Tom Coates

Contact Information

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Education and Employment

Professor of Pure Mathematics Sep 2015–present
Imperial College London, UK

Reader in Pure Mathematics Dec 2009–Aug 2015
Imperial College London, UK

Royal Society University Research Fellow Jun 2006–Nov 2013
Imperial College London, UK

Clay Research Scholar and Postdoctoral Fellow Jan 2006–May 2006
Mathematical Sciences Research Institute, Berkeley, USA

Benjamin Peirce Assistant Professor Aug 2003–Dec 2005
Harvard University, USA

Clay Mathematics Institute Liftoff Fellow Jun 2003–Aug 2003
Imperial College London, UK

University of California at Berkeley, USA 1998–2003

Ph.D. in Mathematics, awarded May 2003

- Thesis title: *Riemann–Roch Theorems in Gromov–Witten Theory*
- Thesis advisor: Prof. Alexander Givental

Cambridge University, UK 1997–1998
Part III of the Mathematical Tripos, with Distinction

Cambridge University, UK 1994–1997
BA in Mathematics with First Class Honours

Grants and Awards

European Union ERC Consolidator Grant Oct 2016–Sep 2021

This award (€2M) pays for 4 post-docs, a research assistant, and 50% of my salary for 2016–21. These grants are highly competitive, with roughly 12 awards per year in mathematics across Europe.

EPSRC Programme Grant Oct 2016–Sep 2021

I co-wrote this with Prof. A Corti, Prof. M Gross (University of Cambridge), and Prof. M Reid (University of Warwick). The grant (£2.2M) pays for 6 post-docs, HPC equipment, and 20% of my salary for 2016–21.

Adams Prize Mar 2015

One Adams Prize is awarded each year, to a UK-based mathematician under the age of 40. I was awarded the 2015 Prize jointly with Dr Arend Bayer.

Whitehead Prize Jul 2014

This is the London Mathematical Society's most prestigious prize for early-career mathematicians. Four Whitehead Prizes are awarded each year, to mathematicians within 15 years of their PhD.

Philip Leverhulme Prize Nov 2010

The Philip Leverhulme Prizes are awarded by the Leverhulme Trust to "outstanding young scholars who have made a substantial and recognised contribution to their particular field of study, are recognised at an international level, and whose future contributions are held to be of correspondingly high promise".

European Union ERC Starting Independent Researcher Grant Oct 2009–Sep 2015

This award (€1.5M) paid for 4 post-docs, a visitor program, and my salary for 2013–15. These grants are extremely competitive, with roughly 12 awards per year in mathematics across Europe.

Royal Society University Research Fellowship Jun 2006–Sep 2013

This provided salary and expenses for full-time research at Imperial College London. These fellowships are internationally competitive, across all sciences; on average only one or two are awarded in Mathematics each year.

Clay Research Scholarship Spring 2006

The Clay Mathematics Institute is the leading source of private funding for maths in the USA. This scholarship allowed me to take part in the semester-long research program "New Topological Structures in Physics" at the Mathematical Sciences Research Institute, Berkeley, USA in the spring of 2006.

Grant from the US National Science Foundation Jul 2004–Jun 2007

This award (grant DMS-0401275) provided summer salary and expenses for a 3-year research program titled *Gromov–Witten Theory*.

Other Research Grants

EPSRC Responsive Mode grant Oct 2010–Mar 2014

I co-wrote this with Prof. Corti. The grant (£380K), titled *Extremal Laurent Polynomials*, paid for a post-doc, a PhD student, high-performance computing, and several research workshops.

EPSRC Platform Grant Feb 2011–Feb 2016

I co-wrote this with Prof. Lamb, Dr Haskins, and others. The grant (£527K) provides five years of seed funding to improve the research environment in the Department of Mathematics.

EU Marie Curie Fellowship Oct 2011–Sep 2013

I co-wrote this with Dr Brini. The grant (£150K) provided salary and research expenses for Dr Brini to join my research group.

EU Marie Curie Fellowship June 2012–Dec 2014

I co-wrote this with Dr Manolache and Prof. Corti. The grant (£160K) provided salary and research expenses for Dr Manolache to join my research group.

EPSRC Small Equipment Grant Jan 2013

This grant (£8K) paid for 3 high-memory nodes for the Imperial College High Performance Computing centre, to be used in my Fanosearch project.

Grants for Impact

EPSRC Pathways To Impact grant Oct 2011–Jun 2012

I co-wrote this with Dr Buck, Prof. Corti, and Dr Haskins. The grant (£29K) paid for a residency by the artist Gemma Anderson at the Department of Mathematics, as well as associated exhibition and publication costs. Anderson produced artworks based on Coates–Corti's Fanosearch research program, and on Dr Buck's research on DNA topology.

Leverhulme Artist in Residence grant Oct 2012–Jun 2013

I co-wrote this with Dr Buck. The grant (£15K) paid for a residency by the artist Gemma Anderson at the Department of Mathematics, as well as associated exhibition costs.

PUBLICATIONS (1) On the Topology of Fano Smoothings.
T Coates, A Corti, G Da Silva Jr. 2019.
http://arxiv.org/abs/1912.04383
To appear in *Interactions with Lattice Polytopes*, Springer Verlag, 2020.

(2) Gromov–Witten Invariants of Local $\mathbb{P}^2$ and Modular Forms.
T Coates, H Iritani. 2018.
http://arxiv.org/abs/1804.03292
To appear in the *Kyoto Journal of Mathematics*.

(3) Quantum periods for certain four-dimensional Fano manifolds.
T Coates, S Galkin, A Kasprzyk, A Strangeway.
Experimental Math. 29 (2020), no. 2, 183–221.

(4) Hodge-theoretic mirror symmetry for toric stacks.
T Coates, A Corti, H Iritani, H-H Tseng.
Journal of Differential Geometry 114 (2020), no. 1, 41–115.

(5) Laurent Inversion.
T Coates, A Kasprzyk, T Prince. 2017.
http://arxiv.org/abs/1707.05842
Pure and Applied Mathematics Quarterly 15 (2019), no. 4, 1135–1179.

(6) Some Applications of the Mirror Theorem for Toric Stacks.
T Coates, A Corti, H Iritani, H-H Tseng. 2014.
http://arxiv.org/abs/1401.2611
Advances in Theoretical and Mathematical Physics 23 (2019), no.3, 767–802.

(7) The Crepant Transformation Conjecture for Toric Complete Intersections.
T Coates, H Iritani, Y Jiang.
Advances in Mathematics 329 (2018), 1002–1087.

(8) A Fock Sheaf for Givental Quantization.
T Coates, H Iritani.
Kyoto Journal of Mathematics 58 (2018), no. 4, 695–864.

(9) On the existence of a global neighbourhood.
T Coates, H Iritani.
Glasgow Math. Journal 58 (2016), no. 3, 717–726.

(10) Quantum periods for 3-dimensional Fano manifolds.
T Coates, A Corti, S Galkin, A Kasprzyk.
Geometry and Topology 20 (2016), no. 1, 103–256.

(11) Mirror symmetry and the classification of orbifold del Pezzo surfaces.
M Akhtar, T Coates, A Corti, L Heuberger, A Kasprzyk, A Oneto, A Petracci, T Prince, K Tveiten.
Proceedings of the Americal Mathematical Society 144 (2016), no. 2, 513–527.

(12) K-theoretic and categorical properties of toric Deligne–Mumford stacks.
T Coates, H Iritani, Y Jiang, E Segal.
Pure Appl. Math. Quarterly 11 (2015), no. 2, 239–266.

(13) A mirror theorem for toric stacks.
T Coates, A Corti, H Iritani, H-H Tseng.
Compositio Math. 151 (2015), no. 10, 1878–1912.

(14) On the convergence of Gromov–Witten potentials and Givental's formula.
T Coates, H Iritani.
Michigan Math. Journal 64 (2015), no. 3, 587–631.

(15) Drawing in Mathematics: from Inverse Vision to the Liberation of Form.
G Anderson, D Buck, T Coates, A Corti.
Leonardo 48 (2015). no. 5, 439–448.

(16) Four-dimensional Fano Toric Complete Intersections.
T Coates, A Kasprzyk, T Prince. 2014.
Proceedings of the Royal Society A 471 (2015), no. 2175.

(17) Mutations of Fake Weighted Projective Spaces.
T Coates, S Gonshaw, A Kasprzyk, N Nabijou.
Electronic Journal of Combinatorics, 21 (2014), no. 4, paper #P4.14.

(18) Mirror Symmetry and Fano Manifolds.
T Coates, A Corti, S Galkin, V Golyshev, A Kasprzyk.
In *European Congress of Mathematics Kraków, 2-–7 July, 2012*, pp. 285–300. 2014.

(19) Minkowski Polynomials and Mutations.
M Akhtar, T Coates, S Galkin, A Kasprzyk.
SIGMA 8 (2012), Paper 094.

(20) The Quantum Lefschetz Hyperplane Principle can fail for orbifold hypersurfaces.
T Coates, A Gholampour, H Iritani, Y Jiang, P Johnson, C Manolache.
Mathematical Research Letters, 19 (2012), no. 5, 997–1005.

(21) Quantum Cohomology and Crepant Resolutions: A Conjecture.
T Coates and Y Ruan.
Annales de l'Institut Fourier, 63 (2013), no. 2, 431–478.

(22) Wall-Crossings in Toric Gromov–Witten Theory I: Crepant Examples.
T Coates, H Iritani, H-H Tseng.
Geometry and Topology, 13 (2009), 2675–2744.

(23) The Quantum Orbifold Cohomology of Weighted Projective Spaces.
T Coates, A Corti, Y-P Lee, and H-H Tseng.
Acta Mathematica, 202 (2009), 139–193.

(24) Computing Genus-Zero Twisted Gromov–Witten Invariants.
T Coates, A Corti, H Iritani, H-H Tseng.
Duke Mathematical Journal, 147 (2009), no. 3, 377–438.

(25) On the Crepant Resolution Conjecture in the Local Case.
T Coates.
Communications in Mathematical Physics, 287 (2009), 1071–1108.

(26) Givental's Lagrangian cone and S^1-equivariant Gromov–Witten theory.
T Coates.
Mathematical Research Letters, 15 (2008), no. 1, 15–31.

(27) Quantum Riemann–Roch, Lefschetz and Serre.
T Coates and A Givental.
Annals of Mathematics, 165 (2007), no. 1, 15–53.

(28) Quantum cobordisms and formal group laws.
T Coates and A Givental.
In *The Unity of Mathematics*, Progr. Math., 244, pp. 155–171,
Birkhäuser Boston, 2006.

PREPRINTS

(29) Maximally Mutable Laurent Polynomials.
T Coates, A Kasprzyk, G Pitton, K Tveiten. 2021.
https://arxiv.org/abs/2107.14253

(30) A Splitting of the Virtual Class for Genus One Stable Maps.
T Coates, C Manolache. 2018.
http://arxiv.org/abs/1809.04162

(31) The Quantum Lefschetz Principle for Vector Bundles as a Map Between Givental Cones.
T Coates. 2014.
http://arxiv.org/abs/1405.2893

(32) Wall-Crossings in Toric Gromov–Witten Theory II: Local Examples.
T Coates. 2008.
http://arxiv.org/abs/0804.2592
This is an expanded version of my published paper *On the Crepant Resolution Conjecture in the Local Case*. It will not be published.

FORMER POSTDOCS

Dr Hiroshi Iritani
co-supervised with Prof. Corti
now Associate Professor (with tenure) at Kyoto University, Japan

Dr Paul Johnson
co-supervised with Prof. Corti
now Lecturer at the University of Sheffield

Dr Amin Gholampour
now Associate Professor (with tenure) at the University of Maryland, USA

Dr Sara Pasquetti
now Associate Professor at Università degli Studi di Milano–Bicocca, Italy

Dr Andrea Brini
now Senior Lecturer at the University of Birmingham

Dr Yunfeng Jiang
now Associate Professor (with tenure) at the University of Kansas, USA

Dr Cristina Manolache
now Senior Lecturer at the University of Birmingham

Dr Al Kasprzyk
co-supervised with Prof. Corti
now Associate Professor at the University of Nottingham

Dr Thomas Prince
now Junior Research Fellow at Magdalen College Oxford

Dr Hülya Argüz
now Postdoctoral Fellow at Laboratoire de Mathématiques de Versailles, France

Dr Genival Da Silva, Jr
now a faculty member at Eastern Illinois University, USA

Dr Sara Filippini
now Postdoctoral Fellow at Jagiellonian University, Poland

Dr Giuseppe Pitton
now a data scientist in the finance sector

PHD STUDENTS

Dr Andrew Strangeway (completed Dec 2013)

Dr Mohammad Akhtar (completed Jun 2015)

Dr Thomas Prince (completed Jun 2016)

Dr Navid Nabijou (completed Jun 2018)

Dr Elana Kalashnikov (completed Jun 2019)

Giulia Gugiatti (expected completion: Jun 2020)

Qaasim Shaafi (expected completion: Jun 2022)

Wendelin Luntz (expected completion: Jun 2022)

ADMINISTRATION

Chair, Department Equality, Diversity, and Inclusion Committee, 2016–present.

PUBLIC ENGAGEMENT ACTIVITIES

Invited talk at the workshop *Beauty in Art and Mathematics* at the Henry Moore Institute, Leeds, in October 2014.

Keynote address at the conference *Young Researchers in Mathematics*, a conference for graduate students in all areas of mathematics, at the University of Warwick in July 2014.

Ongoing collaboration with the artist Gemma Anderson, based on my Fanosearch research project with Prof. Corti. This included a keynote address, joint with Anderson, Dr Buck, and Prof. Corti, at the interdisciplinary conference *Thinking Through Drawing 2012: Drawing in STEAM*, as well as exhibitions at EB&Flow Gallery, London and Galerie Thore Krietemeyer, Berlin in 2013.

In March 2012 I took part in *Voice of the Future*, an event at the Houses of Parliament where the Science and Technology Select Committee was replaced for the day by a panel of young scientists and engineers, who had the opportunity to ask questions to David Willetts MP (Minister for Universities and Science), Chi Onwurah MP (Shadow Minister for Innovation and Science), and the members of the Select Committee.

Invited talk at Prospects in Mathematics 2011, a conference for prospective PhD students organized by the London Mathematical Society.

A successful public outreach campaign in early 2011, leading to:

- articles on the Fanosearch project in *Science*, *New Scientist*, *Cosmos*, *Physics World*, *Le Temps* (a Swiss daily newspaper), *NWT Magazine* (a Dutch popular science magazine), and other publications.
- an interview by Corti on Norwegian radio
- an exhibit in a mathematical museum in Rome
- front-page billing on the Imperial College website

In mid-2009 I took part in a documentary, *The Truth Behind Crop Circles*, for National Geographic TV. I designed a mathematically-based crop circle pattern, based on a theorem by the Ancient Greek mathematician Apollonius of Perga, to help debunk the claim that crop circles are too mathematically and geometrically complicated to have been constructed by humans.

3_{27} and B_4, G Anderson and T Coates, Copper Investment Casts of RP Forms, 2012.