

Seth A. Marvel

CONTACT INFORMATION	University of Michigan 915 East Washington Street Ann Arbor, MI 48109	<i>Office:</i> 0574 Rackham <i>Email:</i> smarvel@umich.edu <i>Phone:</i> (734) 585-6502
RESEARCH INTERESTS	Mathematical modeling of social, ecological, and biological systems. Relationships between networks, algorithms, and dynamical systems. Other areas of interest include linear algebra, probability theory, stochastic processes, combinatorics, complex analysis, differential geometry, asymptotic analysis, perturbation theory, game theory, topology, and mathematical physics.	
EDUCATION	Doctorate in Applied Mathematics May 2011 Master of Science in Applied Mathematics May 2009 <i>Cornell University, Ithaca, NY</i> <i>Advisor:</i> Steven H. Strogatz <i>Committee:</i> Steven H. Strogatz, Jon M. Kleinberg, David F. Delchamps <i>Dissertation:</i> Simple mathematical models of social behavior	
	Bachelor of Science in Chemical Physics May 2005 (Also fulfilled all degree requirements for a Bachelor of Arts in Mathematics) <i>Rice University, Houston, TX</i> <i>Honors:</i> Highest GPA in Rice Class of 2005	
EMPLOYMENT	T. H. Hildebrandt Research Assistant Professor Fall 2011 – Spring 2014 Junior Fellow, Michigan Society of Fellows Fall 2011 – Spring 2014 Research Fellow, Michigan Society of Fellows Summer 2014 – Spring 2015 <i>Department of Mathematics & Center for the Study of Complex Systems</i> <i>University of Michigan, Ann Arbor, MI</i>	
	Visiting Scholar Summer 2011 <i>Cornell University, Ithaca, NY</i> <i>Collaborators:</i> Steven H. Strogatz, Hyunsuk Hong <i>Topics:</i> Mean-field nonlinear opinion dynamics, catastrophe theory.	
	Research Assistant in NSF Research Group Spring 2009 – Spring 2011 <i>Cornell University, Ithaca, NY</i> <i>Advisors:</i> Steven H. Strogatz, Eric J. Friedman, A. Kevin Tang <i>Topics:</i> Structural balance theory, coupled oscillator systems, biological and ecological processes involving exchange of information or resources between nodes, numerical renormalization, equation-free methods.	
	Teaching Assistant and Recitation Session Instructor Fall 2008 <i>Cornell University, Ithaca, NY</i> <i>Professor:</i> A. Kevin Tang <i>Course:</i> ECE 4450 Computer Networks & Telecommunications <i>Responsibilities:</i> Lectured one hour per week. Helped write both midterms and the final exam.	
	NSF-IGERT Fellow in Nonlinear Systems Fall 2006 – Summer 2008 <i>Cornell University, Ithaca, NY</i> <i>Advisors:</i> Steven H. Strogatz, John M. Guckenheimer <i>Topics:</i> Dynamical processes on graphs (e.g. percolation, coupled oscillation, resource allocation, exchange of information), a formulation of Hardy-Weinberg principles in terms of discrete-time iterated maps, academic testing in social networks of interacting peers.	

Research Associate at Smalley Institute

Summer 2005 – Summer 2006

Rice University, Houston, TX

Advisor: Nobel laureate Richard E. Smalley

Topics: Research areas prioritized by the Alliance for NanoHealth, including Brownian motion and aggregation of nanotubes in solution, dielectric properties and dielectrophoretic forces of mesoscopic particles, and radiofrequency-induced heating of nanotube solutions.

Research Assistant at FAS Center for Systems Biology

Summer 2004

Harvard University, Cambridge, MA, and Harvard Medical School, Boston, MA

Advisors: Steve Altschuler, Lani Wu

Topic: Intracellular biochemistry and cell surface geometry during neutrophil chemotaxis.

Research Assistant in Research Training Program

Summer 2003

Methodist Hospital, Houston, TX

Advisor: Joel D. Morrisett

Topic: Mathematical analysis of calcification in arterial atherosclerotic lesions.

JOURNAL
ARTICLES

S. Marvel, D. Parise. A near optimal polynomial-time algorithm for an NP-hard problem. *In preparation.*

S. Marvel, D. Forger. A new minimal model of synchronization. *In preparation.*

S. Marvel, T. Martin, C. Doering, D. Lusseau, M. Newman. Human mobility and the spread of pandemic disease. *Submitted. An early draft with similar technical content is available at arXiv:1310.2636. Current draft is enclosed.*

S. Marvel, H. Hong, A. Papush, S. Strogatz. Encouraging moderation: Clues from a simple model of ideological conflict. *Physical Review Letters*, 109, 118702, 2012.
Recipient of Editors' Suggestion Award.

S. Marvel, J. Kleinberg, R. Kleinberg, S. Strogatz. Continuous-time model of structural balance. *Proceedings of the National Academy of Sciences*, 108, 1771-1776, 2011.

S. Marvel, S. Strogatz, J. Kleinberg. Energy landscape of social balance. *Physical Review Letters*, 103, 198701, 2009.

S. Marvel, R. Mirollo, S. Strogatz. Identical phase oscillators with global sinusoidal coupling evolve by Möbius group action. *Chaos*, 19, 043104, 2009.

S. Marvel, S. Strogatz. Invariant submanifold for series arrays of Josephson junctions. *Chaos*, 19, 013132, 2009.

C. Higgins, **S. Marvel**, J. Morrisett. Quantification of calcification in atherosclerotic lesions. *Arteriosclerosis, Thrombosis, and Vascular Biology*, 25, 1567-1576, 2005.

PRESS
COVERAGE

Research featured in: Scientific American, The Los Angeles Times, BBC Future, Phys.org, Complexity Digest, Cornell Chronicle, i (a Portuguese newspaper), and politik&kommunikation (a German professional journal)

Recent press: "Medieval social networks: A small world?" by Philip Ball, in BBC Future.

REVIEWER
SERVICE

Proceedings of the National Academy of Sciences (PNAS), PLOS ONE, Physica A, Physics Letters A, SIAM Journal on Applied Dynamical Systems (SIADS), Journal of Statistical Physics, Europhysics Letters (EPL)

SELECTED
INVITED TALKS

- “The connection between small-world networks and the spread of contagions” March 24, 2014
School of Mathematics, Georgia Institute of Technology, Atlanta, GA
- “Two projects with implications for social learning” January 10, 2014
NSF Institute for Pure & Applied Mathematics, UCLA, Los Angeles, CA
- “Mathematical analysis of social phenomena: From examples to foundations” April 16, 2013
Center for the Study of Complex Systems, University of Michigan, Ann Arbor, MI
- “Three mathematical models of social dynamics” March 7, 2013
Sloan School of Management, MIT, Cambridge, MA
- “A closer look at the nature of mathematical modeling” September 25, 2012
Dinner Talk, Michigan Society of Fellows, Ann Arbor, MI
- “Discrete and continuous-time mechanisms for desynchronization” September 14, 2012
Department of Mathematics, University of Michigan, Ann Arbor, MI
- “Moderation, as an escape from a persistent cycle of ideological revolutions” July 3, 2012
9th AIMS Conference on Dynamical Systems & Differential Equations, Orlando, FL
- “How to encourage moderation in polarized populations” April 23, 2012
6th Annual Network Science Workshop, United States Military Academy, West Point, NY
- “The nature of mathematics, and what it can tell us about human behavior” March 19, 2012
Lunch Colloquium, Michigan Society of Fellows, Ann Arbor, MI
- “Confident moderates can increase vulnerability to extremism” November 15, 2011
École Polytechnique, Paris, France
- “A simple model of pair formation” October 14, 2011
University of Michigan / Santa Fe Institute Joint Conference, Ann Arbor, MI
- “Stylized models of social behavior” April 11, 2011
Santa Fe Institute, Santa Fe, NM
- “Reducing identical phase oscillator dynamics to Möbius group action” December 2, 2010
Princeton Center for Theoretical Science, Princeton, NJ
- “ Z_2 gauge theory and frustration in networks of interpersonal relations” December 1, 2010
Institute for Advanced Study, Princeton, NJ
- “Analysis of a continuous-time model of social balance” August 11, 2010
32rd Annual Meeting of the Cognitive Science Society, Portland, OR
- “A dynamic model for the emergence of two-sided social conflicts” August 10, 2010
43rd Annual Conference of the Society for Mathematical Psychology, Portland, OR
- “Jammed networks of friends and enemies” May 21, 2009
SIAM Conference on Applications of Dynamical Systems, Snowbird, UT
- “How friendships form and fracture in social networks” March 11, 2009
Rhodes Hall, Cornell University, Ithaca, NY
- “Scale-free networks and percolation” February 11, 2008
Thurston Hall, Cornell University, Ithaca, NY
- “Nanotubes: Electronic structure and physical properties” April 21, 2005
Herzstein Hall, Rice University, Houston, TX
- “Geometric negative feedback in human neutrophils” July 27, 2004
Bauer Center for Genomics Research, Harvard University, Cambridge, MA
- “Determining the reliability of calcification detection by MRI” July 24, 2003
Smith Tower, Methodist Hospital, Houston, TX

COURSES TAUGHT	ECE 4450 Computer Networks & Telecommunications (Recitation session and substitute lectures only)	Cornell University	Fall 2008
	MATH 115 Calculus I (Designed and wrote class lectures)	University of Michigan	Fall 2011
	MATH 255 Applied Honors Calculus III (Designed and wrote full curriculum)	University of Michigan	Winter 2013
	CMPLXSYS 511 Theory of Complex Systems (Designed and wrote full curriculum)	University of Michigan	Fall 2013
STUDENTS MENTORED	<i>Student:</i>	<i>Currently:</i>	
	Anna Papush	Ph.D. Student in the Operations Research program at MIT	
	Cheng Qian	Ph.D. Student in the Statistics program at the University of Michigan	
	Namyi Kang	Senior Mathematics Major at Amherst College	
	Linglu Zhou	Information Technology Analyst at Cisco Systems, Inc.	
	Dominick Parise	Senior Computer Science Major at the University of Michigan, Co-founder and Lead Developer of the technology startup Vivergy	
HONORS & TRIVIA	▷ Editors' Suggestion Award, Physical Review Letters		2012
	▷ Junior Fellowship, Michigan Society of Fellows		2011–2014
	▷ Erdős number of 3		2010
	▷ NSF-IGERT Fellowship in Nonlinear Systems		2006–2008
	▷ Tom W. Bonner Book Prize in Physics		2005
	▷ Leeds Award for Excellence in Scholarship		2005
	▷ Graduation Speaker, <i>Phi Beta Kappa</i> Convocation		2005
	▷ Member, <i>Sigma Pi Sigma</i>		2005
	▷ American Heart Association Predoctoral Fellowship		2002
	▷ Dean's Select Honor Scholarship		2001–2002
	▷ Vanderbilt College Scholar		2001
PROFESSIONAL ACTIVITIES	▷ Michigan Math Circle Instructor, University of Michigan, Fall 2013		
	▷ Advised Dominick Parise and Namyi Kang in Research Experiences for Undergraduates (REU) Program, University of Michigan Department of Mathematics, Summer 2013		
	▷ Advised Dominick Parise in Undergraduate Research Opportunity Program (UROP), University of Michigan, Fall 2012 – Spring 2013		
	▷ Math Lab Tutor, University of Michigan, Fall 2011		
	▷ Session Chair, 2010 Conference of the Society for Mathematical Psychology		
	▷ Workshop Presenter, Invited Workshop on Cognitive Social Sciences: Grounding the Social Sciences in the Cognitive Sciences, 2010 Meeting of the Cognitive Science Society		
	▷ Session Leader and Organizer, 2009–2010 Odyssey Series in Mathematics, hosted by Cornell University in connection with the Center for Talented Youth at John Hopkins University		
	▷ Served on a student committee to improve network-based communication at Cornell University (achievements during my tenure included significant improvements in Cornell web portal design and presentation-layer features)		
	▷ Tutored high school students in pre-algebra, algebra, and calculus, 2005–2006 (100+ hrs/yr)		
	▷ Pro bono computational work, Page-Campbell Heart Institute, Vanderbilt Medical Center		
PROFESSIONAL AFFILIATIONS	Society for Industrial and Applied Mathematics (SIAM), American Mathematical Society (AMS), American Physical Society (APS), American Chemical Society (ACS), Society for Mathematical Psychology (SMP), Cognitive Science Society (CSS)		