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CURRICULUM VITAE – SEPTEMBER 2009

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EDUCATION

August 1994 Ph.D. in Mathematics, Cornell University, Ithaca, NY.
Dissertation: *Regularized Models of Phase Transformation in One-Dimensional Nonlinear Elasticity.*
Dissertation Advisor: Philip Holmes.
Minor in Theoretical and Applied Mechanics.

May 1992 M.S. in Mathematics, Cornell University, Ithaca, NY.

June 1989 B.S. in Mathematics, The Ohio State University, Columbus, OH.

PROFESSIONAL EXPERIENCE

1998-present Professor, Department of Mathematical Sciences,
Florida Atlantic University, Boca Raton, FL.

Fall 2006 General Member, Program on Computational Applications of Algebraic Topology,
Mathematical Sciences Research Institute, Berkeley, CA.

Spring 2006 Visiting Researcher, Department of Mathematics, Vrije Univ., Amsterdam, NL.

Fall 2005 Visiting Researcher, Center for Dynamical Systems and Nonlinear Studies,
Georgia Institute of Technology, Atlanta, GA.

1996-1998 Lecturer, Department of Mathematics, Cal. Poly. State Univ., San Luis Obispo, CA.

1994-1996 Postdoctoral Fellow, Center for Dynamical Systems and Nonlinear Studies,
Georgia Institute of Technology, Atlanta, GA.

1992-1994 Graduate Research Assistant, Department of Mathematics, Cornell University.

1989-1992 National Science Foundation Graduate Fellow, Dept. of Mathematics, Cornell Univ.

1987-1989 Teaching Assistant, Department of Mathematics, The Ohio State University.

RESEARCH SUPPORT AND FELLOWSHIPS

2009-2012 National Science Foundation Grant (DMS-0914995, \$252,246),
Computing Dynamics of Multiparameter Systems.

2005-2008 U.S. Department of Energy Grant (DE-FG02-05ER25713, \$284,003),
Multiscale Analysis of Nonlinear Systems using Computational Homology.

2005-2008 National Science Foundation Grant (DMS-0511208, \$161,220),
Topological Methods for the Study of Nonlinear Infinite Dimensional Systems.

2004 and 2005 FAU Research Enhancement travel award (\$700 and \$1000).

1999-2002 National Science Foundation Grant (DMS-9973331, \$33,400),
Numerical Analysis of Qualitative Dynamics in Flows.

1997 National Science Foundation Research Opportunity Award (\$7,000).

1997 California State Faculty Support Grant (\$3,500).

1989-1992 National Science Foundation Graduate Fellowship.

1989-1990 Sage Graduate Fellowship (Cornell University).

SCHOLARLY ACTIVITY

REFEREED WORKS – JOURNAL PUBLICATIONS

- Verified homology computations for nodal domains (with S. Day, and T. Wanner). *Multiscale Modeling and Simulation: A SIAM Interdisciplinary Journal* 7, pp. 1695-1726, 2009.
- A database schema for the analysis of global dynamics of multiparameter systems (with Z. Arai, H. Kokubu, K. Mischaikow, H. Oka, and P. Pilarczyk). *SIAM Journal on Applied Dynamical Systems* 8, pp. 757-789, 2009.
- Three-dimensional analysis of solid oxide fuel cell Ni-YSZ anode interconnectivity (with J. Wilson, M. Gameiro, K. Mischaikow, P. Voorhees, and S. Barnett). *Microscopy and Microanalysis* 15, pp. 71-77, 2009.
- Closed characteristics on singular energy levels of second-order Lagrangian systems (with M. Wess), *Journal of Differential Equations* 244, pp. 555–58, 2008.
- Probabilistic and numerical validation of homology computations for nodal domains (with S. Day, K. Mischaikow, and T. Wanner), *Electronic Research Announcements of the American Mathematical Society* 13, pp. 60–73, 2007.
- Topological horseshoes of traveling waves for a fast-slow predator-prey system (with M. Gameiro, T. Gedeon, H. Kokubu, K. Mischaikow, and H. Oka), *Journal of Dynamics and Differential Equations* 19, pp. 623–654, 2007.
- Polygonal approximation of flows (with E. Boczko and K. Mischaikow), *Topology and Its Applications* 154, pp. 2501-2520, 2007.
- A computational approach to Conley’s decomposition theorem (with H. Ban), *Journal of Computational and Nonlinear Dynamics* 1(4), pp. 312–319, 2006.
- On the detection of simple points in higher dimensions using cubical homology (with M. Niethammer, K. Mischaikow, and A. Tannenbaum), *IEEE Transactions on Image Processing* 15(8), pp. 2462–2469, 2006.
- An algorithmic approach to chain recurrence (with K. Mischaikow and R. VanderVorst), *Foundations of Computational Mathematics* 5, pp. 409-449, 2005.
- Topological characterization of spatial-temporal chaos (with M. Gameiro and K. Mischaikow), *Physical Review E* 70, Article 035203 (Rapid communication), 2004.
- Closed characteristics of second-order Lagrangians (with R. VanderVorst), *Proc. Roy. Soc. Edinburgh Sect. A* 134, pp. 143–158, 2004.
- Analysis of blood vessel topology via cubical homology (with M. Niethammer, A. Stein, P. Pilarczyk, K. Mischaikow, and A. Tannenbaum), *Proceedings of International Conference on Image Processing 2002*, vol. 2, pp. 969-972.
- Slow motion in higher-order systems and Γ -convergence in one space dimension (with R. VanderVorst and T. Wanner), *Nonlinear Analysis: Theory, Methods, and Applications* 44, pp. 33–57, 2001.
- Homotopy classes for stable periodic and chaotic patterns in fourth-order Hamiltonian systems (with J. Kwapisz, J.B. VandenBerg, and R. VanderVorst), *Communications in Mathematical Physics* 214, pp. 573–592, 2000.

- Cubical approximation and computation of homology (with K. Mischaikow and G. Watson), *Banach Center Publications* 47, pp. 115–131, 1999.
- Homotopy classes for stable connections between Hamiltonian saddle-focus equilibria (with J. Kwapisz and R. VanderVorst), *Communications in Mathematical Physics* 193, pp. 337–371, 1998.
- On the asymptotic behavior of a phase-field model for elastic phase transitions, *Journal of Dynamics and Differential Equations* 9, pp. 289–306, 1997.
- Multitransition heteroclinic and homoclinic solutions of the extended Fisher-Kolmogorov equation (with R. VanderVorst), *Journal of Differential Equations* 131, pp. 209–228, 1996.
- On a dynamical model of phase transformation in nonlinear elasticity (with P. Holmes), *Fields Institute Communications volume 5 on Pattern Formation: Symmetry Methods and Applications*, pp. 255–270, 1996.

GRANTS RECEIVED

- 2009-2012 National Science Foundation Grant (DMS-0511208, \$252,246 to FAU), *Computing Dynamics of Multiparameter Systems*, with K. Mischaikow (Rutgers).
- 2005-2008 U.S. Department of Energy Grant (DE-FG02-05ER25713, \$284,003 to FAU), *Multiscale Analysis of Nonlinear Systems using Computational Homology*, with K. Mischaikow (Rutgers), M. Schatz (Georgia Tech), and T. Wanner (George Mason)
- 2005-2008 National Science Foundation Grant (DMS-0511208, \$161,220 to FAU), *Topological Methods for the Study of Nonlinear Infinite Dimensional Systems*, with K. Mischaikow (Rutgers).
- 1999-2002 National Science Foundation Grant (DMS-9973331, \$33,400), *Numerical Analysis of Qualitative Dynamics in Flows*.

NON-REFEREED WORKS – COMPUTER SOFTWARE

- 2002 *CHomP: Computational Homology Project*: developed approximately 4000 lines of C++ code as part of this project published at <http://chomp.rutgers.edu> under the GNU public license.

INVITED LECTURES AND PAPERS PRESENTED AT CONFERENCES

- 2009 **Invited Lecturer:** 5 lectures on *Computational Conley Theory*, Summer School on Topology, Computation, and Dynamics, Munich, Germany.
- 2009 **Invited talk:** *Computational Conley Theory*, IMA New Directions Short Course on Applied Algebraic Topology, Minneapolis, MN.
- 2009 **Invited talk:** *Homology of Nodal Domains*, IMA New Directions Short Course on Applied Algebraic Topology, Minneapolis, MN.
- 2009 **Minisymposium talk:** *Multivalued Maps from Time Series*, SIAM Conference on Applications of Dynamical Systems, Snowbird, UT.
- 2009 **Contributed talk:** *Databases for the global dynamics of multiparameter systems*, Air Force Complex Networks Conference, Arlington, VA.
- 2008 **Contributed talk:** *Multivalued maps for time series*, Workshop on Computational Topology and Dynamics, MSU, Bozeman, MT.
- 2008 **Minisymposium talk:** *Building databases for global dynamics of multiparameter systems*, Foundations of Computational Mathematics '08, Hong Kong.

- 2007 **Invited talk:** *Computing global decompositions of dynamical systems*,
Workshop on Topological and Computational Approaches to Dynamical Systems and Applications,
Ryukoku University, Kyoto, Japan.
- 2007 **Colloquium talk:** *Building a database of global dynamics for multiparameter systems*,
Vrije Universiteit, Amsterdam, the Netherlands.
- 2007 **Invited talk:** *Computational dynamics from a topological point of view*,
CSUMS lecture at College of William and Mary, Williamsburg, VA.
- 2007 **Minisymposium talk:** *Computing global decompositions of dynamical systems*
SIAM Conference on Applications of Dynamical Systems, Snowbird, UT.
- 2006 **Invited talk:** *Computational Conley theory*,
Workshop on Applications of Topology in Science and Engineering, MSRI, Berkeley, CA.
- 2006 **Colloquium talk:** *Computing global decompositions of dynamical systems*,
Rutgers University, New Brunswick NJ..
- 2006 **Plenary talk:** *A computational approach to Conley's decomposition theorem*,
Conference on Dynamics, Topology, and Computation, Bedlewo, Poland
- 2006 **Invited talk:** *Computing recurrence in dynamics*, Nowy Sacz, Poland
- 2006 **Invited talk:** *Computational dynamics via combinatorial approximation and Conley theory*,
Workshop on Computational and Topological Aspects of Dynamics,
Lorentz Center, Leiden Universiteit, the Netherlands.
- 2006 **Invited talk:** *Computational dynamics via combinatorial approximation and the Conley index*,
Seminars on Nonlinear Dynamics of Natural Systems, Vrije Universiteit, the Netherlands.
- 2006 **Colloquium talk:** *An algorithmic approach to Conley's decomposition theorem*,
Georgia Institute of Technology, Atlanta, GA.
- 2005 **Minisymposium talk:** *An algorithmic approach to chain recurrence*,
Third Pacific Rim Conference on Mathematics, Shanghai, China.
- 2005 **Minisymposium talk:** *Topological characterization of spatial-temporal chaos*,
SIAM Conference on Applications of Dynamical Systems, UT.
- 2005 **Minisymposium talk:** *Chain recurrence from a combinatorial point of view*,
SIAM Conference on Applications of Dynamical Systems, UT.
- 2005 **Invited colloquium talk:** *Computational Conley index theory*,
George Mason University, VA.
- 2005 **Invited seminar talk:** *Computational Conley index theory*,
Cornell University Dynamics Seminar, Ithaca, NY.
- 2004 **Invited talk:** *Polygonal approximation of flows*,
Summer School in Mathematics on the Conley Index and Computational Homology,
Pappenheim, Germany.
- 2004 **Invited talk:** *Algorithmic approach to Conley's decomposition theorem and polygonal
approximation of flows*,
International Workshop on Geometric Methods in Dynamical Systems, Delaware.
- 2004 **Invited talk:** *Polygonal approximation of flows*,
US-Japan Workshop on Dynamics and Computation, Tokyo, Japan.
- 2004 **Invited talk:** *Variational methods for second-order Lagrangian systems*,
Kyoto Dynamics Days 3, Kyoto, Japan.

- 2002 **Invited colloquium talk:** *Polygonal approximation of flows*, Embry Riddle Aeronautical University.
- 2001 **Invited talk:** *Polygonal approximation of flows*, Second Workshop on the Conley Index, Sherbrooke, Quebec.
- 2001 **Invited colloquium talk:** *Variational methods for second-order Lagrangian systems*, The Ohio State University.
- 2001 **Invited seminar talk:** *Variational methods for second-order Lagrangian systems*, Georgia Institute of Technology.
- 2000 **Minisymposium talk:** *Simplicial approximation and Conley index computations for flows*, SIAM Pacific Rim Dynamical Systems Conference in Maui, HI.
- 2000 **Invited seminar talk:** *Variational methods for second-order Lagrangian systems*, University of Maryland, Baltimore County.
- 1999 **Minisymposium talk:** *Patterns in gradient-like bistable equations in one-space dimension*, Fifth SIAM Conference on Applications of Dynamical Systems in Snowbird, UT.
- 1999 **Minisymposium talk:** *Numerical computation of invariant sets in flows*, AMS Southeastern Sectional Meeting in Charlotte, NC.
- 1998 **Special session talk:** *Fourth-order bistable evolution equations*, Third Americas Conference on Differential Equations and Nonlinear Analysis in Atlanta, GA.
- 1997 **Invited talk:** *Variational methods for stable patterns and slow motion in one-dimensional phase-field equations*, Workshop on Multibump Solutions, Leiden University, the Netherlands.
- 1997 **Special session talk:** *Higher-order bistable systems and slow motion in one space dimension*, International Conference on Differential Equations and Dynamical Systems, Waterloo, Ontario.
- 1997 **Invited talk:** *Computing the homological Conley index*, Workshop on the Conley Index, Banach Center, Warsaw, Poland.
- 1997 **Contributed talk:** *Higher-order bistable systems in one space dimension*, SIAM Conference on Applications of Dynamical Systems, Snowbird, UT.
- 1997 **Invited talk:** *Variational methods for stable patterns and slow motion in one-dimensional phase-field equations*, University of California at Davis.
- 1997 **Invited talk:** *Higher-order bistable systems in one space dimension*, University of Augsburg, Germany.
- 1997 **Invited talk:** *Bistable systems and slow motion in one space dimension*, California Polytechnic State University.
- 1996 **Invited talk:** *Multitransition solutions in the extended Fisher-Kolmogorov equation*, US-Japan Conference on Singular Perturbations and Dynamical Systems, Callaway Gardens, GA.
- 1996 **Invited talk:** *Higher-order bistable systems and slow motion in one space dimension*, Princeton University.
- 1996 **Invited talk:** *Bistable systems and slow motion in one space dimension*, New Mexico State University.
- 1996 **Invited talk:** *Multitransition solutions in the extended Fisher-Kolmogorov equation*, Utah State University.
- 1996 **Invited talk:** *Higher-order bistable systems and slow motion in one space dimension*, Clemson University.
- 1995 **Contributed talk:** *Asymptotic behavior of a phase-field model in nonlinear elasticity*, CRM Summer School on Boundaries, Layers, and Transitions in Banff, Alberta.

- 1995 **Seminar talk:** *Multitransition solutions in the extended Fisher-Kolmogorov equation*, Georgia Institute of Technology.
- 1994 **Seminar talk:** *Dynamic models of phase transitions in nonlinear elasticity*, Georgia Institute of Technology.
- 1994 **Seminar talk:** *Dynamic models of phase transitions in nonlinear elasticity*, Cornell University.

PROFESSIONAL ACTIVITIES

Ph.D. students advised:

Hyunju Ban – Ph.D. awarded 12/2006 – *Computing Global Decompositions of Dynamical Systems*
 Postdoctoral Fellow in Biomedical Informatics at Vanderbilt University 2007-08
 Instructor at College of William and Mary 2008-present.

Mark Wess – Ph.D. awarded 12/2008 – *Computing Topological Dynamics from Time Series*
 Instructor at FAU 2008-present.

Journal referee:

Journal of Differential Equations
Journal of Mathematical Analysis and Applications
Journal of Nonlinear Science
Mathematical and Computer Modelling
Nonlinear Analysis: Theory, Methods, and Applications
Physica D
SIAM Journal on Applied Dynamical Systems
Journal of Fixed Point Theory and Applications

Other referee/review:

Reviewer for VENI grant from the Netherlands Organisation for Scientific Research.
 Reviewer for VIDI grant from the Netherlands Organisation for Scientific Research.
 National Science Foundation Applied Dynamical Systems reviewer

Workshop and Conference Organizer:

- 2008 **Workshop co-organizer:** *Computational Topology and Dynamics Workshop*
 Montana State University, Bozeman, MT.
- 2007 **Minisymposium co-organizer:** *Computational topology and dynamics*,
 6th International Congress on Industrial and Applied Mathematics in Zurich, Switzerland.
- 2007 **Workshop co-organizer:** *Computational Homology and Fluid Dynamics Workshop*
 Georgia Institute of Technology, Atlanta, GA.
- 2006 **Workshop co-organizer:** *Computational Homology and Materials Science Workshop*
 Georgia Institute of Technology, Atlanta, GA.
- 2005 **Minisymposium co-organizer:** *Rigorous computational dynamics*,
 SIAM Conference on Applications of Dynamical Systems in Snowbird, UT.
- 2000 **Minisymposium co-organizer:** *Computational topology and geometry in analysis of ODE's
 and time series*, SIAM Pacific Rim Dynamical Systems Conference in Maui, HI.
- 1999 **Minisymposium co-organizer:** *Fourth-order Hamiltonian systems and variational techniques
 in dynamics*, SIAM Annual Meeting in Atlanta, GA.

Memberships in professional societies:

American Mathematical Society

Society for Industrial and Applied Mathematics

UNIVERSITY SERVICE**University level:**

2008-present Representative to the Boca Senate.

2003-2005 Representative to the University Faculty Senate from the CES College of Science.

1998-1999 Mathematics faculty search committee for the FAU Honors College.

College level:

2007-present CESCOS Graduate Programs committee.

Departmental level:

2007-present Graduate Director for Mathematics.

2004-present Graduate Programs committee (chair 2007-present)

2006-present Executive committee for Department of Mathematical Sciences.

2004-2008 Engineering-Mathematics Liaison committee.

2004-2005 Undergraduate Programs committee chair.

2004-2005 Research and Grants committee.

2003-2005 Department Honors coordinator.

2002-2003 Faculty search committee for the Department of Mathematical Sciences.

2000-2005 Undergraduate advisor for Mathematics majors.

2000-2006 Calculus committee chair.

2000-2001 Faculty search committee for the Department of Mathematical Sciences.

1998-2004 Applied Mathematics Program Planning committee.

1998-2004 Representative of the Department of Mathematical Sciences to the Southeast Florida Engineering Education Consortium.

1998-2000 Undergraduate Engineering Mathematics committee.

Courses Taught at FAU

Graduate: Ordinary Differential Equations, Differential Topology, Topological Methods in Nonlinear Analysis, Introductory Analysis 1 & 2, Topics in Differential Equations, Directed Independent Study, and Ph.D. Research.

Undergraduate: Numerical Analysis, Numerical Methods, Calculus 1, 2, & 3 (including honors section), Modern Analysis, Discrete Mathematics, Matrix Theory, Methods of Calculus, Math for Liberal Arts 1, and Directed Independent Study.