GREGORY R. CHAMBERS

Contact Information

- Address
  Department of Mathematics
  Rice University
  MS-136, Box 1892
  Houston, TX
  77251
- Phone number
  Office: 713-348-4053
- E-mail address
  gchambers@rice.edu
- Website
  http://www.math.rice.edu/~grc3/

Mathematical Interests

- Metric geometry
- Geometric analysis
- Discrete and combinatorial geometry

Employment

- **Assistant Professor**, Department of Mathematics, Rice University, July 2017 - Present
- **L. E. Dickson Instructor**, Department of Mathematics, University of Chicago, September 2014 - June 2017

Education

- **PhD, University of Toronto, September 2010 - June 2014**; Title: *Optimal homotopies of curves on surfaces*; Advisors: Alexander Nabutovsky and Regina Rotman
- **MSc, University of Toronto, September 2009 - August 2010**; Title: *On the plane fixed point problem*; Advisor: Larry Guth
- **BSc with High Distinction, University of Toronto, September 2005 - June 2009**; Mathematics Specialist Program

Honors, Awards and Grants

- NSERC Postdoctoral Fellowship, April 2016 - Present
- Ontario Graduate Scholarship, 2013 - 2014
- School of Graduate Studies Conference Grant, 2013
- NSERC Canadian Graham Bell Postgraduate Award at the Doctoral Level, 2010 - 2013
- NSERC Canadian Graham Bell Postgraduate Award at the Master's Level, 2009 - 2010
- NSERC Undergraduate Student Research Award, Summer 2009
  - Supervisor: Larry Guth
  - Research project on the Kakeya problem and designing Greedy-type algorithms to approach geometric combinatorial problems
- Norman Stuart Robertson Scholarship in Mathematics, 2008 - 2009
  - Awarded by the Department of Mathematics for academic excellence
- NSERC Undergraduate Student Research Award, Summer 2008
  - Supervisor: Almut Burchard
  - Research project on quantitative geometry inequalities
- NSERC Undergraduate Student Research Award, Summer 2007
  - Supervisor: Almut Burchard
  - Research project on measure theory and problems in envy-free division

Publications

Submitted

(15) **Constructing monotone homotopies and sweepouts,** with E. W. Chambers, A. de Mesmay, T. Ophelders, and R. Rotman
Submitted to the Journal of Differential Geometry, arXiv:1704.06175

(14) **Quantitative nullhomotopy and rational homotopy type,** with F. Manin, and S. Weinberger
Submitted to Geometric and Functional Analysis, arXiv:1611.03513

(13) **Quantitative null-cobordism,** with D. Dotterrer, F. Manin, and S. Weinberger
Submitted to the Journal of the AMS, arXiv:1610.04888

(12) **Existence of minimal hypersurfaces in complete manifolds of finite volume,** with Y. Liokumovich
Submitted to Inventiones Mathematicae, arXiv:1609.04058

(11) **A note on the affine-invariant plank problem**
Submitted to Discrete and Computational Geometry, arXiv:1604.00456

Published

(10) **Area of convex disks,** with C. Croke, Y. Liokumovich, and H. Wen
Proceedings of the AMS, to appear, arXiv:1701.06594

(9) **Monotone homotopies and contracting discs on Riemannian surfaces,** with R. Rotman
Journal of Topology and Analysis, to appear, arXiv:1311.2995

(8) **Optimal sweepouts of a Riemannian 2-sphere,** with Y. Liokumovich
Journal of the European Mathematics Society (JEMS), to appear, arXiv:1411:6349

(7) **Proof of the Log-Convex Density Conjecture**
Journal of the European Mathematics Society (JEMS), to appear, arXiv:1311.4012

(6) **Ergodic properties of folding maps on spheres,** with A. Dranovski and A. Burchard
Discrete and Continuous Dynamical Systems - Series A 37(3):1183-1200 (2017), DOI 10.3934/dcds.2017049, arXiv:1509.02454

(5) **Isoperimetric Regions in with density r^p in $\mathbb{R}^n$,** with W. Boyer, B. Brown, A. Loving, and S. Tammen
Analysis and Geometry in Metric Spaces 4(1):236-265 (2016), DOI 10.1515/agms-2016-0009, arXiv:1504:01720

(4) **Splitting a contraction of a simple curve traversed m times,** with Y. Liokumovich
Journal of Topology and Analysis (2016), DOI 10.1142/S1793525317500157, arXiv:1510.03445

(3) **Geometric stability of the Coulomb energy,** with A. Burchard
Calculus of Variations and PDE 54(3):3241-3250 (2015), DOI 10.1007/s00526-015-0900-8, arXiv:1407.1918

(2) **Perimeter under multiple Steiner symmetrizations,** with A. Burchard
Journal of Geometric Analysis (2015) 25:871, DOI 10.1007/s12220-013-9448-z, arXiv:1209.4521

(1) **Converting homotopies to isotopies and dividing homotopies in half in an effective way,** with Y. Liokumovich
Geometric and Functional Analysis (2014) 24:1080, DOI 10.1007/s00039-014-0283-6, arXiv:1311.0779

Seminar Presentations

- *Problems in Quantitative Geometry*,
  Colloquium, UC Riverside, California, February 2017
- *Problems in Quantitative Geometry*,
  Colloquium, Rice University, Texas, December 2016
- *Problems in Quantitative Geometry*,
  Colloquium, University of Waterloo, Ontario, November 2016
- *Existence of homotopies with prescribed Lipschitz constants*,
  Analysis Seminar, University of Texas at Austin, Texas, April 2016
- *The Log-Convex Density Conjecture*, Geometry and Analysis Seminar,
  Imperial College London, United Kingdom, February 2016
- *The Log-Convex Density Conjecture*, Geometry and Topology Seminar,
  University of Pennsylvania, Pennsylvania, April 2015
- *The Isoperimetric Problem*, Mathematics and Statistics Colloquium,
  Williams College, Massachusetts, June 2014
- *Optimal homotopies of curves on surfaces*, Geometry and Topology
  Seminar, University of Toronto, Ontario, April 2013

Conference Presentations

- *Monotone homotopies and sweepouts*,
  Mathematical Congress of the Americas, Session on Quantitative
  Geometry and Topology, Montreal, July 2017
- *Existence of homotopies with prescribed Lipschitz constants*,
  CMS Winter Meeting, Session on Differential Geometry, Montreal,
  December 2015
- *Existence of homotopies with prescribed Lipschitz constants*,
  AMS Central Sectional Meeting, Special Session on Metric Spaces:
  Geometry, Group Theory, and Dynamics, Loyola University,
  Chicago, Illinois, September 2015
- *The Log-Convex Density Conjecture*, Isoperimetric Problems Between
  Analysis and Geometry, SNS, Pisa, Italy, June 2014
- *Optimal homotopies of curves on surfaces*, Banff International Research
  Station Workshop on Metric Geometry, Geometric Topology and
  Groups, Banff, Alberta, August 2013. Link to Video: www.birs.ca/
  events/2013/5-day-workshops/13w5040/videos/watch/
  201308060956-Chambers.mp4
- *Optimal homotopies of curves on surfaces*, Workshop on Minimal Surfaces,
  3-Manifold Topology and Related Topics, MIT, Cambridge,
  Massachusetts, April 2013
- *How to divide a cake without envy*, Undergraduate Math Conference,
  University of Toronto, Toronto, Ontario, July 2008

Other Activites

- *Applications of Topology to the Analysis of 1-Dimensional Objects*,
  Schloss Dagstuhl, Saarbrücken, Germany, February 2017
- Participant, Bernoulli Brainstorm, Bernoulli Center at the EPFL,

Lausanne, Switzerland, June 28, 2017 - July 10, 2017
- Visiting researcher, Max Planck Institute for Mathematics in Bonn, Germany, July 14, 2012 - August 5, 2012

Service

- SMALL Research Experience for Undergraduates, Williams College, June 2014; Assisted Frank Morgan in supervising the geometry group
- Mentored undergraduate student A. Dranovski, Summer 2012 - June 2014; Published article with Almut Burchard in DCDS-A (see (8) above)
- University of Toronto Mentorship Program, Spring 2012; Mentored two high school students, teaching them basic point-set topology and the classical isoperimetric inequality
- Peer tutor, University of Toronto, 2007 - 2008
- Reviewer for the Journal of Topology and Analysis and for Geometric and Functional Analysis (GAFA)

Teaching

University of Chicago

- Course Instructor, October 2016 - Present
  Analysis in $\mathbb{R}^n$ 3 Accelerated
- Course Instructor, March 2016 - June 2016
  Topics in Geometry
- Course Instructor, January 2016 - March 2016
  Analysis in $\mathbb{R}^n$ 1 Accelerated
- Course Instructor, October 2015 - December 2015
  Analysis in $\mathbb{R}^n$ 3 Accelerated
- Course Instructor, March 2015 - June 2015
  Analysis in $\mathbb{R}^n$ 2 Accelerated
- Course Instructor, January 2015 - March 2015
  Analysis in $\mathbb{R}^n$ 1 Accelerated
- Course Instructor, October 2014 - December 2014
  Calculus 3, Analysis in $\mathbb{R}^n$ 3

University of Toronto

- Teaching Assistant, 2013 - 2014
  Multivariable Calculus, Advanced Ordinary Differential Equations, Linear Algebra II
- Teaching Assistant, 2012 - 2013
  Differential Equations for Engineers, Analysis II
- Teaching Assistant, 2011 - 2012
  Advanced Ordinary Differential Equations, Analysis II, Multivariable Calculus
- Teaching Assistant, 2010 - 2011
  Applications of Linear Programming, Calculus A and Calculus B for Engineers, Calculus I

- Teaching Assistant, 2009 - 2010
  Calculus I, Nonlinear Optimization