

# Heather Macbeth

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## Employment history

- 2019– **Assistant Professor**  
**Fordham University**, New York, NY, USA
- 2018–19 **Fondation Sciences Mathématiques de Paris** postdoctoral fellow  
**Ecole Normale Supérieure**, Paris, France
- 2015–18 **C.L.E. Moore Instructor**  
**Massachusetts Institute of Technology**, Cambridge, MA, USA
- 2016 Postdoctoral Fellow, “Differential Geometry” special semester  
**Mathematical Sciences Research Institute**, Berkeley, CA, USA

## Academic history

- 2010–15 **Ph.D. in Mathematics**  
**Princeton University**, Princeton, NJ, USA  
Thesis: *Kähler-Einstein metrics, Bergman metrics, and higher alpha-invariants*  
(advisor: Gang Tian)
- 2009–10 **M.A.St. in Mathematics (“Part III”), with Distinction**  
Trinity College, **University of Cambridge**, Cambridge, UK  
Part III Essay: *The Arnold chord conjecture* (supervisor: Gabriel Paternain)
- 2006–09 **B.Sc. (Hons) in Mathematics, with First Class Honours**  
**University of Auckland**, Auckland, New Zealand  
Dissertation: *Conformal and projective geometries of Einstein manifolds*  
(supervisor: Rod Gover)

## Research interests

Differential geometry and PDE. Kähler geometry, conformal geometry, Ricci solitons, Einstein metrics.

## Publications and preprints

- [8] **Kähler-Ricci solitons on crepant resolutions of finite quotients of  $\mathbb{C}^n$ . November 2017** (with Olivier Biquard). arXiv:1711.02019.
- [7] **Kähler-Einstein metrics and higher alpha-invariants. November 2014.** arXiv:1411.7366.
- [6] **Conformal classes realizing the Yamabe invariant. 2019.** *Int. Math. Res. Not.*, 2019(5):1333–1349.
- [5] *Kähler-Einstein metrics, Bergman metrics and higher alpha-invariants. 2015.* PhD thesis, Princeton University.
- [4] **Detecting Einstein geodesics: Einstein metrics in projective and conformal geometry. 2014** (with A. Rod Gover). *Differential Geom. Appl.*, 33(suppl.):44–69.
- [3] **Einstein metrics in projective geometry. 2014** (with A. Čap, and A. R. Gover). *Geom. Dedicata*, 168:235–244.

- [2] **Cayley graphs of given degree and diameter for cyclic, Abelian, and metacyclic groups. 2012** (with Jana Šiagiová, and Jozef Širáň). *Discrete Math.*, 312(1):94–99.
- [1] **Large Cayley graphs and vertex-transitive non-Cayley graphs of given degree and diameter. 2010** (with Jana Šiagiová, Jozef Širáň, and Tomáš Vetrík). *J. Graph Theory*, 64(2):87–98.

## Invited talks

### *Conferences*

- May 2019 “Géométrie: échanges et perspectives,” Institut de Mathématiques de Jussieu, Paris
- Jun 2018 “Index Theory and Applications to Positive Scalar Curvature,” University of Adelaide
- Mar 2018 Shanks Workshop in Complex Differential Geometry, Vanderbilt University, Nashville
- Feb 2018 “Conformal and Symplectic Geometry,” University of Auckland
- Jan 2018 “Constant Scalar Curvature Metrics in Kähler and Sasaki Geometry,” CIRM, Luminy
- Jan 2018 Special Session on Metric Geometry and Topology, Joint Mathematics Meetings, San Diego
- Aug 2017 “Representations of Riemannian Geometry,” St Joseph’s University, Philadelphia
- Jul 2017 “Differentialgeometrie im Großen,” Mathematisches Forschungsinstitut Oberwolfach
- Jun 2017 “Current Developments and New Directions in Kähler Geometry,” University of Notre Dame
- Mar 2016 “Kähler Geometry, Einstein Metrics, and Generalizations,” MSRI, Berkeley
- Mar 2016 Midwest Geometry Conference, Wichita State University
- Nov 2015 Special Session on Geometric Analysis, AMS Sectional Meeting, Rutgers University
- May 2015 Geometric Analysis Colloquium, Fields Institute, Toronto
- Mar 2015 Rutgers-CUNY Symposium on Geometric Analysis

### *Seminars/Colloquia*

- Mar 2019 Centre for Quantum Geometry of Moduli Spaces, Aarhus University
- Dec 2018 Geometry and Topology Seminar, Université de Brest
- Oct 2018 Dirac Operators Seminar, Université Paris-Sud, Orsay
- May 2018 Pure Mathematics Seminar, University of Melbourne
- Apr 2018 Geometry/Topology Seminar, Stony Brook University
- Apr 2018 Differential Geometry Seminar, University of California, San Diego
- Apr 2018 Differential Geometry Seminar, University of California, Irvine
- Jun 2016 University of Auckland
- May 2016 Victoria University of Wellington
- Mar 2016 Geometric Analysis Seminar, University of Oregon
- Mar 2016 Colloquium, Oregon State University
- Mar 2016 Geometry/Topology Seminar, University of California, Davis

Oct 2015 Geometric Analysis Seminar, Massachusetts Institute of Technology  
 Sep 2015 Everytopic Seminar, Brandeis University  
 Jun 2015 Dirac Operators Seminar, Université Paris-Sud, Orsay  
 Mar 2015 Geometric Analysis Seminar, Rutgers University  
 Feb 2015 Geometry-Topology Seminar, University of Pennsylvania  
 Dec 2014 Complex Geometry Seminar, Johns Hopkins University/University of Maryland

*Undergraduate/General Audience*

Apr 2018 Open Neighborhood Seminar, Harvard University  
 Jan 2018 Mathematics Lecture Series, Massachusetts Institute of Technology  
 Sep 2017 Math Club, Fordham University

## Teaching

*At MIT*

Instructor **18.100P Real Analysis**, Spring 2018  
**18.950 Differential Geometry**, Fall 2016  
 Writing instructor **18.100P Real Analysis**, Spring 2017  
 Recitation instructor **18.02 Multivariable Calculus**, Fall 2015, Fall 2017

*At Princeton*

Instructor **MAT 201 Calculus III (Multivariable Calculus)**, Fall 2013  
 Review sessions **MAT 104 Calculus II**, Fall 2014  
**MAT 204 Advanced Linear Algebra with Applications**, Spring 2012

*At workshops*

Teaching assistant **Summer Graduate School: Geometry and Analysis**,  
 Mathematical Sciences Research Institute, Berkeley, CA, Jul–Aug 2014

*Supervision of student projects*

Daheng Min first-year essays, Ecole Normale Supérieure, 2019  
 Ivan Yakovlev  
 Adela (YiYu) Zhang **Undergraduate Research Opportunities Program**,  
 Massachusetts Institute of Technology, 2017

*Extension for high-school students*

Co-organizer           Après-midi de mathématiques à l'ENS, 2019  
Lecturer                **British Mathematical Olympiad Committee, 2010**  
                              **New Zealand Mathematical Olympiad Committee, 2006–09**

## **Service**

2016–18           **Diversity Committee**, Department of Mathematics, Massachusetts Institute of Technology  
2016                Organizer, **Geometry Seminar**, Mathematical Sciences Research Institute  
2014–15           Co-organizer, **informal differential geometry seminar**, Princeton University  
2011–13           Organizer, **Noetherian Ring** (women-in-math group), Princeton University  
2011–14           Mentor, **Mentoring Möbius** (support for undergrad math majors), Princeton University

## **Awards, scholarships, academic honours**

*MSRI*

**Strauch Postdoctoral Fellowship**, spring semester 2016

*Princeton*

**Bradford H. Arnold \*42 and Mary Ellen Arnold Fellowship**, 2010–11 academic year

*Cambridge*

**Trinity College Research Scholarship and Senior Scholarship**, 2010–11 academic year (declined)  
**Trinity College Studentship in Mathematics**, 2009–10 academic year

*Auckland*

**2009 Collins Prize, 2008 Annual Prize in Mathematics**

Various government and university **full tuition scholarships and stipends**, 2006–09 academic years

*Other*

Silver (2005) and bronze (2004) medals, **International Mathematical Olympiad**