RALPH C. SMITH

Education

Ph.D., Mathematics, Montana State University, 1990

M.S., Mathematics, Montana State University, 1987

A.B., Applied Mathematics, Harvard University, 1983

Professional Experience

2018 - Present	Distinguished University Professor, Department of Mathematics, NC State Univ., Raleigh, NC.
2014 - 2018	Distinguished Professor, Department of Mathematics, NC State Univ., Raleigh, NC.
2005 - 2008	Associate Director, Statistical and Applied Mathematical Sciences Institute (SAMSI)
2002 - Present	Professor, Department of Mathematics, NC State Univ., Raleigh, NC.
2002 - 2004	Co-Director, Operations Research Program, NC State University, Raleigh, NC.
2000 - 2018	Associate Director, Center for Research in Scientific Computation (CRSC), North Carolina State University, Raleigh, NC.
1998 - 2002	Associate Professor, Department of Mathematics, NC State Univ., Raleigh, NC.
1998 - 2000	Assistant Director, CRSC, North Carolina State University, Raleigh, NC.
1993 - 2002	Scientific Consultant, Institute for Computer Applications in Science and Engineering (ICASE), Hampton, VA.
1993 - 1997	Assistant Professor, Department of Mathematics, Iowa State Univ., Ames, IA.
1990 - 1993	Staff Scientist, Institute for Computer Applications in Science and Engineering (ICASE), Hampton VA.

Awards and Honors

2018	Elected as a *SIAM Fellow* for the class of 2018 for contributions in uncertainty quantification and materials science.
2016	Recipient of the SPIE *2017 Smart Structures and Materials Lifetime Achievement Award* "In recognition of his sustained contributions to the advancement of Smart Structures and Materials Technologies."
2016	Recipient of the 2016 ASME *Adaptive Structures and Material Systems Award* "for extraordinary contributions in the development of smart materials and adaptive structures through constitutive model development, modeling and nonlinear control, and uncertainty analysis; and for modeling research that has been validated across a broad range of smart materials."

2015   Recipient of a 2015 Alumni Association Outstanding Research Award for seminal contributions to the modeling and control of smart material systems and to uncertainty quantification.

2003   The paper "Analytical and Experimental Issues in Ni-Mn-Ga Transducers" (see [44] in Proceedings Papers), presented by LeAnn Faidley, was awarded the *2nd Place Best Student Paper Award 2003* at the SPIE Symposium on Smart Structures and Materials, March 2003.

2002   The paper "Nonlinear Adaptive Parameter Estimation Algorithms for Hysteresis Models of Magnetostrictive Actuators" (see [35] in Proceedings Papers), presented by James Nealis, was awarded the *3rd Place Best Student Paper Award 2002* at the SPIE Symposium on Smart Structures and Materials, March 2002.

1999   The paper "A Coupled Structural-Magnetic Strain Model for Magnetostrictive Transducers" (see [20] in Proceedings Papers), presented by Marcelo Dapino, was awarded the *1999 Smart Structures and Materials Best Student Paper Award* at the SPIE Symposium on Smart Structures and Materials, March 1999.

1997   Recipient of the *Iowa State University Foundation Award for Early Achievement in Research.*

1996   The paper "The Modeling and Control of Acoustic/Structure Interaction Problems via Piezoceramic Actuators: 2-D Numerical Examples," (see [6] in Journal Papers), was awarded the *1994/1995 Best-paper in Structures, Structural Dynamics, and Control.* Award sponsored by the Adaptive Structures and Material Systems Committee of the ASME Aerospace Division.

1994   Individual recipient of a *NASA Group Achievement Award* for "Development of important insights into basic fluid mechanical phenomena and theoretical analysis tools which have contributed to major advances in flow prediction and control including laminar flow control" as a member of the ICASE Fluid Mechanics Group, 1994.

Research Program

Mathematical modeling of smart materials, numerical analysis and numerical methods for physical systems, parameter estimation, control theory, uncertainty quantification for physical and biological systems.

Undergraduate, Master's and Ph.D. Students

Praktikum Advisor

Konstanze Wulf – "Optimization Routines for Parameter Estimation in Structural Models," Augsburg University, 1995.

Master's Advisor

Ricardo del Rosario – "Numerical Approximation of Thin Shell Dynamics," Master's Oral 4/12/95, enrolled in a PhD program at North Carolina State University. Presently a Computational Biologist at Broad Institute, Cambridge, MA.

Wei Li – "Spline Approximation of a Thick Plate Model," Master's Oral 8/1/95, enrolled in a PhD program at the University of California, Berkeley.

Paul Spiker – "Model Development and Numerical Approximation of Acoustic Power Radiation from a Non-Uniform Composite Beam," Master's Oral 7/11/98.

William Turner – "Time-Discretization of Structural Problems," Master's Oral 4/12/96, enrolled in a PhD program at North Carolina State University. Presently an Associate Professor and Department Chair at Wabash College, Crawfordsville, IN.

Danny Kolepp – "Broadband, Narrowband and Hybrid Control Design for Structural Systems," Master's Oral 11/6/00, High school teacher in Raleigh, NC. Presently a Software Developer/Data Scientist for the US Government, Evans, GA.

Jessica Matthews – "Monte Carlo Simulation of Nafion Structure," Master's Oral 7/29/04, Constella Group, Durham, NC. Presently a Staff Scientist at the NOAA National Climatic Data Center (NCDC), Asheville, NC.

Thomas Braun – "Model Development and Numerical Implementation Algorithms for Electric and Magnetic Transducers," Master's Oral 6/20/06, enrolled in a PhD Program, North Carolina State University, Raleigh, NC. Presently an R&D Scientist at the National Geospatial-Intelligence Agency (NGA), Washington, DC.

Brendan O'Connor – "Model Development for a Cymbal Transducer," Master's Oral 6/21/06, MIT Lincoln Laboratory, Lexington, MA.

Francesca Reale – "Statistical Emulator Construction for Nonlinear Smart Systems," Master's Oral 11/6/09, Analyst at Johns Hopkins University Applied Physics Laboratory, Laurel, MD.

Dominic Pafundi – "Global Sensitivity Analysis of an Articular Cartilage Model," Master's Oral 8/12/15.

Ph.D. Advisor

Kamala Dadashova – Present, TA and SAMSI.

Harley Hanes – Present, RA Support (NASA).

Chris Edwards – Present, RA Support (NASA, NNSA-CNEC).

Walker Powell – Present, RA Support (NEUP).

Jessica Notestine – "Sensitivity and Active Subspace Analysis for Agent-Based Models," PhD Defense 8/17/22.

Jared Cook – "Surrogate Model Construction, Data Assimilation, and Data-Driven Equation Learning to Enable Nonproliferation Capabilities," RA Support (NNSA-CNEC) PhD Defense 4/21/20, Research Scientists, Teledyne Scientific, Durham, NC.

Evangelina Brayfindley – "Automated Defect Detection in Spent Nuclear Fuels in Wet Storage Using Machine Learning and Image Analysis Techniques," , RA Support (NNSA-CNEC) PhD Defense 8/15/19, Data Scientist (Machine Learning Researcher) at Pacific Northwest National Laboratory (PNNL), Richland, WA; Junior Professional Officer (JPO) in the safeguards information management group at the IAEA, Vienna, Austria, 2021-22.

Kayla Coleman – Active Subspace Techniques, Bayesian Inference and Uncertainty Propagation for Nuclear Neutronics and Chemistry Models, RA Support (DOE-CASL), PhD Defense 7/25/19, Front End Software Engineer, Udacity, Los Angeles, CA.

Nikolas Bravo – "Synthesis of Uncertainty Quantification, Surrogate Modeling, and Robust Control Design for PZT Birmorph Actuators", RA Support (AFOSR/SAMSI), PhD Defense 6/28/19, Senior System Engineer, Raytheon, Tuscon, AZ.

Isaac Michaud – "Simulation-Based Bayesian Experimental Design Using Mutual Information," Statistics PhD student co-directed with Eric Laber, RA Support (NNSA-CNEC), PhD Defense 1/14/19, Staff Scientist at Las Alamos National Laboratory.

Lider Leon – "Parameter Subset Selection and Subspace Analysis Techniques Applied to a Polydomain Ferroelectric Material Phase-Field Energy Model," RA Support (NSF, NSF-SEAS), PhD Defense 8/27/18, Staff Scientist at the Johns Hopkins Applied Physics Lab.

Deena Hannoun – "Simulating Non-Dilute Transport in Porous Media Using a Thermodynamically Constrained Averaging Theory-Based Model," PhD Defense 4/13/17, Limnology Modeling Project Manager at the Southern Nevada Water Authority.

Kathleen Schmidt – "Uncertainty Quantification for Mixed-Effects Models with Applications in Nuclear Engineering," RA Support (DOE-CASL, NNSA-CNEC, NSF), PhD Defense 6/21/16, Postdoc in the Applied Statistics group at Lawrence Livermore National Laboratory, Livermore, CA.

Allison Lewis – "Gradient-Free Active Subspace Construction and Model Calibration Techniques for Complex Models," RA Support (DOE-CASL), PhD Defense 5/19/16, Senior Professional Staff I in the Air and Missile Defense Sector, Johns Hopkins University Applied Physics Laboratory, Laurel, MD, St. Mary's College of Maryland, St. Mary's City, MD, Lafayette College, PA.

Mami Wentworth – "Verification Techniques for Parameter Selection and Bayesian Model Calibration Presented for an HIV Model," RA Support (SAMSI, DOE-CASL), PhD Defense 3/2/15, Assistant Professor at Wentworth Institute of Technology, Boston, MA.

Jerry McMahan – "Control Applications for Smart Systems Exhibiting Hysteretic Nonlinearities," RA Support (AFOSR, NSF-RTG), PhD Defense 7/24/13. Research Associate at the Air Force Research Lab, Wright Patterson AFB, Dayton, OH., Senior R&D Engineer, Digimarc, Beaverton, OR.

Jessica Matthews – "Sensitivity Analysis and Development of a Model that Quantifies the Effect of Soil Moisture and Plant Age on Leaf Conductance," PhD Defense 7/23/10. Staff Scientist at NOAA's National Climatic Data Center (NCDC), Asheville, NC.

Heather Wilson – "Model Development Nanotube-Infused Polyimides," SMART Fellowship, PhD Defense 7/28/09. Computer scientist at the Naval Undersea Warfare Center, Newport, RI.

Fan Xiang – "Model-Based Adaptive Control of Hysteresis in Smart Materials," RA Support (AFOSR), PhD Defense 7/24/09.

Ryan Siskind – "Model Development for Shape Memory Polymers," RA Support (NSF-RTG), PhD Defense 7/22/08. Senior Lead Data Scientist at Target, Minneapolis, MN.

Jon Ernstberger – "High Speed Parameter Estimation for a Homogenized Energy Model," RA Support (AFOSR), PhD Defense 6/23/08. Assistant Professor at LaGrange College, LaGrange, GA.

Thomas Braun – "High Speed Model Implementation and Inversion Techniques for Smart Material Transducers," GAANN Fellow, PhD Defense 8/1/07. R&D Scientist at National Geospatial-Intelligence Agency (NGA), Washington, DC.

Brian Ball – "Characterization of Stress Effects in Ferrolelectrics with Application to Transducer Design," RA Support (NASA, AFOSR, NSF), PhD Defense 8/15/06. Senior Engineer I at National Renewable Energy Laboratory, Golden, CO.

Andrew Hatch – "Model Development and Control Design for Atomic Force Microcopy," RA Support (DARPA, NSF), PhD Defense 8/25/04. Scientist III, Bioinformatics at Thermo Fisher Scientific (Life Technologies), San Diego, CA.

Jordan Massad – "Macroscopic Models for Shape Memory Alloy Characterization and Design," RA Support (NSF), PhD Defense 6/3/03. Principal Member of Technical Staff at Sandia National Laboratory, Albuquerque, NM.

James Nealis – "Model-Based Robust Control Designs for High Performance Magnetostrictive Transducers," RA Support (AROSR), *3rd Place Best Student Paper Award 2002* at the SPIE Symposium on Smart Structures and Materials, PhD Defense 5/23/03. Staff Engineer, Genomic Sciences at Becton Diskinson Technologies, Research Triangle Park, NC.

Postdoc Advisor

Emily Lada – Support (SAMSI, AFOSR), 2003-2004; Operations Research Specialist at SAS Institute, Inc., Cary, NC.

William Oates – Support (AFOSR), 2004-2006; Associate Professor of Mechanical Engineering, Florida State University, Tallahassee, FL.

Jayasimha Atulasimha – Support (Etrema/ONR), 2007-2008; Qimonda Associate Professor of Mechanical and Nuclear Engineering, Virginia Commonwealth University, Richmond, VA.

Michael Stuebner – Support (NSF-RTG), 2007-2010; Senior Scientist at Global Engineering and Materials, Inc., Princeton, NJ. Presently at University of Dayton Research Institute.

Zhengzheng Hu – Support (NSF RTG, DOE-CASL), 2009-2013; Owner and Center Director at Mathnasium, Raleigh, NC.

John Crews – Support (AFOSR), 2011-2012; Senior Scientist at Applied Research Associates, Raleigh, NC.

Nathan Burch – Support (AFOSR), 2012-2013; Assistant Professor, Gonzaga University, Spokane, WA.

Jerry McMahan – Support (DOE-CASL), 2013-2014; Postdoc at the AFRL, Wright Paterson AFB, Dayton, OH.

Razvan Stefanescu – Support (NNSA-CNEC), 2015-16; Data Assimilation Scientist at Spire working on weather products.

Lider Leon – Support (AFOSR), September 2018-January 2019; Staff Scientists at Johns Hopkins Applied Physics Lab.

Amanda Bernstein – Support (AFOSR), September 2018-January 2019; ORISE postdoc at EPA.

Paul Miles – Support (NNSA-CNEC, AFOSR), July 2017 - July 2019, Staff Scientist at Sandia National Laboratories, Albuquerque.

Publications

Books

1. H.T. Banks, R.C. Smith and Y. Wang, *Smart Material Structures: Modeling, Estimation and Control*, Masson/John Wiley, Paris/Chichester, 1996.

2. P.A. Gremaud, Z. Li, R.C. Smith and H.T. Tran, eds., *Industrial Mathematics: The 1998 CRSC Workshop*, SIAM, Philadelphia, 2000.

3. R.C. Smith and M.A. Demetriou, eds., *Research Directions in Distributed Parameter Systems,* SIAM, Philadelphia, 2003.

4. R.C. Smith, *Smart Material Systems: Model Development*, SIAM, Philadelphia, 2005.

5. R.C. Smith, *Uncertainty Quantification: Theory, Implementation and Applications*, SIAM, Philadelphia, 2014.

Chapters in Books (Invited)

1. H.T. Banks and R.C. Smith, "Models for Control in Smart Material Structures," in *Identification and Control in Systems Governed by Partial Differential Equations,* SIAM, Philadelphia 1993, pp. 26-44.

2. H.T. Banks and R.C. Smith, "Active Control of Acoustic Pressure Fields Using Smart Material Technologies," in *Flow Control*, Institute for Mathematics and Its Applications (IMA) Volume 68, Springer-Verlag, 1995, pp. 1-33.

3. H.T. Banks and R.C. Smith, "Numerical Techniques for Simulation, Parameter Estimation and Noise Control in Structural Acoustic Systems," in *Dynamics and Control of Distributed Systems*, Editors: H.S. Tzou and L.A. Bergman, Cambridge University Press, 1998, pp. 202-263.

4. A.R. Paterson, B.J. Reich, R.C. Smith, A.G. Wilson, and J.L. Jones, "Bayesian Approaches to Uncertainty Quantification and Structure Refinement from X-ray Diffraction," chapter in *Materials Discovery and Design: Data Science and Optimal Learning*, T. Lookman, S. Eidenbenz, F. Alexander and C. Barnes, Eds., Springer Series in Materials Science, Vol. 280, pp. 81-102, 2018.

5. S. P. Singh, A. R. Paterson, L. J. Wendelberger, C. M. Fancher, B. J. Reich, R. C. Smith, A. G. Wilson, and J. L. Jones, "Algorithms in Diffraction Profile Analysis," chapter in *Volume 1: Big Data Methods in Experimental Materials Discovery*, World Scientific Publishers, Ed. S.R. Kalidindi, S.V. Kalinin and T. Lookman, https://doi.org/10.1142/11389m May 2020.

Papers (Refereed Journals)

1. R.C. Smith, G.A. Bogar, K.L. Bowers and J. Lund, "The Sinc-Galerkin Method for Fourth-Order Differential Equations," *SIAM Journal on Numerical Analysis*, 28(3), 1991, pp. 760-788.

2. R.C. Smith, K.L. Bowers and J. Lund, "A Sinc-Galerkin Method for Euler-Bernoulli Beam Models," *Numerical Methods for Partial Differential Equations*, 8, 1992, pp. 171-202.

3. K.M. McArthur, R.C. Smith, K.L. Bowers and J. Lund, "The Sinc-Galerkin Method for Parameter Dependent Self-Adjoint Problems," *Applied Mathematics and Computation*, 50, 1992, pp. 175-202.

4. H.T. Banks, W. Fang, R.J. Silcox and R.C. Smith, "Approximation Methods for Control of Acoustic/Structure Models with Piezoceramic Actuators," *Journal of Intelligent Material Systems and Structures*, 4(1), 1993, pp. 98-116.

5. R.C. Smith and K.L. Bowers, "Sinc-Galerkin Estimation of Diffusivity in Parabolic Problems," *Inverse Problems*, 9(1), 1993, pp. 113-135.

6. H.T. Banks, R.J. Silcox and R.C. Smith, "The Modeling and Control of Acoustic/Structure Interaction Problems via Piezoceramic Actuators: 2-D Numerical Examples," *ASME Journal of Vibration and Acoustics*, 116(3), 1994, pp. 386-396.

7. H.T. Banks and R.C. Smith, "Feedback Control of Noise in a 2-D Nonlinear Structural Acoustics Model," *Discrete and Continuous Dynamical Systems*, 1(1), 1995, pp. 119-149.

8. H.T. Banks, R.C. Smith and Y. Wang, "The Modeling of Piezoceramic Patch Interactions with Shells, Plates and Beams," *Quarterly of Applied Mathematics*, 53(2), 1995, pp. 353-381.

9. H.T. Banks and R.C. Smith, "Well-Posedness of a Model for Structural Acoustic Coupling in a Cavity Enclosed by a Thin Cylindrical Shell," *Journal of Mathematical Analysis and Applications*, 191, 1995, pp. 1-25.

10. H.T. Banks and R.C. Smith, "Parameter Estimation in a Structural Acoustic System with Fully Nonlinear Coupling Conditions," *Mathematical and Computer Modelling*, 23(4), 1996, pp. 17-50.

11. H.T. Banks, M.A. Demetriou and R.C. Smith, "An H^∞/MinMax Periodic Control in a 2-D Structural Acoustic Model with Piezoceramic Actuators," *IEEE Transactions on Automatic Control*, 41(7), 1996, pp. 943-959.

12. H.T. Banks, M.A. Demetriou and R.C. Smith, "Robustness Studies for H^∞ Feedback Control in a Structural Acoustic Model with Periodic Excitation," *International Journal of Robust and Nonlinear Control*, 6, 1996, pp. 453-478.

13. H.T. Banks, R.C. Smith and Y. Wang, "Inverse Problems in Smart Material Structures," *Journal of Inverse and Ill-Posed Problems*, 4(5), 1996, pp. 371-380.

14. H.T. Banks, R.C. Smith, D.E. Brown, V.L. Metcalf and R.J. Silcox, "The Estimation of Material and Patch Parameters in a PDE-Based Circular Plate Model," *Journal of Sound and Vibration*, 199(5), 1997, pp. 777-799.

15. R.C. Smith, K.L. Bowers and C.R. Vogel, "Numerical Recovery of Material Parameters in Euler-Bernoulli Beam Models," *Journal of Mathematical Systems, Estimation and Control*, 7(2), 1997, pp. 157-195.

16. R.C. Smith, "A Galerkin Method for Linear PDE Systems in Circular Geometries with Structural Acoustic Applications," *SIAM Journal on Scientific Computing*, 18(2), 1997, pp. 371-402.

17. H.T. Banks, R.C. Smith, D.E. Brown, R.J. Silcox and V.L. Metcalf, "Experimental Confirmation of a PDE-Based Approach to Design of Feedback Controls," *SIAM Journal on Control and Optimization*, 35(4), 1997, pp. 1263-1296.

18. R.C.H. del Rosario and R.C. Smith, "Spline Approximation of Thin Shell Dynamics," *International Journal for Numerical Methods in Engineering*, 40, 1997, pp. 2807-2840.

19. H.T. Banks, R.C. Smith and Y. Zhang, "Damage Detection as Inverse Problems for Distributed Parameter Systems: Computational Approaches," *International Journal of Applied Electromagnetics and Mechanics*, 8, 1997, pp. 61-76.

20. H.T. Banks, M.A. Demetriou and R.C. Smith, "Utilization of Coupling Effects in Compensator Design for Structural Acoustic Systems," *Journal of the Acoustical Society of America*, 103(2), 1998, pp. 872-887.

21. R.C. Smith, "Hysteresis Modeling in Magnetostrictive Materials Via Preisach Operators," *Journal of Mathematical Systems, Estimation and Control*, 8(2), 1998.

22. R.C.H. del Rosario and R.C. Smith, "LQR Control of Thin Shell Dynamics: Formulation and Numerical Implementation," *Journal of Intelligent Material Systems and Structures*, 9(4), 1998, pp. 301-320.

23. R.C. Smith, "A Nonlinear Optimal Control Method for Magnetostrictive Actuators," *Journal of Intelligent Material Systems and Structures*, 9(6), 1998, pp. 468-486.

24. R.C. Smith and C.L. Hom, "Domain Wall Theory for Ferroelectric Hysteresis," *Journal of Intelligent Material Systems and Structures*, 10(3), 1999, pp. 195-213.

25. F.T. Calkins, R.C. Smith and A.B. Flatau, "An Energy-Based Hysteresis Model for Magnetostrictive Transducers," *IEEE Transactions on Magnetics*, 36(2), 2000, pp. 429-439.

26. M.J. Dapino, R.C. Smith and A.B. Flatau, "A Structural-Magnetic Strain Model for Magnetostrictive Transducers," *IEEE Transactions on Magnetics*, 36(3), 2000, pp. 545-556.

27. H.T. Banks and R.C. Smith, "Hysteresis Modeling in Smart Material Systems," *Applied Mechanics and Engineering*, 5(1), 2000, pp. 31-45.

28. H.T. Banks, R.C.H. del Rosario and R.C. Smith, "Reduced Order Model Feedback Control Design: Numerical Implementation in a Thin Shell Model," *IEEE Transactions on Automatic Control*, 45(7), 2000, pp. 1312-1324.

29. J.C. Piquette and R.C. Smith, "Analysis and Comparison of Four Anhysteretic Polarization Models for Lead Magnesium Niobate (PMN)" *Journal of the Acoustical Society*, 108(4), 2000, pp. 1651-1662.

30. R.C. Smith and Z. Ounaies, "A Domain Wall Model for Hysteresis in Piezoelectric Materials," *Journal of Intelligent Material Systems and Structures*, 11(1), 2000, pp. 62-79.

31. M.J. Dapino, R.C. Smith, L.E. Faidley and A.B. Flatau, "A Coupled Structural-Magnetic Strain and Stress Model for Magnetostrictive Transducers," *Journal of Intelligent Material Systems and Structures*, 11(2), 2000, pp. 134-152.

32. S. Chandrasekaran, D.K. Lindner and R.C. Smith, "Optimized Design of Switching Amplifiers for Piezoelectric Actuators," *Journal of Intelligent Material Systems and Structures*, 11, 2000, pp. 887-901.

33. R.C. Smith, "Inverse Compensation for Hysteresis in Magnetostrictive Transducers," *Mathematical and Computer Modelling*, 33, 2001, pp. 285-298.

34. D.M. Bortz, A.D. Rubio, H.T. Banks, A.B. Cain and R.C. Smith, "Control of Open Bay Acoustics by Harmonic Mass Injection," *International Journal of Aeroacoustics,* 1(1), 2002, pp. 65-81.

35. M.J. Dapino, R.C. Smith, F.T. Calkins and A.B. Flatau, "A Magnetoelastic Model for Villari-Effect Magnetostrictive Sensors," *Journal of Intelligent Material Systems and Structures*, 13(11), 2002, pp. 737-748.

36. R.C. Smith, M.J. Dapino and S. Seelecke, "A Free Energy Model for Hysteresis in Magnetostrictive Transducers," *Journal of Applied Physics*, 93(1), 2003, pp. 458-466.

37. J.E. Massad and R.C. Smith, "A Domain Wall Model for Hysteresis in Ferroelastic Materials," *Journal of Intelligent Material Systems and Structures*, 14(7), 2003, pp. 455-471.

38. R.C. Smith, S. Seelecke, Z. Ounaies and J. Smith, "A Free Energy Model for Hysteresis in Ferroelectric Materials," *Journal of Intelligent Material Systems and Structures*, 14(11), 2003, pp. 719-739.

39. R.C. Smith and C.L. Hom, "A Temperature-Dependent Constitutive Model for Relaxor Ferroelectrics," *Journal of Intelligent Material Systems and Structures*, 16(5), pp. 433-448, 2005.

40. J.E. Massad and R.C. Smith, "A homogenized free energy model for hysteresis in thin-film shape memory alloys," *Thin Solid Films*, 489(1-2), pp. 266-290, 2005.

41. R.C. Smith and A.G. Hatch, "Parameter Estimation Techniques for a Class of Nonlinear Hysteresis Models," *Inverse Problems*, 21, pp. 1363-1377, 2005.

42. R.C. Smith, A.G. Hatch, B. Mukherjee and S. Liu, "A Homogenized Energy Model for Hysteresis in Ferroelectric Materials: General Density Formulation," *Journal of Intelligent Material Systems and Structures*, 16(9), pp. 713-732, 2005.

43. R.C. Smith, S. Seelecke, M.J. Dapino and Z. Ounaies, "A Unified Framework for Modeling Hysteresis in Ferroic Materials," *Journal of the Mechanics and Physics of Solids*, 54(1), pp. 46-85, 2005.

44. S. Seelecke, S-J. Kim, B. Ball and R.C. Smith, "A Rate-Dependent Two-Dimensional Free Energy Model for Ferroelectric Single Crystals," *Continuum Mechanics and Thermodynamics*, 17(4), pp.337-350, 2005.

45. L.M. Weiland, E.K. Lada, R.C. Smith and D.J. Leo, "Application of Rotational Isomeric State Theory to Ionic Polymer Stiffness Predictions," *Journal of Materials Research*, 20(9), pp. 2443–2455, 2005.

46. J.L. Matthews, E.K. Lada, L.M. Weiland, R.C. Smith and D.J. Leo, "Monte Carlo Simulation of a Solvated Ionic Polymer with Cluster Morphology," *Smart Materials and Structures*, 15, pp. 187–199, 2006.

47. T.R. Braun, R.C. Smith and M.J. Dapino, "Experimental Validation of a Homogenized Energy Model for Magnetic After-Effects," *Applied Physics Letters*, 88, pp. 122511- 122513, 2006.

48. R.C. Smith, M.J. Dapino, T.R. Braun and A.P. Mortensen, "A Homogenized Energy Framework for Ferromagnetic Hysteresis," *IEEE Transactions on Magnetics*, 42(7), pp. 1747-1769, 2006.

49. R.C. Smith and M.J. Dapino, "A Homogenized Energy Model for the Direct Magnetomechanical Effect," *IEEE Transactions on Magnetics*, 42(8), pp. 1944-1957, 2006.

50. T.R. Braun and R.C. Smith, "Efficient Implementation Algorithms for Homogenized Energy Models," *Continuum Mechanics and Thermodynamics*, 18(3-4), pp. 137-155, 2006.

51. B.L. Ball, R.C. Smith, S-J. Kim and S. Seelecke, "A Stress-Dependent Hysteresis Model for Ferroelectric Materials," *Journal of Intelligent Material Systems and Structures*, 18(1), pp. 69–88, 2007.

52. A.G. Hatch, R.C. Smith, T. De and M.V. Salapaka, "Construction and Experimental Implementation of a Model-Based Inverse Filter to Attenuate Hysteresis in Ferroelectric Transducers," *IEEE Transactions on Control Systems Technology*, 14(6), pp. 1058–1069, 2006.

53. J.M. Nealis and R.C. Smith, "Model-Based Robust Control Design for Magnetostrictive Transducers Operating in Hysteretic and Nonlinear Regimes," *IEEE Transactions on Control Systems Technology*, 15(1), pp. 22–39, 2007.

54. R.C. Smith, A.G. Hatch, T. De, M.V. Salapaka, R.C.H. del Rosario and J.K. Raye, "Model Development for Atomic Force Microscope Stage Mechanisms," *SIAM Journal on Applied Mathematics*, 66(6), pp. 1998-2026, 2006.

55. M. Lenczner and R.C. Smith, "A Two-Scale Model for an Array of AFM's Cantilever in the Static Case," *Mathematical and Computer Modeling*, 46, pp. 776–805, 2007.

56. M.A. Demetriou, K. Ito and R.C. Smith, "Adaptive Monitoring and Accommodation of Nonlinear Actuator Faults in Positive Real Infinite Dimensional Systems," *IEEE Transactions on Automatic Control*, 52(12), pp. 2332–2338, 2007.

57. W.S. Oates and R.C. Smith, "Nonlinear Optimal Control Techniques for Vibration Attenuation Using Magnetostrictive Actuators," *Journal of Intelligent Material Systems and Structures*, 19(2), pp. 193–209, 2008.

58. T.R. Braun and R.C. Smith, "High Speed Model Implementation and Inversion Techniques for Ferroelectric and Ferromagnetic Transducers," *Journal of Intelligent Material Systems and Structures*, 19(11), pp. 1295–1310, 2008.

59. W.S. Oates and R.C. Smith, "Optimal Tracking Using Magnetostrictive Transducers Operating in the Nonlinear and Hysteretic Regime," CRSC Technical Report CRSC-TR05-36; *Journal of Dynamic Systems, Measurement, and Control*, 131(3), 2009.

60. M.A. Demetriou, K. Ito and R.C. Smith, "Adaptive Techniques for the MRAC, Adaptive Parameter Identification, and On-Line Fault Monitoring and Accommodation for a Class of Positive Real Infinite Dimensional Systems," *International Journal of Adaptive Control and Signal Processing*, 23(2), pp. 193-215, 2009.

61. W.S. Oates, P.G. Evans, R.C. Smith and M.J. Dapino, "Experimental Implementation of a Hybrid Nonlinear Control Design for Magnetostrictive Actuators," *Journal of Dynamic Systems, Measurement, and Control*, 131, 041004, 2009.

62. M. Stuebner, J. Atulasimha and R.C. Smith, "Quantification of Hysteresis and Nonlinear Effects on the Frequency Response of Ferroelectric and Ferromagnetic Materials," *Smart Materials and Structures*, 18, 104019, 2009.

63. W.S. Oates, R. Zrostlik, S. Eichhorn and R.S. Smith, "A Nonlinear Optimal Control Design Using Narrowband Perturbation Feedback for Magnetostrictive Actuators," *Journal of Intelligent Material Systems and Structures*, 21(16), pp. 1681–1693, 2010.

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75. J.H. Crews, R.C. Smith and J. Hannen, "Development of robust control algorithms for shape memory alloy bending actuators," Proceedings of the ASME 2012 Conference on Smart Materials, Adaptive Structures and Intelligent Systems, SMASIS 2012, Stone Mountain, GA, September 19-21, 2012.

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80. W.S. Oates, P. Miles, L. Leon and R.C. Smith, "Uncertainty analysis of continuum scale ferroelectric energy landscapes using density functional theory," Proceedings of the SPIE, Smart Structures and Materials 2016.

81. N. Bravo, R.C. Smith and J. Crews, "Surrogate model development and feedforward control implementation of PZT bimorph actuators employed for robobee," Proceedings of the SPIE, Smart Structures and Materials 2017, Portland,OR, doi:10.1117/12.2259948.

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85. S. Haque, L.P. Kindrat, L. Zhang, V. Mikheev, D. Kim, S. Liu, J. Chung, M. Kuian, J.E. Massad and R.C. Smith, "Uncertainty-enabled design of electromagnetic reflectors with integrated shape control," Proceedings of the SPIE, Smart Structures and Materials 2018, Denver, CO.

86. L.S. Leon, R.C. Smith, P. Miles and W.S. Oates, "Active subspace uncertainty quantification for a polydomain ferroelectric phase-field model," Proceedings of the SPIE, Smart Structures and Materials 2018, Denver, CO.

87. N. Bravo and R.C. Smith, "Parameter dependent surrogate model development for PZT biomorph actuators employed for robobee," Proceedings of the SPIE, Smart Structures and Materials 2019, Denver, CO.

88. P.R. Miles, G.T. Pash, R.C. Smith and W. Oates, "Global sensitivity analysis of fractional-order viscoelasticity models," Proceedings of the SPIE, Smart Structures and Materials 2019, Denver, CO.

Conference Talks, Workshops, Colloquia and Plenary Lectures, Short Courses

(* = support received from organizers)

Conference Talks

1988   "A Sinc-Galerkin Approximation to Fourth-Order Linear Ordinary Differential Equations," Eleventh Annual Idaho State University Spring Conference, Pocatello, ID, April 27.

"Efficient Numerical Solution of Fourth-Order Problems in the Modeling of Flexible Structures," Bozeman Conference on Computation and Control, Bozeman, MT, August 2 (Invited).

1989 "A Sinc-Galerkin Method for Flexible Structures," Minisymposium on Numerical Methods in Parameter Identification, SIAM Conference on Control in the 90's, San Francisco, CA, May 18 (Invited).

1990 "A Fully Galerkin Method for the Recovery of Stiffness and Damping Parameters in Euler-Bernoulli Beam Models," Second Bozeman Conference on Computation and Control, Bozeman, MT, August 2 (Invited).

1991 "A Sinc-Galerkin Method for the Recovery of Material Parameters in Euler-Bernoulli Beams," Minisymposium on Sinc Procedures for Time-Dependent Problems in Mathematical Physics at ICIAM 91, Washington, D.C., July 10 (Invited).

1992 "Approximation Methods for Control of Acoustic/Structure Models with Piezoceramic Actuators," Conference on Recent Advances in Adaptive and Sensory Materials and Their Applications, Virginia Polytechnic Institute and State University, Blacksburg, VA, April 29.

* "A Piezoelectric Actuator Model for Feedback Control of Noise in Thin Cylindrical Shells," Third Bozeman Conference on Computation and Control, Bozeman, MT, August 6 (Invited).

"Feedback Control of Nonlinear Fluid/Structure Interaction Models via Piezoceramic Actuators," Minisymposium on Computational Control of Distributed Parameter Systems, SIAM Conference on Control and Its Applications, Minneapolis, MN, September 19 (Invited).

"Modeling, Approximation and Feedback Control in a Structural Acoustics Problem," Session on Control of Smart Structures, 31st IEEE Conference on Decision and Control, Tucson, AZ, December 17 (Invited).

1993 "Modeling of the Structural Acoustic Coupling Inside a Thin Cylindrical Shell," Session on Computational Methods II, North American Conference on Smart Structures and Materials, Albuquerque, NM, February 1.

"Modeling and Parameter Estimation Issues in Structural Acoustic Control Applications," Second Conference on Recent Advances in Active Control of Sound and Vibration, Virginia Polytechnic Institute and State University, Blacksburg, VA, April 28.

1994 "A PDE-Based Methodology for Modeling, Parameter Estimation and Feedback Control in Structural and Structural Acoustic Systems," Session on Structural Acoustics, 1994 North American Conference on Smart Structures and Materials, Orlando, FL, February 15.

"Noise Control in a 3-D Structural Acoustic System," Second International Conference on Intelligent Materials, Williamsburg, VA, June 8.

"Parameter Estimation in a 3-D Structural Acoustic System," 2nd IEEE Mediterranean Symposium on New Directions in Control and Automation, Maleme, Chania, Crete, June 21 (Invited).

* "Distributed Parameter Control Techniques for Structural Acoustic Systems – Numerical Issues," Fourth Bozeman Conference on Computation and Control, Bozeman, MT, August 5 (Invited).

"Noise Control in a 3-D Structural Acoustic System: Numerical and Experimental Implementation of a PDE-Based Methodology," Session on Control of Fluid Dynamical Systems, 33rd IEEE Conference on Decision and Control, Orlando, FL, December 14 (Invited).

1995   "Distributed Parameter Control Techniques for Structural Acoustic Systems," Minisymposium on Applications of PDE Control Methods, Third SIAM Conference on Control and Its Applications, St. Louis, MO, April 29 (Invited).

"Parameter Estimation for an Imperfectly Clamped Plate – Numerical Examples," Minisymposium on Parameter Estimation, 1995 ASME Design Engineering Technical Conferences, Boston, MA, September 18 (Invited).

"PDE-Based Control of Structural Vibrations Using Piezoceramic Actuators," Session on Smart Material Applications, 24th Midwestern Mechanics Conference, Ames, IA, October 3 (Invited).

"PDE-Based Control of Vibration and Sound in Structural and Structural Acoustic Systems," Session on Acoustics and Vibration, 1995 SIAM Annual Meeting, Charlotte, NC, October 26.

"H^∞ Control of Noise in a 3-D Structural Acoustic System," Minisymposium on Control and Identification of Hybrid Distributed Parameter Systems, 34th IEEE Conference on Decision and Control, New Orleans, LA, December 15 (Invited).

1996   *   "PDE-Based Compensators for Structural Acoustic Systems," 1996 AMS-IMS-SIAM Summer Research Conferences in the Mathematical Sciences, Session on Optimization Methods in Partial Differential Equations, Mount Holyoke College, South Hadley, MA, June 18 (Invited).

   *   "PDE-Based Controllers for Structural and Structural Acoustic Systems," International Conference on Control and Estimation of Distributed Parameter Systems, Vorau, Austria, July 16 (Invited).

"PDE-Based Compensator Design for Structural Acoustic Systems," Minisymposium on Identification and Control in Distributed Parameter Systems, 1996 SIAM Annual Meeting, Kansas City, MO, July 22.

   *   "The Modeling of Magnetostrictive Transducers," Fifth Bozeman Conference on Computation and Control, Bozeman, MT, July 31 (Invited).

1997   "Modeling Aspects Concerning Magnetostrictive Transducers," SPIE's Fourth Annual Symposium on Smart Structures and Materials, San Diego, CA, March 3.

"Modeling Hysteresis and Material Nonlinearities in Magnetostrictive Transducers," Minisymposium on Mathematical Issues in Smart or Active Material Structures and Devices, Second SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, PA, May 12 (Invited).

   *   "Modeling and Control Issues Concerning Magnetostrictive Actuators," Conference on Control and Partial Differential Equations, CIRM, Marseille-Luminy, France, June 20 (Invited).

"Identification and Control Issues Concerning Magnetostrictive Materials," Minisymposium on Implementation Issues Concerning Control and Identification in Distributed Parameter Systems, SIAM's 45th Anniversary and Annual Meeting, Palo Alto, CA, July 14.

"Hysteresis Modeling for Magnetostrictive Materials," Session on Stability and Stabilization, 18th IFIP Conference on System Modelling and Optimization, Detroit, MI, July 24 (Invited).

"LQR Control of Shell Vibrations via Piezoceramic Actuators," Session on Shape Optimization and Control of Elastic Systems, 18th IFIP Conference on System Modelling and Optimization, Detroit, MI, July 25 (Invited).

"Experimental Confirmation of a PDE-Based Approach to Feedback Design," Session on Distributed Parameter Systems III, 36th IEEE Conference on Decision and Control, San Diego, CA, December 11 (Invited).

"A Nonlinear Model-Based Control Method for Magnetostrictive Actuators," Session on Modeling for Identification and Control of Controllable Material Structures, 36th IEEE Conference on Decision and Control, San Diego, CA, December 12 (Invited).

1998   "An Active and Structural Strain Model for Magnetostrictive Transducers," SPIE's Fifth Annual Symposium on Smart Structures and Materials, San Diego, CA, March 3.

"Modeling and Control Issues Concerning Nonlinear Transducers," Session on Implementation Issues Concerning Identification and Control in Distributed Parameter Systems, Fourth SIAM Conference on Control and its Applications, Jacksonville, FL, May 9 (Invited).

*   "Modeling and Control Issues Concerning Nonlinear Smart Material Transducers," Computation and Control VI, Bozeman, MT, August 7 (Invited).

1999   "A Domain Wall Model for Ferroelectric Hysteresis," SPIE's Sixth Annual Symposium on Smart Structures and Materials, Newport Beach, CA, March 1.

"Modeling Aspects Concerning THUNDER Actuators," SPIE's Sixth Annual Symposium on Smart Structures and Materials, Newport Beach, CA, March 4.

*   "Modeling and Control Issues Concerning Magnetostrictive Actuators," Eighteenth Annual Conference on Properties and Applications of Magnetic Materials, Illinois Institute of Technology, Chicago, IL, April 28 (Invited).

"Modeling and Control Issues Concerning Smart Materials with Hysteresis," Minisymposium on Control Problems for Nonlinear Partial Differential Equations, 20th Annual Meeting of the Canadian Applied and Industrial Mathematics Society, Université Laval, Québec, Canada, June 12 (Invited).

*   "Modeling and Control Issues Concerning Smart Materials with Hysteresis," NSF-CBMS Workshop on Control of Distributed Parameter Systems, University of Nebraska, Lincoln NE, August 10 (Invited).

"Modeling and Control Issues Concerning Smart Materials," Session on Engineering Acoustics: Transducer Loss Mechanisms, 138th Meeting of the Acoustical Society of America, Columbus, OH, November 1 (Invited).

"Modeling and Control Issues Concerning Smart Materials with Hysteresis," Adaptive Structures and Material Systems Symposium, 1999 ASME International Mechanical Engineering Congress and Exposition, Nashville, TN, November 17.

"Modeling Aspects Concerning THUNDER Actuators," Adaptive Structures and Material Systems Symposium, 1999 ASME International Mechanical Engineering Congress and Exposition, Nashville, TN, November 18.

"Modeling and Optimization Issues Concerning a Circular Piezoelectric Actuator Design," Adaptive Structures and Material Systems Symposium, 1999 ASME International Mechanical Engineering Congress and Exposition, Nashville, TN, November 18.

"Modeling and Control Issues Concerning Smart Materials with Hysteresis," Smart Materials Symposium, Fall Meeting of the Materials Research Society, Boston, MA, December 2.

"Inverse Compensation for Hysteresis in Piezoceramic, Electrostrictive and Magnetostrictive Materials," Session on Control of Distributed Parameter Systems: New Approaches and Applications, 38th IEEE Conference on Decision and Control, Phoenix, AZ, December 9 (Invited).

2000   "A Domain Wall Model for Hysteresis in Piezoelectric Materials," SPIE's Seventh Annual Symposium on Smart Structures and Materials, Newport Beach, CA, March 7.

"Control Strategies for Smart Material Systems with Hysteresis," SPIE's Seventh Annual Symposium on Smart Structures and Materials, Newport Beach, CA, March 7.

"A Temperature-Dependent Constitutive Model for Relaxor Ferroelectrics," SPIE's Seventh Annual Symposium on Smart Structures and Materials, Newport Beach, CA, March 8.

"Development and Validation of a Hysteresis Model for Piezoelectric Actuators," Session on Analytic and Experimental Characterization of Piezoelectric Materials, Third SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, PA, May 23 (Invited).

"Partial and Full Inverse Compensation for Hysteresis in Smart Material Systems," Session on Control of Distributed Parameter Systems, 2000 American Control Conference, Chicago, IL, June 29 (Invited).

"Hysteresis Modeling for an Atomic Force Microscope," Computation and Control VII, Bozeman, MT, August 4 (Invited).

2001   "A Unified Model for Hysteresis in Ferroic Materials," SPIE's Eighth Annual Symposium on Smart Structures and Materials, Newport Beach, CA, March 5 (Invited).

"A Displacement Model for THUNDER Actuators Having General Loads and Boundary Conditions," SPIE's Eighth Annual Symposium on Smart Structures and Materials, Newport Beach, CA, March 6.

"A Frequency-Dependent Model for Relaxor Ferroelectrics," SPIE's Eighth Annual Symposium on Smart Structures and Materials, Newport Beach, CA, March 7.

"Compensation for Hysteresis in Smart Material Systems," SPIE's Eighth Annual Symposium on Smart Structures and Materials, Newport Beach, CA, March 8.

*   "The Modeling and Control of Hysteresis and Nonlinear Dynamics in an Atomic Force Microscope," 8th Conference on Control of Distributed Parameter Systems," Graz, Austria, July 19 (Invited).

"Modeling of Hybrid Piezoelectric/Magnetostrictive Transducers," 2001 ASME Design Engineering Technical Conferences, Pittsburgh, PA, September 10.

"A Unified Model for Hysteresis in Ferroic Materials," 2001 ASME Design Engineering Technical Conferences, Pittsburgh, PA, September 10.

"Narrowband Control Design for Smart Structural Systems," 2001 ASME Design Engineering Technical Conferences, Pittsburgh, PA, September 10.

"Model Development for High-Performance Piezoelectric Polymers," Symposium on Electroactive Polymers and their Applications as Actuators, Sensors and Artificial Muscles, Fall Meeting of the Materials Research Society, Boston, MA, November 27.

"Adaptive Estimation and Control Design for Smart Systems with Hysteresis," 40th IEEE Conference on Decision and Control, Orlando, FL, December 7.

2002   "A Free Energy Model for Hysteresis in Piezoceramic Materials," SPIE's 9th Annual Symposium on Smart Structures and Materials, San Diego, CA, March 18.

"An Energy Formulation for Preisach Models," SPIE's 9th Annual Symposium on Smart Structures and Materials, San Diego, CA, March 18.

"Model Development and Control Design for Atomic Force Microscopy," SPIE's 9th Annual Symposium on Smart Structures and Materials, San Diego, CA, March 19.

"Model Development for Piezoelectric Polymer Unimorphs," SPIE's 9th Annual Symposium on Smart Structures and Materials, San Diego, CA, March 20.

"A Free-Energy Model for Hysteresis in Ferroelectric and Ferromagnetic Materials," Symposium on Continuum Mechanics and Thermodynamics, 14th US National Congress of Theoretical and Applied Mechanics, Blacksburg, VA, June 28 (Invited).

"Modeling and Control Issues Associated with Atomic Force Microscopy," Fifteenth International Symposium on Mathematical Theory of Networks and Systems, South Bend, IN, August 16 (Invited).

"Model Development and Control Design for High Performance Nonlinear Smart Material Systems," Symposium on New Trends in Nonlinear Dynamics and Control, and Their Applications, Naval Postgraduate School, Monterey, CA, October 19.

"Model Development and Control Design for High Speed Nanopositioning," 41st IEEE Conference on Decision and Control, Las Vegas, NV, December 13.

2003   "A Unified Model for Hysteresis in Ferroic Materials," SPIE's 10th Annual Symposium on Smart Structures and Materials, San Diego, CA, March 3.

"A Fully Coupled Free Energy Model for Hysteresis in Magnetostrictive Transducers," SPIE's 10th Annual Symposium on Smart Structures and Materials, San Diego, CA, March 3.

"Design of a Membrane Aperture Deployable Structure," 44th AIAA/ASME/ASCE/ AHS Structures, Structural Dynamics and Materials Conference, Norfolk, VA, April 7.

"A Free Energy-Based Model for Hysteresis and Nonlinearities in Piezoceramic Materials," 105th Annual Meeting and Exposition of the American Ceramic Society, Symposium on High Strain Piezoelectric Materials, Devices and Applications, Nashville, TN, May 30 (Invited).

"A Unified Model for Hysteresis in Ferroic Materials," Fifth International Conference on Intelligent Materials, The Pennsylvania State University, State College, PA, June 15.

"Modeling and Control Issues Arising in the Quest for Single Electron Spin Detection," Computational Control and Biological Systems VIII, Bozeman, MT, July 31 (Invited).

"Control Design for Nonlinear Smart Transducers," 42nd IEEE Conference on Decision and Control, Maui, HA, December 10.

"Model Development for Piezoceramic Nanopositioners," 42nd IEEE Conference on Decision and Control, Maui, HA, December 10 (Invited).

2004   "Parameter Estimation Techniques for Nonlinear Hysteresis Models," SPIE's 11th Annual Symposium on Smart Structures and Materials, San Diego, CA, March 16.

"Electrostatic Operation and Curvature Modeling for a MEMS Flexible Film Actuator," SPIE's 11th Annual Symposium on Smart Structures and Materials, San Diego, CA, March 16.

"Model Development and Control Design for High Performance Systems," World Congress of Nonlinear Analysts, Orlando, FL, July 2.

"Multiscale Models for Smart Material Transducers," SIAM Annual Meeting, Portland, OR, July 14.

"Experimental Implementation of a Model-Based Inverse Filter to Attenuate Hysteresis in an Atomic Force Microscope," 43rd IEEE Conference on Decision and Control, Paradise Island, The Bahamas, December 16.

2005   "Application of Monte Carlo Simulations to the Prediction of the Effective Elastic Moduli of Hydrated Nafion," SPIE's 12th Annual Symposium on Smart Structures and Materials, San Diego, CA, March 9.

"Application of Monte Carlo Simulations to the Prediction of Effective Elastic Moduli of Hydrated Ionic Polymers," Minisymposium on Nonlinear Smart Material Control Systems, Sixth SIAM Conference on Control and Its Applications, New Orleans, LA, July 13 (Invited).

"A Stress-Dependent Hysteresis Model for Ferromagnetic Transducer Materials," ASME International Mechanical Engineering Contress and Exposition, Orlando, FL, November 9.

2006   "A Reptation Model for Magnetic Materials," SPIE's 13th Annual Symposium on Smart Structures and Materials, San Diego, CA, February 28.

"Nonlinear Perturbation Control for Magnetic Transducers," 45th IEEE Conference on Decision and Control, San Diego, CA, December 14.

2007   "Perturbation Control Techniques for Magnetic Transducers," Minisymposium on Nonlinear Smart Material Systems, SIAM Conference on Control and Its Applications, San Francisco, CA, June 29 (Invited).

"Model Development for Shape Memory Polymers," 44th Annual Technical Meeting, Society of Engineering Science, College Station, TX, October 23.

"High Speed Model Implementation for Real-Time Control of Ferroelectric and Ferromagnetic Transducers Operating in Nonlinear and Hysteretic Regimes," 46th IEEE Conference on Decision and Control, New Orleans, LA, December 12 (Invited).

2008   "An Energy Derivation for Classical and Extended Preisach Models," Minisymposium on Nonlinear Smart Material Systems, SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, PA, May 14 (Invited).

"An Energy Formulation for Preisach Models with Applications to Structural Models," Eighteenth International Symposium on Mathematical Theory of Networks and Systems (MTNS2008), Blacksburg, VA, July 29 (Invited).

2009   "Efficient Algorithms for Implementation of Hysteresis Models," SPIE's 16th Symposium on Smart Structures and Materials, San Diego, CA, March 9.

"Adaptive Control Design for Hysteretic Systems Modeled by the Homogenized Energy Framework," Minisymposium on Model Development and Control Design for Hysteretic Systems, SIAM Conference on Control and Its Applications, Denver, CO, July 7 (Invited).

2010   "Adaptive Nonlinear Control Design for Hysteretic Smart Systems," SPIE's 17th Symposium on Smart Structures and Materials, San Diego, CA, March 8.

2011   "Data-Driven Techniques to Estimate Parameters in Rate-Dependent Hysteresis Models, International Symposium on Hysteresis Modelling and Micromagnetics (HMM 2011), Levico, Italy, May 11.

"Model Development, Uncertainty Quantification, and Control Design for Nonlinear Smart Material systems," SIAM Conference on Control and Its Applications, Baltimore MD, July 25 (Invited).

"Model Development, Uncertainty Quantification, and Control Design for Systems with Nonlinear and Hysteretic Actuators," SIAM Conference on Analysis of Partial Differential Equations, San Diego, CA, November 16 (Invited).

"Statistical Parameter Estimation and Uncertainty Quantification for Macro-Fiber Composite Actuators Operating in Hysteretic and Nonlinear Regimes," 50th IEEE Conference on Decision and Control, Orlando, FL, December 13 (Invited).

2012   "Statistical Parameter Estimation and Uncertainty Quantification for Macro-Fiber Composite Actuators Operating in Hysteretic and Nonlinear Regimes," SPIE Symposium on Smart Structures and Materials, San Diego, CA, March 12.

"Parametric and Model Uncertainty Quantification for Macro-Fiber Composite Actuators Employed in Nonlinear and Hysteretic Regimes," SIAM Conference on Uncertainty Quantification, Raleigh, NC, April 5 (Invited).

"Model Development and Uncertainty Quantification for Applications Employing Macro-Fiber Composites," Florida Center for Advanced Aero-Propulsion Annual Technical Symposium, April 27 (Invited).

"Bayesian Techniques to Quantify Parameter and Model Uncertainty in Nonlinear Distributed Smart Material Systems," 8th International Conference on Differential Equations and Dynamical Systems, Waterloo, Canada, August 1 (Invited).

"Homogenized Energy Model for Characterizing Magnetization and Strains in Ferromagnetic Materials," ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS 2012), Stone Mountain, GA, September 20.

2013   "Quantification of Parameter Uncertainties and Construction of Prediction Intervals for Nonlinear Distributed Material Models," SIAM Conference on Computational Science and Engineering, Boston, MA, March 1 (Invited).

"Bayesian Techniques to Quantify Parameter and Model Uncertainty in Nonlinear Distributed Smart Material Systems," SPIE Symposium on Smart Structures and Materials, San Diego, CA, March 11.

"Bayesian Techniques for Model Calibration and Quantification of Model Errors," SIAM Conference on Control and Its Applications, San Diego, CA, July 9 (Invited).

"Uncertainty Quantification for Robust Control Design of Smart Material Systems," ASME 2013 Conference on Smart Materials, Adaptive Structures and Intelligent Systems, Snowbird, UT, September 18.

"Model Development, Uncertainty Quantification, and Robust Control Design for Distributed Systems with Nonlinear and Hysteretic Actuators," SIAM Conference on Analysis of Partial Differential Equations," Orlando, FL, December 9 (Invited).

2014   "Bayesian Techniques to Quantify Parameter and Model Uncertainty in Smart Material Systems," SPIE Symposium on Smart Structures and Materials, San Diego, CA, March 11.

"Bayesian Model Calibration in the Presence of Model Uncertainty," SIAM Conference on Uncertainty Quantification, Savannah, GA, April 2 (Invited).

"Parameter Selection Techniques for an HIV Model," SIAM Conference on Uncertainty Quantification, Savannah, GA, April 2 (Invited).

"Bayesian Model Calibration in the Presence of Model Discrepancy," 7th International Conference "Inverse Problems: Modeling and Simulation", Öludeniz–Fethiye, Turkey, May 27 (Invited).

"Bayesian Model Calibration in the Presence of Model Discrepancy," Second Conference of the International Society of Nonparametric Statistics, Cádid, Spain, June 13 (Invited).

2015   "Bayesian Techniques to Quantify Parameter and Model Uncertainty in Smart Material Systems," SPIE Symposium on Smart Structures and Materials, San Diego, CA, March 9.

"Parameter Selection Techniques for Disease Models," SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 14 (Invited).

"An Information Theoretic Approach to Use High-Fidelity Codes to Calibrate Low-Fidelity Codes," Montana Uncertainty Quantification (MUQ) Conference, June 24 (Invited).

2016   "Global Sensitivity Analysis for Constructing a Quantum-Informed Homogenized Energy Model, SPIE Symposium on Smart Structures and Materials, Las Vegas, NV, March 21.

"Gradient-Free Active Subspace Construction Via Adaptive Morris Indices," SIAM Conference on Uncertainty Quantification, Lausanne, Switzerland, April 7 (Invited).

"LASSO Techniques for Parameter Selection," IFAC Symposium on Nonlinear Control Systems, Monterey, CA, August 24 (Invited).

"Parameter Estimation for Predictive Simulation of Oscillatory Systems with Model Discrepancy," IFAC Symposium on Nonlinear Control Systems, Monterey, CA, August 24 (Invited).

"Calibration of Complex Material Models on Reduced Parameter Spaces," ASME 2016 Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS), Stowe, VT, September 28.

2017   "An Information Theoretic Approach to Use High-Fidelity Codes to Calibrate Low-Fidelity Codes," SIAM Conference on Computational Science and Engineering, Atlanta, GA, February 28.

"Bayesian Model Calibration on Active Subspaces," American Control Conference, Seattle, WA, May 25 (Invited).

2018   "Active Subspace Uncertainty Quantifiation for a Polydomain Ferroelectric Phase-Field Model,' SPIE Symposium on Smart Structures and Materials, Denver, CO, March 6.

"Mutual Information-Based Experimental Design for Problems in Nuclear Engineering," SIAM Conference on Uncertainty Quantification, Garden Grove, CA, April 16 (Invited).

2019   "Surrogate-Based Bayesian Inference for Source Localization," American Geophysical Union Conference, San Francisco, CA, December 9 (Invited).

2020   "Mathematical Uncertainty Quantification for Science and Engineering Models," Joint Statistical Meetings, Remote, August 5 (Invited).

"Sensitivity Analysis for Biological Models," Session: Model Analysis Boot Camp for Pharmacometricians, American Conference on Pharmacometrics, Remote, November 13 (Invited).

"Parameter Estimation for Biological Models," Session: Model Analysis Boot Camp for Pharmacometricians, American Conference on Pharmacometrics, Remote, November 13 (invited).

2021   "Techniques to Quantify, Improve, and Validate the Predictive Capabilities of Models," Roundtable at the Society for Risk analysis (SRA) Annual Meeting, Remote, December 8 (Invited).

2022   "Techniques to Quantify, Improve, and Validate the Predictive Capabilities of Models," Sensitivity Analysis of Model Output Conference, Florida State University, Tallahassee, FL, Remote, March 14 (Invited).

"Active Subspace Techniques for Sensitivity Analysis and Uncertainty Quantification," Joint Mathematics Meetings, Remote, April 6 (Invited).

"Model-Based Techniques for Radiation Source Localization in an Urban Environment," SIAM Conference on Uncertainty Quantification, Atlanta, GA, April 15.

"The Role of Uncertainty Quantification in the Mars Sample Return Mission," Joint Statistical Meetings (JSM), Washington, DC, August 11 (Invited).

Invited Workshop Talks

1992   "Feedback Control of Noise in Structural Acoustics Models via Piezoceramic Actuators," NASA Langley Research Center Workshop on Adaptive/Intelligent/Smart Materials & Structures, Hampton, VA, October 26.

1995   "PDE-Based Control of Noise and Vibration in Structural Acoustic Systems," NASA Interior Noise Workshop, NASA Langley Research Center, Hampton, VA, April 27.

1996   "Galerkin Methods for Constructing PDE-Based Controllers," Second International ISU Workshop on Numerics for Dynamical Systems," Iowa State University, Ames, IA, April 15.

"Model-Based Compensator Design for Structural Acoustic Systems," NASA Interior Noise Workshop, NASA Langley Research Center, Hampton, VA, September 11.

"Model-Based Controllers for Structural Acoustic Systems," ICASE/LaRC Second Industry Roundtable, Session on Structural Acoustics, Williamsburg, VA, October 9.

1997   "Active Control of Noise," 1997 AFOSR Workshop on Dynamics and Control, Wright-Patterson AFB, OH, May 22.

1998   "Reduced Order Control Design for High Order Systems," NASA Interior Noise Workshop, Hampton, VA, February 22.

"Strain Modeling for Magnetostrictive Transducers," 1998 ONR Transducer Materials and Transducers Workshop, Penn State University, State College, PA, May 13.

"Reduced Order Control Design for High Order Systems," 1998 AFOSR Workshop on Dynamics and Control, Pasadena, CA, May 28.

1999   "A Domain Wall Model for Ferroelectric Hysteresis," 1999 U.S. Navy Workshop on Acoustic Transduction Materials and Devices, Penn State University, State College, PA, April 14.

"Modeling and Control Issues Concerning Smart Materials with Hysteresis," Fourth ARO Workshop on Smart Structures, Penn State University, State College, PA, August 16.

2000   "A Magnetoelastic Model for Magnetostrictive Sensors," 2000 U.S. Navy Workshop on Acoustic Transduction Materials and Devices, Penn State University, State College, PA, April 12.

"A Domain Wall Model for Hysteresis in Piezoelectric Materials," 2000 U.S. Navy Workshop on Acoustic Transduction Materials and Devices, Penn State University, State College, PA, April 13.

"A Domain Wall Model for Hysteresis in Ferroic Materials," Twelfth International Workshop on Hysteresis, Metastability and Aftereffect, University of Illinois at Chicago, IL, August 30.

2001   "Control Design for High Performance Nonlinear Smart Transducers," 2001 AFOSR Workshop on Dynamics and Control, Wright-Patterson AFB, OH, July 31.

2002   "A Free-Energy Model for Hysteresis in Ferroelectric and Ferromagnetic Materials," 2002 U.S. Navy Workshop on Acoustic Transduction Materials and Devices, Baltimore, MD, May 14.

*   "Modeling and Control Challenges for High Performance Materials in Aerospace and Aeronautic Applications," Symposium in Honor of ICASE's 30th Anniversary, Newport News, VA, July 25.

"Control Design for High Performance Nonlinear Smart Transducers," 2002 AFOSR Workshop on Dynamics and Control, Pasadena, CA, August 13.

2003   "Control Design for Nonlinear Smart Transducers," 2003 AFOSR Workshop on Dynamics and Control, Destin, FL, September 9.

2004   *   "Model Development, Numerical Approximation and Control Design for Nonlinear Smart Material Systems," Conference on Emerging Methodologies and Applications in Numerical PDE's, Florida State University, Tallahassee, FL, March 9.

"Control Design for High Performance Nonlinear Smart Transducers (Poster)," 2004 AFOSR Workshop on Dynamics and Control, Pasadena, CA, August 13.

2005   "Multiscale Model Development for Smart Materials," SAMSI Undergraduate Workshop, Research Triangle Park, NC, February 19.

"A Unified Model for Hysteresis in Ferroic Materials," 2005 U.S. Navy Workshop on Acoustic Transduction Materials and Devices, Penn State University, State College, PA, May 12.

*   "Model Development and Nonlinear Optimal Control Design for Nonlinear Smart Material Systems," International Workshop on Control of Infinite-Dimensional Systems, University of Waterloo, Waterloo, Ontario, July 29.

"Model Development and Model-Based Control Design for High Performance Nonlinear Smart Systems," 2005 AFOSR Joint Program Review, Long Beach, CA, September 2.

*   "Multiscale Model Development for Ionic Polymers," ICAM Workshop on Mathematics as an Enabling Science, Blacksburg, VA, October 1.

2006   *   "Model Development, Numerical Approximation and Control Design for High Performance Nonlinear Smart Material Systems," CSRI Workshop on Numerical PDEs in the 21st Century, Albuquerque, NM, April 21.

"Model Development and Model-Based Control Design for High Performance Nonlinear Smart Systems," 2006 AFOSR Joint Program Review, Atlanta, GA, August 11.

"Piezoelectric Hysteresis Software," ICAT 47th International Smart Actuator Symposium, Penn State University, State College, PA, October 4.

2007 "High Speed Implementation of Ferroic Hysteresis Models," 2007 U.S. Navy Workshop on Acoustic Transduction Materials and Devices, Penn State University, State College, PA, May 15.

"Model Development and Model-Based Control Design for High Performance Nonlinear Smart Systems," 2007 AFOSR Joint Program Review, Long Beach, CA, August 9.

"FPGA-Based Model Implementation for Real-Time Control of Smart Material Systems Operating in Hysteretic Regimes," CANSMART 2007, Montreal, Quebec, Canada, October 10.

2008 "Model Development and Model-Based Control Design for Nonlinear Smart Composite Systems," 2008 AFOSR Joint Program Review, Washington, DC, August 5.

2009 "Efficient Algorithms for Implementation and Identification of Hysteresis Models," 2009 U.S. Navy Workshop on Acoustic Transduction Materials and Devices, Penn State University, State College, PA, May 13.

"Model Development and Model-Based Control Design for Nonlinear Smart Composite Systems," 2009 AFOSR Joint Program Review, Washington, DC, July 15.

2010 "Model Development and Model-Based Control Design for Nonlinear Smart Composite Systems," 2010 AFOSR Joint Program Review, Washington, DC, August 9.

2011 "Model Development and Model-Based Control Design for Nonlinear Smart Composite Systems," 2011 AFOSR Joint Program Review, Washington, DC, June 15.

* "Model Development, Uncertainty Quantification, and Control Design for Nonlinear Smart Material systems," 7th Workshop on Control of Distributed Parameter Systems (CDPS 2011), Wuppertal, Germany, July 20.

* "Model Development, Uncertainty Quantification, and Control Design for Nonlinear Smart Material systems," Second Monterey Workshop on Computational Issues in Nonlinear Control, Monterey, CA, November 8.

2012 "A Model Development and Calibration, Simulation, and Uncertainty Quantification Framework for Transducer Materials Operating in Hysteretic Regimes," 2012 International Workshop on Acoustic Transduction Materials and Devices, State College, PA, May 8.

"Development of a Framework for Model-Based Analysis, Uncertainty Quantification, and Robust Control Design of Nonlinear Smart Composite Systems," 2012 AFOSR Joint Program Review, Washington, DC, August 7.

2013 "Development of a Framework for Model-Based Analysis, Uncertainty Quantification, and Robust Control Design of Nonlinear Smart Composite Systems," 2013 AFOSR Joint Program Review, Washington, DC, August 6.

"Bayesian Techniques to Quantify Parameter and Model Uncertainty for a Macro-Fiber Composite Model," 1st IFAC Workshop on Control of Systems Governed by Partial Differential Equations, CPDE 2013, Paris, France, September 25.

    *   "Prediction Interval Construction for Smart Material Systems in the Presence of Model Discrepancy," IMA Hot Topics Workshop on Uncertainty Quantification in Materials, Minneapolis, MN, December 16.

2015   "Introduction to Uncertainty Quantification and Sensitivity Analysis," Eastman Workshop on Modern Statistics for the Non-Specialist and Applications to Materials and Chemistry Research, North Carolina State University, Raleigh, NC, February 25.

    *   "Uncertainty Quantification for Physical and Biological Models," AIM Workshop on "Integrated Analysis for Agricultural Management Strategies," San Jose, CA, May 4.

    *   "The Role of Uncertainty Quantification in Predictive Models," INFORMS Summer Roundtable on Uncertainty Quantification, Jackson Lake Lodge, WY, July 20.

    *   "Roles of Uncertainty Quantification in Materials Science," IMA Hot Topics Workshop on Uncertainty Quantification in Materials Modeling, Purdue University, West Lafayette, IN, July 27.

    "Gradient-Free Active Subspace Construction Via Adaptive Morris Indices," Workshop on "Advances in Scientific Computing and Applied Mathematics (ASCAM 15), Las Vegas, NV, Oct 11.

2016   *   "Bayesian Inference and Sensitivity Analysis for Multi-Scale Materials," NIST Workshop on Uncertainty Quantification in Materials Science, Gaithersburg, MD, January 14.

    "An Information Theoretic Approach to Use High-Fidelity Codes to Calibrate Low-Fidelity Codes," CASL CTF Workshop, North Carolina State University, Raleigh, NC, January 25.

    "Synthesis of Bayesian Model Calibration, Experimental Design, and Active Subspace Construction for CASL Codes," CASL VMA Workshop and Roundtable, Sandia National Laboratory, Albuquerque, NM, July 18 and 19.

    "Synthesis of Reduced-Order Modeling, Global Sensitivity Analysis, and Uncertainty Quantification for Robust Control Design of Nonlinear Smart Composite Systems," AFOSR Dynamics and Control Program Review, Arlington, MD, August 3.

2017   "Synthesis of Bayesian Model Calibration and Experimental Design for CASL Codes (Hi2Low)," CASL VVI Workshop, Sandia National Laboratory, Albuquerque, NM, May 24.

    "A Mutual Information-Based Framework to Use High-Fidelity Codes to Calibrate Low-Fidelity Codes (Hi2LO)", 1st Workshop on Multi-Physics Validation, Raleigh, NC, June 28.

    "Bayesian Inference on Active Subspaces," SIAM Workshop on Parameter Space Reduction (DR17), Pittsburgh, PA, July 9 (Invited).

    "Sensitivity Analysis and Active Subspace Construction for Surrogate Models Employed for Bayesian Inference," Workshop on Quantification of Uncertainty: Improving Efficiency and Technology (QUITE), SISSA, International School for Advanced Studies, Trieste, Italy, July 21 (Invited).

    "Synthesis of Reduced-Order Modeling, Global Sensitivity Analysis, and Uncertainty Quantification for Robust Control Design of Nonlinear Smart Composite Systems," AFOSR Dynamics and Control Program Review, Arlington, MD, September 13.

2018   "Uncertainty Quantification from a Mathematical Perspective," Workshop on Key UQ Methodologies and Motivating Applications, Isaac Newton Institute for Mathematical Sciences, Cambridge University, January 8 (Invited).

           "Active Subspace Techniques to Construct Surrogate Models for Complex Physical and Biological Models," Workshop on Surrogate Models for UQ in Complex Systems", Isaac Newton Institute for Mathematical Sciences, Cambridge University, February 5 (Invited).

           "Active Subspace Techniques to Construct Surrogate Models for Complex Physical and Biological Models," Workshop on Current Trends and Challenges in Data Science and Uncertainty Quantification, Purdue University, West Lafayette, IN, March 31 (Invited).

           "Synthesis of Reduced-Order Modeling, Global Sensitivity Analysis, and Uncertainty Quantification for Robust Control Design of Nonlinear Smart Composite Systems," AFOSR Dynamics and Control Program Review, Arlington, MD, September 26.

           "SAM Overview and Accomplishments", Schubert Review of CNEC SAM, North Carolina State University, November 7.

2019   "Sensitivity Analysis, Uncertainty Quantification, and Control Design for Transductive Materials and Adaptive Systems," Third AFOSR Monterey Workshop on Computational Issues in Nonlinear Control, October 7 (Invited).

2020   "The Role of Surrogate Model Development and Uncertainty Quantification to Localize a Radiation Source in an Urban Environment," CONNECT Undergraduate Research Program, University of Texas at San Antonio, Remote, July 27 (Invited).

2021   "Bayesian Inference and Uncertainty Propagation for Physical and Biological Models," *Numerical Analysis in Data Science Transition Virtual Workshop*, SAMSI, May 24 (Invited).

           "Techniques to Quantify the Information Content of Models Employed for Adaptive Material Systems and Aerial Monitoring Strategies," AFOSR Computational Math Program Review, Remote, August 1.

2022   "The Use of Sensitivity Analysis and Uncertainty Quantification to Guide Model Validation," Workshop session on *Up to the Task? Quantitative Evaluation Criteria for Physiologically Based Pharmacokinetic (PBPK) Models*, Society of Toxicology (SOT) Annual Meeting, Remote, March 28 (Invited).

           "Roles of Information Criteria for Model Calibration, Validation, Updating, and Surrogate Construction," AFOSR Computational Math Program Review, Arlington, VA, August 15.

Colloquia and Seminars

1991   *   "A Fully Sinc-Galerkin Method for Parameter Recovery in Parabolic Problems," Numerical Analysis Seminar, North Carolina State University, Raleigh, NC, April 22.

      *   "Active Noise Control in Acoustic/Structure Interaction Models via Piezoceramic Actuators," Numerical Analysis Seminar, North Carolina State University, Raleigh, NC, September 17.

1992   *   "Active Noise Suppression in Acoustic/Structure Interaction Models: Feedback Control via Piezoceramic Actuators," Interdisciplinary Center for Applied Mathematics Seminar, Virginia Polytechnic Institute and State University, Blacksburg, VA, March 30.

"Active Noise Suppression in Acoustic/Structure Interaction Models: Feedback Control via Piezoceramic Actuators," ICASE Colloquium, Hampton, VA, May 5.

1993   "Parameter Estimation and Noise Control in a Structural Acoustic System," Mathematics Colloquium, Iowa State University, Ames, IA, October 12.

1994   *   "Parameter Estimation and Noise Control in Structural Acoustic Systems," Mathematics Colloquium, Institut Für Mathematik, Karl-Franzens-Universität Graz, Graz, Austria, June 17.

1996   "PDE-Based Controllers for Coupled Systems," Control Systems Seminar, Department of Electrical Engineering, Iowa State University, Ames, IA, February 16.

"Smart Material Actuators and Sensors," Control Systems Seminar, Department of Electrical Engineering, Iowa State University, Ames, IA, April 12.

"Preisach Modeling of Hysteresis in Magnetostrictive Materials," Mathematics Colloquium, Iowa State University, Ames, IA, December 3.

1997   *   "Smart Material Controllers for Structural Systems," Colloquium, Department of Mathematics, University of Wisconsin - La Crosse, La Crosse, WI, April 4.

*   "Modeling and Design Issues for Smart Material Controllers," Colloquium, Department of Computational and Applied Mathematics, Rice University, Houston, TX, April 14.

*   "Modeling and Control Issues Concerning Magnetostrictive Materials," Colloquium, Department of Mathematics, University of Arkansas, Fayetteville, AR, October 17.

1998   *   "Nonlinear Control Issues Concerning Smart Material Systems," Colloquium, Department of Mathematics, University of Southern California, Los Angeles, CA, March 5.

*   "Modeling and Control Issues Concerning Nonlinear Smart Material Actuators," Colloquium, Electrical and Computer Engineering Department, University of California, Santa Barbara, Santa Barbara, CA, March 6.

*   "Modeling and Control Issues Concerning Nonlinear Smart Material Actuators," Colloquium, Department of Mathematics, Virginia Polytechnic Institute and State University, Blacksburg, VA, October 23.

1999   *   "Modeling and Control Issues Concerning Smart Materials with Hysteresis," Colloquium, Department of Applied Mechanics & Engineering Sciences, University of California, San Diego, San Diego, CA, March 5.

*   "Modeling and Control Issues Concerning Smart Materials with Hysteresis," Colloquium, Department of Electrical Engineering & Institute for Systems Research, University of Maryland, College Park, MD, March 15.

"Modeling and Control Issues Concerning Smart Materials with Hysteresis," Colloquium, Bradley Department of Electrical and Computer Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA, September 20.

2000   *   "Modeling and Control Issues Concerning Smart Materials with Hysteresis," Colloquium, Department of Electrical Engineering, Iowa State University, Ames, IA, May 12.

      *   "The Modeling and Control of Hysteresis and Nonlinear Dynamics in an Atomic Force Microscope," Colloquium, Department of Mathematical Sciences, Clemson University, Clemson, SC, September 22.

       "The Modeling and Control of Hysteresis and Nonlinear Dynamics in an Atomic Force Microscope," Colloquium, Department of Mathematics, University of Massachusetts-Dartmouth, Dartmouth, MA, October 13.

2001   *   "The Modeling and Control of Hysteresis and Nonlinear Dynamics in an Atomic Force Microscope," Colloquium, Department of Mathematics, Texas Tech University, Lubbock, TX, February 15.

       "Modeling and Control of Hysteresis and Nonlinear Dynamics in an Atomic Force Microscope," Colloquium, Department of Electrical Engineering, Iowa State University, April 13.

      *   "Modeling and Control Issues Associated with Atomic Force Microscopy," Colloquium, Division of Applied Mathematics, Brown University, Providence, RI, September 28.

      *   "Modeling and Control Issues Associated with Atomic Force Microscopy," Colloquium, Department of Mathematics, Michigan State University, East Lansing, MI, November 8.

2002   *   "Modeling and Control Issues Associated with Atomic Force Microscopy," Colloquium, Department of Mechanical Engineering, Ohio State University, Columbus, OH, January 18.

       "Model Development and Control Design for High Performance Nonlinear Smart Material Systems," Colloquium, Sandia National Laboratories, Albuquerque, NM, January 29.

      *   "Model Development and Control Design for High Performance Nonlinear Smart Material Systems," Colloquium, Electrical and Computer Engineering Department, University of California, Santa Barbara, Santa Barbara, CA, March 22.

       "Model-Based Control Design for High Performance Nonlinear Smart Systems," Colloquium, Bradley Department of Electrical and Computer Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA, September 20.

       "Model-Based Control Design for High Performance Nonlinear Smart Systems," Colloquium, Mechanical and Aerospace Engineering, North Carolina State University, Raleigh, NC, September 26.

       "Research and Career Options in Mathematics and Operations Research," Seminar, Department of Mathematics, Virginia Commonwealth University, Richmond, VA, November 18.

      *   "Model Development and Control Design for High Performance Nonlinear Smart Material Systems," Colloquium, School of Computational Science and Information Technology, Florida State University, Tallahassee, FL, November 22.

2003   *   "Model Development and Control Design for High Performance Nonlinear Smart Material Systems," Colloquium, Department of Applied Mechanics & Engineering Sciences, University of California, San Diego, San Diego, CA, March 7.

"Models for Piezoceramic, Magnetostrictive and Shape Memory Alloy Characterization and Design," Seminar, Acoustics and Fluid Mechanics Group, The Boeing Company, Seattle, WA, May 28.

2004   *   "Model Development and Control Design for High Performance Nonlinear Smart Material Systems," Colloquium, Department of Mathematics, University of Wyoming, Laramie, WY, January 29.

      *   "Model Development and Control Design for High Performance Nonlinear Smart Material Systems," Colloquium, Department of Mathematics, Clemson University, Clemson, SC, April 8.

2005   *   "Multiscale Model Development for Ionic Polymers," Colloquium, Department of Mathematical Sciences, Montana State University, Bozeman, MT, February 10.

2006   "Model Development and Control Design for High Performance Nonlinear Smart Material Systems," Colloquium, Department of Mathematical Sciences, Montana State University, Bozeman, MT, November 30.

2007   "Multiscale Model Development for Ionic Polymers," Colloquium, Department of Mechanical Engineering, Florida State University, Tallahassee, FL, February 1.

"Model Development and Control Design for Structural Systems," Seminar, Idaho National Laboratory, Idaho Falls, ID, March 15.

"Model Development and Control Design for High Performance Nonlinear Smart Material Systems, Colloquium, Department of Mathematics, University of Waterloo, Waterloo, Ontario, April 26.

"Model Development and Control Design for High Performance Nonlinear Smart Material Systems, Mechanics and Materials Seminar, North Carolina State University, Raleigh, NC, December 5.

"Model Development and Real-Time Model-Based Control Design for High Performance Nonlinear Smart Systems," Seminar, Starfire Optical Range, Kirtland Air Force Base, Albuquerque, NM, December 13.

2008   "Model Development and Real-Time Model-Based Control Design for High Performance Nonlinear Smart Systems," Colloquium, Department of Electrical and Computer Engineering, University of Wyoming, Laramie, WY, September 12.

"Model Development and Real-Time Model-Based Control Design for High Performance Nonlinear Smart Systems," Applied Math Seminar, Duke University, Durham, NC, September 22.

2010   "Model Development and Model-Based Control Design for Nonlinear Smart Composite Systems," Colloquium, Department of Mathematics, University of Waterloo, Waterloo, Ontario, June 15.

"Model Development and Control Design for High Performance Smart Material Systems," Colloquium, Applied Mathematics Department, University of Colorado Boulder, August 27.

2011   *   "Model Development, Uncertainty Quantification, and Robust Control Design for Nonlinear Smart Material Systems," Center for Control, Dynamical Systems, and Computation Seminar, University of California, Santa Barbara, Santa Barbara, CA, October 21.

      *   "Model Development for Design and Control of Nonlinear Smart Composite Systems," Mechanical Engineering Seminar, University of California, Santa Barbara, Santa Barbara, CA, October 24.

2012   "Model Development, Uncertainty Quantification, and Control Design for Transductive Materials with Energy Applications," National Renewable Energy Laboratory, Golden, CO, June 22.

        "Model Development, Uncertainty Quantification, and Control Design for Nonlinear Smart Material Systems," Colloquium, Department of Mathematical Sciences, University of Montana, Missoula, MT, October 1.

2013   *   "Uncertainty Quantification for Physical and Biological Models," Colloquium, Department of Mathematics and Statistics, Missouri University of Science and Technology, Rolla, MO, November 15.

2014   *   "Uncertainty Quantification for Physical and Biological Models," Mechanical Engineering Seminar, University of California, Santa Barbara, Santa Barbara, CA, February 3.

        "Prediction Interval Construction for Smart Material Systems in the Presence of Model Discrepancy," CSRI Seminar, Sandia National Laboratories, Albuquerque, NM, February 6.

      *   "Uncertainty Quantification for Physical and Biological Models," Colloquium, Department of Mathematics, VA Tech, Blacksburg, VA, February 21.

      *   "Uncertainty Quantification for Physical and Biological Models," Colloquium, Department of Mathematics, University of Alabama at Birmingham, October 24.

      *   "Model Development, Uncertainty Quantification, and Control Design for Nonlinear Smart Material Systems," Colloquium, Department of Mechanical & Aeronautical Engineering, Clarkson University, November 7.

2015   *   "Uncertainty Quantification for Physical and Biological Models," Applied Statistics and Computational Modeling Seminar, Pacific Northwest National Laboratory, Richland, WA, January 30.

      *   "Parameter Selection and Surrogate Model Calibration Techniques for Complex Physical and Biological Models," Applied Mathematics and Statistics, Colorado School of Mines, Golden, CO, Oct 4.

      *   "Parameter Selection and Surrogate Model Calibration Techniques for Complex Physical and Biological Models," CSRI Seminar, Sandia National Laboratories, Albuquerque, NM, Nov 20.

2016   "Uncertainty Quantification for Predictive Models," Colloquium, NASA Langley Research Center, June 27.

        "Mixed-Effects Models for Physical and Biological Applications," NASA Langley Research Center, June 27.

* "Active Subspace and Surrogate Model Techniques for Complex Physical and Biological Models," Colloquium, Department of Computer Science and Engineering, University of South Carolina, October 21.

2017 "The Role of Sensitivity Analysis and Uncertainty Quantification for Control Design of Smart Material Systems ," Colloquium, Department of Aerospace Engineering, Texas A&M University, College Station, TX, November 2.

2018 "Active Subspace Techniques to Construct Surrogate Models for Complex Physical and Biological Models," Applied Statistics Group, Lawrence Livermore National Laboratory, Livermore, CA, February 22.

* "Uncertainty Quantification for Physical and Biological Models", Operation Research Seminar, North Carolina State University, Raleigh, NC, February 26.

2019 * "The Role of Sensitivity Analysis and Uncertainty Quantification for Engineering Models," Colloquium, Department of Mechanical and Nuclear Engineering, Penn State University, State College, PA, February 4.

"The Role of Uncertainty Quantification for Predictive Models," Seminar, NC Chapter of the ASA, SAMSI, RTP, March 19.

"Active Subspace Techniques to Construct Surrogate Models for Complex Physical and Biological Models", Mathematics Department Colloquium, University of North Carolina Chapel Hill, Raleigh, NC, April 5.

* "Roles of Sensitivity Analysis and Uncertainty Quantification for Science and Engineering Models," Colloquium, NASA Jet Propulsion Laboratory, Pasadena, CA, June 24.

* "Active Subspace Techniques to Construct Surrogate Models for Complex Simulation Codes," Computing at PNNL Seminar, Pacific Northwest National Laboratory, November 12.

* "Active Subspace Techniques to Construct Surrogate Models for Complex Simulation Codes," Colloquium, Department of Applied Physics and Applied Mathematics (APAM), Columbia University, December 3.

2020 "Sensitivity Analysis and Uncertainty Quantification for Smart Materials and Adaptive Structures," Harbin Institute of Technology, Harbin, China, Remote, August 24.

2021 "Sensitivity Analysis and Uncertainty Quantification for Biological Models," Applied Biomath, Remote, March 24.

"Roles of Sensitivity Analysis and Uncertainty Quantification for Science and Engineering Models," Joint NASA JPL/Sandia Colloquium, Remote, May 25.

"Sensitivity Analysis and Uncertainty Quantification for Biological and Pharmacokinetic Models, Food and Drug Administration (FDA) QSP Seminar, Remote, December 1.

2022 "Parameter Selection and Active Subspace Techniques for Engineering and Biological Models," Invited Statistical and Data Sciences Seminar Series, Los Alamos National Laboratory, Remote, March 2.

Plenary and Keynote Lectures

2001 * "Modeling and Control Issues Associated with Atomic Force Microscopy," Workshop on Pluralism in Distributed Parameter Systems," University of Twente, The Netherlands, July 3.

* "Model Development and Control Design for High Performance Nonlinear Smart Material Systems," SIAM Conference on Control and Its Applications, San Diego, CA, July 14.

2006 * "Model Development and Control Design for Nonlinear Smart Material Systems," SIAM-SEAS 30th Annual Meeting, Auburn University, Auburn, AL, March 31.

* "Model Development and Control Design for High Performance Nonlinear Smart Material Systems," (Keynote) Fourth World Conference on Structural Control and Monitoring, San Diego, CA, July 12.

2014 * "Uncertainty Quantification for Physical and Biological Models," Rose-Hulman Institute of Technology Undergraduate Mathematics Conference, April 11.

2016 "Uncertainty Quantification for Smart Materials and Adaptive Structures," (Keynote) ASME 2016 Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS), Stowe, VT, September 28.

* "Uncertainty Quantification for Physical and Biological Models," (Keynote) 36th Annual Mathematics Symposium at Western Kentucky University, November 11.

2017 * "Uncertainty Quantification for Physical and Biological Models," Workshop on Parameter Estimation and Uncertainty Quantification for Dynamical Systems, University of Pittsburgh, March 5.

2018 * "Sensitivity Analysis and Uncertainty Quantification for Smart Materials and Adaptive Structures" (Plenary), SPIE Smart Structures and Nondestructive Evaluation, Denver, CO, March 5.

* "Sensitivity Analysis, Uncertainty Quantification, and Control Design for Smart Material Systems," (Keynote), Workshop on Dynamics, Control and Numerics for Fractional PDEs, Hotel Embassy Suites, Isla Verde, Carolina, Puerto Rico, December 5.

2019 * "The Role of Uncertainty Quantification for Predictive Models," SCALA 2019: Scientific Computing around Louisiana, Tulane University, New Orleans, LA, February 15.

2020 "The Role of Sensitivity Analysis and Uncertainty Quantification for Engineering Models," (Keynote), 22nd AIAA Non-Deterministic Approaches Conference, Orlando, FL, January 6.

Short Courses

2016 "Applications of Uncertainty Quantification and Sensitivity Analysis in Smart Materials and Adaptive Structures," with William Oates, Florida State University, SPIE Symposium on Smart Structures and Materials, Las Vegas, NV, March 20.

"Applications of Uncertainty Quantification and Sensitivity Analysis in Smart Materials and Adaptive Structures," with William Oates, Florida State University, ASME 2016 Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS), Stowe, VT, September 27.

2017   "Applications of Uncertainty Quantification and Sensitivity Analysis in Smart Materials and Adaptive Structures," with William Oates, Florida State University, SPIE Symposium on Smart Structures and Materials, Portland OR, March 27.

"Uncertainty Quantification and Sensitivity Analysis in Engineering and Scientific Applications," with William Oates, College of Engineering, Florida State University, June 23.

"Uncertainty Quantification for Biological Models," with Clayton Webster, Mac Hyman, Ben Fitzpatrick, and Marisa Eisenberg, NIMBioS, University of Tennessee, Knoxville, TN, June 26-28.

"Applications of Uncertainty Quantification and Sensitivity Analysis in Smart Materials and Adaptive Structures," with William Oates, Florida State University, ASME 2017 Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS), Snowbird, UT, September 17.

2018   "Applications of Uncertainty Quantification and Sensitivity Analysis in Smart Materials and Adaptive Structures," with William Oates, Florida State University, SPIE Symposium on Smart Structures and Materials, Denver, CO, March 5.

"Uncertainty Quantification," DATAWorks 2018, Defense and Aerospace Test and Analysis (DATA) Workshop, Springfield, VA, March 20.

"Sensitivity and Uncertainty Quantification," Consortium for Advanced Simulation of Light-Water Reactors (CASL) Summer Institute, North Carolina State University, August 14.

"Applications of Uncertainty Quantification and Sensitivity Analysis in Smart Materials and Adaptive Structures," with William Oates, Florida State University, ASME 2017 Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS), Snowbird, UT, September 17.

2019   "Applications of Uncertainty Quantification and Sensitivity Analysis in Smart Materials and Adaptive Structures," SPIE Symposium on Smart Structures and Materials, Denver, CO, March 4.

"Uncertainty Quantification," DATAWorks 2019, Defense and Aerospace Test and Analysis (DATA) Workshop, Springfield, VA, April 9.