Theodore B. Stanford

October 2018

Education

- Ph.D. Mathematics, Columbia University, May 1993
- M.A. Mathematics, Columbia University, May 1998
- B.S. Mathematics, Brigham Young University, August 1986

Employment

- August 2004–Present Associate Professor of Mathematics, New Mexico State University
- 2000–2004 Assistant Professor of Mathematics, New Mexico State University
- 1997–2000 Assistant Professor of Mathematics, United States Naval Academy
- 1996-1997 Visiting Assistant Professor, Department of Mathematics, University of Nevada, Reno
- 1994–1996 Adjunct Assistant Professor, Department of Mathematics, University of California, Berkeley
- 1993-1994 Postdoc, University of Geneva, Switzerland (funded by NSF)
- 1990–1991 (Summers) Researcher, Center for Communications Research , Princeton, NJ
- 1989 (Summer) Cryptologic Mathematician, National Security Agency, Fort Meade, MD

Research Interests

- Low-dimensional topology. Knots and links in S_3. Knotted graphs. Finite-type invariants. Braid groups.
- Tilings. Topological spaces of tilings.
- Symbolic dynamics.
- Mathematics education. Elementary understanding of mathematical properties. Mathematical reasoning in elementary and middle school. Learning games. Use of number lines. Characteristics of students in introductory university math courses.

Teaching Interests

- Topology
- Linear Algebra
- Statistics for Non-technical Majors
- Mathematics courses for future K-12 teachers
- Courses, workshops, and professional development for inservice K-12 teachers
- Nontraditional approaches to teaching

Works in Progress

- The space of tilings of a torus by squares (paper in preparation)
- Properties which characterize multiplication (paper in preparation)

- Addressing mathematics anxiety in introductory university mathematics courses (paper in preparation with Abby Train)
- Free Newton polynomials, with applications to the concordance group of two-strand string links (paper in preparation)
- Topological entropy with respect to non-generating partitions (paper in preparation with Erik Bollt and Mark Kidwell)
- Vassiliev invariants and knots modulo pure braid subgroups (paper in revision)
- Brunnian braids and some of their generalizations (paper in revision)
- Teaching algebra to teachers in a K-12 master's degree cohort (writing project with Karin Wiburg, based on the LIFT project 2009-2014)
- The use of number lines in grade 3-5 classrooms (research project)
- Lessons and protocols for learning geometry and measurement in grades 3-5 (research project)

PhD Students

- Khaled Bataineh, New Mexico State University, May 2003
- Mohammad Yasein, New Mexico State University, August 2006

Mathematical Research Publications

- The functoriality of Vassiliev-type invariants of links, braids, and knotted graphs. Random knotting and linking (Vancouver, BC, 1993). Journal of Knot Theory and itsRamifications 3 (1994).
- Braid commutators and Vassiliev invariants. Pacific Journal of Mathematics 174 (1996)
- Finite-type invariants of knots, links, and graphs. Topology 35 (1996)
- Computing Vassiliev's invariants. Topology and its Applications 77 (1997)
- On Gusarov's Groups of Knots (with Ka Yi Ng). Mathematical Proceedings of the Cambridge Philosophical Society 126 (1999)
- Four observations on n-triviality and Brunnian links. Journal of Knot Theory and its Ramifications 9 (2000)
- Validity of threshold crossing analysis of symbolic dynamics from chaotic time series (with Erik Bollt, Ying-Cheng Lai, and Karol Zyczkowski). Physical Review Letters, 85 (2000)
- Braid commutators and delta finite-type invariants. Knots in Hellas '98 (Delphi), Series of Knots and Everything 24, World Scientific Publishing, River Edge, NJ, 2000
- Brunnian links are determined by their complements (with Brian Mangum). Algebraic and Geometric Topology 1 (2001)
- What symbolic dynamics do we get with a misplaced partition? On the validity of threshold crossings analysis of chaotic time-series (with Erik Bollt, Ying-Cheng Lai, and Karol Zyczkowski). Physica D. 154 (2001)
- On the z-degree of the Kauffman polynomial of a tangle decomposition (with Mark Kidwell). Knots, Braids and Mapping Class Groups - Papers Dedicated to Joan S. Birman (editors Gilman, Menasco, and Lin), 85 AMS/IP Studies in Advanced Mathematics (2001)

- On knot invariants which are not of finite type (with Rolland Trapp). Knots, Braids and Mapping Class Groups - Papers Dedicated to Joan S. Birman (editors Gilman, Menasco, and Lin), 85 AMS/IP Studies in Advanced Mathematics (2001)
- On invariants of Morse knots (with Jacob Mostovoy). Topology and its Applications 121 (2002)
- Some computational results on mod 2 finite-type invariants of knots and string links. Invariants of knots and 3-manifolds (Kyoto, 2001). Geometry and Topology Monographs 4, Coventry (2002)
- A move on diagrams that generates S-equivalence of knots (with Swatee Naik). Journal of Knot Theory and its Ramifications 12 (2003)
- On a map from pure braids to knots (with Jacob Mostovoy). Journal of Knot Theory and its Ramications 12 (2003)
- Finite-type knot invariants based on the band-pass and doubled-delta moves (with Jacob Mostovoy and James Conant). Journal of Knot Theory and its Ramifications 19 (2010)

Mathematics Education Publications

- Knots and surfaces. A guide to discovering mathematics (with David W. Farmer). Mathematical World, 6. American Mathematical Society, Providence, RI, 1996. ISBN: 0-8218-0451-0.
- The distributive property: the core of multiplication (With Cathy Kinzer). Teaching Children Mathematics 20 (2013)
- Impact of Math Snacks games on Students' conceptual understanding (with Wiburg, Chamberlin, Valdez, and Trujillo). Journal of Computers in Mathematics and Science Teaching 35 (2016)

Grants Awarded

- Sloan Doctoral Dissertation Fellowship 1992-1993
- National Science Foundation Postdoctoral Research Fellowship 1993-1996
- Naval Academy Research Council Summer Grants 1998-1999
- NMSU Department of Mathematical Sciences Summer Research Award 2001
- Math Snacks: Addressing gaps in conceptual mathematics understanding with innovative media (co-PI). National Science Foundation. 2009-2013
- Math Snacks for early algebra – using games and inquiry to help students transition from number to variable (co-PI). National Science Foundation 2015-2019

Selected Colloquium Talks

- Brigham Young University, Utah, September 1993.
- University of Geneva, Switzerland, November 1993.
- Santa Clara University, California, February 1996. *n-Triviality in knots, braids, and groups.*
- University of Nevada, Reno, April 1997. *Free groups, free group rings, braids, and tangles.*
- United States Naval Academy, Annapolis, January 1998. *Knots, surfaces, and matrices.*

- George Washington University, Washington DC, February 1999. *Free Newton polynomials and the concordance group of two-strand string links.*
- University of Tennessee, Knoxville, October 2004. *Brunnian links are determined by their complements.*
- Plenary talk, American Mathematical Society Regional Meeting, Albuquerque, NM, October 2004. *Knots modulo braids.*
- University of Texas, El Paso, September 2010. *Linking numbers for knotted graphs.*
- Northern Arizona University, Flagstaff, March 2013. *On the distributive property.*

Selected Mathematics Seminars and Conference Talks.

- University of Minnesota, Minneapolis, July 1993.
- American Mathematical Society Special Session, Vancouver, August 1993. *The functoriality of Finite-type invariants of knots, links, and knotted graphs.*
- University of Paris VII, March 1994.
- University of Bern, Switzerland, May 1994.
- University of Dijon, France, May 1994.
- University of Nantes, France, June 1994.
- "Knots in Huia" conference. Auckland, New Zealand, December 1994.
- Brigham Young University, January 1995.
- Knot theory conference, Oberwolfach, Germany, September 1995.
- University of California, Riverside, October 1995.
- American Mathematical Society Special Session, Orlando, FL, January 1996. *Milnor invariants of singular knots.*
- Columbia University, October 1997.
- American Mathematical Society Special Session, Baltimore, MD, January 1998. *Extending the Gassner representation from pure braids to tangles, and some rational functions that generate Milnor invariants.*
- "Knots in Hellas" conference, Delphi, Greece, August 1998. *Knots modulo braid commutators.*
- University of Rochester, NY, November 1998.
- American Mathematical Society Special Session, New York, NY, November 2000. *Finite and nilpotent quotients of braid groups and link groups.*
- American Mathematical Society Special Session, Las Vegas, NV, April 2001. *On the non-existence of a mod 2 Kontsevich integral.*
- Workshop on knots and three-manifolds, RIMS, Kyoto, Japan, September 2001. *Computational results on mod 2 finite-type invariants of knots and string links.*
- UNAM, Cuernavaca, Mexico, February 2002. *Symbolic dynamics from a misplaced partition.*
- Cinvestav, Mexico City, February 2002.
- American Mathematical Society Special Session, Portland, OR, June 2002. *Twist sequences and finite quotients of knot groups.*

- University of California, San Diego, November 2002. *Finite-type invariants based on doubled-delta moves.*
- George Washington University, Washington, DC, October 2003. *Type one invariants for knotted graphs, and criteria for graph planarity.*

Selected Mathematics Education Presentations.

- Mathematical Association of America Special Session, Baltimore, MD, January 2003. *High school outreach activities at New Mexico State University.*
- Mathematical Sciences Research Institute Workshop, Pacific Grove, CA, May 2005. *Two perspectives on teachers' development of mathematical thinking* (with Kristin Umland)
- US Department of Education Mathematics and Science Partnerships Conference, Seattle, WA, March 2006. *Connecting Mathematical and Teaching Expertise* (with Kristin Umland)
- National Council of Supervisors of Mathematics Annual Meeting, St Louis, MO, April 2006. *An Educator and a Mathematician Cooperate on Professional Development* (with Wanda Guzman)
- US Department of Education Mathematics and Science Partnerships Conference, San Francisco, CA, February 2008. *Developing an Evaluation Plan* (with Karin Wiburg)
- American Mathematical Society Special Session, Baton Rouge, LA, March 2008. *Identifying and analyzing alternative sequences for learning mathematical concepts*
- New Mexico Public Education Department Day of Professional Development for Professional Developers, Santa Fe, NM, February 2009. *Connecting Area Across the K12 Curriculum* (with Tom Gruszka)
- New Mexico Council of Teachers of Mathematics, Ruidoso, October 2009. *When Bad Things Happen to Bad People, or Why the Product of Two Negatives is a Positive* (with Kristin Umland)
- US Department of Education Mathematics and Science Partnerships Conference, San Diego, CA, February 2010. *Deep and Practical Teacher Content Knowledge via Connections Between Grade Levels* (with Karin Wiburg)
- Hawaii Education Conference, Honolulu, January 2011. *Math Snacks: Using Innovative Media to Address Conceptual Gaps in Mathematics Understanding* (with Milos Savic, Karen Trujillo, Karin Wiburg)
- US Department of Education Mathematics and Science Partnerships Conference, Washington, DC, September 2013. *Assessing Teachers' Integrated Knowledge of Mathematics and Pedagogy* (with Karin Wiburg)
- American Mathematical Society Special Session, Albuquerque, NM, April 2014. *The properties of addition and multiplication.*
- MidSchoolMath Conference, Santa Fe, NM, February 2016. *Numeric and Algebraic Expressions from Geometric Patterns of Squares*

- New Mexico Council of Teachers of Mathematics, Socorro, October 2016. *Using Measurement to Understand Fractions and Algebra*
- MidSchoolMath Conference, Santa Fe, NM, February 2017. *Doodles: Surprising Linear Relationships from Random Drawings* (with Allison Conway)
- New Mexico STEM Symposium, Albuquerque, June 2018. *Integrating Mathematics and Science Practices in the Grades 3–5 Classroom* (with Wanda Bulger-Tamez)