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Research Interests

Algebraic geometry, higher dimensional birational geometry. Properties of varieties covered by rational curves, explicit birational geometry of Fano 3-folds, geometry of Calabi-Yau and hyperkähler manifolds. Interactions of birational geometry with mirror symmetry.

Education

2003–2007	PhD in Algebraic Geometry, <i>The topology of terminal quartic 3-folds</i> Queens' College, University of Cambridge
2002–2003	Certificate of Advanced Studies in Mathematics, Part III (Distinction) Queens' College, University of Cambridge
2000–2003	Degree of the Ecole Centrale Paris
2000–2001	Licence (BA) in Pure Mathematics (Honours) Université d'Orsay, Paris XI
1998–2000	Classes Préparatoires Mathématiques supérieures et spéciales Lycée Joffre, Montpellier

Employment

Sep 2014–present	Lecturer in Mathematics, Brunel University London Maternity Leave November 2016–April 2017
Jan 2012–Aug 2014	Research Associate, Imperial College London
Mar 2011–Dec 2011	Postdoctoral Fellow, University of Cambridge
Oct 2007–Aug 2011	Junior Research Fellow, Trinity Hall, University of Cambridge

Visiting positions

May 2019	Research Member, MSRI, Berkeley, USA
Jan–Apr 2014	Postdoctoral Fellow, Hausdorff Institute, Bonn, Germany
Aug–Dec 2011	Visiting Scholar, University of Illinois at Chicago
Nov 2009–Apr 2010	JSPS Postdoctoral Fellow, RIMS, Kyoto, Japan
Jan–May 2009	Postdoctoral Fellow, MSRI, Berkeley, USA

Grants, Awards and Scholarships

2017–2019	EPSRC First Grant <i>Calabi-Yau Pairs and Mirror Symmetry for Fano Varieties</i> , £91,852
2017–2018	Athena Swan Research Award, Brunel University, £12,500
2014	Hausdorff Research Institute for Mathematics Junior Trimester Program in Algebraic Geometry, <i>Birational and Hyperkähler Geometry</i> (with D. Greb, V. Lazić and C. Xu)
2011–2014	EPSRC Postdoctoral Research Fellowship <i>Birational Geometry and Topology of Singular Fano 3-folds</i> , £231,682
2009–2010	JSPS Short Term Visiting Fellowship. ¥2,078,500
2003–2007	Munro Studentship, Queens' College; Sims Fund Scholarship; Allen, Meek and Read Scholarship; Cambridge European Trust Scholarship
2003	Foundation Scholarship, Queens' College, Cambridge

Selected Invited Talks (past 5 years)

Conferences and workshops

- *Mutations and crepant birational maps between Calabi–Yau pairs*
“Cremona transformations and the Sarkisov Program”, University of Ferrara, 2020
- *3-fold Calabi–Yau pairs*
“Mutations: Mirror Symmetry, Deformations, and Combinatorics”, Banff International Research Station, 2019
Conference VBAC 2019 “GIT, Wall-crossings and Moduli Spaces”, Sandbjerg Gods, 2019
British Mathematical Colloquium 2019, Geometry session, Lancaster, 2019
“Constructions and Obstructions in Birational Geometry”, ICMS, Edinburgh, 2018
“Birational Geometry and Moduli Spaces”, INdAM, Rome, 2018
- *The Sarkisov program for Mori fibred Calabi–Yau pairs*
“Algebraic geometry: Old and new”, Clay Mathematics Institute, Oxford, 2016
Workshop on the Minimal Model Program, Leibniz Universität Hannover, 2016
Workshop on Birational geometry, University of Warwick, 2016
Workshop on higher dimensional algebraic geometry, IMPA, Rio de Janeiro, Brazil, 2015
Colloquium GRIFGA, Brescia, Italy, 2015

Seminars

- *3-fold Calabi–Yau pairs*, 2019: University of Glasgow, Stanford University, Utrecht University, Boston College
- *Birational geometry of Calabi–Yau pairs*, 2014–15: University of Cambridge, University of Nottingham

Teaching Experience

Postgraduate teaching

Lecturer, *Birational geometry* intensive course, London Taught Course Centre, May 2016

Lecturer, Winter school *Birational methods in hyperkähler geometry*, University of Bonn, 2014

Lecturer, *Probability theory and stochastic calculus*, Financial Mathematics Msc course, Brunel University, 2014–2020

Lecturer, *Algebraic curves*, Structured Master's course, African Institute in Mathematical Sciences (AIMS), Limbe, Cameroon, January 2015

Lecturer, *Hodge theory*, Examinable Part III course, University of Cambridge, 2010–2011

Instructor, *Differential geometry*, Problem classes, Examinable Part III course, University of Cambridge, 2008–2009

PhD supervision

K. Kubiliute, London School of Geometry and Number Theory (LSGNT), started 2016 (co-supervised with A. Corti)

Postgraduate research supervision

PhD project *Birational geometry of hyperkähler varieties*, F. Bernasconi, Y. Li, and M. Mauri, LSGNT, 2016 (co-supervised with P. Cascini)

PhD project *Explicit volume preserving Sarkisov links in dimension 2 and 3*, K. Kubiliute, LSGNT, 2016 (co-supervised with A. Corti)

Part III essay (Master's thesis) *Mori Dream Spaces*, T. Ducat, University of Cambridge, 2011

Msc Dissertation supervision

Financial Mathematics Msc, Brunel University London, 7 students, since 2015

Undergraduate teaching

Final year project supervision, Mathematics, Brunel University, (2014–2015: 2 students, 2015–2016: 5 students, 2017–2018: 4 students, 2018–2019: 3 students)

Lecturer, *Probability and Statistics*, 1st year course, Mathematics, Brunel University, 2017–2020

Lecturer, *Analytical methods and skills*, 1st year course, Mechanical Engineering, Brunel University, 2015–2017

Lecturer, *Algebraic curves*, 3rd year course, Imperial College London, 2012–2014

Instructor, *Linear algebra*, Example Classes, 2nd year course, Queens' College, Cambridge, 2006–2007

Small-group teaching (supervising), University of Cambridge, 2003–2009

1st year courses: *Analysis I*, *Metric and topological spaces*; 2nd year courses: *Analysis II*, *Linear algebra*, *Geometry*; 3rd year courses: *Riemann surfaces*, *Algebraic topology*, *Differentiable manifolds*, *Number theory*, *Galois theory*

Academic Service

Workshops organised

British Algebraic Geometry meeting, Imperial College London, with P. Cascini (Imperial College), C. Manolache (Sheffield) and N. Pagani (Liverpool), September 2020

Mirror symmetry and cluster algebras, University of Cambridge, with T. Coates (Imperial College), A. Corti (Imperial College), M. Gross (Cambridge), M. Mazzocco (Birmingham), M. Reid (Warwick), K. Rietsch (King's College), L. Williams (Harvard) and M. van Garrel (Warwick), July 2019

British Algebraic Geometry meeting, University of Liverpool, with P. Cascini (Imperial College), N. Pagani (Liverpool) and J. Ross (UIC), April 2019

EDGE days, University of Edinburgh, with I. Cheltsov (Edinburgh), June 2015

Birational geometry and foliations, Hausdorff Research Institute for Mathematics, Bonn, with C. Xu (Beijing), D. Greb (Bochum) and V. Lazić (Bonn), February 2014

Seminars organised

Member of the COW seminar steering group (Cambridge, Oxford, Warwick, Bath, and Imperial College joint seminar in Algebraic Geometry), January 2018–present

Brunel organiser for the COW seminar, 2014–present

Cambridge organiser for the COW seminar, 2008–2011

Cambridge organiser for the CALF (Junior COW seminar), 2003–2005

Reviewing and panel work for Research Councils

EPSRC Proposals Reviewing, 2019-present

UKRI Future Leaders Fellowship panellist, 2019-present

Committee and Board memberships

Mentoring African Research in Mathematics Board, London Mathematical Society, 2019- present

Research Committee, Department of Mathematics, Brunel University, 2019-present

Hiring panels

Maître de conférence hiring panel, Université de Montpellier, 2016

Maître de conférence hiring panel, Université de Strasbourg, 2016

Refereeing and Reviewing

Acta Mathematica, *Advances in Mathematics*, *Compositio Mathematica*, *European Journal of Mathematics*, *Geometriae Dedicata*, *International Mathematics Research Notices*, *Proceedings A*, *Proceedings of the LMS*, and *Transactions of the AMS*

Cambridge Admissions Interviews

Interviews and admission board decisions for Trinity Hall (2007–2010) and Sidney Sussex (2008) undergraduate mathematics

Public Engagement and Outreach

Lecturer at the African Institute for Mathematics, Limbe, Cameroon, January 2015

Interview *La classification des formes géométriques*, *La Recherche* (N.453)

Volunteer for the Teach First foundation (2011–present). Preparation of Year 13 pupils for university admission interviews and Sixth Term Examination Paper in Mathematics

Volunteer for the Nuffield Foundation (2012–2014). Mentor in a Programme designed to support gifted students from disadvantaged backgrounds through Years 12 and 13

Mathematics Subject Lead for the Higher Education Access Programme, Teach First Foundation (2010–2011). University-level Mathematics “taster” course for Year 12 pupils

Professional memberships

Fellow of the Higher Education Academy

Member of the London Mathematical Society

Referees

- Professor Alessio Corti
Department of Mathematics, Imperial College London, 180, Queen’s Gate, London SW7 2AZ
a.corti@imperial.ac.uk; *Tel:* +44 (0)2075 941 870; *Fax:* +44 (0)20 7594 8517
- Professor Miles Reid, FRS
Warwick Mathematics Institute, University of Warwick, Coventry CV4 7AL
miles.reid@warwick.ac.uk; *Tel:* +44 (0)2476 523 491; *Fax:* +44 (0)2476 524 182
- Professor Ivan Cheltsov
School of Mathematics, University of Edinburgh, Mayfield Rd, Edinburgh EH9 3JZ
i.cheltsov@ed.ac.uk; *Tel:* +44 (0)131 650 4881; *Fax:* +44 (0)131 650 6553
- Professor James McKernan, FRS
Department of Mathematics, UC San Diego, 9500 Gilman Dr., La Jolla, CA 92093 USA
jmckernan@math.ucsd.edu; *Tel:* +1 858 534 6347; *Fax:* +1 858 534 5273

Publications and Preprints

Publications

1. *Some examples of Calabi-Yau pairs with maximal intersection and no toric model*, to appear in Proceedings of the INdAM Workshop BGMS, Rome June 2018, Springer INdAM series
2. *The Sarkisov program for Mori fibred Calabi-Yau pairs* (with A. Corti), *Algebraic Geometry*, 3 (2016), no. 3, 370–384
3. *Non-rigid quartic 3-folds* (with H. Ahmadinezhad), *Compositio Mathematica*, 152 (2016) no. 5, 955–983
4. *Finite generation and geography of models* (with A. Küronya and V. Lazić), in *Minimal models and extremal rays*, *Advanced Studies in Pure Mathematics*, vol. 70 (2016) 215–246
5. *Relations in the Sarkisov program*, *Compositio Mathematica*, 149 (2013) no. 10, 1685–1709
6. *The defect of Fano 3-folds– Errata*, *J. Algebraic Geom.* 21 (2012), no. 2, 397–399
7. *A classification of terminal quartic 3-folds and rationality questions*, *Math. Annalen* 354 (2012), no. 1, 263–296
8. *Introduction to the MMP and the existence of flips* (with A. Corti and V. Lazić), *Bull. London Math. Soc.* 43 (2011), no. 3, 415–448
9. *The defect of Fano 3-folds*, *J. Algebraic Geom.* 20 (2011), no. 1, 127–149

Reports

- (i) *Birational geometry and mirror symmetry of Calabi–Yau pairs*, Mathematisches Forschungsinstitut Oberwolfach Report No.28/2018 (2018)

Preprints

- (a) *Smoothings of toric Fano 3-folds with isolated Gorenstein singularities* (with A. Petracci), in preparation (expected 2020)
- (b) *3-fold Calabi-Yau pairs*, in preparation (expected 2020)
- (c) *Volume preserving maps of tori and mutations*, in preparation (expected 2020)
- (d) *Birational rigidity of quartic hypersurfaces with $cA1$ points* (with H. Ahmadinezhad), in preparation
- (e) *The topology of terminal quartic 3-folds*, University of Cambridge PhD thesis, arXiv:0707.1852