise cl. Audience: 15 MA students, 3 Postdocs, 1 Prof. Designed and graded exams.

Lecturer for University of Chicago courses:

Lecturer, **Calculus**, University of Chicago, Fall 2006, Winter 2007, Spring 2007. Ca. 90 lectures, 30 students. Course evaluation: 4.8/5.0. Nominated by students for *Physical Sciences Teaching Prize.*

Apprentice Instructor, Algebra, **University of Chicago**, 2005-2006. Taught 7 Lectures, 25 students. Mentor: Prof. Robert Kottwitz. Nominated by the students for the *Physical Sciences Teaching Prize.*

Supervisor at Cambridge University: (Tutorials of 4 hours/student)

Analysis, 13 students, Lent 2012.
Linear Algebra, 16 students, Michaelmas 2010.
Linear Algebra, 16 students, Michaelmas 2009.
Groups, 6 students, Michaelmas 2011.
Geometry & Groups, 16 students, Lent 2010.

Teaching Assistant at MIT: (20 hours/course of afternoon classes + 3 weekly office hours)

Multivariable Calculus, Fall 2008. Approx. 20 students.
Linear Algebra, Spring 2008. Approx. 20 students.

Teaching Workshops / Professional Development

MIT Teaching Workshop for mathematicians, MIT, Fall 2008. Organizer: Prof. Denis Auroux.
Training for admissions interviewing, Oxford Learning Institute, Tutored online course, Nov 2012.
Workshop on Effective DPhil Supervision, Oxford Learning Institute, University of Oxford, Feb 2016.

Languages

Fluent: **English**, **German**, **Italian**. (Italian high-school diploma 100/100 at Liceo Marinelli, Udine)
Advanced: **French**. (*DELF A1-A4*, Alliance Française, 2004).
Intermediate: **Modern Greek** (3–year course 2016–2019, Oxford University Language Centre).

References

Prof. Paul Seidel (*pseidel@mit.edu*, Tel: +1 617 253 3773)
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University of Paris – Saclay, Département de Mathématiques, 91405 Orsay Cedex, France.

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