CURRICULUM VITAE : SIDDHARTHA GADGIL

Citizenship. : Indian

Date of Birth. : 11 July 1974.

Education. :

- California Institute of Technology, 1995–1999
  - *Ph. D.* received in June 1999.
    Thesis title: *On the geometric simple-connectivity of* 4*-manifolds.*
    Advisor: David Gabai
  - *M.S.* received in June 1998
- Indian Statistical Institute, Calcutta, 1992–1995
  Bachelor of Statistics (Honours) received in 1995

Positions Held. :

- *Professor* at the Indian Institute of Science 2012–
- *Associate Professor* at the Indian Institute of Science 2006–2012.
- *Associate Professor* at the Indian Statistical Institute, Bangalore, 2002–2006.
- *Simons Instructor* at the State University of New York, Stony Brook, 1999–2002
- *Graduate Teaching Assistant*, California Institute of Technology, 1995–98.

Research interests. :

- *Low-dimensional topology* including 3-manifold topology and geometric topology of smooth 4-manifolds.
- *Geometric Group theory* in particular connections with and applications of topology.
- *Automated Theorem Proving* and *Homotopy Type Theory.*

Publications

Research Publications.

(1) *Cobordisms and Reidemeister torsions of homotopy lens spaces*, Geom. Topol. **5** (2001), 109–125.
(2) *The pq-condition for* 3*-manifold groups*, Proc. Amer. Math. Soc. **129** (2001), no. 6, 1873–1875.
(3) *Topological geodesics and virtual rigidity* (joint with Louis Funar), Algebr. Geom. Topol. **1** (2001), 369–380.
(4) *Equivariant framings, lens spaces and contact structures*, Pacific Journal of Mathematics **1** (2003), 73–84.
(5) *Contact Structures on elliptic* 3*-manifolds*, Proc. Amer. Math Soc.132 (2004), no. 12, 3705–3714.

(6) *On the Geometric simple-connectivity of open manifolds* (joint with Louis Funar), Int. Math. Res. Not. 2004, no. 24, 1193–1248.
(7) *Limits of functions and elliptic operators.* Proc. Indian Acad. Sci. Math. Sci. 114 (2004), no. 2, 153–158.
(8) *Homology and homeomorphisms of non-orientable surfaces* (joint with Dishant Pancholi), Proc. Indian Acad. Sci. Math. Sci. 115 (2005), no. 3, 251–257.
(9) *Embedded spheres in* $S^2 \times S^1 \# ... \# S^2 \times S^1$, Topology Appl. 153 (2006), no. 7, 1141–1151.
(10) *Extremes of the Indian summer monsoon*, (joint with Sulochana Gadgil, P.N. Vinaychandran and P.A. Francis) Geophysical Research letters, Volume 31, Issue 12, 2004.
(11) *The Chord algebra and fundamental groups* (joint with Lenny Ng), Appendix to Knot and braid invariants from contact homology II by Lenny Ng, Geom. Topol. 4 (2005), 1603-1637.
(12) *Degree-one maps, Surgery and four-manifolds*, Bull. Lond. Math. Soc. 39 (2007), no. 3, 419–424
(13) *On theta characteristics of a compact Riemann surface.* (joint with Indranil Biswas and Parameswaran Sankaran) Bull. Sci. Math. 131 (2007), no. 5, 493–499.
(14) *Least-area surfaces and Incompressibility*, Expos. Math. 26 (2008), 93–98.
(15) *Non-orientable Thom-Pontrjagin constructions and Seifert surfaces*, (joint with Dishant Pancholi), J. Ramanujan Math. Soc. 23 (2008), 143–149
(16) *Watson-Crick pairing for RNA and Milnor invariants of links*, Journal of Mathematical Biology. Vol. 59, 123–142.
(17) *Algebraic and Geometric intersection numbers for free groups* (joint with Suhas Pandit), Topology Appl. 156 (2009), no. 9, 1615–1619.
(18) *Cup products for groups and commutators* (joint with Geetanjali Kachari), to appear in Journal of Group theory.
(19) *Real theta characteristics and automorphisms of a real curve*(joint with Indranil Biswas), to appear in Journ. Aust. Math. Soc.
(20) *On the topology of manifolds with positive isotropic curvature* (joint with Harish Seshadri), Proc. Amer. Math. Soc. **137** (2009), no. 5, 1807–1811.
(21) *Open manifolds, Ozsvath-Szabo invariants and Exotic* $\mathbb{R}^4$*'s*, Expo. Math. **28** (2010), no. 3, 254–261.
(22) *Splittings of free groups, Normal forms and Partitions of Ends* (joint with Suhas Pandit), Proc. Indian Acad. Sci. (Math. Sci.) **120** (2010), 217-241.
(23) *Real theta characteristics and automorphisms of a real curve*(joint with Indranil Biswas), J. Aust. Math. Soc. **88** (2010), 29–42.
(24) *Conjugacy invariant pseudo-norms, representability and RNA secondary structures*, Indian Journal of Pure and Applied Mathematics **42** (2011), 225–237.
(25) *Surfaces of bounded mean curvature in Riemannian manifolds* (joint with Harish Seshadri), Trans. Amer. Math. Soc. **363** (2011), 3977-4005.
(26) *A chain complex and Quadrilaterals for normal surfaces* (joint with Tejas Kalelkar), Rocky Mountain J. Math. **43** (2013), 479–487.
(27) *Geosphere Laminations in free groups*, Geom. Dedicata **158** (2012) 211–234.

(28) *The Goldman bracket characterizes homeomorphisms*, C. R. Math. Acad. Sci. Paris **351** (2013) 915–920.
(29) *Lipschitz correspondence between metric measure spaces and random distance matrices*, Int. Math. Res. Not. **24** (2013) 5623–5644.
(30) *The projective plane, Holomorphic curves and Desargues theorem*, C. R. Math. Acad. Sci. Paris **351** (2013) 915–920.
(31) *Relative symplectic caps, 4-genus and fibered knots* (joint with Dheeraj Kulkarni), Proc. Indian Acad. Sci. Math. Sci. **126** (2016) 261–275.
(32) *The extended Goldman bracket determines intersection numbers for surfaces and orbifolds*, Algebraic & Geometric Topology **16**, (2016) 2813–2838.
(33) *Graphs of Systoles on hyperbolic surfaces* (joint with Bidyut Sanki), to appear in Journal of Topology and Analysis.
(34) *Homogeneous length function on Groups* (joint with Tobias Fritz, Apoorva Khare, Pace Nielsen, Lior Silberman and Terrence Tao), Algebra and Number Theory 12 (2018), 1773–1786.
(35) *Homogeneous Length Functions on Groups: Intertwined Computer and Human Proofs*, to appear in Journal of Automated Reasoning.

Expository articles.

(1) *On the proof of the Poincaré conjecture*, J. Indian Inst. Sci. 87 (2007), 451–456.
(2) *Orders on manifolds and surgery*, Math. Student **77** (2008), 145-159 (2009).
(3) *Ricci flow and Perelman's proof of the Poincaré conjecture* (joint with Harish Seshadri), Current Science 91 (2007), 1326–1334.
(4) *Ricci flow and the Poincar conjecture.*(joint with Harish Seshadri) Math. Intelligencer 29 (2007), no. 4, 34–43.
(5) *A topological characterisation of hyperbolic groups (following Bowditch)*, Proceedings of the Workshop on Topological methods in Group theory, I.M.Sc., Chennai, 2002.
(6) *Dynamics on the circle*, Resonance, November 2003.
(7) *Chern and total curvature*, Resonance, April 2005.

1. Courses Taught

I have taught many of these courses more than once.

- UM 102: Analysis and Linear Algebra II (IISc core course).
- Introduction to Homotopy type theory (new course).
- Introduction to Algebraic Topology.
- Algebraic Topology.
- Topology.
- Logic Types and Spaces (new course).
- Basic Analysis.
- Elementary Algebra and Number Theory.
- Algebra I.
- Symplectic Topology(new course).
- Mathematical Logic (new course).
- Cohomology of Manifolds and Groups (new course).
- Topology and Geometry.

Invited lectures

- *On the Andrew-Curtis conjecture and Algorithms from topology*, West Coast topology colloquium, Stanford University, April 1999
- *Finite groups that act on S^3 without fixed points*, Colloquium, I.I.Sc., Bangalore, June 2000
- *Introductory lectures (five lectures) on 3-manifolds*, Instructional Conference in low-dimensional topology, Allahabad, December 2000.
- *Cobordisms and Reidemeister torsions of homotopy lens spaces*, Seminar, T.I.F.R., Mumbai, January 2001
- *Equivariant framings of 3-manifolds*, Seminar, T.I.F.R., Mumbai, June 2001
- *Topological Geodesics in 3-manifolds*, Topology seminar, University of Melbourne, August 2001
- *On the Andrew-Curtis conjecture and Algorithms from topology*, Topology Seminar, University of Melbourne, August 2001.
- *On the Andrew-Curtis conjecture and Algorithms from topology*, Special session in Computational topology, American Mathematical Society National meeting, San Diego, January 2002.
- *On the Andrews-Curtis conjecture and Algorithms from Topology*, Groupes et leurs applications en géométrie et topologie, Institut Fourier, Grenoble, 2002.
- *Equivariant framings, Space forms and Contact structures*, Groupes et leurs applications en géométrie et topologie, Institut Fourier, Grenoble, 2002.
- *Random walks and Contact geometry*, Groupes et leurs applications en géométrie et topologie, Institut Fourier, Grenoble, 2002.
- *A topological characterisation of hyperbolic groups (following Bowditch)*, Workshop on Topological methods in Group theory, I.M.Sc., Chennai, 2002 (3 lectures).
- *Contact structures on 3-manifolds*, Colloquium, T.I.F.R., Bangalore, 2002.
- *Topological geodesics in 3-manifolds*, Colloquium, Chennai Mathematical institute, 2002.
- *Topological geodesics in 3-manifolds*, Colloquium, T.I.F.R., Mumbai, 2003.
- *Topological spherical space forms*, Institut Fourier, Grenoble, 2003 (3 lectures).
- *On the Andrew-Curtis conjecture and Algorithms from topology*, Frankfurt-Bocham group theory seminar, Frankfurt, 2003.
- *Topological spherical space forms*, AMS-India meeting, Bangalore, 2003.
- *Symmetries of spheres*, Indian Academy of Sciences Annual Meeting, Varanasi, 2004.
- *Exotic $\mathbb{R}^4$'s and Ozsvath-Szabo invariants*, I.I.Sc. Mathematics Colloquium, 2005.
- *Automorphisms of surfaces*, H.R.I., Allahabad, June-July 2005 (4 lectures).
- *The Quest for the best metric*, Conference on *Relativity and its impact on Mathematics*, Belgaum, September 2005.
- *Degree-one maps, surgery and low-dimensional topology*, North-Eastern Hill University, Shillong, October 2006.
- *Heegaard Floer theory, Open manifolds and Teichmuller spaces*, Geometric Topology Conference, Peking University, Beijing, 2007.

- *Embedded spheres, intersection numbers and free groups*, International Conference on Surface mapping class groups, North-Eastern Hill University, Shillong 2008.
- *Topology of Manifolds : Constructing, Describing and Distinguishing spaces*, T.I.F.R. Young Indian Scientists Colloquium, September 2009.
- *Metric Measure spaces and Random matrices*, Young Topologists Conference, Chennai, December 2013.
- *Triangulating Moduli spaces of Surfaces*, Conference on Topolgy and Geometry, IISER Bhopal, December 2015.
- *Automating Mathematics?*, IISER, Tirupathi, September 2017.
- *String Topology and the Geometric decomposition of three-dimensional manifolds*, East Asian Conference on Algebraic Topology, December 2017.
- *Homogeneous length functions on Groups: A polymath adventure*, Ashoka University, April 2018

Students Guidance

- I have supervised the Ph.D. thesis of 7 students.
- Tomoaki Hashizaki worked on implementation of Homotopy Type theory in scala with me under IISc-JAIST program.
- I have guided several summer students under KVPY and INSPIRE.
- I have supervised the undergraduate projects at IISc of 4 students and jointly of 2 other students.

Other activities

- Member of the Senate Curriculum Committee, I.I.Sc., 2013-2015.
- Member of the UGC review committee for Chennai Mathematical Institute, 2018.
- Member selection committees for the faculty of IISER Bhopal, IISER Tirupathi and IIT, Hyderabad.
- Member of the UGC advisory committee for the Department of Mathematics, NEHU, Shillong, 2016-2021.
- Co-organiser of the ICM Satellite Conference on *Geometric Topology and Riemannian Geometry*, June 2010.
- Co-organiser of the International Conference *Geometric method in low-dimensional topology*, IISc, Bangalore, June 2006.
- Member, Programme Committee, International Center for Theoretical Science, 2010–2012.
- Co-organiser of the conference 'Low-dimensional manifolds and Groups', ISI, Bangalore June 2004.
- Co-organiser of the Geometry/Topology seminar at Stony Brook, 1999-2002
- Member, Graduate committee, Department of Mathematics, Stony Brook, 2001-2002
- Colloquium chair, I.S.I. Bangalore, 2005-2006
- Seminar-in-charge, IISc, Bangalore, 2006-2009
- Member, Research fellows advisory committee, I.S.I. Bangalore, 2005-2006
- Convener, computer committee, I.S.I. Bangalore, 2004-2006

Grants received.

- *Homotopy Type theory and Natural language processing for Computer-Assisted Mathematics*, SERB extra-mural grant, 2018-2021.

Honours and Awards. :

- *Sloan dissertation fellowship* in Mathematics, 1998-99.
- *Associate of the Indian Academy of Sciences*, 2003-2008.
- *Indian National Science Academy medal for Young Scientists*, 2008.
- *Platinum Jubilee medal for Young Scientist*, National Academy of Sciences India, 2008.
- *Ganesh Prasad Memorial Award lecture* at the Indian Mathematical Society, 2007.
- *NASI-Scopus Young Scientist Award* from Elsevier, 2010.