

## Employment

- **University of Melbourne:** Research Fellow, 2010–present
- **University of Texas at Austin:** Lecturer, 2007–2010
- **Stanford University:** Graduate student, 2001–2007

## Research Interests

- 3-Manifolds and Triangulations
- Deformation and Character Varieties
- Hyperbolic Geometry
- Mathematical Art

## Education

- **Stanford University,** Ph.D. in Mathematics under Steven Kerckhoff. Thesis (2007): *Incompressible Surfaces in Hyperbolic Punctured Torus Bundles are Strongly Detected*
- **University of Oxford,** Master of Mathematics (MS), 2001

## Fellowships & Awards

- **Research Fellowship** under Australian Research Council grant DP1095760, University of Melbourne and University of Queensland, 2010–present.
- **RTG Postdoctoral Fellowship:** University of Texas at Austin, 2007–2010
- **Research Assistant:** Stanford, 2002–2006
- **Stanford University Centennial Teaching Assistant award,** June 2007

## Publications & Preprints

- **Geometry and Topology**
  - *Triangulations of hyperbolic 3-manifolds admitting strict angle structures*, with Craig D. Hodgson and J. Hyam Rubinstein, 2011, arXiv: 1111.3168, 27 pages, 8 figures.
  - *A generalisation of the deformation variety*, 2011, arXiv:0904.1893, 41 pages, 26 figures.
  - *Pseudo-developing maps for ideal triangulations I: Essential edges and generalised hyperbolic gluing equations*, with Stephan Tillmann, *Topology and Geometry in Dimension Three: Triangulations, Invariants, and Geometric Structures (Proceedings of the Jacofest conference)*, AMS Contemporary Mathematics **560** (2011), pp. 85–102, 18 pages, 8 figures.
  - *Veering triangulations admit strict angle structures*, with Craig D. Hodgson, J. Hyam Rubinstein and Stephan Tillmann, *Geometry & Topology* **15** (2011), pp. 2073–2089, 15 pages, 9 figures.
  - *Incompressible surfaces in handlebodies and boundary compressible 3-manifolds*, with João Miguel Nogueira, *Topology and its Applications* **158** (2011), no. 4, pp. 551–571, 31 pages, 14 figures.
  - *Detection of incompressible surfaces in hyperbolic punctured torus bundles*, *Geometriae Dedicata* **150** (2011), no. 1, pp. 181–232, 52 pages, 25 figures.
  - *On spun-normal and twisted squares surfaces*, *Proc. Amer. Math. Soc.* **137** (2009), pp. 4259–4273, 15 pages, 13 figures.
- **In progress**
  - *Triangulations of 3-manifolds with essential edge loops*, with Craig D. Hodgson, J. Hyam Rubinstein and Stephan Tillmann.
  - *Taut developing maps*, with Saul Schleimer.
- **Neuroscience**
  - *Evaluation of fractional learning indices for associative conditioning*, with Sukant Khurana, Wen-ke Li and Nigel S. Atkinson, submitted.

- **Mathematical Art and Recreational Mathematics**
  - *Recent 3D printed sculptures*, *Hyperseeing*, in press, 2011, 10 pages, 11 figures.
  - *Fractal graphs by iterated substitution*, *Journal of Mathematics and the Arts*, ©Taylor and Francis, Volume 5, Issue 2, 2011, pp. 51–70, 20 pages, 20 figures.
  - *The Sunflower Spiral and the Fibonacci Metric*, 2010, *Proceedings of the Bridges conference 2010*, 4 pages, 4 figures.
  - *Autoglyphs*, with P.-O. Dehaye, in *Math. Intell.* **26** (2004), no. 2, [cover art](#) and pp. 37–39.
  - *100 prisoners and a lightbulb*, with P.-O. Dehaye and D. Ford, in *Math. Intell.* **25** (2003), no. 4, pp. 53–61.

## Seminars & Talks

- *Some Mathematical Sculptures*, Temple University Geometry-Topology Seminar Special Undergraduate Talk, January 2012; New Orleans Center for Creative Arts, January 2012; Melbourne University Mathematics and Statistics Society, March 2012, Virtual Environments guest lecture, Melbourne School of Design, The University of Melbourne, March 2012; National Youth Science Forum, The University of Melbourne, March 2012.
- *Hyperbolic Geometry, Triangulations of 3-manifolds, and Mathematical Art*, Oklahoma State University, January 2012; Wesleyan University, February 2012.
- *Fractal graphs and Rep-tiles*, New Orleans Center for Creative Arts, January 2012.
- *Triangulations of hyperbolic 3-manifolds admitting strict angle structures*, Australian Mathematical Society (AustMS) Meeting, University of Wollongong, September 2011; AMS Special Session on Hyperbolicity in Manifolds and Groups, Joint Mathematics Meetings, Boston, January 2012.
- *When is a Knot Not a Knot?*, Oberlin College, January 2010; Davidson College, February 2010; University of Queensland, November 2010; Melbourne High School visit to the University of Melbourne, September 2011; Yass High School visit to the University of Melbourne, December 2011.
- *Veering triangulations admit strict angle structures*, University of Texas Topology Seminar, Dec 2010; University of Melbourne Algebra/Geometry/Topology Seminar, March 2011; University of Coimbra Topology Seminar, July 2011.
- *Geometric structures on triangulated 3-manifolds*, University of Warwick, March 2011.
- *A generalisation of the deformation variety*, University of Texas Topology Seminar, May 2009; Oklahoma State University Topology Seminar, September 2009; Georgia Tech Topology Seminar, October 2009; AMS 2010 Spring Western Section Meeting, Albuquerque, NM, April 2010; AMS-SMM Eighth International Meeting, Berkeley, CA, June 2010; University of Melbourne Topology Seminar, Australia, October 2010; University of Queensland Topology Seminar, Australia, October 2010.
- *The Sunflower Spiral and the Fibonacci Metric*, Bridges Pécs, Pécs, Hungary, July 2010.
- *Autoglyphs: Self Referential Mathematical Typography*, Gathering 4 Gardner 9, Atlanta, March 2010.
- *The Mathfest 2009 Poster Image, Mathematical Art, Design and Education in Second Life*, Mathfest 2009, Portland, August 2009.
- *Drawing knots using computers*, Unknot Conference (Undergraduate Knot Theory Conference), Denison University, July 2009.

- *Extending the deformation variety*, University of Texas Topology Seminar, November 2008.
- *Ideal Triangulations and Components of the Character Variety*, Rice University Topology Seminar, November 2007; University of Texas Topology Seminar, November 2007
- *Incompressible Surfaces in Punctured Torus Bundles, and the Ideal Points They Come From*, UC Davis Geometry/Topology Seminar, April 2006; Southern California Topology Conference, Caltech, January 2007; University of Texas Topology Seminar, March 2007; thesis defence, Stanford, April 2007.
- *When is a Knot Not a Knot?*, Educational Program for Gifted Youth, Stanford, July 2006.
- *Geometric Structures and Dehn Surgery on the Figure 8 Knot Complement*, area exam talk, Stanford, November 2004.
- *Foliation of the Figure 8 Knot Complement in  $S^3$  (with lots of pictures)*, graduate students seminar, October 2003.
- *The Mathematics of Juggling*, graduate students seminar, March 2003; Stanford University Math Camp July 2004 and July 2006; Saturday Morning Math Group (at Texas), February 2008; Melbourne University Mathematics and Statistics Society, September 2010, New Orleans Center for Creative Arts, January 2012; various other venues.

## Teaching

- **University of Texas at Austin**
  - Lecturer (each course approx. 36 hours of classtime)
    - *Hyperbolic Geometry and Triangulations of 3-Manifolds*, Spring 2010
    - *Differential Calculus*, Fall 2009
    - *Real Analysis I*, Spring 2009
    - *Multivariable Calculus*, Fall 2008
    - *Introduction to Number Theory*, Spring 2008
    - *Discrete Mathematics*, Fall 2007
- **Stanford University**
  - Teaching Assistant (each course approx. 33 hours of classtime)
    - *Linear Algebra and Calculus of Several Variables* (Accelerated Calculus for Engineers TA<sup>1</sup>), Spring 2007 and Spring 2006
    - *Calculus II*, (Accelerated Calculus for Engineers TA), Winter 2007
    - *Calculus I*, (Accelerated Calculus for Engineers TA), Fall 2006
    - *Calculus II* (Accelerated Calculus for Engineers TA), Winter 2006
    - *Linear Algebra and Calculus of Several Variables* (Administrative TA), Fall 2005
    - *Linear Algebra and Calculus of Several Variables*, Winter 2005 and Fall 2003
    - *Calculus I*, Fall 2002
  - Course Assistant (office hours only)
    - *Algebraic Topology*, Spring 2005
    - *Differential Topology*, Spring 2004
    - *Matrix Theory and Applications*, Spring 2003
    - *Modern Algebra I*, Fall 2001
- **New Orleans Center for Creative Arts<sup>2</sup>**

<sup>1</sup>The [Accelerated Calculus for Engineers](#) program is one of a number of recruitment and retention programs run by Stanford's School of Engineering, geared towards increasing breadth and diversity in engineering.

<sup>2</sup>[NOCCA](#), the New Orleans Center for Creative Arts, is a pre-professional arts training center that offers secondary

- Served on the “NOCCA Advisory Council”, a group convened to help guide the transition of NOCCA from a half-day arts school to a full-day diploma-granting institution covering all subjects, whilst preserving the creativity and spirit of this highly successful school, April 2009.
- NOCCA have hired me to write the curriculum framework for their mathematics program. In addition, I will act as a consultant on connections between mathematics and the arts, for both students and teachers at NOCCA.
- **Other**
  - Stanford University Math Camp TA/Live-In Counsellor, July 2004
  - Putnam Competition Seminar, Fall 2004
  - Work on creating mathematical learning experiences based around mathematical sculptures in the virtual world Second Life, funded by the New Media Consortium<sup>3</sup>, September 2006.

## Math Art Exhibitions

- *Joint Mathematics Meetings 2012*:  
Round Möbius strip, Round Klein bottle.
- *Bridges conference<sup>4</sup> 2011*:  
Space filling graph 1, Octahedron fractal graph, Cuboctahedral fractal graph.
- *Bridges conference 2010*:  
Sphere autoglyph, Torus autoglyph.

## Mathematical Illustration

- Cover image for *Number Theory Through Inquiry*, by David C. Marshall, Edward Odell & Michael Starbird, published December 2007.
- Cover design and some illustrations for *A Mathematical Mosaic: Patterns & Problem Solving (Revised Edition)*, by Ravi Vakil, published October 2007.

## Service

- Associate Editor for the *Journal of Mathematics and the Arts*, 2012–present.
- University of Melbourne Department of Mathematics and Statistics Recruitment Publicity Committee, 2012–present.
- Program Committee member for the Bridges 2012 conference.
- Program Committee member for the Shape Modeling International 2012 conference, “Fabrication and Sculpting” track.

## Other Activities

- Various graphic design/art/math crossover projects. Of particular interest: *3d printed sculpture*, *Escher's Printgallery at Stanford*, *Book Covers and Posters*, *T-shirts* and “Autoglyphs.”
- **University of Melbourne**
  - *Melbourne University Mathematics and Statistics Society*, 2010–present.
- **University of Texas at Austin**
  - *UT Math Club*, 2007–2010.
  - *Texas Juggling Society*, 2007–2010.
- **Stanford University**
  - *Stanford Gaming Society* Board Games VP, 2003-2007.
  - *Stanford Court Jugglers*, 2001-2007.

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school-age children intensive instruction in dance, media arts, music, theatre arts, visual arts and creative writing.

<sup>3</sup>The [New Media Consortium](#) is an international 501(c)3 not-for-profit consortium of nearly 200 leading colleges, universities, museums, corporations, and other learning-focused organizations dedicated to the exploration and use of new media and new technologies.

<sup>4</sup> The [Bridges conference](#) is an annual international meeting on connections between art and mathematics, featuring invited speakers, full and short paper presentations, educational workshops, and a juried art exhibition.

- University of Oxford
- *Oxford University Go Society* President, 1999-2000.

## Personal

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## References

### Research

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### Teaching

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