

# Jessica S. Purcell

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## Qualifications

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

Master of Science in Mathematics, **University of Michigan**, Ann Arbor, Michigan, May 1999.

Bachelor of Arts in Mathematics, **University of Utah**, Salt Lake City, Utah, June 1998.  
Graduated *summa cum laude*, minor in Computer Science.

## Positions

**Professor**, Monash University.  
Clayton, Victoria, Australia. January 2019 to present.

**Associate Professor**, Monash University.  
Clayton, Victoria, Australia. August 2015 to December 2018.

**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.

## Selected Awards and Grants for Research

### *National and International Awards*

**Australian Research Council (ARC) Future Fellowship**

*Interactions of geometry and knot theory.* 2017 through 2021.

A four-year fellowship to support outstanding Australian mid-career researchers.

**ARC Discovery Grant**, *Quantum invariants and hyperbolic manifolds in three-dimensional topology.* January 2016 through December 2019.

**National Science Foundation (NSF) CAREER Award**, *Hyperbolic geometry and knots and links*, award DMS-1252687. June 2013 through September 2016.

The National Science Foundation's Faculty Early Career Development (CAREER) Program offers the foundation's most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization.

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

In recognition of distinguished performance and a unique potential to make substantial contributions to their field. One of twenty mathematicians selected from the United States and Canada in 2011.

**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.

## 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. Abhijit Champanerkar, Ilya Kofman, and Jessica S. Purcell, *Density spectra for knots*, J. Knot Theory Ramifications, **25** (2016), no. 3, 164001, 11 pages.
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., **284** (2016), no. 1, 1–39.
29. Marc Lackenby and Jessica S. Purcell, *Cusp volumes of alternating knots*, Geom. Topol., **20** (2016), no. 4, 2053–2078.
30. Marc Lackenby and Jessica S. Purcell, *Essential twisted surfaces in alternating link complements*, Algebr. Geom. Topol., **16** (2016), no. 6, 3209–3270.
31. Abhijit Champanerkar, Ilya Kofman, and Jessica S. Purcell, *Volume bounds for weaving knots*, Algebr. Geom. Topol., **16** (2016), no. 6, 3301–3323.
32. Abhijit Champanerkar, Ilya Kofman, and Jessica S. Purcell, *Geometrically and diagrammatically maximal knots*, J. Lond. Math. Soc., **94** (2016), no. 3, 883–908.
33. Jessica S. Purcell and Alexander Zupan, *Independence of volume and genus  $g$  bridge numbers*, Proc. Amer. Math. Soc., **145** (2017), no. 4, 1805–1818.
34. Neil R. Hoffman and Jessica S. Purcell, *Geometry of planar surfaces and exceptional fillings*, Bull. Lond. Math. Soc., **49**, (2017), no. 2, 185–201.
35. Autumn Kent and Jessica S. Purcell, *Spacious knots*, Math. Res. Lett., **25**, (2018), 581–595.
36. Vinh Dang and Jessica S. Purcell, *Cusp shape and tunnel number*, Proc. Amer. Math. Soc., **147** (2019), 1351–1366.
37. David Futer, Jessica S. Purcell, and Saul Schleimer, *Effective distance between nested Margulis tubes*, Trans. Amer. Math. Soc., to appear. Available at [arxiv.org/abs/1801.05342](https://arxiv.org/abs/1801.05342).
38. Abhijit Champanerkar, Ilya Kofman, and Jessica S. Purcell, *Geometry of bi-periodic alternating links*, J. Lond. Math. Soc., to appear. Available at [arxiv.org/abs/1802.05343](https://arxiv.org/abs/1802.05343).
39. David Futer, Efstratia Kalfagianni, and Jessica S. Purcell, *A survey of hyperbolic knot theory*, Proceedings of Knots in Hella 2016, to appear. Available at [arxiv.org/abs/1708.07201](https://arxiv.org/abs/1708.07201).
40. Clément Maria and Jessica S. Purcell, *Treewidth, crushing, and hyperbolic volume*, Algebr. Geom. Topol., to appear. Available at [arxiv.org/abs/1805.02357](https://arxiv.org/abs/1805.02357).

## Academic Presentations

### *Recent invited conference and workshop talks*

Topology of manifolds: Interactions between high and low dimensions. MATRIX research centre, Creswick, Victoria, Australia. September 2018.

Dynamics, foliations, and geometry in dimension 3. MATRIX research centre, Creswick, Victoria, Australia. September 2018.

Dynamics, foliations, and geometry in dimension 3. MATRIX research centre, Creswick, Victoria, Australia. September 2018.

International conference of Honam-Youngnam Mathematical Societies. Jeju, South Korea. June 2018.

Hyperbolic 3-manifolds and related topics. POSTECH, Pohang, South Korea. June 2018.

3-Manifolds and geometric group theory (three workshop addresses). CIRM, Marseille Luminy, France. June 2018.

Topology in Australia and South Korea. POSTECH, Pohang, South Korea. April 2018.

Computation in geometric topology. The University of Warwick, Coventry, UK. December 2017.

Geometric topology in low dimensions. The University of Warwick, Coventry, UK. September 2017.

Computational and algorithmic topology. The University of Sydney, Sydney, Australia. June 2017.

Interactions between topological recursion, modularity, quantum invariants and low-dimensional topology, workshop speaker (three workshop addresses). MATRIX research centre, Creswick, Victoria, Australia. December 2016.

Workshop on low-dimensional topology and quantum algebra, Australian National University, Canberra, Australia. November 2016.

Effective and Algorithmic Methods in Hyperbolic Geometry and Free Groups, ICERM, Brown University, Providence, Rhode Island, USA. May 2016.

### *Recent invited seminar and colloquium talks*

Macquarie University mathematics colloquium. North Ryde, Australia. August 2018.

Okinawa Institute of Science and Technology, topology seminar (three talks). Okinawa, Japan. May 2018.

University of Melbourne pure mathematics seminar. Melbourne, Australia. May 2018.

Seoul National University, topology seminar (two talks). Seoul, South Korea. April 2018.

University of Queensland, mathematics colloquium, Brisbane, Australia. August 2017.

University of Sydney, geometry and topology seminar, Sydney, Australia. May 2017.

University of Adelaide, colloquium, Adelaide, Australia. April 2017.

University of Adelaide, geometry seminar, Adelaide, Australia. April 2017.

Australian National University, topology seminar, Canberra, Australia. April 2016.

Melbourne University knot theory seminar, Melbourne, Australia, March 2016.

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.

## Service and Leadership

### *Australian Mathematical Society*

**Chair**, Women in Mathematics Special Interest Group (WIMSIG), 2019–2020.

**Incoming Chair**, Women in Mathematics Special Interest Group (WIMSIG), 2018.

**Fellowship Committee**. Incoming chair 2017, Chair 2018, Outgoing chair 2019.

**WIMSIG Selection Committee**. Incoming chair and Chair, 2017.

### *Organiser and co-organiser of conferences*

1. Classical and quantum 3-manifold topology, Monash University, December 2018.  
Co-Principal Investigator on NSF conference grant, small grants from the Australian Mathematical Sciences Institute, and the Australian Mathematical Society.
2. Geometry and Topology of 3-Manifolds Workshop, Okinawa Institute of Science and Technology, Okinawa, Japan. May 2018.
3. Workshop on low-dimensional topology and quantum algebra, Australian National University, Canberra, Australia, November 2016.
4. Moab topology conference 2015, Moab, Utah, May 2015.  
Supported by NSF Career funds.

5. Geometric Topology in Cortona, Cortona, Italy, June 2013.  
Co-Principal Investigator on NSF Conference grant DMS-1313541.
6. Moab topology conference 2012, Moab, Utah, May 2012.  
Principal Investigator on NSF Conference grant DMS-1202922.
7. Rigidity and Flexibility in Dimensions 2, 3, and 4, in honor of Steven Kerckhoff, Luminy, France, May 2012.  
Co-Principal Investigator on NSF Conference grant DMS-1211355
8. Wasatch topology conference, Park City Utah, bi-annually, 2011 through 2015.
9. Moab topology conference, Moab, Utah, May 2009.  
Principal Investigator on NSF Conference grant DMS-0932037