

Tristan C. Collins

Department of Mathematics
Harvard University
1 Oxford St.
Cambridge, MA, 02138 USA

Email: tcollins@math.harvard.edu

Biographical Information

Citizenship: Canada, New Zealand

Employment

Harvard University, Benjamin Peirce Assistant Professor, 2014- Present (on leave, Spring 2017)
Chalmers University, Visiting Assistant Professor, Spring 2017

Education

Ph.D., Mathematics, Columbia University, 2014, Advisor: Prof. Duong H. Phong.
M. Phil., Mathematics, Columbia University, 2012.
M.A., Mathematics, Columbia University, 2010.
B.Sc., Mathematics, University of British Columbia, 2009 (with Honours).

Fields of Interest

Differential Geometry, Partial Differential Equations, Algebraic Geometry, Analysis.

Books

1. (edited with S.-T. Yau) Harvard CMSA Series in Mathematics: Proceedings of the Special Year on Nonlinear Equations, *International Press*, to appear

Preprints and Publications

21. *Log-canonical thresholds in real and complex dimension 2*, arXiv:1707.08994, preprint 2017
20. *Restricted volumes on Kähler manifolds* (with V. Tosatti), arXiv:1608.07089, preprint 2016
19. *K stability and stability of chiral ring* (with D. Xie and S.-T. Yau), arXiv:1606.09260, preprint 2016
18. *Sasaki-Einstein metrics and K-stability* (with G. Székelyhidi), arXiv:1512.07213, preprint 2015
17. *(1,1) forms with specified Lagrangian phase: A priori estimates and algebraic obstructions* (with A. Jacob and S.-T. Yau), arXiv:1508.01934, preprint 2015
16. *Dimension of the minimum set for the real and complex Monge-Ampère equations in critical Sobolev spaces* (with C. Mooney), *Anal. and PDE* **10** (2017), no. 8, 2031–2041
15. *Concavity of the Lagrangian phase operator and applications* (with S. Picard and X. Wu), *Calc. Var. Partial Differential Equations* **56** (2017), no. 4, Art. 89

14. *Poisson metrics on flat vector bundles over non-compact curves* (with A. Jacob and S.-T. Yau), to appear in *Comm. Anal. Geom.*, arXiv:1403.7825
13. *Convergence of the J-flow on toric manifolds* (with G. Székelyhidi), *J. Differential Geom.* **107** (2017), no. 1, 47–81
12. *K-Semistability for irregular Sasakian manifolds* (with G. Székelyhidi), to appear in *J. Differential Geom.*, arXiv:1204.2230
11. *The twisted Kähler-Ricci flow* (with G. Székelyhidi), *J. Reine Angew. Math.*, **716** (2016), 179–205.
10. *Stability and convergence of the Sasaki-Ricci flow*, *J. Reine Angew. Math.*, **716** (2016), 1–27.
9. $C^{2,\alpha}$ estimates for nonlinear elliptic equations of twisted type, *Calc. Var. Partial Differential Equations* **55** (2016), no. 6, Art. 6
8. *A singular Demailly-Păun theorem* (with V. Tosatti), *C. R. Math. Acad. Paris* **354** (2016), no. 1, 91–95.
7. *Kähler currents and null loci* (with V. Tosatti), *Invent. Math.* **202** (2015), no. 3, 1167–1198.
6. *On the convergence of the Sasaki-Ricci flow* (with A. Jacob), *Analysis, complex geometry, and mathematical physics: in honor of Duong H. Phong*, 11–21, *Contemp. Math.*, **644**, (2015).
5. *An extension theorem for Kähler currents* (with V. Tosatti), *Ann. Fac. Sci. Toulouse Math.* (6) **23** (2014), no. 4, 893–905.
4. *Uniform Sobolev inequality along the Sasaki-Ricci flow*, *J. Geom. Anal.* **24** (2014), no. 3, 1323–1336.
3. *Remarks on the Yang-Mills flow on a compact Kahler manifold* (with A. Jacob), *Univ. Iagel. Acta Math.*, no. 51 (2013), 17–43.
2. *The transverse entropy functional and the Sasaki-Ricci flow*, *Trans. Amer. Math. Soc.* **365** (2013), no. 3, 1277–1303.
1. *A multidimensional resolution of singularities with applications to analysis* (with A. Greenleaf, M. Pramanik), *Amer. J. Math.* **135** (2013), no. 5, 1179–1252.

Honors, Awards, & Fellowships

Harvard Certificate of Teaching Excellence, 2015.

NSF Grant DMS- 1506652: Geometric PDEs and Algebraic Geometry.

NSERC PGS-D scholarship, Columbia University, 2010-2012.

Presidential Fellowship, Columbia University, 2009.

NSERC PGS scholarship, Columbia University, 2009.

NSERC Undergraduate Student Research Award, University of British Columbia, 2008. Critical Integrability Indices of Multivariate Polynomials under the supervision of Malabika Pramanik.

G.C. Webber Memorial Prize in Mathematics, University of British Columbia, 2009.

Conference and Seminar Presentations

City University of New York, January 31, 2012. Geometry and Analysis Seminar.

University of Rochester, February 3, 2012. Analysis and Geometry Seminar.

Northwestern University, October 9, 2012. Geometry and Physics Seminar.

Columbia University, May 8, 2013. Analysis, Complex Geometry, and Mathematical Physics: A Conference in Honor of Duong H. Phong.

Rutgers University, August 12, 2013. Summer School in Complex Geometry.

Johns Hopkins University, September 24, 2013. Complex Geometry Seminar.

University of Connecticut, October 7, 2013. PDE and Differential Geometry Seminar.

Northwestern University, November 15, 2013. Complex Geometry Seminar.

Duke University, March 25, 2014. Geometry and Topology Seminar.

University of New Mexico, April 5-6, 2014. AMS Spring Sectional Meeting: Special Session on Analysis and Topology in Special Geometries.

Banff International Research Station, April 8, 2014. Complex Monge-Ampère equations on compact Kähler manifolds.

Temple University, September 30, 2014, PATCH Seminar.

Harvard University, October 10, 2014, Gauge Theory, Topology and Symplectic Geometry Seminar.

Harvard University, October 21, 2014, Differential Geometry Seminar.

Northwestern University, November 21, 2014, Informal Geometric Analysis Seminar.

Northwestern University, April 11, 2015, Special Day on Analytic Methods in Algebraic Geometry.

Columbia University, April 16, 2015, Complex Geometry and PDE Seminar.

University of California, Irvine, April 21, 2015, Differential Geometry Seminar.

Fields Institute, May 8, 2015, Geometric Analysis Colloquium.

Jagiellonian University, June 2, 2015, Hessian Type Equations in Complex Geometry.

Simons Center for Geometry and Physics, October 9, 2015, Workshop on Toric Kähler Geometry

University of Pennsylvania, October 21, 2015, Geometry and Topology Seminar

Université Paris-Sud, November 25, 2015, Séminaire Opérateurs de Dirac

Université de Québec à Montréal, March 11, 2016, Séminaire Géométrie et Topologie

Stony Brook University, March 18, 2016, AMS Sectional Meeting, Special Session on PDE methods in Geometric Flows

Stony Brook University, March 19, 2016, AMS Sectional Meeting, Special Session on Complex Geometric Analysis

Stony Brook University, May 3, 2016, Geometry/Topology Seminar

Columbia University, May 5, 2016, Complex Geometry and PDE Seminar

Center of Mathematical Sciences and Applications, May 27, 2016, Members' Seminar

Institut de Mathématiques de Toulouse, June 15, 2016, Recent Advances in Complex Geometry

Hayama Symposium on Several Complex Variables, July 18, 2016

University of Tokyo, July 24, 2016, Trends in Modern Geometry

American Institute of Math, August 15-19, 2016, Workshop on Complex Monge-Ampère Equations

Virginia Tech, October 8-9, 2016, Workshop on the Mathematics and Physics of F-theory

University of Michigan, November 4, 2016, Geometry Seminar

Florida International University, January 4, 2017, Winter Conference on Geometry, Topology and Applications

Imperial College, London, January 10, 2017, Collapse, Adiabatic Limits, and Special Holonomy

Chalmers University, January 23, 2017, KASS seminar
 Cambridge University, February 15, 2017, Algebraic Geometry Seminar
 Chalmers University, February 27, 2017, KASS seminar
 ICMS Edinburgh, April 24, 2017, Positivity in Algebraic and Complex Geometry
 Harvard University, May 2, 2017, Conference Celebrating the 50th Anniversary of JDG
 National University of Singapore, May 15, 2017, Complex Geometry, Dynamical Systems and Foliation Theory
 Näss Fabriker, May 19, 2017, Nordan Conference on Complex Analysis
 Institut Fourier, Grenoble, June 6-9, 2017, Conference in Honour of Jean-Pierre Demailly's 60th Birthday
 Université Paris-Sud, June 14, 2017, Séminaire Opérateurs de Dirac
 MFO Oberwolfach, July 3-7, 2017, Differentialgeometrie im Großen

Service

Co-organizer of the Minischool on Nonlinear Equations, December 3-4, Harvard University
 Co-organizer of the Differential Geometry Seminar, Fall 2016, 2017/2018, Harvard University
 Co-organizer of the Conference on Nonlinear Equations, April 8-10, 2016, Harvard University
 Co-organizer of the Geometric Analysis seminar, 2015/2016, Harvard University
 Co-organizer of the Evolution Equations seminar, 2015/2016, Harvard University
 Co-organizer of the Special Day on Geometry and PDE, October 26, 2013, Columbia University
 Co-organizer of the Informal Complex Geometry and PDE Seminar at Columbia University, 2012-2014
 Organizer of the Graduate Student Geometric Analysis Seminar, 2011-2013
 Supervised PRISE student, Jake McNamara, Summer 2015.
 Harvard Senior Theses supervised: Pakawut Jiradlok, 2016/2017
 Harvard Independent Study supervised: Christian Hallas, 2016/2017
 Served on the graduate student admission committee, Harvard University, 2014/2015, 2015/2016, 2017/2018
 Served on the qualification exam committee, Harvard University, 2016/2017, 2017/2018
 Referee for: Journal of the American Mathematical Society, Mathematical Research Letters, Crelle's Journal, Proceedings of the London Mathematical Society, Journal of Differential Geometry, Journal of Geometric Analysis, Acta Mathematica, Mathematische Zeitschrift, Annals of PDE, Asian Journal of Math, Journal of the European Mathematical Society, Analysis and PDEs

Teaching

Harvard University

Math 263: Analytic Techniques in Algebraic Geometry, Fall 2016
 Math 230a: Differential Geometry, Fall 2016, Fall 2017
 Math 264: Nonlinear Elliptic PDE, Spring 2016.
 Math 262: The Geometry of the Complex Monge-Ampère Equation, Spring 2015
 Math 112: Introductory Real Analysis, Spring 2015, Spring 2016
 Math 136: Differential Geometry of Curves and Surfaces, Fall 2014, Fall 2015, Fall 2017

Columbia University

Ordinary Differential Equations, Summer 2012, Summer 2013, Summer 2014

Last updated: September 18, 2017