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William David Kalies

Education

August 1994	**Cornell University**, *Mathematics*, Doctor of Philosophy.
	Minor in Theoretical and Applied Mechanics
May 1992	**Cornell University**, *Mathematics*, Master of Science.
June 1989	**The Ohio State University**, *Mathematics*, Bachelor of Science.

Experience

2019–present	**Associate Dean for Graduate Studies**, *Charles E. Schmidt College of Science*, Florida Atlantic University.
Spring 2019	**Dean's Fellow for Special Initiatives**, *Charles E. Schmidt College of Science*, Florida Atlantic University.
1998–present	**Professor (asst., assoc., full)**, *Mathematical Sciences*, Florida Atlantic University.
1996-1998	**Instructor**, *Mathematics*, Cal. Poly. State Univ., San Luis Obispo, CA.
1994-1996	**Postdoctoral Fellow**, *Center for Dyn. Sys and Nonlin. Stud.*, Georgia Inst. of Technology, Atlanta, GA.
1992-1994	**Graduate Teaching Assistant**, *Mathematics*, Cornell University, Ithaca, NY.
1989-1992	**National Science Foundation Graduate Fellow**, *Mathematics*, Cornell University, Ithaca, NY.
1987-1989	**Teaching Assistant**, *Mathematics*, The Ohio State University, Columbus, OH.

Visiting Positions

Fall 2016	**Visiting Researcher**, *Mathematical Biosciences Institute*, The Ohio State University, Columbus, OH.
Spring 2015	**Visiting Researcher**, *Mathematics*, College of William and Mary, Williamsburg, VA.
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 Universiteit, Amsterdam, NL.
Fall 2005	**Visiting Researcher**, *Center for Dyn Sys and Nonlin. Stud.*, Georgia Institute of Technology, Atlanta, GA.

Research Support

2018-2021	**Army Research Office**, *A Combinatorial and Topological Framework for Deriving Dynamics from Data*, W911NF1810306, $228,619 to FAU, co-PI with S. Day.
2009-2014	**National Science Foundation**, *Computing Dynamics of Multiparameter Systems*, DMS-0914995, $252,246 to FAU, co-PI with K. Mischaikow.
2005-2008	**U.S. Department of Energy**, *Multiscale Analysis of Nonlinear Systems using Computational Homology*, DE-FG02-05ER25713, $284,003 to FAU, co-PI with K. Mischaikow.
2005-2008	**National Science Foundation**, *Topological Methods for the Study of Nonlinear Infinite Dimensional Systems*, DMS-0511208, $161,220 to FAU, co-PI with K. Mischaikow.
1999-2002	**National Science Foundation**, *Numerical Analysis of Qualitative Dynamics in Flows*, DMS-9973331, $33,400.

Refereed Journal Publications

[29] **An algorithmic approach to lattices and order in dynamics**, with D. Kasti and R. VanderVorst, *SIAM Journal on Applied Dynamical Systems,* 17, pp. 1617–1649, 2018.

[28] **Analytic continuation of local (un)stable manifolds with rigorous computer assisted error bounds**, with S. Kepley and J.D. Mireles-James, *SIAM Journal on Applied Dynamical Systems,* 17, pp. 157–202, 2018.

[27] **On the dynamics of second-order Lagrangian systems**, with R. Adams and R. VanderVorst, *Electronic Journal of Differential Equations,* Vol. 2017, No. 101, pp. 1–20, 2017.

[26] **Chaos near a resonant inclination-flip**, with M. Fontaine and V. Naudot, *Physica D: Nonlinear Phenomena,* 334, pp. 141–157, 2016.

[25] **Lattice structures for attractors II**, with K. Mischaikow and R. VanderVorst, *Foundations of Computational Mathematics,* 16, pp. 1151–1191, 2016.

[24] **Efficient computation of Lyapunov functions for Morse decompositions**, with A. Goullet, S. Harker, D. Kasti, and K. Mischaikow, *Discrete and Continuous Dynamical Systems,* 20, pp. 2419-2451, 2015.

[23] **Lattice structures for attractors I**, with K. Mischaikow and R. VanderVorst, *Journal of Computational Dynamics,* 1, pp. 307-338, 2014.

[22] **Rigorous computation of the global dynamics of integrodifference equations with smooth nonlinearities**, with S. Day, *SIAM Journal on Numerical Analysis,* 51, pp. 2957–2983, 2013.

[21] **A reinjected cuspidal horseshoe**, with M. Fontaine and V. Naudot, *Discrete and Continuous Dynamical Systems - special issue,* pp. 227-236, 2013.

[20] **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.

[19] **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.

[18] **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.

[17] **Closed characteristics on singular energy levels of second-order Lagrangian systems**, with M. Wess, *Journal of Differential Equations,* 244, pp. 555–558, 2008.

[16] **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.

[15] **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.

[14] **Polygonal approximation of flows**, with E. Boczko and K. Mischaikow, *Topology and Its Applications,* 154, pp. 2501-2520, 2007.

[13] **A computational approach to Conley's decomposition theorem**, with H. Ban, *Journal of Computational and Nonlinear Dynamics,* 1, pp. 312–319, 2006.

[12] **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, pp. 2462–2469, 2006.

[11] **An algorithmic approach to chain recurrence**, with K. Mischaikow and R. VanderVorst, *Foundations of Computational Mathematics,* 5, pp. 409-449, 2005.

[10] **Topological characterization of spatial-temporal chaos**, with M. Gameiro and K. Mischaikow, *Physical Review E,* 70, Article 035203 (Rapid communication), 2004.

[9] **Closed characteristics of second-order Lagrangians**, with R. VanderVorst, *Proc. Roy. Soc. Edinburgh Sect. A,* 134, pp. 143–158, 2004.

[8] **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,* pp. 969-972.

[7] **Slow motion in higher-order systems and Γ-convergence in one space dimension**, with R. Vander-Vorst and T. Wanner, *Nonlinear Analysis: Theory, Methods, and Applications,* 44, pp. 33–57, 2001.

[6] **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.

[5] **Cubical approximation and computation of homology**, with K. Mischaikow and G. Watson, *Banach Center Publications,* 47, pp. 115–131, 1999.

[4] **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.

[3] **On the asymptotic behavior of a phase-field model for elastic phase transitions**, Journal of Dynamics and Differential Equations, *9, pp. 289–306, 1997.*

[2] **Multitransition heteroclinic and homoclinic solutions of the extended Fisher-Kolmogorov equation**, *with R. VanderVorst*, *Journal of Differential Equations,* 131, pp. 209–228, 1996.

[1] **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.

Non-refereed **Computational Conley Theory**, *with R. VanderVorst*, *Nieuw Archief voor Wiskunde. Vijfde Serie,* 17, pp. 200-206, 2017.

Recent Invited Lectures and Conference Presentations

2019 **CRM Workshop on Data Driven Dynamics**, *Order Theory and Dynamics*, Invited Talk, Montreal, Canada.

2019 **CRM Workshop on Data Driven Dynamics**, *Order Theory and Dynamics Tutorial*, Invited Tutorial, Montreal, Canada.

2018 **Algebraic Topology in Data and Dynamics**, *Order Theory and Dynamics*, Invited Talk, Bozeman, MT.

2017 **SIAM Conference on Applications of Dynamical Systems**, *Lattice Structures for Dynamics*, Minitutorial Talk, Snowbird, UT.

2016 **Math Biosciences Institute**, *Set-Based Computations for Global Dynamics*, Invited Talk, Columbus, OH.

2016 **11th AIMS Conf. on Dyn. Sys., Diff. Eq., and App.**, *Set-Based Methods for Global Dynamics*, Invited Talk, Orlando, FL.

2014 **Workshop on Combinatorial and Topological Frameworks for Multiparameter Nonlinear Dynamics**, *Lattice Structures of Attractors*, Invited Talk, Leiden, The Netherlands.

2012 **IV Developer's Workshop on the Conley-Morse Database**, *Rigorous Computation of the Global Dynamics of Integrodifference Equations*, Invited Talk, Kauai, HI.

2011 **IMA Summer School on Topological Methods in Complex Systems**, *Rigorous Computation of the Global Dynamics of Integrodifference Equations with Smooth Nonlinearity*, Invited Talk, Philadelphia, PA.

2010 **Workshop on Bifurcation Analysis and Applications**, *Computing Global Dynamics of Multiparameter Systems*, Invited Talk, Montreal, Canada.

2010 **Algebra and Topology: Methods, Computation, and Science**, *Computing Global Dynamics of Multiparameter Systems*, Invited Talk, Münster, Germany.

2010 **AMS Spring Eastern Sectional Meeting of the AMS**, *Computing Global Dynamics of Multiparameter Systems*, Invited Talk, Newark, NJ.

2009 **Summer School on Topology, Computation, and Dynamics**, 5 lectures on *Computational Conley Theory*, Invited Lecturer, Munich, Germany.

2009 **IMA New Directions Short Course on Applied Algebraic Topology**, *Computational Conley Theory*, Invited Talk, Minneapolis, MN.

2009 **IMA New Directions Short Course on Applied Algebraic Topology**, *Homology of Nodal Domains*, Invited Talk, Minneapolis, MN.

2009 **SIAM Conference on Applications of Dynamical Systems**, *Multivalued Maps from Time Series*, Minisymposium Talk, Snowbird, UT.

2009 **Air Force Complex Networks Conference**, *Databases for the global dynamics of multiparameter systems*, Contributed Talk, Arlington, VA.

Ph.D. Students

Shane Kepley, Ph.D. awarded 12/2017, *The Circular Restricted Four Body Problem is Non-Integrable: A Computer Assisted Proof,* co-supervisor with Jason Mireles-James.

Dinesh Kasti, Ph.D. awarded 8/2016, *An Algorithmic Approach to the Lattice Structures of Attractors and Lyapunov Functions.*

Marcus Fontaine, Ph.D. awarded 5/2016, *Nonlinear Phenomena from a Reinjected Horseshoe,* co-supervisor with Vincent Naudot.

Ronald Adams, Ph.D. awarded 8/2014, *Curve Shortening in Second-Order Lagrangian Systems.*

Mark Wess, Ph.D. awarded 12/2008, *Computing Topological Dynamics from Time Series.*

Hyunju Ban, Ph.D. awarded 12/2006, *Computing Global Decompositions of Dynamical Systems.*

Recent FAU Service

2019-present **BS in Data Science Committee**.

2019-present **MS in Data Science Committee**.

2016-present **Data Science Platform Committee**.

2012-2014 **University Honors Council**.

2009-2010 **Core Curriculum Subcommittee on Mathematics and Quantitative Reasoning**.

2008-2009 **University Faculty Senator**.

2012&2019 **Science Graduate Academic Appeals Committee**.

2012&2014 **Science Non-Tenure-Track Promotion Committee**.

2010-2013 **Science Promotion and Tenure Committee**.

2015-present **SIAM Student Chapter Faculty Advisor**.

2013-present **Mathematics Honors co-Chair**.

2016&2018 **Mathematics Faculty Search Committee**, 2016 chair.

2011-2014 **Mathematics Master Teacher**.

2007-2010 **Mathematics Graduate Director**.

Professional Memberships

Society for Industrial and Applied Mathematics.

American Mathematical Society.