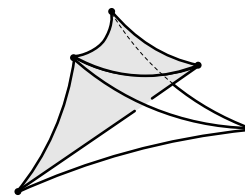




Nathan M. Dunfield

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Area: Topology and geometry of 3-manifolds and related topics.

Personal: Born in Ann Arbor, Michigan in 1975. U.S. citizen.

Education:

University of Chicago: Ph.D. in Mathematics, 1999.

Advisors: Peter Shalen and Mel Rothenberg.

Oregon State University: B.S. in Mathematics, summa cum laude, 1994.

Employment:

University of Illinois at Urbana-Champaign: Associate Professor of Mathematics, 2007–present.

Caltech: Associate Professor of Mathematics, 2003–2007.

Harvard: Benjamin Peirce Assistant Professor of Mathematics, 1999–2003.

Awards and Grants:

Sole PI on NSF grants #DMS-0707136 and #DMS-1105476, total of \$465,000, 2007–2014.

Simons Fellowship in Mathematics, Fall 2013.

Distinguished Teaching Award, Dept. of Mathematics, 2012.

Alfred P. Sloan Fellow, 2004–2008.

NSF grant #DMS-0405491 (co-PI with D. Calegari), \$258,000, 2004–2007.

Faculty Teaching Award from the Associated Students of Caltech, 2006.

NSF Mathematical Sciences Postdoctoral Fellow, 2000–2003.

Alfred P. Sloan Dissertation Fellow, 1998–1999.

NSF Graduate Fellow, 1995–1998.

Publications: Available on web page listed above, and at arXiv.org.

(with N. Brown and G. Perry) Colorings of the Plane, Parts I, II, and III.

Geombinatorics **3** (1993), 24–31, **3** (1994), 64–74, **3** (1994), 110–114.

Examples of non-trivial roots of unity at ideal points of hyperbolic 3-manifolds.

Topology **38** (1999), 457–465.

Cyclic surgery, degrees of maps of character curves, and volume rigidity of hyperbolic manifolds.

Invent. Math. **136** (1999), 623–657.

A table of boundary slopes of Montesinos knots. *Topology*, **40** (2001), 309–315.

- Alexander and Thurston norms of fibered 3-manifolds. *Pacific J. Math.* **200** (2001), 43–58.
- (with Danny Calegari) Commensurability of 1-cusped hyperbolic 3-manifolds. *Trans. Amer. Math. Soc.* **354** (2002), 2921–2932.
- (with Danny Calegari) Laminations and groups of homeomorphisms of the circle. *Invent. Math.* **152** (2003) 149–207.
- (with William Thurston) The Virtual Haken Conjecture: Experiments and examples. *Geom. Topol.* **7** (2003) 399–441.
- (with Stavros Garoufalidis) Non-triviality of the A -polynomial for knots in S^3 . *Algebr. Geom. Topol.* **4** (2004) 1145–1153.
- (with Danny Calegari) An ascending HNN extension of a free group inside $SL(2, \mathbb{C})$. *Proc. Amer. Math. Soc.* **134** (2006) 3131–3136.
- (with Sergei Gukov and Jacob Rasmussen) The superpolynomial for knot homologies. *Experimental Math.* **15** (2006), 129–159.
- (with Frank Calegari) Automorphic forms and rational homology 3-spheres. *Geom. Topol.* **10** (2006) 295–329.
- (with William Thurston) Finite covers of random 3-manifolds. *Invent. Math.* **166** (2006) 457–521.
- (with Dylan Thurston) A random tunnel number one 3-manifold does not fiber over the circle. *Geom. Topol.* **10** (2006) 2431–2499.
- Volume change under drilling: theory vs. experiment. 5 pages. Appendix to Agol, Storm, and W. Thurston, Lower bounds on volumes of hyperbolic Haken 3-manifolds. *J. Amer. Math. Soc.* **20** (2007), 1053–1077.
- (with Dinakar Ramakrishnan) Increasing the number of fibered faces of arithmetic hyperbolic 3-manifolds. *Amer. J. Math* **132** (2010), 53–97.
- (with S. Garoufalidis, A. Shumakovitch, and M. Thistlethwaite) Behavior of knot invariants under genus 2 mutation. *New York J. Math.* **16** (2010) 99–123.
- The Mahler measure of the A -polynomial of $m129(0, 3)$. 9 pages. Appendix to D. Boyd and F. Rodriguez Villegas, Mahler’s measure and the dilogarithm (II). Preprint, 2003.
- (with John W. Aaber) Closed surface bundles of least volume. *Algebr. Geom. Topol.* **10** (2010) 2315–2342.
- (with Helen Wong) Quantum invariants of random 3-manifolds. *Algebr. Geom. Topol.* **11** (2011) 2191–2205.
- (with Anil Hirani) The Least Spanning Area of a Knot and the Optimal Bounding Chain Problem. *Proceedings of the 27th annual ACM symposium on Computational Geometry*, SoCG 2011, 135–144.
- (with Stavros Garoufalidis) Incompressibility criteria for spun-normal surfaces. *Trans. Amer. Math. Soc.* (to appear), 28 pages.
- (with Stefan Friedl and Nicholas Jackson) Twisted Alexander polynomials of hyperbolic knots. *Experimental Math.* (to appear), 36 pages.

Talks:

Conferences:

Georgia Topology Conference, University of Georgia, August 1998.
Workshop on Computation in Low-dimensional Topology, Oklahoma State, March 1999.
Symposium on Computation in Group Theory and Geometry, University of Warwick, July 1999.
Weekend Topology Conference, UC Berkeley, April 2000.
3-manifolds workshop, Barnard College, November 2000.
Georgia Topology Conference, University of Georgia, May 2001.
Workshop on groups and 3-manifolds, CRM, Montréal, June 2001.
Topology in and around dimension three, Banff Research Station, September 2003.
Trends in 3-manifolds, Université du Québec à Montréal, May 2004.
Cornell Topology Festival, May 2004.
Knots in Vancouver, University of British Columbia, July 2004.
Low-dimensional topology, University of Virginia, December 2004.
Geometry and Topology of 3-Manifolds, ICTP, Trieste, Italy, June 2005.
Foundations of Computational Mathematics, Santander, Spain, July 2005.
Pacific Northwest Geometry Seminar, Oregon State, November, 2005.
3-manifold Topology in Honor of Peter Shalen's 60th Birthday, CRM, Montréal, June 2006.
IAS/Park City Mathematics Institute, June 2006.
Interactions of Geometry and Topology, Banff Workshop, March 2009.
Hamilton Geometry and Topology Workshop, Dublin, September 2009.
Computational Differential Geometry, Topology, and Dynamics, Fields Institute, Nov. 2009.
Bloomington Geometry Workshop, Indiana University, April 2010.
Virtual properties of 3-manifolds, Université du Québec à Montréal, April 2010.
Workshop on pseudo-Anosovs with small dilatation, UW Madison, April 2010.
Topology and Geometry in Dimension Three, Oklahoma State, June 2010.
Workshop on Low-Dimensional Topology and Number Theory, Oberwolfach, August 2010.
Geometry, analysis, and surfaces, Autrans, France, March 2011.
ACM Symposium on Computational Geometry, INRIA, Paris, June 2011.
Geometry & Topology Down Under, Melbourne, July 2011.
3-Manifolds, Artin Groups, and Cubical Geometry, CUNY Graduate Center, August 2011.
Ordered Groups and Topology, Banff, February 2012.
Redbud Topology Conference, Oklahoma State, March 2012.
GEAR Network Retreat, University of Illinois, August 2012.

Seminar Talks:

1999: Bay Area Topology Seminar (UC Davis), SUNY Stony Brook, SUNY Buffalo, Brown.
2000: Univ. of Michigan, Université du Québec à Montréal, SUNY Albany.
2001: Boston College, SUNY Buffalo.
2002: Univ. of Texas, Yale, Bay Area Topology Seminar (UC Davis), Caltech, Columbia.
2003: Stanford, Cornell, UC Santa Barbara, Univ. of British Columbia, Maryland, Univ. of Utah.

2004: UC Berkeley.
2005: Princeton, Columbia, Univ. of Southern California, UC Davis.
2006: UC Berkeley, UW Madison.
2007: Michigan State, UC Santa Barbara.
2008: Indiana University, UIC.
2009: Northwestern.
2011: UC Santa Barbara, Temple, Columbia, Brown, Harvard, Northwestern.
2012: UCLA, Stanford, Berkeley, LA Topology Seminar (at USC), Harvard.

Departmental Colloquia:

2000: SUNY Albany.
2002: Caltech, Georgia Tech.
2003: UIC, Univ. of Utah, UC Davis, Univ. of British Columbia, Univ. of Toronto.
2005: Columbia, UIUC, Oregon State.
2006: UW Madison, UC San Diego, Northeastern.
2007: UCLA, Michigan State, UIUC, UC Santa Cruz, Univ. of Oregon, Brown, Bowdoin.
2008: Indiana University.
2011: UIC, Temple, Tufts.

Special Lectures:

The Dan E. Christie Mathematics Public Lecture at Bowdoin College, 2007
Invited address: AMS Sectional meeting in Raleigh, NC, 2009.

Teaching:

I have a broad range of teaching experience, having taught more than 20 distinct courses ranging from a vector calculus class with 270 students to an advanced graduate topics class with only 5 students. My courses have been consistently well-received; for instance, I won a Faculty Teaching Award from the Associated Students of Caltech in 2006, my department's Distinguished Teaching Award for Tenured Faculty in 2012, and was on the *List of Teachers Rated as Excellent* at Illinois five times, including for a Fall 2009 calculus class.

Calculus and linear algebra: At Illinois, I have taught three large vector calculus classes with between 170 and 270 students, as well as two smaller calculus classes for honors students. At Caltech, I twice taught a 120-student vector calculus class aimed at science and engineering majors. At Harvard, I twice taught a one-semester multivariable calculus and linear algebra class aimed at social science students. I also taught a year-long single-variable calculus course at the University of Chicago.

Advanced undergraduate classes: I have taught classes aimed at students concentrating in math and related fields in a number of areas: elementary number theory, algebra, probability, topology, and differential geometry.

Graduate classes: I have taught first-year graduate classes both in my core area of topology and also in algebraic number theory. I have twice given a one-term introduction to Riemannian geometry. I have also given four graduate topics classes.

Mentoring: My first PhD student, Vaibhav Gadre, graduated in Spring 2010 and is now a BP at

Harvard. My second PhD student, Jonah Sinick, graduated in Summer 2011 and is now a math teacher at the Thomas Jefferson High School for Science and Technology. I am currently the PhD advisor for three graduate students. At Caltech, I mentored three undergraduate summer research projects, as well as three undergraduate honors theses when I was at Harvard. I have also done numerous reading courses with both undergraduate and graduate students on a variety of topics.

Service:

Selected Departmental Committees:

Undergraduate affairs committee (2011–).

Executive committee (2009–2011).

Chair of colloquium committee (2008–9).

Chair of mathematics graduate admissions (Caltech, 2005–2007).

Organizer for:

Geometry and topology seminar at Caltech. 2004–2006.

$N + 2$ nd Southern California Topology Conference. April 2005.

Conference in Honor of Peter Shalen's 60th Birthday, CRM, Montréal. June 2006.

Special session at the Raleigh AMS meeting in April 2009.

Semester program at ICERM, *Computation in Geometry and Topology*, Fall 2013.

Software:

(with Marc Culler and Jeffery Weeks) *SnapPy*, a program for studying the topology and geometry of 3-manifolds. 2009–present. <http://snappy.computop.org>