

Jessica S. Purcell

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Employment

Associate Professor, Monash University.
Melbourne, Victoria, Australia. August 2015 to present.

Von Neumann Fellow, Institute for Advanced Study.
Princeton, New Jersey, USA. September 2015 to December 2015.

Associate Professor, Brigham Young University.
Provo, Utah, USA. September 2013 to July 2015.

Visiting Academic, University of Melbourne.
Melbourne, Victoria, Australia. January 2014 to August 2014.

Assistant Professor, Brigham Young University.
Provo, Utah, USA. June 2007 to August 2013.

Postdoctoral Researcher, University of Oxford Mathematical Institute.
Oxford, England, UK. September 2007 to September 2008.

Instructor and VIGRE Instructor (Postdoctoral), University of Texas at Austin.
Austin, Texas, USA. September 2004 to June 2007.

Education

Stanford University, Stanford, California, Ph.D. in Mathematics, June 2004.
Dissertation: *Cusp shapes of hyperbolic link complements and Dehn filling*.
Advisor: Steven Kerckhoff.

University of Michigan, Ann Arbor, Michigan, M.S. in Mathematics, May 1999.

University of Utah, Salt Lake City, Utah, B.A. *summa cum laude* in Mathematics, minor in Computer Science, June 1998.

Selected Awards and Grants

National and International Awards

Australian Research Council (ARC) Discovery Grant, *Quantum in variants and hyperbolic manifolds in three-dimensional topology*. January 2015 through December 2018.

National Science Foundation (NSF) CAREER Award, *Hyperbolic geometry and knots and links*, award DMS-1252687. June 2013 through May 2018 (estimated).

Sloan Research Fellow, from the Alfred P. Sloan Foundation, 2011 through 2014.

NSF Research Grant, *Collaborative Research: Hyperbolic geometry of knots and 3-manifolds*, award DMS-1007437. 2010 to 2013.

NSF Research Grant, *Geometry and topology of knots and links*, award DMS-0704359. 2007 to 2010.

ARCS Foundation Graduate Fellowship, 2002-2003.

NSF Graduate Fellowship, 1998-2001.

Alice Schafer Prize, from the Association for Women in Mathematics, 1998.

Additional Awards

BYU Young Scholar Award, from Brigham Young University, to “encourage and acknowledge outstanding promise and contributions by junior faculty” with 3–10 years of service. August 2014.

Distinguished Mentoring Award, from the Brigham Young University Mathematics Department. August 2013.

BYU FWA Scholarship Award, from the Brigham Young University Faculty Women’s Association, to recognize research accomplishments. April 2013.

BYU CPMS Young Scholar Award, from the Brigham Young University College of Physical and Mathematical Sciences, to recognize outstanding research for a faculty member with 3–10 years of service. January 2013.

Distinguished Teaching Award, Brigham Young University Department of Mathematics. December 2012.

Distinguished Scholarship Award, from the Brigham Young University Mathematics Department. December 2010.

BYU CPMS High Impact Teaching Fund Grant, Co-Principal Investigator, to enhance training of graduate student teaching assistants at Brigham Young University, 2009 and 2010.

Centennial Teaching Award, Stanford University, 2003.

Conference Grants

Geometric Topology in Cortona, Co-Principal Investigator. NSF Conference grant DMS-1313541, May 2013.

Moab Topology Conference 2012, Principal Investigator. NSF Conference grant DMS-1202922, April 2012.

Rigidity and Flexibility in dimensions 2, 3, and 4, Co-Principal Investigator. NSF Conference grant DMS-1211355, May 2012.

Moab Topology Conference, Principal Investigator. NSF Conference grant DMS-0932037. May 2009.

Publications

1. Jessica S. Purcell, *Volumes of highly twisted knots and links*, *Algebr. Geom. Topol.* **7** (2007), 93–108.
2. David Futer and Jessica S. Purcell, *Links with no exceptional surgeries*, *Comment. Math. Helv.* **82** (2007), no. 3, 629–664.
3. David Futer, Efstratia Kalfagianni, and Jessica S. Purcell, *Dehn filling, volume, and the Jones polynomial*, *J. Differential Geom.* **78** (2008), no. 3, 429–464.
4. Jessica S. Purcell, *Slope lengths and generalized augmented links*, *Comm. Anal. Geom.* **16** (2008), no. 4, 883–905.
5. Jessica S. Purcell, *Cusp shapes under cone deformation*, *J. Differential Geom.* **80** (2008), no. 3, 453–500.
6. David Futer, Efstratia Kalfagianni, and Jessica S. Purcell, *Symmetric links and Conway sums: volume and Jones polynomial*, *Math. Res. Lett.* **16** (2009), no. 2, 233–253.
7. Daryl Cooper, Marc Lackenby, and Jessica S. Purcell, *The length of unknotting tunnels*, *Algebr. Geom. Topol.* **10** (2010), no. 2, 637–661.
8. Jessica S. Purcell, *Hyperbolic geometry of multiply twisted knots*, *Comm. Anal. Geom.* **18** (2010), no. 1, 101–120.
9. David Futer, Efstratia Kalfagianni, and Jessica S. Purcell, *On diagrammatic bounds of knot volumes and spectral invariants*, *Geom. Dedicata* **147** (2010), 115–130.
10. Jessica S. Purcell, *On multiply twisted knots that are Seifert fibered or toroidal*, *Comm. Anal. Geom.* **18** (2010), no. 2, 219–256.
11. David Futer, Efstratia Kalfagianni, and Jessica S. Purcell, *Cusp areas of Farey manifolds and applications to knot theory*, *Int. Math. Res. Not. IMRN* **2010** (2010), no. 23, 4434–4497.
12. Jessica S. Purcell and Juan Souto, *Geometric limits of knot complements*, *J. Topol.* **3** (2010), no. 4, 759–785.
13. David Futer, Efstratia Kalfagianni, and Jessica S. Purcell, *Slopes and colored Jones polynomials of adequate knots*, *Proc. Amer. Math. Soc.* **139** (2011), 1889–1896.
14. Jessica S. Purcell, *An introduction to fully augmented links*, *Interactions between hyperbolic geometry, quantum topology and number theory*, *Contemp. Math.*, vol. 541, Amer. Math. Soc., Providence, RI, 2011, pp. 205–220.

15. Abhijit Champanerkar, David Futer, Ilya Kofman, Walter Neumann, and Jessica S. Purcell, *Volume bounds for generalized twisted torus links*, Math. Res. Lett. **18** (2011), no. 6, 1097–1120.
16. James Kaiser, Jessica S. Purcell, and Clint Rollins, *Volumes of chain links*, J. Knot Theory Ramifications **21** (2012), no. 11, 1250115, 17.
17. David Futer, Efstratia Kalfagianni, and Jessica Purcell, *Guts of surfaces and the colored Jones polynomial*, Research monograph published in Lecture Notes in Mathematics, vol. 2069, Springer, Heidelberg, 2013.
18. David Futer and Jessica S. Purcell, *Explicit Dehn filling and Heegaard splittings*, Comm. Anal. Geom. **21** (2013), no. 3, 625–650.
19. Daryl Cooper, David Futer, and Jessica S. Purcell, *Dehn filling and the geometry of unknotting tunnels*, Geom. Topol. **17** (2013), no. 3, 1815–1876.
20. David Futer, Efstratia Kalfagianni, and Jessica S. Purcell, *Jones polynomials, volume, and essential knot surfaces: a survey*, Proceedings of Knots in Poland III, vol. 100, Banach Center Publications, 2014, pp. 51–77.
21. David Futer, Efstratia Kalfagianni, and Jessica S. Purcell, *Quasifuchsian state surfaces*, Trans. Amer. Math. Soc. **366** (2014), no. 8, 4323–4343.
22. Stephan D. Burton and Jessica S. Purcell, *Geodesic systems of tunnels in hyperbolic 3-manifolds*, Algebr. Geom. Topol. **14** (2014), no. 2, 925–952.
23. Marc Lackenby and Jessica S. Purcell, *Geodesics and compression bodies*, Experiment. Math. **23** (2014), no. 2, 218–240.
24. Paige Bartholomew, Shane McQuarrie, Jessica S. Purcell, and Kai Weser, *Volume and geometry of homogeneously adequate knots*, J. Knot Theory Ramifications **24** (2015), no. 8, 1550044, 29.
25. David Futer, Efstratia Kalfagianni, and Jessica S. Purcell, *Hyperbolic semi-adequate links*, Comm. Anal. Geom., **23** (2015), no. 5, 993–1030.
26. Kathleen Finlinson and Jessica S. Purcell, *Volumes of Montesinos links*, Pacific J. Math., **282** (2016), no. 1, 63–105.
27. Marc Lackenby and Jessica S. Purcell, *Cusp volumes of alternating knots*, Geom. Topol., to appear. Preprint available at arxiv.org/abs/1410.6297.
28. J. W. Cannon, W. J. Floyd, L. Lambert, W. R. Parry, and J. S. Purcell, *Bitwist manifolds and two-bridge knots*, Pacific J. Math., to appear. Preprint available at arxiv.org/abs/1306.4564
29. Abhijit Champanerkar, Ilya Kofman, and Jessica S. Purcell, *Density spectra for knots*, J. Knot Theory Ramifications, to appear. Preprint available at arxiv.org/abs/1506.05841.

Preprints and papers under review

1. Marc Lackenby and Jessica S. Purcell, *Essential twisted surfaces in alternating link complements*, preprint available at arxiv.org/abs/1410.6318.
2. Abhijit Champanerkar, Ilya Kofman, and Jessica S. Purcell, *Geometrically and diagrammatically maximal knots*, preprint available at arxiv.org/abs/1411.7915.
3. Abhijit Champanerkar, Ilya Kofman, and Jessica S. Purcell, *Volume bounds for weaving knots*, preprint available at arxiv.org/abs/1506.04139.
4. Neil R. Hoffman and Jessica S. Purcell, *Geometry of planar surfaces and exceptional fillings*, preprint available at arxiv.org/abs/1504.01471.
5. Jessica S. Purcell and Alexander Zupan, *Independence of volume and genus g bridge numbers*, preprint available at arxiv.org/abs/1512.03869.

Academic Presentations

Invited conference and workshop talks

Special session on geometry of groups, surfaces, and 3-manifolds, AMS sectional meeting, Rutgers University, New Brunswick, New Jersey, USA. November 2015.

Workshop on geometric structures on 3-manifolds, Institute for Advanced Study, Princeton, New Jersey, USA. October 2015.

Classical and quantum hyperbolic geometry and topology, in honor of Francis Bonahon, Université Paris-Sud, Orsay, France. July 2015.

Temple Graduate Student Conference in Algebra, Geometry, and Topology (keynote speaker), Temple University, Philadelphia, Pennsylvania, USA. May 2015.

Special session on knots and 3-manifolds, AMS sectional meeting, University of Nevada at Las Vegas, Las Vegas, Nevada, USA. April 2015.

Redbud Topology Conference, Oklahoma State University, Stillwater, Oklahoma, USA. April 2015.

Texas Geometry and Topology Conference, University of Texas, Austin, Texas, USA. November 2014.

The Thin Manifold, University of Iowa, Iowa City, Iowa, USA. August 2014.

The Thin Manifold, Workshop speaker (three workshop addresses), University of Iowa, Iowa City, Iowa. August 2014.

Computational and Algorithmic Topology, The University of Sydney, Sydney, NSW, Australia. April 2014.

Special session on geometric aspects of 3–manifold invariants, AMS sectional meeting, Washington University, St. Louis, Missouri, USA. October 2013.

Topology, Geometry, and Group Theory, Informed by Experiment, Institute for Computational and Experimental Research in Mathematics (ICERM), Brown University, Providence, Rhode Island, USA. October 2013.

Geometric topology in New York, Columbia University, New York, USA. August 2013.

Low-dimensional topology and geometry in Toulouse, Toulouse Mathematics Institute, Toulouse, France. June 2013.

The topology of 3–dimensional manifolds, Centre de Recherches Mathématiques, Montreal, Canada. May 2013.

Special session on groups and geometry, MSRI-AWM Research Symposium, Santa Clara University, Santa Clara, California, USA. March 2013.

Knots in Washington (plenary speaker), George Washington University, Washington DC, USA. December 2012.

Special session on combinatorial methods in knot theory, AMS sectional meeting, New Orleans, Louisiana, USA. October 2012.

Modern Math Workshop at SACNAS, Seattle, Washington, USA. October 2012.

Rigidity and flexibility in dimensions 2, 3, and 4. A conference in honor of Steven Kerckhoff. Luminy, France. May 2012.

Workshop on immersed surfaces in 3–manifolds, Institut Henri Poincaré, Paris, France. March 2012.

Special session on invariants of knot theory and low dimensional topology, AMS sectional meeting, Lincoln, Nebraska, USA. October 2011.

Geometric topology of knots, Centro di Ricerca Matematica Ennio De Giorgi, Pisa, Italy. May 2011.

Topology and Computers 2010, two talks. Tokyo Institute of Technology, Tokyo, Japan. September 2010.

Topology and Geometry in Dimension Three: Triangulations, Invariants, and Geometric Structures. A conference in honor of William Jaco. Oklahoma State University, Stillwater, Oklahoma, USA. June 2010.

Special session on geometric aspects of link and 3–manifold invariants, Joint Mathematics Meetings, San Francisco, California, USA. January 2010.

Geometry and dynamics in surfaces and 3–manifolds, Park City, Utah, USA. August 2009.

Interactions between hyperbolic geometry, quantum topology, and number theory, Conference. Columbia University, New York, USA. June 2009.

Interactions between hyperbolic geometry, quantum topology, and number theory, Workshop (three invited workshop talks). Columbia University, New York, USA. June 2009.

Oberwolfach workshop in topology, Oberwolfach, Germany. September 2008.

Workshop in Geometric Topology, Park City, Utah, USA. June 2008.

Wasatch Topology Conference, University of Utah, Salt Lake City, Utah, USA. August 2007.

Workshop on 3-manifold geometry and topology, Warwick Mathematics Institute, University of Warwick, Coventry, England. July 2007.

A second time around the volume conjecture, Louisiana State University, Baton Rouge, Louisiana, USA. June 2007.

Cascade Topology Seminar, Portland State University, Portland, Oregon, USA. Oct. 2006.

Workshop on the deformation theory of hyperbolic 3-manifolds, Ahlfors-Bers Colloquium, University of Michigan, Ann Arbor, Michigan, USA. May 2005.

Special session on low-dimensional topology and Kleinian groups, AMS sectional meeting, Northwestern University, Evanston, Illinois, USA. Oct. 2004.

Special session on the geometry of hyperbolic manifolds, AMS sectional meeting, Vanderbilt University, Nashville, Tennessee, USA. October 2004.

2004 Georgia Topology Conference, University of Georgia at Athens, Athens, Georgia, USA. August 2004.

Invited seminar and colloquium talks

Bryn Mawr and Haverford mathematics colloquium, Bryn Mawr, Pennsylvania, USA. November 2015.

City University of New York (CUNY) geometry and topology seminar, New York, New York, USA. November 2015.

Tufts University geometric group theory and topology seminar, Tufts University, Medford, Massachusetts, USA. November 2015.

Philadelphia area topology seminar (PATCH), Temple University, Philadelphia, Pennsylvania, USA. October 2015.

University of Melbourne knot theory seminar, Melbourne, Victoria, Australia. August 2015.

Vanderbilt University topology and group theory seminar, Nashville, Tennessee, USA. December 2014.

Vanderbilt University mathematics colloquium, Nashville, Tennessee, USA. December 2014.

Washington University mathematics colloquium, St Louis, Missouri, USA. October 2014.

Monash University, Melbourne, Victoria, Australia. October 2014.

University of Melbourne knot theory seminar, Melbourne, Victoria, Australia. February 2014.

University of Melbourne Algebra/Geometry/Topology seminar, Melbourne, Victoria, Australia. January 2014.

Temple University mathematics colloquium, Philadelphia, Pennsylvania, USA. October 2013.

Temple University topology seminar, Philadelphia, Pennsylvania, USA. October 2013.

Columbia University topology seminar, New York, USA. December 2012.

Brigham Young University mathematics colloquium, Provo, Utah, USA. September 2012.

University of California, Santa Barbara, topology seminar, Santa Barbara, California, USA. November 2011.

University of Utah Max Dehn seminar, Salt Lake City, Utah, USA. September 2011.

Santa Clara University mathematics colloquium, Santa Clara, California, USA. May 2010.

California State University Channel Islands, mathematics colloquium, Camarillo, California, USA. April 2010.

Joint Temple, Bryn Mawr, Haverford topology seminar, Philadelphia, Pennsylvania, USA. November 2009.

University of Michigan, Ann Arbor, topology seminar, Ann Arbor, Michigan, USA. March 2009.

Michigan State University topology seminar, East Lansing, Michigan, USA. March 2009.

Brigham Young University mathematics colloquium, Provo, Utah, USA. October 2008.

Warwick University topology seminar, Coventry, England. March 2008.

University of Oxford topology seminar, Oxford, England. January 2008.

University of Liverpool mathematics colloquium, Liverpool, England. November 2007.

Columbia University topology seminar, New York, USA. May 2007.

Rice University topology seminar, Houston, Texas, USA. April 2007.

Vassar College mathematics colloquium, Poughkeepsie, New York, USA. February 2007.

University of Oklahoma, Norman, Oklahoma, USA. February 2007.

Brigham Young University topology seminar and colloquium, Provo, Utah, USA. January 2007.

University of Texas at Austin topology seminar, Austin, Texas, USA. December 2006.

Michigan State University topology seminar, East Lansing, Michigan, USA. October 2006.

Stanford University topology seminar, Palo Alto, California, USA. May 2006.

University of Texas at Austin topology seminar, Austin, Texas, USA. February 2005.

University of California, Berkeley topology seminar, Berkeley, California, USA. March 2004.

University of Texas at Austin topology seminar, Austin, Texas, USA. February 2004.

University of Utah topology seminar, Salt Lake City, Utah, USA. January 2004.

Stanford University topology seminar, Palo Alto, California, USA. January 2004.

Invited Presentations for Undergraduates and General Audiences

University of Utah Math Camp Presentation, for high school students, Salt Lake City, Utah, USA. June 2015.

Brigham Young University Awards Night, for high school seniors, Provo, Utah, USA. November 2014.

Melbourne University Mathematics and Statistics Society seminar, for undergraduate mathematics club, Melbourne, Australia. April 2014.

Expanding Your Horizons, workshop for junior high and high school girls, Utah Valley University, Orem, Utah, USA. March 2010, 2011, 2012, and 2013.

Brigham Young University Awards Night, for high school seniors, Provo, Utah, USA. November 2010.

Utah Valley University invited guest speaker in knot theory, Orem, Utah, USA. 2010.

Spring Research Conference presentation, Center for Undergraduate Research in Mathematics, Provo, Utah, USA. March 2010.

Saturday Morning Math Group, University of Texas at Austin, Austin, Texas, USA. September 2006.

Other

Poster presentation, “*The shape of cusps of hyperbolic knot complements*,” Spaces of Kleinian groups and hyperbolic 3-manifolds, Isaac Newton Institute Workshop, Cambridge, England. August 2003.

Teaching

Courses Taught

Brigham Young University

Differential calculus. Large section: winter 2011, fall 2009. Honors section: fall 2010, winter 2009, fall 2008.

Fundamentals of mathematics: fall 2012, fall 2014.

Introduction to topology, for graduates and advanced undergraduates: fall 2014, winter 2015.

Algebraic topology, graduate level: winter 2012, winter 2011, winter 2009.

Hyperbolic knot theory, graduate level: winter 2010.

Differential topology, graduate level: fall 2011, fall 2010.

Low dimensional topology, graduate level: winter 2013.

University of Texas at Austin

Linear algebra. Large section: spring 2007

Single variable calculus. Large section: fall 2006, fall 2005

Multivariable calculus. Large section: spring 2005

Discrete math: fall 2006, spring 2006

Probability: fall 2004.

Hyperbolic geometry, graduate level: spring 2007.

Stanford University

Single variable calculus: summer 2002, winter 2004

Undergraduate Mentored Research

Visiting participant, Center for Undergraduate Research in Mathematics.

Workshop training faculty to conduct undergraduate research in mathematics. Heber, Utah, August 2009.

Undergraduate research advising

1. Clint Rollins and James Kaiser, *Hyperbolic geometry of chain links*. 2009 – 2011.
Student presentations: BYU Spring Research Conference, March 2010 (won “best in section” award); Poster at Young Mathematicians Conference, Ohio State University, August 2010; BYU Student Research Conference, March 2011 (“best in section” award).
Research article published in *J. Knot Theory and its Ramifications*, 2012.
2. Kamal Pangeni, *Triangulations and augmented links*. 2010–2011.
Presented at BYU Student Research Conference, March 2011.
3. Jennifer Joslin and Alicia Pixton, *Visualizing Ford domains of hyperbolic 3-manifolds*. 2011–2012, and Alicia Pixton 2013.
Student presentations: BYU Student Research Conference, March 2012 (“best undergraduate presentation in section” award); BYU Student Research Conference, March 2014.
Student software created, available upon request (C++ source code or Windows).

4. Eric Walters, *Discrete structures on hyperbolic compression bodies*. 2012–2013.
Presented at BYU Student research conference, March 2013.
5. Paige Bartholomew, Shane McQuarrie, Kai Weser, *Geometry of homogeneously adequate links*. 2013–2014.
Presented at BYU Student research conference, March 2014 (“best undergraduate presentation in section” award).
Research article published in *J. Knot Theory and its Ramifications*, 2015.
6. Charles Johnson, Jarrod Lund, Jordan Wadsack-Stewart, *Volume bounds for twisted torus knots*. 2014–2015.
Presented at BYU Student research conference, March 2015 (“best undergraduate presentation in section” award).

Graduate Advising

Masters students

1. Stephan Burton, *Tunnel systems in hyperbolic 3-manifolds*, 2010–2012. Master of Science degree received 2012.
2. Kathleen Finlinson, *Volumes of Montesinos links*, 2012–2014. Master of Science degree received 2014.
3. Daniel Carrier, *Visualizing connected sums of 3-manifolds*, 2013–2014. Master of Science degree received 2014.

PhD students

1. Vinh Dang, *Compression bodies and their boundary hyperbolic structures*. PhD received December 2015.

Service

Professional Service

Organizer and co-organizer of conferences

1. Moab topology conference 2015, Moab, Utah, May 2015.
2. Geometric Topology in Cortona, Cortona, Italy, June 2013.
3. Moab topology conference 2012, Moab, Utah, May 2012.
4. Rigidity and Flexibility in Dimensions 2, 3, and 4, in honor of Steven Kerckhoff, Luminy, France, May 2012.
5. Wasatch topology conference, Park City Utah, bi-annually, 2011 through 2015.
6. Moab topology conference, Moab, Utah, May 2009.

Co-organizer of topology seminars, Brigham Young University, September 2008 to April 2015.

Referee and reviewer, Research journals, Math Reviews.

Panelist, NSF grant review panel, 2008, 2011, 2015.

BYU Mathematics Department Service

Committee chair.

Calculus common homework revision, committee chair. 2009.

Calculus committee chair. 2011 to 2013.

Thesis and dissertation committee member.

Committee member (not advisor) for six master's theses, four PhD dissertations, Brigham Young University.

Committee work.

Teaching committee member, co-organizer of teaching seminars. 2008 to 2010.

Student advising committee member. 2008 to 2010.

Teaching assistant training committee member, 2009 to 2012. co-PI on BYU College High Impact Teaching Fund Grant, 2009 and 2010.

Calculus textbook selection committee member. 2011.

Hiring committee member. 2011 to 2013.

Topology committee member. Co-organizer of seminars, writer of qualifying exams. 2008 to 2013.

Stanford University Service

Teaching liason and consultant. Provided training for graduate teaching assistants at Stanford University. 2002–2004.

Organizer, mathematics department teaching seminars. 2003–2004.

Public Service

Math Circles. Co-organizer, co-presenter of weekly mathematics events for local elementary school children during the academic year. Provo, Utah, USA. 2011 to 2013, and 2014 to 2015.