

# Dan Knopf

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## Contact Information

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## Professional History

### Higher education.

- Ph. D. in Mathematics (1999) University of Wisconsin-Milwaukee.  
(Adviser: Kevin McLeod. Mentor: Bennett Chow.)
- B. A. in Mathematics (1993) University of Wisconsin-Milwaukee.

### Academic positions.

- Associate Professor, University of Texas (2008–present).
- Research Professorship, Mathematical Sciences Research Institute (MSRI),  
*Geometric Evolution Equations and Related Topics* (2006–2007).
- Assistant Professor, University of Texas at Austin (2004–2008).
- Visiting Assistant Professor, The University of Iowa (2002–2004).
- VIGRE Van Vleck Visiting Assistant Professor, University of Wisconsin  
Madison (1999–2002).

### Research grants, awards, and honors.

- PI, NSF CAREER award: *Investigating Ricci flow singularity formation*,  
2006–2011, \$400,000 (DMS-0545984).
- PI, NSF grant: *Singularity models for Ricci flow*, 2005–2008, \$108,000  
(DMS-0505920).
- University of Texas Summer Research Assignment (2005).
- PI, NSF grant: *Behavior of the Ricci flow and related curvature flows*,  
2002–2006, \$80,000 (DMS-0202796, DMS-0328233, DMS-0511184).
- University of Wisconsin-Milwaukee Dissertation Fellowship (1996–1998).
- Office of Naval Research Graduate Fellowship (1993–1996).

### Teaching awards.

- Services for Students with Disabilities Appreciation Award, Office of the  
Dean of Students, University of Texas, 2006.

## Research and Scholarship

### Areas of scholarship.

- Geometric analysis: applications of nonlinear PDE to differential geometry.
- Geometric evolution equations: heat flows that improve geometric objects.
- Ricci flow and its applications, including low-dimensional topology.

**Research papers.**

- Neckpinching dynamics for asymmetric solutions of mean curvature flow. Coauthors: Zhou Gang and Israel Michael Sigal. *In preparation.*
- Minimally invasive surgery for Ricci flow singularities. Coauthors: Sigurd Angenent and M. Cristina Caputo. *Submitted.* ([arXiv:0907.0232](https://arxiv.org/abs/0907.0232))
- Cross curvature flow on a negatively curved solid torus. Coauthors: Jason DeBlois and Andrea Young. *Submitted.* ([arXiv:0906.4592](https://arxiv.org/abs/0906.4592))
- Convergence and stability of locally  $\mathbb{R}^N$ -invariant solutions of Ricci flow. *J. Geom. Anal.* **19** (2009), no. 4, 817–846.
- Estimating the trace-free Ricci tensor in Ricci flow. *Proc. Amer. Math. Soc.* **137** (2009), no. 9, 3099–3103.
- Asymptotic stability of the cross curvature flow at a hyperbolic metric. Coauthor: Andrea Young. *Proc. Amer. Math. Soc.* **137** (2009), no. 2, 699–709.
- Local monotonicity and mean value formulas for evolving Riemannian manifolds. Coauthors: Klaus Ecker, Lei Ni, and Peter Topping. *J. Reine Angew. Math. (Crelle)* **616** (2008) 89–130.
- Precise asymptotics of the Ricci flow neckpinch. Coauthor: Sigurd Angenent. *Comm. Anal. Geom.* **15** (2007), no. 4, 773–844.
- Linear stability of homogeneous Ricci solitons. Coauthors: Christine Guenther and James Isenberg. *Int. Math. Res. Not.* (2006), Art. ID 96253, DOI: 10.1155/IMRN/2006/96253, 30 pp.
- Positivity of Ricci curvature under the Kähler–Ricci flow. *Commun. Contemp. Math.* **8** (2006), no. 1, 123–133.
- An example of neckpinching for Ricci flow on  $S^{n+1}$ . Coauthor: Sigurd Angenent. *Math. Res. Lett.* **11** (2004), no. 4, 493–518.
- Rotationally symmetric shrinking and expanding gradient Kähler–Ricci solitons. Coauthors: Mikhail Feldman and Tom Ilmanen. *J. Differential Geom.* **65** (2003), no. 2, 169–209.
- A lower bound for the diameter of solutions to the Ricci flow with nonzero  $H^1(M^n; \mathbb{R})$ . Coauthor: Tom Ilmanen. *Math. Res. Lett.* **10** (2003), no. 2, 161–168.
- Hamilton’s injectivity radius estimate for sequences with almost nonnegative curvature operators. Coauthors: Bennett Chow and Peng Lu. *Comm. Anal. Geom.* **10** (2002), no. 5, 1151–1180.
- Stability of the Ricci flow at Ricci-flat metrics. Coauthors: Christine Guenther and James Isenberg. *Comm. Anal. Geom.* **10** (2002), no. 4, 741–777.
- New Li–Yau–Hamilton inequalities for the Ricci flow via the space-time approach. Coauthor: Bennett Chow. *J. Differential Geom.* **60** (2002), no. 1, 1–51.
- Quasi-convergence of model geometries under the Ricci flow. Coauthor: Kevin McLeod. *Comm. Anal. Geom.* **9** (2001), no. 4, 879–919.
- Quasi-convergence of the Ricci flow. *Comm. Anal. Geom.* **8** (2000), no. 2, 375–391.

**Books.**

- *The Ricci Flow: Techniques and Applications, Part III: Geometric-Analytic Aspects*. Coauthors: Bennett Chow, Sun-Chin Chu, David Glickenstein, Christine Guenther, Jim Isenberg, Tom Ivey, Peng Lu, Feng Luo, and Lei Ni. Mathematical Surveys and Monographs. American Mathematical Society, Providence, RI. (xxii + 835 pp.) *Accepted and in preparation*.
- *The Ricci Flow: Techniques and Applications, Part II: Analytic Aspects*. Coauthors: Bennett Chow, Sun-Chin Chu, David Glickenstein, Christine Guenther, Jim Isenberg, Tom Ivey, Peng Lu, Feng Luo, and Lei Ni. Mathematical Surveys and Monographs, Vol. 144. American Mathematical Society, Providence, RI, 2008. (xxv + 458 pp.)
- *The Ricci Flow: Techniques and Applications, Part I: Geometric Aspects*. Coauthors: Bennett Chow, Sun-Chin Chu, David Glickenstein, Christine Guenther, Jim Isenberg, Tom Ivey, Peng Lu, Feng Luo, and Lei Ni. Mathematical Surveys and Monographs, Vol. 135. American Mathematical Society, Providence, RI, 2007. (xxiv + 536 pp.)
- *The Ricci Flow: An Introduction*. Coauthor: Bennett Chow. Mathematical Surveys and Monographs, Vol. 110. American Mathematical Society, Providence, RI, 2004. (xii + 325 pp.)

#### Surveys and expository articles.

- An introduction to the Ricci flow neckpinch. *Geometric Evolution Equations*. Edited by Shu-Cheng Chang, Bennett Chow, Sun-Chin Chu, and Chang-Shou Lin. Contemporary Mathematics. Vol. 367, 141–148. American Mathematical Society, Providence, RI. 2005. (Refereed.)
- Singularity models for the Ricci flow: an introductory survey. *Variational Problems in Riemannian Geometry: Bubbles, Scans and Geometric Flows*. Edited by Paul Baird, Ahmad El Soufi, Ali Fardoun, and Rachid Regbaoui. Progress in Nonlinear Differential Equations and Their Applications, Vol. 59, 67–80. Birkhäuser, Basel, 2004.
- An injectivity radius estimate for sequences of solutions to the Ricci flow having almost nonnegative curvature operators. Coauthors: Bennett Chow and Peng Lu. *Proceedings of ICCM 2001*. Edited by Chang-Shou Lin, Lo Yang, and Shing-Tung Yau. New Studies in Advanced Mathematics, Vol. 4, 249–256. International Press, Somerville, MA, 2004.

#### Invited lectures

##### National.

- Calderón–Zygmund Analysis Seminar, University of Chicago (invited for February 2010).
- Colloquium, University of Notre Dame (invited for February 2010).
- Geometric Analysis Seminar, University of Oregon (November 2009).
- AMS Sectional Meeting, Baylor University (October 2009).
- PDE Seminar, The Ohio State University (May, 2009).
- Differential Geometry Seminar, University of California, San Diego (April 2009).
- 41<sup>st</sup> Texas Geometry and Topology Conference, University of Houston (February 2009).

- Geometric PDE Seminar, Institute for Advanced Study, Princeton (January 2009).
- Colloquium, University of Oregon (January 2009).
- Geometry Seminar, University of Arizona (October 2007).
- Geometric Analysis Seminar, University of Wisconsin-Madison (October 2007).
- Geometry Seminar, Texas A&M University (May 2007).
- Geometry/Topology Seminar, University of California, Davis (April 2007).
- Workshop on Geometric Evolution Equations, MSRI (March 2007).
- Colloquium, University of Massachusetts, Amherst (February 2007).
- Colloquium, University of California, Riverside (February 2007).
- Colloquium, University of Oregon (February 2007).
- Colloquium, University of Illinois at Chicago (January 2007).
- Geometry Seminar, University of Minnesota (December 2006).
- Geometric Analysis Seminar, University of Wisconsin-Madison (November 2006).
- Analysis and Geometry Seminar, University of Rochester (October 2006).
- Geometry and Analysis Seminar, Columbia University (September 2006).
- Colloquium, University of Oklahoma (April 2006).
- 35<sup>th</sup> Texas Geometry and Topology Conference, University of Houston (February 2006).
- Colloquium, Rice University (February 2006).
- Geometry Seminar, Stanford University (December 2005).
- Workshop on Geometric Analysis and Flows, University of California, San Diego (July 2005).
- AMS Sectional Meeting, University of California, Santa Barbara (April 2005).
- Geometric Analysis Seminar, University of Wisconsin-Madison (December 2004).
- JDG - Lehigh University Geometry and Topology Conference (June 2004).
- Geometry Seminar, University of Michigan, Ann Arbor (March 2004).
- Geometry Seminar, Lehigh University (November 2003).
- Geometry and Analysis Seminar, Columbia University (November 2003).
- Geometric Analysis Seminar, Princeton University (October 2003).
- Geometry-Topology Seminar, SUNY Buffalo (September 2003).
- Topology seminar, University of Illinois at Chicago (April 2003).
- AMS Sectional Meeting, University of Wisconsin-Madison (October 2002).
- Colloquium, University of Oregon (January 2002).
- AMS Sectional Meeting, The Ohio State University (September 2001).
- Institute for Theoretical Science, University of Oregon (January 2001).
- Midwest Geometry Conference 2000, The University of Iowa (November 2000).
- Colloquium, University of Oregon (February 1999).
- International Conference on Nonlinear Partial Differential Equations and Applications, Northwestern University (March 1998).

### **International.**

- Colloquium, University of Toronto, Canada (invited for December 2009).

- Conference on Complex and Differential Geometry, Leibniz Universität, Hannover, Germany (September 2009).
- Conference on conformal geometry, Roscoff, France (June 2008).
- Conference on Ricci flow and related topics, Institut Henri Poincaré (IHP), Centre Emile Borel, Paris, France (June 2008).
- Geometric Analysis and Gravitation Seminar, Max Planck Institut für Gravitationsphysik (Albert Einstein Institut), Golm, Germany (March 2008).
- Workshop on Geometric flows and related topics, Warwick Symposium on Low Dimensional Geometry and Topology, Warwick Mathematics Institute, United Kingdom (March 2007).
- Colloquium, University of British Columbia, Canada (January 2007).
- Thirteenth Gökova Geometry/Topology Conference, Turkey (May 2006).
- Conference on Analytic aspects of problems in Riemannian geometry, Université de Bretagne Occidentale, Brest, France (May 2005).
- Workshop on Aspects of Ricci Flow, Mathematisches Forschungsinstitut, Oberwolfach, Germany (May 2005).
- Geometric Analysis and Gravitation Seminar, Max Planck Institut für Gravitationsphysik (Albert Einstein Institut), Golm, Germany (October 2004).
- Workshop on Geometric Evolution Equations, Banff International Research Station, Canada (July 2004).
- Analysis Seminar, University of Warwick, United Kingdom (June 2004).
- Workshop on Geometric Evolution Equations, National Center for Theoretical Sciences, Hsinchu, Taiwan (July 2002).
- Conference on Harmonic Maps, Minimal Surfaces, and Geometric Flows, Université de Bretagne Occidentale, Brest, France (July 2002).
- Canadian Mathematical Society Winter Meeting, Toronto, Canada (December 2001).
- Workshop on Geometric Evolution Equations, National Center for Theoretical Sciences, Hsinchu, Taiwan (July 2001).
- Seminaire de geometrie differentielle, Paris VI, France (June 1997).

### Service

#### Student advising.

- Haotian Wu, 2009–present.
- Davi Nogueira, 2008–present (in candidacy).
- Michael Williams, 2008–present (in candidacy).
- Bradley Anderson, 2006–2008 (M.A. in Mathematics).

#### Departmental service.

- Graduate Adviser, 2009–2013.
- Graduate Review Committee, 2009.
- Assistant Graduate Adviser, 2008–2009.
- Undergraduate Studies Committee, Department of Mathematics, University of Texas, 2007–2009.
- Topology Preliminary Exam Committee, Department of Mathematics, University of Texas (various times).

**Grant development.**

- Contributor to the University of Texas Geometry Group RTG proposal, 2006 (awarded \$750,000 by the NSF on May 31, 2007).
- VIGRE committee, Department of Mathematics, The University of Iowa, 2003.
- Design and implementation of the undergraduate research component of the VIGRE program at UW-Madison, 2001–2002.

**University service.**

- Panelist, UT Austin Faculty Orientation Seminar, University of Texas, 2009.
- Faculty Fellow Program, Department of Residence Life, University of Texas, 2007–2009.
- Panelist, New Faculty Teaching, Learning and Orientation Seminar, University of Texas, 2005.

**Other professional service.**

- Co-organizer, 40<sup>th</sup> Texas Geometry and Topology Conference, University of Texas, 2008.
- Organizer, SAGE workshops, University of Texas. SAGE (Symposia on Analysis of Geometric Evolution) denotes five annual workshops (2007–2011) designed to integrate research, graduate education, and undergraduate outreach components. They are supported by NSF CAREER grant DMS-0545984. For more information, see:
  - <http://www.ma.utexas.edu/users/danknopf/SAGE07.htm>
  - <http://www.ma.utexas.edu/users/danknopf/SAGE08.htm>
  - <http://www.ma.utexas.edu/users/danknopf/SAGE09.htm>
- Contributor, 34<sup>th</sup> Texas Geometry and Topology Conference, University of Texas, 2005.
- Co-organizer, Session on Geometric PDE, Midwest Geometry Conference 2002, The University of North Dakota, April 2002.
- Committee on Grading, Mathematics Department, University of Wisconsin-Madison, 2001.

**Courses taught***University of Texas at Austin.*

- Modes of Reasoning (TC 310). “Optimal Geometry in Nature, Art, and Mathematics” Plan II course in development for Spring 2010.
- Curves and Surfaces (M365G). Spring 2009.
- Advanced Calculus for Applications I, (M427K) *Engineering Honors*. Spring 2009.
- Riemannian Geometry (M392C). Fall 2007.
- Differential Topology (M382D). Spring 2007, Spring 2008.
- Differential and Integral Calculus (M408C). Fall 2006, Fall 2009.
- Ricci flow (M392C). Spring 2006.
- Advanced Calculus for Applications I (M427K). Fall 2005, Fall 2008.
- Matrices and Matrix Calculations (M340L). Spring 2005.
- Integral Calculus (M408L). Fall 2004.

*The University of Iowa.*

- Topics in Analysis: Introduction to the Ricci Flow. Spring 2004.
- Fundamental Properties of Spaces and Functions I. Fall 2003.
- Introduction to Abstract Algebra I. Fall 2002.
- Calculus II. Spring 2003, Fall 2003.
- Calculus I. Fall 2002.

*University of Wisconsin-Madison.*

- Differential Geometry. Spring 2002.
- Introduction to the Theory of Probability. Spring 2001.
- Elementary Matrix and Linear Algebra. Fall 2000.
- Linear Algebra and Differential Equations. Spring 2000.
- Applied Linear Algebra. Fall 1999.

*University of Wisconsin-Milwaukee.*

- Calculus and Analytic Geometry II. Fall 1998, Spring 1999.