

SARAH DAY

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Education

- Ph.D. (Mathematics) Georgia Institute of Technology, Summer 2003
A Rigorous Numerical Method in Infinite Dimensions, Ph.D. dissertation
advisor: Dr. Konstantin Mischaikow
- M.S. (Mathematics) Emory University, Spring 1998
Chaotic Dynamics on Julia Sets for the Quadratic Family, M.S. dissertation
advisor: Dr. Steven Batterson
- B.S. with Highest Honors (Mathematics/Physics) Emory University, Spring 1998

Employment

- Assistant Professor of Mathematics, College of William and Mary, 2006-present
Postdoctoral Fellow, MSRI, Fall 2006
VIGRE Assistant Professor of Mathematics, Cornell University, 2003-2006
Visiting Researcher, Vrije Universiteit Amsterdam, 2003-2004

Research Interests

Dynamical Systems Theory with an emphasis on topological and numerical methods,
Computational Topology, and applications from Biology, Materials Science, and Physics

Publications

- Verified Homology Computations for Nodal Domains*
(with W. D. Kalies and T. Wanner),
SIAM Journal on Multiscale Modeling and Simulation **7**(4), 1695–1726 (2009).
- Algorithms for Rigorous Entropy Bounds and Symbolic Dynamics*
(with R. Frongillo and R. Trevino),
SIAM Journal on Applied Dynamical Systems **7**(4), 1477–1506 (2008).
- Quantitative Hyperbolicity Estimates in One-Dimensional Dynamics*
(with H. Kokubu, S. Luzzatto, K. Mischaikow, H. Oka, and P. Pilarczyk)
Nonlinearity **21**, 1967–1987 (2008).
- Probabilistic and Numerical Validation of Homology Computations for Nodal Domains*
(with W. D. Kalies, K. Mischaikow, and T. Wanner), ERA-AMS **13**, 60–73 (2007).
- Validated Continuation for Equilibria of PDEs* (with J. P. Lessard and
K. Mischaikow), SIAM Journal on Numerical Analysis **45**, 1398–1424 (2007).
- Rigorous Numerics for Global Dynamics: a study of the Swift-Hohenberg equation*
(with Y. Hiraoka, K. Mischaikow, and T. Ogawa),
SIAM Journal on Applied Dynamical Systems **4**, 1–31 (2005).

- Towards Automated Chaos Verification* (with O. Junge and K. Mischaikow),
 Proceedings Equadiff 2003, World Scientific, Singapore, 157–162 (2005).
- A Rigorous Numerical Method for the Global Analysis of Infinite Dimensional
 Discrete Dynamical Systems* (with O. Junge and K. Mischaikow),
 SIAM Journal on Applied Dynamical Systems **3**, 117–160, (2004).
- Towards a Rigorous Numerical Study of the Kot-Schaffer Model*
 Dynamic Systems and Applications **12**, 87–97 (2003).
- Power Weakly Mixing Infinite Transformations*
 (with B. Grivna, E. McCartney, and E. Silva)
 New York Journal of Mathematics **5**, 17–24 (1999).

Funding

- Principal Investigator on *Dynamics at a Fixed Resolution*. NSF DMS O811370
 (\$128,281), 2008-2011.
- co-Principal Investigator on the group grant *CSUMS: Theory, Techniques, and Research
 in Computational Mathematics*. NSF DMS 0703532 (\$484,711), 2007-2010.

Professional Activities

- Co-lecturer for the TopMath Summer School on *Topology, Dynamics, and Computation*,
 Technische Universität München, August 2009.
- PME/math club advisor 2007-2008 and 2008-2009.
- Co-organizer CSUMS lecture series/special topics courses 2007-2008 and 2008-2009.
- Freshman and Major advising 2008-2009.
- Department Undergraduate Curriculum Committee, 2008-2009.
- Co-organizer for *GMU-WM Workshop on Undergraduate Research in
 Computational Mathematics*, George Mason University, April 2008.
- Department Merit Evaluation Committee, 2007-2008.
- Co-organizer for *Rigorous Computational Dynamics*, a minisymposium for the
 2005 SIAM Conference on Applications of Dynamical Systems, Snowbird
- Organizer of the Dynamical Systems Seminar at Cornell, 2004-2006.
- Referee for Journal of Mathematical Biology, SIAM Journal
 on Numerical Analysis, SIAM Journal on Applied Dynamical Systems.

Teaching Experience

- 2007-present Assistant Professor, College of William and Mary
 Calculus I and II for the Life Sciences, Differential Equations, Topology,
 Topics in Computational Mathematics, Senior Seminars on Computational
 Homology and Dynamics
- 2004-2006 VIGRE Assistant Professor, Cornell University
 Differential Equations and Dynamical Systems, Computational Homology
- 1998-2003 Graduate Instructor, Georgia Institute of Technology
 Calculus 1, 2, Survey of Calculus, Differential Equations

Undergraduate research students

William and Mary, 2008-2009:

Kassie Archer, David Gould, Benjamin Holman, Brian Paljug, Niha Zubair.

Cornell 2006 REU program:

Adam Chacon, Chris Green, Rafael Frongillo, Philipp Meerkamp, Rodrigo Trevino.

Selected Presentations (since 2004)

Computational topology in the study of discrete dynamical systems.

Computation Topology Seminar, IAS, November 2009.

Computer-assisted proofs for dynamical systems.

Applied Mathematics Seminar, George Washington University, October 2009.

Computer-assisted proofs for dynamical systems.

joint CSUMS seminar talk with Rafael Frongillo, William and Mary, September 2008.

Braids and connecting orbits in parabolic PDEs.

William and Mary department colloquium, September 2008.

Connecting orbits for parabolic PDEs via braid theory. Workshop on

Computational Topology and Dynamics, MSU, Bozeman, August 2008.

Symbolic dynamics via computational topology. Workshop on Computational

Algebraic Topology, MFO (Oberwolfach), June/July 2008.

Constructing symbolic dynamics representations via Conley Index theory.

FoCM 2008, Hong Kong, June 2008.

Computer-assisted proofs for the Kot-Schaffer model. AMS Sectional meeting,

Session on Mathematical Modeling in Biology, March 2008.

Real Henon Maps – Entropy. CANDY 08, Imperial College London, March 2008.

Computer-assisted proofs for dynamical systems.

George Mason University, February 2008.

Algorithms for symbolic dynamics and entropy bounds. ICIAM 07, Zurich, July 2007.

Validated continuation. SIAM Conference on Applications of Dynamical Systems,

Snowbird, May/June 2007.

Computer-assisted proofs in dynamical systems.

colloquium, Wichita State University, April 2007.

Computational tools for measuring topological entropy. AMS Southeastern

Sectional Meeting, Davidson, March 2007.

Computing symbolic dynamics and entropy for nonlinear systems.

Rutgers University, November 2006.

Dynamics I, II, and III. seminar series, MSRI, September 2006.

Computational topology in the study of dynamical systems. Workshop on

Applications of Topology in Science and Engineering, MSRI, September 2006.

Topological methods for dynamical systems. mini-course, Workshop on Recent

Developments in Arrangements and Configuration Spaces, MSRI, August 2006.

Validity of homology computations for nodal domains. Invited talk, Workshop on

computational and topological aspects of dynamics, Leiden, May 2006.

Chaotic Dynamics: a first example and beyond. Math Club talk.

College of William and Mary, February 2006.

- Computer-assisted proofs for dynamical systems.* College of William and Mary, February 2006.
- Computer-Assisted Proofs for Dynamical Systems: from stationary solutions to global attractors.* Florida Atlantic University, February 2006.
- Continuation and Computer-Assisted Proofs: a study of the Swift-Hohenberg system.* Vrije Universiteit, Amsterdam, January 2006.
- Computer-Assisted Proofs in Dynamics: from fixed points to chaos.* Stony Brook University, December 2005.
- Computing the Homology of Relative Braid Classes: algorithms and implications.* University of Sherbrooke, November 2005.
- Continuation and Computer-Assisted Proofs: a study of the Swift-Hohenberg equation.* University of Montreal, November 2005.
- Homology Computations on Braid Classes: algorithms and implications.* Georgia Institute of Technology, October 2005.
- Rigorous continuation techniques.* George Mason University, October 2005.
- Continuation and Computer-Assisted Proofs: a study of the Swift-Hohenberg equation.* CAM Colloquium, Cornell University, September 2005.
- A topological approach for numerical studies of infinite-dimensional maps.* Invited talk, Third Pacific Rim Conference on Mathematics, Shanghai, August 2005.
- Computer-Assisted Proofs in Dynamics: from fixed points to chaos.* Smorgasbord talk, Cornell University, June 2005.
- Dimension reduction techniques for rigorous numerics.* SIAM Conference on Applications of Dynamical Systems, Snowbird, May 2005.
- Constructing models of global attractors for Swift-Hohenberg.* SIAM Conference on Applications of Dynamical Systems, Snowbird, May 2005.
- Computer-assisted proofs for dynamical systems.* Oliver Club talk, Cornell University, April 2005.
- Rigorous Computations: detecting chaos and rejecting spurious solutions.* Workshop on Qualitative Numerical Analysis of High-Dimensional Nonlinear Systems, Bristol, March 2005.
- A Numerical approach to constructing models for global attractors.* Pan-American Advanced Studies Institute 2005, Santiago, January 2005.
- A multivalued approach to time series analysis,* Osaka University, December 2004.
- Rigorous numerics for infinite dimensional dynamical systems,* University of Minnesota, November 2004.
- Rigorous numerics and the Henon map,* Summer School on the Conley Index and Computational Homology. Pappenheim, Germany, September 2004.
- Rigorous numerics based on the Conley index: infinite-dimensional maps,* Dynamical Systems Seminar, Cornell University, September 2004.
- Rigorous numerics for global dynamics,* International Conference on Nonlinear Dynamics and Evolution Equations. Memorial University of Newfoundland, July 2004.

Conley index techniques for global dynamics: a study of the Swift-Hohenberg equation, Max Planck Institute, Leipzig, June 2004.

Conley index techniques for global dynamics: a study of the Swift-Hohenberg equation. Free University, Berlin, June 2004.

Rigorous numerical methods based on the Conley index: a finite-dimensional example, US-Japan workshop on Dynamics and Computations, Tokyo, March 2004.

Conley index techniques in numerical studies of finite dimensional systems invited lecture series, Osaka University, February 2004.

Conferences and Workshops (since 2004)

Joint Mathematics Meetings, Washington, DC. January 2009.

Computational Topology and Dynamics Workshop, MSU, Bozeman, August 2008.

Workshop on Rhythms in the Hypothalamus and Pituitary. AIM, Palo Alto, August 2008.

Workshop on Computational Algebraic Topology, MFO Oberwolfach June/July 2008.

FoCM 2008, Workshop on Computational Dynamics, Hong Kong, June 2008.

AMS Sectional meeting, Session on Mathematical Modeling in Biology,
Baton Rouge, March 2008.

Computer-Assisted Nonlinear Dynamics (CANDY 08).

Imperial College London, March 2008.

Spring Topology and Dynamics Conference (STDC 08). Milwaukee, March 2008.

ICIAM 07. Zurich, July 2007.

SIAM Conference on Applications of Dynamical Systems. Snowbird, May/June 2007.

Special Session on Dynamical Systems. AMS Southeastern Sectional Meeting
at Davidson, March 2007.

Workshop on Computational Applications of Algebraic Topology.
semester workshop at MSRI, Fall 2006.

Workshop on computational and topological aspects of dynamics.
Lorentz Center, Leiden, May 2006.

Third Pacific Rim Conference on Mathematics. Fudan University, Shanghai,
August 2005.

SIAM Conference on Applications of Dynamical Systems. Snowbird, May 2005.

Workshop on Qualitative Numerical Analysis of High-Dimensional Nonlinear
Systems. Bristol, March 2005.

Pan-American Advanced Studies Institute 2005. Santiago, Chile, January 2005.

Summer School on the Conley Index and Computational Homology.
Pappenheim, Germany, September 2004.

International Conference on Nonlinear Dynamics and Evolution Equations.
Memorial University of Newfoundland, July 2004.

US-Japan workshop on Dynamics and Computations, Shonan
International Center, (Tokyo, Japan), March 2004.

Kyoto Dynamics Days 3, Kyoto University, March 2004.