

ELIZABETH J DENNE

CURRICULUM VITAE 2016

CURRENT ADDRESS

Washington & Lee University
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CITIZENSHIP Australian, US permanent resident.

POSITIONS HELD

Associate Professor July 2015 – present.

Washington & Lee University, Department of Mathematics.

Assistant Professor July 2012 – June 2015.

Washington & Lee University, Department of Mathematics.

Assistant Professor July 2007 – June 2012.

Smith College, Department of Mathematics & Statistics.

Benjamin Peirce Assistant Professor July 2004 – June 2007.

Harvard University, Department of Mathematics.

ACADEMIC DEGREES

Ph.D. Mathematics University of Illinois, Urbana-Champaign. Aug. 1998 – May 2004.

Thesis Advisor: Professor John M. Sullivan.

Thesis Title: *Alternating Quadrisecants of Knots*.

B.Sc. (Hons) University of Sydney, Australia. First class Honours. Feb. 1993 – Dec. 1997.

Thesis Advisor: Dr Donald Cartwright.

Honours Thesis: *The Uniformization Theorem for Riemann Surfaces*.

RESEARCH

Accepted/Published

- (1) *Quadrisecants give new bounds for Ropelength*, with Y. Diao, J.M. Sullivan.
Geometry and Topology **10** (2006), 1–26
- (2) *Convergence and Isotopy for Graphs of Finite Total Curvature*, with J.M. Sullivan.
In *Discrete Differential Geometry*, Birkhäuser, (2008). 163–174
- (3) *The distortion of a knotted curve*, with J.M. Sullivan.
Proc. Amer. Math. Soc. **137** (2009) no. 3, 1139–1148
- (4) *From Molecules to the Universe: an Introduction to Topology*, with Erica Flapan & 17 other members of the Undergraduate Faculty Program at PCMI (July 2011). This is an introductory undergraduate textbook on topology. American Mathematical Society, 2016.
- (5) *Ribbonlength of folded ribbon unknots in the plane*, with Mary Kamp, Rebecca Terry and Xichen (Catherine) Zhu. Accepted for publication in an AMS Contemporary Mathematics volume: *Knots, Graphs, Algebra & Combinatorics*, edited by E. Flapan, Allison Henrich, A. Kaestner, and S. Nelson.

- (6) *Quadriseccants and essential secants of knots: with applications to the geometry of knots*. (August 2017) Accepted for publication in *New directions in Geometric and Applied Knot Theory*, edited by Simon Blatt, Philipp Reiter, and Armin Schikorra. De Gruyter, to appear in 2017.

Submitted

- (1) *Transversality theorems for configuration spaces and applications to the “square-peg” problem*, with J. Cantarella and J. McCleary. Submitted. arXiv:1402.6174 [math.GT]
(2) *Alternating Quadriseccants of Knots*.
Submitted. arXiv:math/0510561 [math.GT]

In Preparation

- (1) *Folded ribbon knots in the plane*, with S. Aryal, E. Conley, S. Kalandarishvili, E. Meehan, and R. Terry. In preparation.
(2) *Structure and interpretation of the medial axis in \mathbb{R}^2* , with J.M. Sullivan and N. Wrinkle. In preparation.
(3) *Ribbonlength for knot diagrams*, with J.M. Sullivan and N. Wrinkle. In preparation.
(4) *Quadriseccants and unknotting number of knots*. In preparation.

Unpublished English translations of math papers

found at <http://home.wlu.edu/~dennee/research.html>

- (1) *On the Total Curvature of a Nonplanar Knotted Curve* by Istvan Fàry. Translated from French. Original paper: *Sur La Courbure Totale D'une Courbe Gauche Faisant un Noeud*. Bull. Soc. Math. France. Vol 77, 1949 128–138.
(2) *An Elementary Geometric Property of Links and Knots* by Erika Panwitz. Translated from German (with Thomas Kuhnt). Original paper: *Eine elementargeometrische Eigenschaft von Verschlingungen und Knoten*. Math. Annal. 108 (1933), 629–672.

3D MATH VISUALIZATION

Thingiverse: The files for all my 3D printed mathematical models can be found at

<http://www.thingiverse.com/dennedesigns/>

Blog: *Visions in Math* <http://mathvis.academic.wlu.edu/>

Entries describe how models were made, including how design & print problems were solved.

Webpage: http://home.wlu.edu/~dennee/math_vis.html

Contains a description of all 3D printed models, instructions files on how to make models, *Mathematica* notebooks, etc.

Math and Art Exhibitions:

- (1) *Unknot Conference III*, at Dennison University, Ohio (July 31 - August 3, 2016). About 30 different objects from my Calculus II, Multivariable Calculus, Geometry & Topology, and Knots & Links collections.
(2) *Illustrating Mathematics, ICERM* (Institute for Computational and Experimental Research in Mathematics) at Brown University (February 25 - March 6, 2016). About 25 different objects from my Calculus II, Multivariable Calculus, Geometry & Topology, and Knots & Links collections.
(3) *Taping Shape* exhibit at the Rueben H. Fleet Science Center in San Diego, California (Jan. 30-Sept 5, 2016): the Schwarz P surfaces, Schwarz P soap film frame, and Pair-of-pants surfaces.

GRANTS and AWARDS

- Nov. 2014 **Simons Center for Geometry and Physics Grant** to hold a workshop I co-organized titled *Symplectic and Algebraic Geometry in the Statistical Physics of Polymers* at the center during October 12–16, 2015.
- Summers 2013-1-6 **Lenfest Grant** for faculty research, Washington & Lee University.
- Spring 2010 **Picker Fellowship** for faculty research, Smith College.
- Summer 2008 **AWM Mentoring Fellowship**. Association for Women in Mathematics.
- Spring 2004 **Bourgin Fellowship**. Math Department, University of Illinois, Urbana-Champaign. Awarded to top student in topology or geometry.
- April 2002 **Liberal Arts and Sciences Award for Excellence in Undergraduate Teaching**. University of Illinois, Urbana-Champaign. (Awarded to 6 out of 1000 LAS College TAs.)
- May 2000 **Mathematics Instructional Award** for excellence in teaching, UIUC.

INVITED TALKS — conferences, most recent

Jan. 2017 **Technical Tools for 3D printing**, an MAA Invited Paper Session at the Joint Mathematics Meeting, Atlanta, GA.

Using Cinema 4D to create Calculus models.

Sep. 2016 **Enhancing Mathematical Learning with 3D printing**, SIAM ED 16 Conference, Philadelphia, PA. *Calculus, Topology and 3D printing.*

July 2016 **Unknot III Conference** Dennison University, Ohio.

Folded Ribbon Knots in the Plane: undergraduate research problems.

Nov. 2015 **Knots and Spatial Graphs 2015** KAIST, Daejeong, Korea.

Folded Ribbon Knots in the Plane.

Oct. 2015 **AMS Sectional Meeting** California State University, Fullerton CA
Special Session on Algebraic and Combinatorial Structures in Knot Theory.

Folded Ribbon Knots in the Plane.

Aug. 2015 **Geometric Energies with Links to Applications, Topology and Open problems**.
Workshop on Knots in Theory and in the Sciences University of Basel, Switzerland.

Folded ribbon knots in the plane.

Aug 2015 **Mathfest 2015** Washington D.C.

What Can a Mathematician Do with a 3D printer? Themed contributed session.

Topology, Calculus, and 3D visualization.

Mar. 2014 **Curvature, Applications, Knots, Energies Conference** Max Plank Institute in
Leipzig, Germany. *Flat ribbons for knot diagrams.*

Aug. 2013 **Mathfest 2013** Hartford, CT.

Open and accessible problems in knot theory session — *Folded ribbon knots in the plane.*

Aug. 2012 **Knots and Spatial Graphs 2012** KAIST, Daejeon, Korea.

Quadriseccants of knots and links, and Quadriseccants and the geometry of knots.

July 2012 **UnKnot Conference** Denison University, Granville, OH.

Folded ribbon knots in the plane.

Jan. 2012 **Configuration spaces, braids and applications** mini-conference Tulane University,
New Orleans LA. *Transversality theorems for configuration spaces and applications to the square-peg problem.*

INVITED TALKS — colloquia and seminars, most recent

- Apr. 2016 **Geometry & Topology seminar** University of Georgia, Athens, GA.
Apr. 2016 **Mathematics Colloquium** Vassar College, Poughkeepsie NY.
Apr. 2016 **Mathematics Colloquium** San Diego State University, San Diego, CA.
Oct. 2015 **Geometry & Topology seminar** and **SUMS seminar** at North Carolina State University, Raleigh, NC.
Feb. 2015 **Geometry Seminar** at University of Virginia, Charlottesville, VA.
Apr. 2014 **Geometry Seminar** University of Georgia, Athens, GA.
Apr. 2012 **Mathematics Colloquium** Wellesley College, Wellesley MA.
Mar. 2012 **Geometric Topology Seminar** Columbia University, New York NY.

RESEARCH PROGRAMS & WORKSHOPS — most recent

- July 2016. **Invited Participant:** Workshop on *Illustrating Mathematics* Institute for Computational and Experimental Research in Mathematics, Brown University, Providence, RI.
Oct. 2015 **Co-organizer:** Workshop on *Symplectic and Algebraic Geometry in the Statistical Physics of Polymers* at the Simons Center for Geometry and Physics, Stony Brook University.
Dec. 2013 **Invited Participant:** *Workshop on Topological Structures in Computational Biology* Institute for Mathematics and its Applications, Minneapolis, MN.
April 2013 **Invited Participant:** *Workshop on Geometric Knot Theory.* Institute for Mathematical Research, Oberwolfach, Germany.
July 2011 **Participant:** *Park City Mathematics Institute* Undergraduate Faculty Program, UT.
Spring 2010 **Participant:** *Homology Theories of Knots and Links program* MSRI, Berkeley, CA.

THESES and RESEARCH EXPERIENCES for UNDERGRADUATES

- Research Experiences

- Washington & Lee University

- Summer 2015 Advisor to Emily Jaekle '16, Ryan McDonnell '17 on *Mathematics & 3D printing.*
- Summer 2014 Advisor to Mary Kamp '15, Xichen Zhu '17 on *Folded ribbon knots in the plane.*

- Previous institutions

- Fall 2011 Smith College. Advisor to Eleanor Conley, Emily Meehan, Rebecca Terry on *Folded ribbon knots in the plane.*
- Summer 2009 Smith College. SURF advisor to Shivani Aryal, Shorena Kalandarishvili, Sarah Meyer on *Knots and flat-ribbons.*
- Summer 2005 & 2006 Harvard University. Advisor to Gerardo con Diaz, a Mellon Mays Undergraduate Fellow, on *Knots and supercrossing number.*

- Honors Thesis advisor

- Emma Schlatter. (Smith '10) *Knot theory and classifying 3-manifolds.*
- Regin McNeill. (Smith '08) *Knots and the Alexander Polynomial.*

- Special Studies advisor Smith College — both reading courses and research experiences.

- Spring 2011 Viktoria Pardey. *Advanced Algebraic Topology.*
- Fall 2009 Emma Schlatter, Nicole Vitale. *Introduction to Algebraic Topology.*
- Spring 2008 Rosanna Speller. *The Minimum Distance Energy of Knots.*

TEACHING – most recent

Washington & Lee University July 2012 – present.

- Math 102 Calculus II (Fall 2012, 2014, 2016, Winter 2013, 2015)
- Math 221 Multivariable Calculus (Fall 2012, Fall 2013, Winter 2017)
- Math 222 Linear Algebra (Winter 2017)
- Math 301 Fundamental Concepts of Mathematics (Spring 2015, 2017)
- Math 311 Real Analysis (Fall 2013)
- Math 341 Introduction to Topology (Fall 2014)
- Math 342 Modern Geometry (Winter 2013)
- Math 345 Calculus on Manifolds (Winter 2015)
- Math 401 GRE preparation course (Fall 2012, 2013, 2014, 2016)

SERVICE – most recent

- **Washington & Lee University** Department of Mathematics
 - Winter 2014 – present Maintain the W&L Math Department’s Facebook page.
 - Fall 2012 – present **Advising** — currently 7 math majors & minors, & 5 pre-majors.
 - AY 2014/15 **Colloquium chair** for Mathematics Department.
 - AY 2014/15 **Member** of the W&L Historic Preservation Committee.
 - Spring 2014 Job search committee (two visiting assistant professors).
 - Winter 2013 Job search committee (two tenure-track assistant professors).
 - Winter 2013 Calculus textbook committee.
 - March 2013 Faculty interviewer for the Johnson Scholarship Competition.
 - July 2012 Job search committee (visiting assistant professor).

PROFESSIONAL ACTIVITIES and SERVICE — most recent

Jan 2014 – present **Member** of the editorial board for the Dolciani book series at the Mathematical Association of America.

Mar. 2017 **Co-organizer** of a special session on *Knot Theory and its Applications* at the AMS sectional meeting, College of Charleston, Charleston SC.

Jan. 2017 **Co-organizer** of a Mathematical Association of America Invited Paper session on *Technical tools for 3D printing*, at the Joint Mathematics Meeting, Atlanta GA.

Oct 2015 **Co-organizer** of a weeklong workshop *Symplectic and Algebraic Geometry in the Statistical Physics of Polymers* at the Simons Center for Geometry and Physics, NY.

Nov 2014 **Co-organizer** Special session on *Knot Theory and its Applications*, at the fall southeastern AMS sectional meeting, Greensboro NC.

Spring 2013 **Reviewer** for a book proposal for Edward Dunne at the AMS.

July 2007 – present **Referee** for articles in various mathematics journals. These include: Geometry and Topology, Journal of Knot Theory and its Ramifications,

PROFESSIONAL SOCIETIES

Aug. 1998 – present **American Mathematical Society**

Aug. 2001 – present **Association for Women in Mathematics**

Aug. 2004 – present **Mathematical Association of America**

July 2016 – present **Society for Industrial and Applied Mathematics**