
Department of Mechanical Engineering
Michigan State University
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EDUCATION

Ph.D., Theoretical and Applied Mechanics, Cornell U., Ithaca, NY, 1983, Advisor: P. Holmes
M.S.E. , Applied Mechanics, U. of Michigan, Ann Arbor, MI, 1979
A.B., Physics, U. of Michigan, Flint, MI, 1978

PROFESSIONAL EXPERIENCE*Academic Employment*

2011-present, University Distinguished Professor, Department of Mechanical Engineering,
Michigan State University (MSU), East Lansing, MI
1994-2011, Professor, Department of Mechanical Engineering, MSU
1991-93, Associate Professor (with tenure), Department of Mechanical Engineering, University
of Michigan (UM)
1987-1991, Associate Professor, Department of Mechanical Engineering, MSU
1990, Acting Associate Chairperson, Department of Mechanical Engineering, MSU
1984-1987, Assistant Professor, Department of Mechanical Engineering, MSU
1983-1984, Assistant Professor, School of Engineering, Oakland University, Rochester, MI

Visiting Positions

July-August 2008, Visiting Professor, Department of Mechanical Engineering, McGill
University, Montreal, QC, Canada
January-June 2004, Visiting Professor, Department of Mechanical Engineering, University of
California-Santa Barbara, CA
Summers 2000, 2002-05, Visiting Research Scientist, Department of Mechanical Engineering,
University of Michigan, Ann Arbor, MI
January-June, 1989, Visiting Associate Professor, Applied Mechanics, California Institute of
Technology, Pasadena, CA
July 1984, Visiting Assistant Professor, Department of Aerospace Engineering and Mechanics,
University of Minnesota, Minneapolis, MN
June 1983, Visiting Assistant Professor, Department of Theoretical and Applied Mechanics,
Cornell University, Ithaca, NY

Consulting

2003-2008, consulting as an expert witness for legal firms on mechanical design and IP issues.
1984-1986, 1993-2002, consultant, Ford Motor Company, assist with the design of dynamic
vibration absorbers, and analytical support for noise and vibration issues.

Teaching Experience

dynamics, vibrations, controls, nonlinear dynamical systems, design projects, engineering

analysis, statics, machine design, strength of materials

Research Interest Areas

Fundamental: nonlinear dynamics and vibrations, exploitation of nonlinearities in the design of mechanical devices. Applications: resonant micro/nano-electromechanical systems for sensing and signal processing, vibration absorbers for rotating machinery, effects of noise in nonlinear oscillations, nonlinear normal modes, mode localization, structural vibration and control, chaotic motions in mechanical systems, nonlinear resonances, vehicle dynamics, impact dynamics, nonsmooth systems, mechanism dynamics, ship dynamics and stability.

HONORS AND AWARDS

University Distinguished Faculty Award, MSU, 2008

Withrow Distinguished Senior Scholar Award, College of Engineering, MSU, 2002

Arch T. Colwell Merit Award, SAE, 1997. For the paper marked + in the publication list below
Fellow, ASME, elected 1995

Westinghouse Distinguished Lecturer, Department of Mechanical Engineering and Applied Mechanics, University of Michigan, Ann Arbor, MI, September, 1990

Henry Ford Customer Satisfaction Award, Ford Motor Company, with 5 others, for
“Development of CAE Tools for Squeak and Rattle Prevention,” 1986

Henry Hess Award, ASME, for the two -part paper marked * in the publication list below, for
best paper by an author under 31 years of age, 1986

James B. Angell Scholar, College of Literature Science & Arts, U. of Michigan, 1976, 1978

SPECIAL LECTURES

Plenary Lecture, International Modal Analysis Conference XXVIII, Jacksonville, FL, 2010

Keynote Lecture, First ASME Dynamic Systems and Control Conference, Ann Arbor, MI, 2008

Symposium Invited Speaker, First ASME Conference on Smart Materials, Adaptive Structures, and Intelligent Systems, Symposium on Nonlinear Dynamics and Passive/Adaptive Controls, Ellicott City, MD, 2008

Symposium Invited Speaker, 42nd Meeting, Society of Engineering Science, Symposium on Nonlinear Localization and Targeted Energy Transfer Phenomena in Dynamical Systems, Champaign-Urbana, IL, 2008

Plenary Lecture, Advanced Problems in Mechanics – APM2008, St. Petersburg, Russia, 2008

Engineer’s Edge Learning Series, Chrysler Technology Center, Auburn Hills, MI, joint with A. G. Haddow and B. Geist, 2007

Keynote Lecture, 2nd International Conference on Nonlinear Normal Modes and Localization in Vibrating Systems, Samos, Greece, 2006

Symposium Invited Speaker, Minisymposium on Reduced-Order Modeling, Fifth Euromech Nonlinear Dynamics Conference, ENOC2005, Eindhoven, 2005

Keynote Lecture, JSME Minisymposium on Nonlinear Dynamics and Chaos in Mechanical Systems, Tokyo, Japan, 2001

Keynote Lecture, IUTAM Symposium on Nonlinear Dynamics and Chaos in Mechanics, Ithaca, NY, 1997

Inaugural Sethna Lecture, Department of Aerospace Engineering and Mechanics, University of

Minnesota, Minneapolis, MN, 1994
Westinghouse Distinguished Lectures (2), Department of Mechanical Engineering and Applied
Mechanics, University of Michigan, Ann Arbor, MI, September, 1990

PROFESSIONAL AFFILIATIONS AND ACTIVITIES

Society Memberships

The Society of Automotive Engineers (SAE), 1995-present
The Society for Industrial and Applied Mathematics (SIAM), 1983-2000, 2009-present
The American Society of Mechanical Engineers (ASME), 1982-present
The American Academy of Mechanics (AAM), 1983-2002

Professional Committee Activities

Vice Chair, SIAM Dynamical Systems Activity Group, 2010-present
Member, Technical Committee on Vibration and Sound, Design Division, ASME, 2006-present

Editorial Service

Associate Technical Editor, *Journal of Vibration and Acoustics*, 2008-present
Contributing Editor, *Nonlinear Dynamics*, Springer, 1990-present
Editorial Board, *Communications in Nonlinear Science and Numerical Simulation*, Elsevier
Science, 2001-2009
Editorial Board, *Journal of Sound and Vibration*, Academic Press, 1995-2007
Editorial Board, *Archive of Applied Mechanics*, Springer-Verlag, 1997-2003
Editorial Advisory Board, *Encyclopedia of Vibration*, Academic Press, appeared in 2001
Editorial Board, *Dynamics and Stability of Systems*, Carfax, 1995-2000
Editorial Board, *International Journal of Bifurcation and Chaos*, World Scientific, 1992-98
Associate Technical Editor, *Journal of Applied Mechanics*, ASME, 1994-97

Paper Refereeing

*IEEE Transactions on Mechatronics; SIAM Journal on Applied Dynamical Systems; Experimental
Mechanics; Journal of Engineering Mathematics; Mechanics Research Communications; Sensors
and Actuators A: Physical; Electron Device Letters; Journal of Physics A: Mathematical and
Theoretical; Journal of Physics: Condensed Matter; Journal of Microelectromechanical Systems;
Journal of Micromechanics and Microengineering; ASME Journal of Vibration and Acoustics;
ASME Journal of Computational and Nonlinear Dynamics; International Journal of Bifurcation
and Chaos; Journal of Guidance, Control, and Dynamics; Journal of Nonlinear Science; Nonlinear
Dynamics; Physica D; Journal of Sound and Vibration; ASME Journal of Dynamic Systems,
Measurement and Control; ASME Journal of Applied Mechanics; Physics of Fluids; International
Journal of Solids and Structures; Journal of Fluids and Structures; Meccanica; IEEE Transactions
on Circuits and Systems; SIAM Journal on Applied Mathematics; Dynamics and Stability of
Systems; International Journal of Mechanical Sciences; Journal of Vibration and Control;
Proceedings of the Royal Society; Mechanism and Machine Theory; ASME Journal of Engineering
for Gas Turbines and Power; Journal of Ship Research; several ASME Conferences.*

Proposal Reviewing

National Science Foundation (regularly), Army Research Office, Michigan Sea Grant Program,

Science and Engineering Research Council-UK, US National Research Council, AFOSR, Australian Research Council, Ohio Board of Regents

Outreach

High School Engineering Exploration, Organizer and Lecturer, Mechanical Engineering Section, 2010

High School Engineering Institute, Organizer and Lecturer, Mechanical Engineering Section, 2005, 2007, 2008, 2009

University Service

Chairperson's Advisory Committee, MSU, 1988-91, 1994-97, 2003-07, 2010-11

Departmental Chairperson Search Committee, Chair, 2009-10

Undergraduate Curriculum Committee, MSU, 1986-87, 1989, 1999-2001, 2008-09 (Chair)

Departmental/College Promotion Committees, MSU, 1989-91, 1994-2002, 2004-11

Faculty Search Committees, MSU, several, chair of successful search for 4 new faculty, 2007

Graduate Studies Committee, MSU, 1985-1991, 1996-98; chair, 1987-88, 1998-2002

Chair, Individual Reappointment/Promotion Committees; UM, 1991-93; MSU, 1994-2005

Co-Organizer, Mechanical Engineering Seminar Series, MSU, 1985-86, 1999-2002

Departmental Graduate Advisor, 1996-98

Chairperson's Advisory Committee, UM, 1993

Search Committee for Vice President of Research and Graduate Studies, MSU, 1987-90

Graduate Council, Oakland University, 1983-84

Professional Service

Organizing Committee, SIAM Conference on Applications of Dynamical Systems, 2011

Co-Organizer and Co-Chair, Funding Panel Session, , SIAM Conference on Applications of Dynamical Systems, 2011

Program Committee, ASME Dynamic Systems and Control Conference, 2008, 2009

Scientific Committee, Symposium on Mechanics of Slender Structures (MoSS), University of Maryland, Baltimore County 2008

Co-Organizer, with O. Gottlieb, Min-symposium on "Nonlinear dynamics in nano- and micro-electromechanical systems," Sixth Euromech Conference on Nonlinear Vibrations, St. Petersburg, Russia, 2008

Organizing Committee, ASME International Conference on Micro and Nanosystems, 2007
ASME IDETC, September, Las Vegas, NV

Scientific Committee, The 2nd International Conference on Nonlinear Dynamics: KhPI 2007, in honor of Alexander Lyapunov 150th Anniversary. National Technical University, Polytechnical Institute, Kharkov, Ukraine, 2007

Scientific Committee, International Conference on Material Theory and Nonlinear Dynamics, Hanoi, Vietnam, 2007

Organizing Committee, International Workshop on Applied Dynamical Systems – Mechanics, Turbulence, Knots, Cockroaches, and Chaos, Montreal, 2005

Co-Organizer, with O. Gottlieb, Min-symposium on "Nonlinear dynamics in nano- and micro-electromechanical systems," Fifth Euromech Conference on Nonlinear Vibrations, Eindhoven, 2005

Co-Organizer, with K. Turner and J. Moehlis, Mini-Symposium on "Nonlinear Dynamics of

MEMS,” SIAM Conference on Dynamical Systems, Snowbird, UT, 2005

Co-Organizer, with O. Gottlieb and K. Turner, Symposium on “Nonlinear dynamics, bifurcations and chaos in nano- and micro-electromechanical systems,” 19th Biennial ASME Conference on Mechanical Vibration and Noise, Chicago, 2003

Co-Organizer, with C. Pierre, Symposium on “Nonlinear Normal Modes and Localization,” 18th Biennial ASME Conference on Mechanical Vibration and Noise, Pittsburgh, 2001

Co-Organizer, with C. Pierre, Symposium on “Nonlinear Normal Modes and Localization,” 17th Biennial ASME Conference on Mechanical Vibration and Noise, Las Vegas, 1999

Scientific Organizing Committee, IUTAM Symposium on Unilateral Multi-body Dynamics, Munich, August, 1998

Co-Organizer, with C. Pierre, Symposium on “Mode Localization and Nonlinear Normal Modes,” 16th biennial ASME Conference on Mechanical Vibration and Noise, Sacramento, CA, 1997

Organizing Committee, Asia-Pacific Vibration Conference, held in Kitakyushu, Japan, November 14-18, 1993

Scientific Organizing Committee, IUTAM Symposium on Nonlinearity and Chaos in Engineering Dynamics, London, July 19-23, 1993

Co-Organizer and Chair, Invited Symposium on Nonlinear Dynamics, ASME Summer Meeting, Columbus, OH 1991

Session Chair, International Conference on Bifurcation and Chaos, Wurzburg, Germany, 1990

Organizer and Chair, Invited Mini-symposium on Nonlinear Mechanical Systems, SIAM Conference on Dynamical Systems, Orlando, FL 1990

Session Chair, Dynamics, Society of Engineering Science Meeting, Ann Arbor, MI, 1989.

Session Co-Chair, Chaotic Dynamics, IUTAM Symposium on Nonlinear Dynamics in Engineering Systems, Stuttgart, West Germany, 1989

Organizer, with F. Moon (Cornell) and R. Miller (USC), Symposium on Nonlinear Dynamics and Chaos, ASME/ASCE Mechanics Conference, San Diego, CA, 1989

Session Chair, Nonlinear Dynamics and Chaos, ASME/ASCE Mechanics Conference, San Diego, CA, 1989

Session Organizer and Chair, Modern Methods in Nonlinear Dynamics, Society of Engineering Science Meeting, Buffalo, NY, 1986

INTELLECTUAL PROPERTY

US Patent 7584649, *Sensor with Microelectromechanical Oscillators*, S. W. Shaw, J. F. Rhoads, B. E. DeMartini, K. L. Turner, issued September 8, 2009.

JOURNAL PUBLICATIONS

In Preparation (near final draft stage)

N. J. Miller, S. W. Shaw, “Non-Adiabatic Bifurcation Detection in the Presence of Noise”

B. Olson, S. W. Shaw, and C. Pierre, “Vibration Absorbers for Linear Cyclic Systems”

B. S. Strachan and S. W. Shaw, “Passive Frequency Division by Subharmonic Resonance Casade”

R. Monroe and S. W. Shaw, "Transient Dynamics of Centrifugal Pendulum Vibration Absorbers, Part I: Theory"

R. Monroe and S. W. Shaw, "Transient Dynamics of Centrifugal Pendulum Vibration Absorbers, Part II: Experimental Results"

N. Miller, M. Dykman, and S. W. Shaw, "Phase Noise for Nonlinear Oscillators"

Under Review

B. Vidmar, B. F. Feeny, S. W. Shaw, and B. Geist, "Effects of Coulomb Friction on Centrifugal Pendulum Vibration Absorbers"

R. Monroe and S. W. Shaw, "Transient Dynamics of Nonlinear Oscillators"

Accepted for Publication

N. J. Miller and S. W. Shaw, "Frequency Sweeping with Concurrent Parametric Amplification," *Journal of Dynamic Systems, Measurement and Control*

S. Gozin, B. J. Olson, C. Pierre, and S. W. Shaw, "Resonance Suppression in Multi-DOF Cyclic Systems Using Order-Tuned Absorbers," *Journal of Vibration and Acoustics*

R. Monroe, S. W. Shaw, B. Geist, and A. G. Haddow, "The Effects of Rollers on the Dynamic Response of Centrifugal Pendulum Vibration Absorbers," *Journal of Vibration and Acoustics*

2010

M. Dykman, J. Portman, M. Khasin, S. W. Shaw, "Spectrum of an Oscillator with Jumping Frequency and the Interference of Partial Susceptibilities," *Physical Review Letters* **105** (23), 230601.

J. F. Rhoads and S. W. Shaw, "Effects of Nonlinearity on Parametric Amplification," *Applied Physics Letters* **96** (23), 234101.

S. W. Shaw and B. Geist, "Tuning for Stability and Performance in Nearly-Tautochronic Torsional Vibration Absorbers," *Journal of Vibration and Acoustics* **132** (4), 041005.

J. Issa, R. Mukherjee, and S. W. Shaw, "Vibration Suppression in Structures Using Cable Actuators," *Journal of Vibration and Acoustics* **132**, 031006.

B. J. Olson and S. W. Shaw, "Nonlinear Behavior of Order-Tuned Absorbers for Cyclic Vibratory Systems," *Nonlinear Dynamics* **60**, 149-182.

J. F. Rhoads, S. W. Shaw, and K. L. Turner, "Nonlinear Dynamics and its Applications in Micro- and Nano-resonators," invited review paper for the *Journal of Dynamic Systems, Measurement and Control*

132, 034001.

G. Bachar, E. Segev, O. Shtempluck, S. W. Shaw, and E. Buks, "Noise-Induced Intermittency in a Superconducting Stripline Resonator," *European Physics Letters* **89** (1) 17003.

M. R. Jeffrey, M. diBernardo, A. R. Champneys, and S. W. Shaw, "Catastrophic Sliding Bifurcations: The Case of Superconducting Stripline Resonators," *Physical Review E* **81**, 016213; also selected for the February 1, 2010 issue of *Virtual Journal of Applications of Superconductivity*.

2008

J. Issa, R. Mukherjee, A. Diaz, and S. W. Shaw, "Modal Disparity and Its Experimental Verification," *Journal of Sound and Vibration* **311**, 1465-1475.

J. F. Rhoads, N. J. Miller, S. W. Shaw, and B. F. Feeny, "Mechanical Domain Parametric Amplification," *Journal of Vibration and Acoustics* **130**, 061006.

B. E. DeMartini, J. F. Rhoads, M. A. Zielke, K. G. Owen, S. W. Shaw, and K. L. Turner, "A Single Input-Single Output Microresonator Array for the Detection and Identification of Multiple Analytes," *Applied Physics Letters* **93**, 054102:1-3; also selected for the August 18, 2008 issue of *Virtual Journal of Nanoscale Science & Technology*.

S. W. Shaw and B. Balachandran, "A Review of Nonlinear Dynamics of Mechanical Systems in Year 2008," *JSME Journal of System Design and Dynamics* **2**, 611-640. Invited Review Paper for the Special Issue on Nonlinear Dynamics in Mechanical Systems.

2007

G. Csernak, G. Stépán, and S. W. Shaw, "Sub-harmonic Resonant Solutions of a Harmonically Excited Dry-Friction Oscillator," *Nonlinear Dynamics* **50**, 93-109.

B. E. DeMartini, J. F. Rhoads, S. W. Shaw, and K. L. Turner, "A Single Input – Single Output Mass Sensor Based on a Coupled Array of Microresonators," *Sensors and Actuators A: Physical* **13**, 147-156.

B. E. DeMartini, J. F. Rhoads, K. L. Turner, J. Moehlis, S. W. Shaw, "Linear and Nonlinear Tuning of Parametrically Excited MEM Oscillators," *Journal of Microelectromechanical Systems* **16**, 310-318.

2006

D. Jiang, C. Pierre, S. W. Shaw, "Nonlinear normal modes and their application in structural dynamics," *Mathematical Problems in Engineering*, Volume 2006, Article 10847, 15 pages.

S. W. Shaw, P. Schmitz, and A. G. Haddow, "Dynamics of Tautochronic Pendulum Vibration Absorbers," *Journal of Computational and Nonlinear Dynamics* **1**, 283-293.

J. Rhoads, S. W. Shaw, K. Turner, B. DeMartini, J. Moehlis, and W. Zhuang, "Generalized Parametric Resonance in Electrostatically Actuated Micromechanical Systems," *Journal of Sound and Vibration* **296**, 797-829.

S. Nudehi, R. Mukherjee, and S. W. Shaw, "Active Vibration Control of a Flexible Beam Using a Buckling-Type End Force," *Journal of Dynamic Systems, Measurement and Control* **128**, 278-286.

J. Rhoads, S. W. Shaw, and K. Turner, "The Nonlinear Response of Resonant Microbeam Systems with Purely Parametric Electrostatic Actuation," *Journal of Micromechanics and Microengineering* **16**, 890-899.

S. W. Shaw and C. Pierre, "The Dynamic Response of Tuned Impact Absorbers for Rotating Flexible Structures," *Journal of Computational and Nonlinear Dynamics* **1**, 13-24.

2005

D. Jiang, C. Pierre, and S. W. Shaw, "Nonlinear Normal Modes for Vibratory Systems Under Periodic Excitation," *Journal of Sound and Vibration* **288**, 791-812.

J. Rhoads, S. Shaw, K. Turner, and R. Baskaran, "Tunable MEMS Filters that Exploit Parametric Resonance," *Journal of Vibration and Acoustics* **127**, 423-430.

P. Apiwattanalunggarn, S. W. Shaw, and C. Pierre. "Component Mode Synthesis Using Nonlinear Normal Modes," *Nonlinear Dynamics* **41**, 17-46.

A. Singh, R. Mukherjee, K. Turner, and S. W. Shaw, "MEMS Implementation of Axial and Follower End Forces," *Journal of Sound and Vibration* **286**, 637-644.

B. J. Olson, S. W. Shaw and G. Stépán, "Stability and Bifurcations of Longitudinal Vehicle Traction," *Nonlinear Dynamics* **40**, 339-365.

D. Jiang, C. Pierre, and S. W. Shaw, "The Construction of Nonlinear Normal Modes for Systems with Internal Resonance," *International Journal of Nonlinear Mechanics* **40**, 729-746.

2004

M. Legrand, D. Jiang, C. Pierre, and S. W. Shaw, "Nonlinear Normal Modes of a Rotating Shaft Based on the Invariant Manifold Method," *International Journal of Rotating Machinery* **10**, 319-335.

D. Jiang, C. Pierre, and S. W. Shaw, "Large-Amplitude Nonlinear Normal Modes of Piecewise Linear Systems," *Journal of Sound and Vibration* **272**, 869-891.

2003

A. Haddow and S. W. Shaw, "Centrifugal Pendulum Vibration Absorbers: An Experimental and Theoretical Investigation," *Nonlinear Dynamics* **34**, 293-307.

B. J. Olson, S. W. Shaw and G. Stépán, "Nonlinear Dynamics of Ground Vehicle Traction," *Vehicle System Dynamics* **40**, 377-399.

P. Apiwattanalungarn, S. W. Shaw, C. Pierre, and D. Jiang, "Finite-Element-Based Nonlinear Modal Reduction of a Rotating Beam with Large-Amplitude Motion," *Journal of Vibration and Control* **9**, 235-263.

A. Alsuwaiyan and S. W. Shaw, "Steady-State Responses of Systems of Nearly-Identical Torsional Vibration Absorbers," *Journal of Vibration and Acoustics* **125**, 80-87.

2002

E. Pesheck, C. Pierre, and S. W. Shaw, "Model Reduction of a Nonlinear Rotating Beam Through Nonlinear Normal Modes," *Journal of Vibrations and Acoustics* **124**, 229-236.

E. Pesheck, C. Pierre, and S. W. Shaw, "A New Galerkin-Based Approach for Accurate Nonlinear Normal Modes Through Invariant Manifolds," *Journal of Sound and Vibration* **249**, 971-993.

A. Alsuwaiyan and S. W. Shaw, "Performance and Dynamic Stability of General-Path Centrifugal Pendulum Vibration Absorbers," *Journal of Sound and Vibration* **252**, 791-815.

2001

E. Pesheck, N. Boivin, C. Pierre, and S. W. Shaw, "Non-Linear Modal Analysis of Structural Systems Using Multi-Mode Invariant Manifolds," *Nonlinear Dynamics* **25**, 183-205.

E. Pesheck, C. Pierre, and S. W. Shaw, "Accurate Reduced-Order Models for a Simple Rotor Blade Model Using Nonlinear Normal Modes," *Mathematical and Computer Modelling* **33** (special issue on applications to rotorcraft), 1085-1097.

2000

C. Jiang, A. W. Troesch, and S. W. Shaw, "Capsize Criteria for Ship Models with Memory-Dependent Hydrodynamics and Random Excitation," *Philosophical Transactions of the Royal Society* **358**, 1761-1791, invited paper.

S.-L. Chen, S. W. Shaw, H. K. Khalil and A. W. Troesch, "Robust Stabilization of Large Amplitude Motions of Vessels in Beam Seas," *Journal of Dynamic Systems, Measurement and Control* **122**, 108-113.

C.-P. Chao and S. W. Shaw, "The Dynamic Response of Multiple Pairs of Subharmonic Pendulum Vibration Absorbers," *Journal of Sound and Vibration* **231**, 411-431.

1999

A. Alsuwaiyan and S. W. Shaw, "Localization of Free Vibration Modes in Systems of Nearly-Identical

Vibration Absorbers," *Journal of Sound and Vibration* **228**, 703-711.

S.-L. Chen, S. W. Shaw and A. W. Troesch, "A Systematic Approach to Modeling Nonlinear Multi-DOF Ship Motions in Regular Seas," *Journal of Ship Research*, **43**, 25-37.

S. W. Shaw, C. Pierre, E. Pesheck, "Modal Analysis-Based Reduced-Order Models for Nonlinear Structures - An Invariant Manifold Approach," *Shock and Vibration Digest* **31**,3-16, invited paper.

1998

C.-P. Chao and S. W. Shaw, "The Effects of Imperfections on the Performance of the Subharmonic Vibration Absorber System," *Journal of Sound and Vibration* **215**, 1065-1099.

1997

C.-P. Chao, S. W. Shaw and C.-T. Lee, "Non-Unison Dynamics of Multiple Centrifugal Pendulum Vibration Absorbers," *Journal of Sound and Vibration* **204**, 769-794.

C.-P. Chao, C.-T. Lee and S. W. Shaw, "Stability of the Unison Response for a Rotating System with Multiple Centrifugal Pendulum Vibration Absorbers," *ASME Journal of Applied Mechanics* **64**, 149-156.

C.-T. Lee and S. W. Shaw, "Nonlinear Dynamic Response of Paired Centrifugal Pendulum Vibration Absorbers," *Journal of Sound and Vibration* **203**, 731-743.

C.-T. Lee, S. W. Shaw and V. T. Coppola, "A Subharmonic Vibration Absorber for Rotating Machinery," *ASME Journal of Vibration and Acoustics* **119**, 590-595.

1996

C. Jiang, A. W. Troesch and S. W. Shaw, "Highly Nonlinear Rolling Motion of Biased Ships in Random Beam Seas," *Journal of Ship Research* **40**(2), 125-135.

S.-L. Chen and S. W. Shaw, "A Fast-Manifold Approach to Melnikov Functions for Slowly Varying Oscillators," *International Journal of Bifurcation and Chaos* **6**(8), 1575-1578.

S.-L. Chen and S. W. Shaw, "Normal Modes for Piecewise-Linear Vibratory Systems," *Nonlinear Dynamics* **10**, 135-164.

C.-T. Lee and S. W. Shaw, "On the Counteraction of Periodic Torques in Rotating Systems Using Centrifugally Driven Vibration Absorbers," *Journal of Sound and Vibration* **191**(5), 695-719.

1995

N. Boivin, C. Pierre and S. W. Shaw, "Non-linear Modal Analysis of Structural Systems Featuring Internal Resonances," *Journal of Sound and Vibration* **182**(2), 336-341.

N. Boivin, C. Pierre and S. W. Shaw, "Non-Linear Normal Modes, Invariance, and Modal Dynamics Approximations of Non-Linear Systems," *Nonlinear Dynamics* **8**, 315-345, 1995.

1994

F. Farahanchi and S. W. Shaw, "Periodic and Chaotic Dynamics of a Slider-Crank Mechanism with Slider Clearance," *Journal of Sound and Vibration* **177**(3),307-324.

S.-R. Hsieh, A. W. Troesch and S. W. Shaw, "A Nonlinear Probabilistic Method for Predicting Vessel Capsizing in Random Beam Seas," *Proceedings of the Royal Society London* **446**, 195-211.

S. W. Shaw, A. G. Haddow and S.-R. Hsieh, "Properties of Cross-Well Chaos in an Impacting System," *Philosophical Transactions of the Royal Society of London A* **347**, 391-410.

S.-R. Hsieh, S. W. Shaw and C. Pierre, "Normal Modes for Large Amplitude Motions of a Cantilever Beam," *International Journal of Solids and Structures* **31** (14), 1981-2014.

S. W. Shaw, "An Invariant Manifold Approach to Nonlinear Normal Modes of Oscillation," *Journal of Nonlinear Science* **4**, 419-448.

S.-R. Hsieh and S. W. Shaw, "Dynamic Stability and Nonlinear Resonances of a Flexible Connecting Rod: Single Mode Model," *Journal of Sound and Vibration* **170**(1),25-49.

S. W. Shaw and C. Pierre, "Normal Modes of Vibration for Nonlinear Continuous Systems," *Journal of Sound and Vibration* **169**(3), 319-347.

1993

S.-R. Hsieh and S. W. Shaw, "Dynamic Stability and Nonlinear Resonance of a Flexible Connecting Rod: Continuous Parameter Model," *Nonlinear Dynamics* **4**, 573-603.

S. W. Shaw and C. Pierre, "Normal Modes for Nonlinear Vibratory Systems," *Journal of Sound and Vibration* **164**(1), 85-124.

1992

J. Falzarano, S. W. Shaw and A. Troesch, "Applications of Modern Geometric Methods for Dynamical Systems to the Problem of Vessel Capsizing with Water-on-Deck," *International Journal of Bifurcation and Chaos* **2**, 101-115.

S. W. Shaw and A. G. Haddow, "On Rollercoaster Experiments for Nonlinear Oscillators," *Nonlinear Dynamics* **3**, 375-384.

M. Sharif-Bakhtiar and S. W. Shaw, "Effects of Nonlinearities and Damping on the Dynamic Response of a Centrifugal Pendulum Vibration Absorber," *ASME Journal of Vibration and Acoustics* **114**, 305-311.

1991

C. Pierre and S. W. Shaw, "Mode Localization Due to Symmetry-Breaking Nonlinearities," *International Journal of Bifurcation and Chaos* **1**, 471-475.

S. W. Shaw and C. Pierre, "Nonlinear Normal Modes and Invariant Manifolds," *Journal of Sound and Vibration* **150**, 170-173.

J. Shaw and S. W. Shaw, "The Effect of Unbalance on Oil Whirl," *Nonlinear Dynamics* **1**, 293-311.

J. Shaw and S. W. Shaw, "Nonlinear Resonance of an Unbalanced Rotating Shaft with Internal Damping," *Journal of Sound and Vibration* **147**, 435-451.

1990

S. R. Hsieh and S. W. Shaw, "The Stability of Modes at Rest in a Chaotic System," *Journal of Sound and Vibration* **138**, 421-431.

D. Moore and S. W. Shaw, "Experimental Response of an Impacting Pendulum System," *International Journal of Nonlinear Mechanics* **25**, 1-16.

1989

J. Shaw and S. W. Shaw, "Instabilities and Bifurcations in a Rotating Shaft," *Journal of Sound and Vibration* **132**, 227-244.

J. Shaw and S. W. Shaw, "The Onset of Chaos in a Two Degree of Freedom Impacting System," *ASME Journal of Applied Mechanics* **56**, 168-174.

J. Shaw, S. W. Shaw and A. Haddow, "On the Dynamic Response of the Nonlinear Vibration Absorber," *International Journal of Nonlinear Mechanics* **24**, 281-293.

S. W. Shaw and R. H. Rand, "The Transition to Chaos in a Simple Mechanical System," *International Journal of Nonlinear Mechanics* **24**, 41-56.

1988

M. Sharif-Bakhtiar and S. W. Shaw, "The Dynamic Response of the Centrifugal Pendulum Vibration Absorber with Motion-Limiting Stops," *Journal of Sound and Vibration* **124**, 221-235.

S. W. Shaw, "Chaotic Dynamics of a Slender Beam Rotating About Its Longitudinal Axis," *Journal of Sound and Vibration* **124**, 329-343.

P.-C. Tung and S. W. Shaw, "A Method for the Improvement of Impact Printer Performance," *ASME Journal of Vibration, Acoustics, Stress and Reliability in Design* **110**, 528-532.

S. W. Shaw and S. Wiggins, "Chaotic Dynamics of a Whirling Pendulum," *Physica* **31D**, 190-211.

P.-C. Tung and S. W. Shaw, "The Dynamics of an Impact Print Hammer," *ASME Journal of Vibration, Acoustics, Stress and Reliability in Design* **110**, 193-200.

S. W. Shaw and S. Wiggins, "Chaotic Motions of a Torsional Vibration Absorber," *ASME Journal of Applied Mechanics* **55**, 952-958.

S. Wiggins and S. W. Shaw, "Chaos and Three Dimensional Horseshoes in Slowly Varying Oscillators," *ASME Journal of Applied Mechanics* **55**, 959-967.

S. W. Shaw and P.-C. Tung, "The Dynamic Response of a System with Pre-Loaded Compliance," *ASME Journal of Dynamic Systems, Measurement, and Control* **110**, 278-283.

1987

P. R. Sethna and S. W. Shaw, "On Codimension Three Bifurcations in the Motion of Articulated Tubes Conveying a Fluid," *Physica* **24D**, 305-327.

1986

S. N. Chow and S. W. Shaw, "Bifurcations of Subharmonics," *Journal of Differential Equations* **65**, 304-320.

S. W. Shaw, "On the Dynamic Response of a System with Dry Friction," *Journal of Sound and Vibration* **108**, 305-325.

1985

*S. W. Shaw, "The Dynamics of a Harmonically Excited System Having Rigid Amplitude Constraints, Part I: Subharmonic Motions and Local Bifurcations," *ASME Journal of Applied Mechanics* **52**, 453-458, 1985, (also ASME paper 85-APM-14).

*S. W. Shaw, "The Dynamics of a Harmonically Excited System Having Rigid Amplitude Constraints, Part II: Chaotic Motions and Global Bifurcations," *ASME Journal of Applied Mechanics* **52**, 459-464, 1985, (also ASME paper 85-APM-15).

S. W. Shaw, "Forced Vibrations of a Beam with One-Sided Amplitude Constraint: Theory and Experiments," *Journal of Sound and Vibration* **99**, 199-212, 1985.

1983

S. W. Shaw and P.J. Holmes, "Periodically Forced Linear Oscillator with Impacts: Chaos and Long Period Motions," *Physical Review Letters* **51**, 623-626.

S. W. Shaw and P.J. Holmes, "A Periodically Forced Impact Oscillator with Large Dissipation," *ASME*

Journal of Applied Mechanics **50**, 849-857 (also ASME paper 83-WA/APM-23).

S. W. Shaw and P.J. Holmes, "A Periodically Forced Piecewise Linear Oscillator," *Journal of Sound and Vibration* **90**, 129-155.

F.C. Moon and S. W. Shaw, "Chaotic Vibrations of a Beam with Nonlinear Boundary Conditions," *International Journal of Nonlinear Mechanics* **18**, 465-477.

OTHER PUBLICATIONS

C. Burgner, K. Turner, N. Miller, Steven Shaw, and M. Dykman, "Parameter Sweep Strategies for Sensing Using Bifurcations in MEMS," Paper 201, *Hilton Head, 2010: A Solid State Sensor, Actuator, and Microsystems Workshop*; Hilton Head, SC, 2010.

Z. Yie, K.L. Turner, N.J. Miller, and S.W. Shaw, "Sensitivity Enhancement Using Parametric Amplification in Resonant Sensing Array," Paper 95, *Hilton Head, 2010: A Solid State Sensor, Actuator, and Microsystems Workshop*; Hilton Head, SC, 2010.

N. Miller, C. Burgner, M. Dykman, S. Shaw, and K. Turner, "Fast estimation of Bifurcation Conditions using Noisy Response Data," *Proceedings of the SPIE*, Vol. 7647, 7647-23, 2010.

J. Portman, M. Khasin, S. W. Shaw, M. I. Dykman, "The spectrum of an oscillator with fluctuating mass and nanomechanical mass sensing," Abstract: V14.00010, APS March Meeting, 2010

S. Gozin, B. J. Olson, C. Pierre, and S. W. Shaw, "Resonance Suppression in Multi-DOF Cyclic Systems Using Order-Tuned Absorbers," *The 2009 ASME International Design Engineering Technical Conferences, DETC2009-86287, 22nd Biennial Conference on Mechanical Vibration and Noise*, 2009, San Diego, CA.

R. Monroe, S. W. Shaw, B. Geist, and A. G. Haddow, "Accounting for Roller Dynamics in the Design of Bifilar Torsional Vibration Absorbers" *The 2009 ASME International Design Engineering Technical Conferences*, Paper DETC2009-87431, *22nd Biennial Conference on Mechanical Vibration and Noise*, 2009, San Diego, CA.

J. F. Rhoads, S. W. Shaw, and K. L. Turner, "Nonlinear Dynamics and its Applications in Micro- and Nano-resonators," invited keynote paper, Paper DSC2008-254, *Proceedings of the ASME Dynamic Systems and Controls Conference*, Ann Arbor, 2008.

J. Issa, R. Mukherjee, and S. W. Shaw, "Control of Space Structures Using Cable Actuators," Paper DSC2008-009, *Proceedings of the ASME Dynamic Systems and Controls Conference*, Ann Arbor, 2008.

N. J. Miller and S. W. Shaw, "Frequency Sweeping with Concurrent Parametric Amplification," Paper DSC2008-118, *Proceedings of the ASME Dynamic Systems and Controls Conference*, Ann Arbor, 2008.

B. E. DeMartini, M. A. Zielke, K. G. Owen, K. L. Turner, J. F. Rhoads, and S. W. Shaw, "Detection and Identification of Multiple Chemicals Using a Single Input-Single Output Coupled Microresonator Array,"

Extended Abstract, *International Workshop on Nanomechanical Cantilever Sensors*, Max Planck Institute for Polymer Research, Mainz, Germany, 2008.

J. F. Rhoads and S. W. Shaw, "Effects of Nonlinearity on Parametric Amplifiers," *Proceedings of the 2008 ASME IDETC*, Paper DETC2008-49594, Brooklyn, NY, 2008.

B. J. Olson and S. W. Shaw, "Vibration Absorbers for Cyclic Rotating Flexible Structures: Linear and Nonlinear Tuning," Paper SMASIS08-632, *Proceedings of the ASME 2008 Conference on Smart Materials, Adaptive Structures, and Intelligent Systems*, Baltimore, 2008.

N. J. Miller, S. W. Shaw, L. A. Oropeza-Ramos, and K. L. Turner, "Analysis of a Novel MEMS Gyroscope Actuated by Parametric Resonance," *Proceedings of the Sixth EUROMECH Nonlinear Dynamics Conference* (ENOC 2008), St. Petersburg, Russia, 2008.

N. Miller, S. Shaw, L. Oropeza-Ramos, and K. Turner, "A MEMS-Based Rate Gyroscope Based on Parametric Resonance," Paper ESDA08-59567, *Proceedings of the 9th Biennial ASME Conference on Design and Analysis*, Haifa, Israel, 2008.

S. W. Shaw, M. Orłowski, A. Haddow, and B. Geist "Transient Dynamics of Centrifugal Pendulum Vibration Absorbers," Paper 2008-20119, *Twelfth International Symposium on Transport Phenomena and Dynamics of Rotating Machinery* (ISROMAC-12), Honolulu, Hawaii, February, 2008.

J. F. Rhoads, N. J. Miller, S. W. Shaw, and B. F. Feeny. "Mechanical Domain Parametric Amplification," Paper DETC2007-35426, *IDETC/CIE 2007: The 2007 ASME International Design Engineering Technical Conferences, 6th International Conference on Multibody Systems, Nonlinear Dynamics, and Control*. Las Vegas, Nevada, 2007.

B. Demartini, J. Rhoads, S. Shaw, K. Turner, "A Resonant SISO Sensor Based on a Coupled Array of Micromechanical Oscillators," *Hilton Head, 2006: A Solid State Sensor, Actuator, and Microsystems Workshop*; Hilton Head, SC, 2006.

J. Rhoads, B. Demartini, S. Shaw, K. Turner, "A SISO, Multi-Analyte Sensor Based on a Coupled Micromechanical Array," *Proceedings of the 2006 ASME IMECE*, Chicago, 2006.

S. W. Shaw, B.J. Olson, and C. Pierre, "Order-Tuned and Impact Vibration Absorbers for Rotating Flexible Structures," *Eleventh International Symposium on Transport Phenomena and Dynamics of Rotating Machinery* (ISROMAC-11), Honolulu, Hawaii, March, 2006.

B. E. DeMartini, J. Moehlis, K. L. Turner, J. F. Rhoads, S. W. Shaw, and W. Zhang, "Modeling of Parametrically Excited Microelectromechanical Oscillator Dynamics with Application to Filtering," Paper PID134530, *IEEE Sensors 2005, 4th IEEE Conference on Sensors*, Irvine, CA, 2005.

B. J. Olson, S. W. Shaw, and C. Pierre, "Order-Tuned Vibration Absorbers for Cyclic Rotating Flexible Structures," Paper DETC2005-84641, *Proceedings of the 20th Biennial Conference on Mechanical Vibration and Noise*, Long Beach, California, 2005.

J. F. Rhoads, S. W. Shaw, K. L. Turner, J. Moehlis, B. E. DeMartini, and W. Zhang. "Nonlinear Response of Parametrically-Excited MEMS," Paper DETC2005-84603, *Proceedings of the 20th Biennial Conference on Mechanical Vibration and Noise*. Long Beach, California, 2005.

S. S. Nudehi, R. Mukherjee, and S. W. Shaw, "Vibration Control in a Flexible Beam Using a Conservative Force," Paper IMECE2004-60783, *Proceedings of the 2004 ASME International Mechanical Engineering Conference*. Anaheim, California, 2004

B. J. Olson, S. W. Shaw, and G. Stépán, "Nonlinear Dynamics of Longitudinal Vehicle Traction," *Proceedings of the 9th Mini-Conference on Vehicle System Dynamics, Identifications and Anomalies* (Budapest, Hungary), 2004.

S. W. Shaw, T. Nester, A. Haddow, and P. Schmitz, "Experimental Observations of Centrifugal Pendulum Vibration Absorbers," *Tenth International Symposium on Transport Phenomena and Dynamics of Rotating Machinery* (ISROMAC-10), Honolulu, Hawaii, March, 2004.

S. W. Shaw, K. L. Turner, J. F. Rhoads, and R. Baskaran, "Parametrically Excited MEMS-Based Filters," *Proceedings of the IUTAM Symposium on Chaotic Dynamics and Control of Systems and Processes in Mechanics*, 137-146. Rome, Italy: Springer. 2003.

T.M. Nester, A. G. Haddow, and S. W. Shaw. "Experimental Investigation of a System of Nearly-Identical Centrifugal Pendulum Vibration Absorbers," *Proceedings of the 19th Biennial Conference on Mechanical Vibration and Noise*, Paper DETC/2003-48410, Chicago, September, 2003.

D. Jiang, C. Pierre, and S. W. Shaw. "Nonlinear Normal Modes for Vibratory Systems Under Periodic Excitation," *Proceedings of the 19th Biennial Conference on Mechanical Vibration and Noise*, Paper DETC/2003-48443, Chicago, September, 2003.

P. Apiwattanalungarn, S. W. Shaw, and C. Pierre. "Component Mode Synthesis Using Nonlinear Normal Modes," *Proceedings of the 19th Biennial Conference on Mechanical Vibration and Noise*, Paper DETC/2003-48441, Chicago, September, 2003.

T.M. Nester, A. G. Haddow, S. W. Shaw, J.E. Brevick, and V.J. Borowski. "Vibration Reduction in Variable Displacement Engines Using Pendulum Absorbers," Paper 2003-01-1484 *Proceedings of the SAE Noise and Vibration Conference and Exhibition*, Traverse City, MI, 2003.

T.M. Nester, S. W. Shaw, A. G. Haddow, and J.E. Brevick. "Centrifugal Pendulum Vibration Absorbers in Variable Displacement Engines." Abstract, *Ninth Conference on Nonlinear Vibrations, Stability, and Dynamics of Structures*. Blacksburg, VA, July 28-August 1, 2002.

D. Jiang, C. Pierre, and S. W. Shaw, "The Construction of Nonlinear Normal Modes for Systems with Internal Resonance: Application to Rotating Beams," Abstract, *Ninth Conference on Nonlinear Vibrations, Stability, and Dynamics of Structures*. Blacksburg, VA, July 28-August 1, 2002.

M. Legrand, D. Jiang, C. Pierre, and S. W. Shaw, "Nonlinear Normal Modes of a Rotating Shaft Based on the Invariant Manifold Method," *Ninth International Symposium on Transport Phenomena and Dynamics of Rotating Machinery (ISROMAC-9)*, Honolulu, Hawaii, February 10-14, 2002.

A. Haddow and S. W. Shaw, "An Experimental Study of Torsional Vibration Absorbers," *Proceedings of the 18th Biennial Conference on Mechanical Vibration and Noise*, ASME Paper DETC2001/VIB-21754, Pittsburgh, Pennsylvania, September 9-12, 2001.

D. Jiang, V. Soumier, C. Pierre, and S. W. Shaw. "Large amplitude nonlinear normal modes of piecewise linear systems," *Proceedings of the 18th Biennial Conference on Mechanical Vibration and Noise*, ASME Paper DETC2001/VIB-21734, Pittsburgh, Pennsylvania, September 9-12, 2001.

A. Haddow and S. W. Shaw, "Torsional Vibration Absorbers: A Testing and Evaluation Apparatus," *Proceedings of SAE Noise and Vibration Conference*, SAE Paper 2001-01-1577, 2001.

S. W. Shaw, "Perturbation Techniques for Nonlinear Systems," *Encyclopedia of Vibration*, Academic Press, pp. 1009-1011, 2001.

S. W. Shaw, Questions for Structural Dynamics 2000, *Structural Dynamics 2000: current status and future directions*, pp. 469-470, D.J. Ewins and D.J. Inman, eds., Research Studies Press, Ltd., 2001.

B. J. Olson, S. W. Shaw, and G. Stépán, "A Nonlinear Model for Vehicle Braking," in the *Eighth Conference on Nonlinear Vibrations, Stability, and Dynamics of Structures*, (Blacksburg, VA), Jul 23-27, 2000.

S. W. Shaw and A. Alsuwaiyan, "Torsional Vibration Reduction Using Passive Nonlinear Absorbers," *Proceedings of the SPIE Conference on Smart Structures*, Newport Beach, CA, March, 2000.

F. Salam, H. Khalil, C. Radcliffe, and S. Shaw, "Development of a Course Sequence in Sensing and Control for Automotive Systems," *Proceedings of the Conference on Decision and Control*, 1999.

H. Khalil and S. W. Shaw, "Classical Stability Theory: Nonlinear," *Wiley Encyclopedia of Electrical and Electronics Engineering*, Volume 20, 390-398, 1999.

S. W. Shaw and C. Pierre, "Invariant Manifolds and Model Reduction in Nonlinear Systems," *Applied Mechanics in the Americas*, Volume 8, Dynamics, 1597-1600, 1999.

E. Pesheck, C. Pierre and S. W. Shaw, "Model Reduction of a Nonlinear Rotating Beam Through Nonlinear Normal Modes," paper DETC99/VIB-8074, Proceedings 1999 ASME Design Engineering Technical Conferences (to appear on CD-ROM).

C. P. Chao and S. W. Shaw, "Dynamically Stable Non-Linear Modes of Multiple Subharmonic Torsional Vibration Absorbers," paper DETC99/VIB-8073, Proceedings 1999 ASME Design Engineering Technical Conferences (to appear on CD-ROM).

A. Alsuwaiyan and S. W. Shaw, "Steady-State Synchronous and Localized Responses of Tuned Pendulum Vibration Absorbers," paper DETC99/VIB-8014, Proceedings 1999 ASME Design Engineering Technical

Conferences (to appear on CD-ROM).

A. Alsuwaiyan and S. W. Shaw, "Stability Limitations for Multiple Centrifugal Pendulum Vibration Absorbers," paper DETC99/VIB-8055, Proceedings 1999 ASME Design Engineering Technical Conferences (to appear on CD-ROM).

S. W. Shaw, C.P. Chao and C.T. Lee, "Nonlinear Dynamics and the Design of Tuned Pendulum Vibration Absorbers," *Proceedings of the IUTAM Symposium on Applications of Nonlinear and Chaotic Dynamics in Mechanics*, 223-234, edited by F. C. Moon. Kluwer, 1998.

"Nonlinear Dynamics with Impacts and Friction," with B.F. Feeny. *Dynamics and Chaos in Manufacturing Processes*, Chapter 9, 241-264, edited by F.C. Moon. Wiley Interscience, 1998,

"Design of Pendulum Vibration Absorbers for the Attenuation of Transverse Vibrations in Rotating Beams," with Y. Wang and C.P. Chao, paper DETC97/VIB-4182, Proceedings 1997 ASME Design Engineering Technical Conferences (CD-ROM).

"Rattle Reduction of Automotive Components - An FEM Approach," with S. R. Hsieh, J. Her and V. Borowski, paper DETC97/VIB-3928, Proceedings 1997 ASME Design Engineering Technical Conferences (CD-ROM).

"On the Effects of Imperfections and Mistuning on the Performance of Subharmonic Vibration Absorbers," with C.P. Chao, paper DETC97/VIB-4104, Proceedings 1997 ASME Design Engineering Technical Conferences (CD-ROM).

"Nonlinear Localization in Systems of Tautochronic Pendulum Vibration Absorbers," with C.P. Chao, paper DETC97/VIB-3956, Proceedings 1997 ASME Design Engineering Technical Conferences (CD-ROM).

"Phase Space Transport in a Class of Multi-Degree of Freedom Systems," with S.L. Chen, paper DETC97/VIB-4105, Proceedings 1997 ASME Design Engineering Technical Conferences (CD-ROM).

+ "Attenuation of Engine Torsional Vibrations Using Tuned Pendulum Absorbers," with V. Garg and C.P. Chao, Paper 971961, Proceedings of the 1997 *SAE Noise and Vibration Conference and Exposition*.

"A CAE Methodology for Reducing Rattle in Structural Components," S. R. Hsieh, V. J. Borowski, J. Y. Her, S. W. Shaw, Paper 972057, Proceedings of the 1997 *SAE Noise and Vibration Conference and Exposition*.

"On the dynamics of systems with multiple centrifugal pendulum vibration absorbers - stability and bifurcation of the unison response," invited paper, with C.P. Chao, 2nd European Nonlinear Oscillations Conference, Prague, September, 1996.

"Robust Stabilization of Large Amplitude Ship Rolling in Regular Beam Seas," with S.L. Chen, H. K. Khalil and A. W. Troesch. Symposium Volume on *Nonlinear Dynamics and Control*, 1996 International Mechanical Engineering Conference and Exposition, Atlanta.

"Nonlinear Modal Analysis of the Forced Response of Structural Systems," Paper 96-1250, with N. Boivin

and C. Pierre, *Proceedings of the AIAA Dynamics Specialists Conference*, Salt Lake City, UT, April 1996.

“Torsional Vibration Reduction in Internal Combustion Engines Using Centrifugal Pendulums,” ASME Design Engineering Technical Conference, Volume DE-84-1, 487-492, with C.T. Lee, 1995.

“A Comparative Study of Nonlinear Centrifugal Pendulum Vibration Absorbers,” *Nonlinear and Stochastic Dynamics*, ASME Volume AMD-Vol.192/DE-Vol. 78,91-98, with C.T. Lee, 1994.

“Nonlinear Dynamics and Capsizing of Small Fishing Vessels,” *Proceedings of the Fifth International Conference on Stability of Ships and Ocean Vehicles*, Volume 3, with C. Jiang and A. W. Troesch, 1994.

“On the Nonlinear Dynamics of Centrifugal Pendulum Vibration Absorbers,” *Proceedings of the Conference on Asymptotics in Mechanics*, with C.T. Lee, St. Petersburg, Russia, 1994.

“On the Nonlinear Dynamics of Centrifugal Pendulum Vibration Absorbers,” *Smart Structures, Nonlinear Vibration and Control*, Volume 1, 247-309, A. Guran and D. J. Inman, eds., Prentice Hall, with C.T. Lee, 1995.

“Non-Linear Modal Analysis of Structural Systems Using Multi-Mode Invariant Manifolds,” Paper 94-1672, with N. Boivin and C. Pierre, *Proceedings of the AIAA Dynamics Specialists Conference*, Hilton Head, SC, April 1994.

“A Predictive Method for Vessel Capsize in Random Seas,” *Nonlinear Dynamics of Marine Vehicles*, ASME Volume, with S. R. Hsieh and A. W. Troesch, 1993.

Forward for Volume 4 (6) of *Nonlinear Dynamics*, pp. 527-530, in honor of the 70th birthday of Professor P. R. Sethna, with A.K. Bajaj, 1993.

“Normal Modes and Modal Analysis Techniques for Nonlinear Structural Systems,” with C. Pierre, to appear in the volume, *Stochastic Modelling and Nonlinear Dynamics: Applications to Mechanical Systems*, CRC Press, N. Sri Namachchivaya and W. Klieman, eds.

“On Nonlinear Normal Modes,” *Nonlinear Vibrations*, ASME Volume DE-50 (and AMD-144), pp. 1-5, R.A. Ibrahim, N.S. Namachchivaya and A.K. Bajaj (eds.), with C. Pierre, 1992, invited.

“Reducing Vibration of Reciprocating Engines with Crankshaft Pendulum Absorbers,” 1991 SAE Technical Paper 911876, with V. J. Borowski, H.H. Denman, D. L. Cronin, J. P. Hanisko, L. T. Brooks, D.A. Mikulec, W. B. Crum, and M.P. Anderson, 1991. Also appeared in the SAE Transactions.

“The Local Stability of Inactive Modes in Chaotic Multi-Degree-of-Freedom Systems,” *International Series of Numerical Mathematics* 97, 333-342, (from the Proceedings of the Conference: Bifurcation and Chaos: Analysis, Algorithms, and Applications, Wurzburg, 1990), with S. R. Hsieh, 1991, invited.

“On Domains of Convergence in Eigenvalue Optimization Problems,” *Proceedings of the Third Air Force/NASA Symposium on Recent Advances in Multidisciplinary Analysis and Optimization*, 198-203, with A. Diaz and J. Pan, 1990.

"On Domains of Convergence in Eigenvalue Optimization Problems," *Proceedings of the Second World Congress on Computational Mechanics*, Extended Abstract, International Association of Computational Mechanics, with A. Diaz, 1990.

"The Stability of Modes at Rest in a Chaotic System," Abstract, Third Conference on Nonlinear Vibrations, Stability, and Dynamics of Structures and Mechanisms, Blacksburg, VA, 1990.

"Nonlinear Interactions in Rotordynamics," Abstract, Third Conference on Nonlinear Vibrations, Stability, and Dynamics of Structures and Mechanisms, Blacksburg, VA, 1990.

"Nonlinear Interactions Between Resonance and Instability in a Symmetric Rotor," *Proceedings of the Third International Symposium on Transport Phenomena and Dynamics of Rotating Machinery*, Volume 2, 198-212, with J. Shaw, 1990, invited.

"The Suppression of Chaos in Periodically Forced Oscillators," *Nonlinear Dynamics in Engineering Systems*, W. Schielen (Ed.), 289-296 (from the IUTAM Symposium, Stuttgart), 1990, invited.

"Nonlinear Dynamics of a Rotating Shaft," *Trends in the Applications of Mathematics to Mechanics*, W. Schneider, H. Troger, and F. Ziegler (eds.), 62-70, with J. Shaw, 1991, invited.

"Nonlinear Interactions in Rotordynamics," Abstract, 26th Meeting of the Society of Engineering Science, 1989, invited.

"Chaotic Dynamics in a Class of Multi-Degree of Freedom Systems," Abstract, Applied Mechanics and Engineering Sciences Conference, 89, 1988.

"Extensions and New Applications of Melnikov's Method for Predicting the Onset of Chaos," Abstract, Second Workshop on Non-linear Vibrations, Stability and Dynamics of Structures and Mechanisms, 1988.

"The Performance of an Impact Print Hammer," *Developments in Mechanics* 14b, 826-831, with P.C. Tung, 1987.

"Experimental Response of a Single Degree of Freedom Impacting System," *Developments in Mechanics* 14b, 839-844, with D. Moore, 1987.

"The Dynamic Analysis of the Centrifugal Pendulum Vibration Absorber with Motion Limiting Stops," *Developments in Mechanics* 14b, 845-850, with M. Sharif-Bakhtiar, 1987.

"On the Effects of Asymmetries on a System Near a Codimension Two Point," *Dynamical Systems Approaches to Nonlinear Problems in Circuits and Systems*, 317-332, SIAM Publication, F. Salam and M. Levi (eds.), with P. R. Sethna.

"Chaotic Dynamics of a Rotating Beam," Abstract, AFOSR/ARO Workshop on Nonlinear Dynamics, Stability, and Dynamics at Structures and Mechanisms, 1987.

“Chaotic Motions of a Torsional Vibration Absorber,” Abstract, 23rd Annual Meeting of the Society of Engineering Science, S-16 #2, 1986, invited.

“Arnold Tongues and Subharmonics in the Forced Oscillations of a Mechanical Clock,” *Proceedings 1985 IEEE Conference on Decision and Control*, 976-981, 1985, invited.

“Forced Oscillations of the Inverted Pendulum with Constraints,” Abstract, 22nd Annual Meeting of the Society of Engineering Science, 321, 1985, invited.

“Bifurcations of Articulated Tubes Conveying a Fluid,” Abstract, 1985 Summer Conference on Multiparameter Bifurcation Theory, American Mathematical Society, 1985, with P. R. Sethna.

“The Dynamic Response of a Single Degree of Freedom System with Dry Friction,” *Developments in Mechanics* 13, 434-435, 1985.

“Piecewise Linear Forced Oscillations,” Abstract, Ninth U.S. National Congress of Applied Mechanics, 149, 1982, with P.J. Holmes.

PRESENTATIONS

Invited Seminars

Mechanical Engineering Department, McGill University, Montreal, 2011
Dynamics Interest Group, UIUC, 2010
Department of Mechanical Engineering, Purdue University, 2010
Dynamics and Controls Group, Department of Mechanical Engineering, TU/Eindhoven, 2009
Research and Innovation Center, Ford Motor Company, Dearborn, MI, 2009
Department of Mechanical Engineering, Rice University, Houston, TX, 2009
Department of Mechanical Engineering, University of Maryland-Baltimore County, 2008
Department of Mechanical Engineering, University of Rhode Island, 2008
Department of Mechanical Engineering, Tel Aviv University, 2008
Department of Mechanical Engineering, Duke University, 1992, 2008
Control Engineering Seminar, University of Michigan, 2004, 2007
Department of Engineering Mathematics, University of Bristol, Bristol, UK, 2007
Boeing Integrated Defense Systems, El Segundo, CA, 2007
Department of Mechanical Engineering, UCLA, 2007
Department of Mechanical Engineering, Technion, Haifa, Israel, 2006.
Department of Mechanical Engineering, McGill University, Montreal, 2005.
Center for Control Engineering and Computing, UC-Santa Barbara, 2000, 2004.
Mechanical Engineering Seminar, Oakland University, March, 2002.
Mathematics Department Seminar, Calvin College, April, 2001.
Mechanical Engineering Department Seminar, University of Akron, April, 2001.
Department of Dynamical Systems and Control, Caltech, 2000.
NASA Langley, Structural Dynamics Branch, Hampton, VA, (with C. Pierre), 1999
Department of Aeronautical and Astronautical Engineering, University of Illinois, Urbana, 1992, 1995
Department of Aerospace Engineering and Mechanics, University of Minnesota, 1994.

Center for Nonlinear and Complex Systems, Duke University, 1992
Department of Mechanical Engineering, Case Western Reserve University, 1992
Department of Mechanical and Aerospace Engineering, Arizona State University, 1990, 1992
Department of Mathematics, University of Missouri-Rolla, 1992
Department of Mechanical Engineering, University of Missouri-Rolla, 1992
School of Mechanical Engineering, Purdue University, West Lafayette, 1985, 1992
Department of Theoretical and Applied Mechanics, Cornell University, 1991
Department of Mechanical Engineering, University of Washington, 1991
Department of Mechanical Engineering, Washington State University,, 1991
Engineering Research, Ford Motor Company, Dearborn, 1984, 1988, 1991.
Power Systems Department, General Motors Research Laboratories, 1990
Department of Mechanical Engineering, University of Michigan, Ann Arbor, 1983, 1987
Scientific Laboratories, Ford Motor Company, Dearborn, 1990
Physics Department, Oberlin College, 1989
Applied Mechanics/Mechanical Engineering, Caltech, 1989
Applied Mathematics, University of Michigan, Ann Arbor, 1988
Physics Department, University of Michigan, Flint, 1988
Department of Mechanical Engineering, Wayne State University, 1987
Department of Mechanical Engineering, University of California, Berkeley, 1986
Physics Department, Wayne State University, 1984

In-House Seminars

Mechanical Engineering Department, MSU, 1986, 1987 (fluids group), 1991, 1994, 2003, 2007
Applied Math Seminar, Department of Mathematics, MSU, 1984, 1987(2), 1991, 2006
School of Engineering, Oakland University, 1983
Department of Theoretical and Applied Mechanics, Cornell University, 1983

Conferences (plenary, keynote, and other special lectures listed above in Special Lectures)

IUTAM Symposium on Nonlinear Dynamics in Advanced Technologies and Engineering Design, Aberdeen, Scotland, 2010.
Nonlinear Vibrations Workshop, Duke University, Durham, NC, 2008, 2010.
SPIE Smart Structures/NDE Conference, San Diego, CA, 2010.
Non-linear Vibrations, Stability, and Dynamics of Structures and Mechanisms, Blacksburg, VA, 1988, 1990, 1992, 1994, 1996, 2000, 2010.
22nd Biennial Conference on Mechanical Vibration and Noise, ASME International Design Engineering Technical Conference, San Diego, CA, 2009.
CMMI Grantees Conference, Honolulu, 2 posters, 2009.
Ninth Biennial ASME Conference on Design and Analysis, Haifa, Israel, 2008.
Sixth EUROMECH Conference on Nonlinear Dynamics, St. Petersburg, Russia, 2008.
Twelfth International Symposium on Transport Phenomena and Dynamics of Rotating Machinery (ISROMAC-12), Honolulu, Hawaii, 2008.
2007 ASME Design Engineering Technical Conferences, Las Vegas.
Applied Nonlinear Dynamics: Making it Real, University of Bristol, Bristol, UK, invited, 2007.
Workshop on Coupled Oscillators and Applications to Nanosystems, Santa Barbara, CA, 2007.
DARPA Workshop on Nonlinear Dynamics in Nano-mechanical Systems, San Francisco, CA, invited, 2007.

Eleventh International Symposium on Transport Phenomena and Dynamics of Rotating Machinery (ISROMAC-11), Honolulu, Hawaii, March, 2006.
 2005 ASME Design Engineering Technical Conferences (2 papers), Long Beach.
 International Workshop on Applied Dynamical Systems – Mechanics, Turbulence, Knots, Cockroaches, and Chaos, Montreal, October, 2005, invited.
 Fifth EUROMECH Conference on Nonlinear Dynamics, Eindhoven, 2005, two presentations, including one invited sectional lecture.
 SIAM Conference on Dynamical Systems, Snowbird, UT, 2005, invited.
 IUTAM Symposium on Chaotic Dynamics and Control of Systems and Processes in Mechanics, Rome, 2003.
 Tenth International Symposium on Transport Phenomena and Dynamics of Rotating Machinery (ISROMAC-10), Honolulu, Hawaii, March, 2004.
 2003 ASME Design Engineering Technical Conferences (3 papers), Chicago.
 SAE Noise and Vibration Conference and Exhibition, Traverse City, MI, 2003.
 JSME Minisymposium on Nonlinear Dynamics and Chaos in Mechanical Systems, Tokyo, 2001
 SPIE Conference on Smart Structures, Newport Beach, 2000.
 Symmetry and Stability in Nonlinear Mechanics, Budapest, 2000, invited.
 1999 ASME Design Engineering Technical Conferences (4 papers), Las Vegas.
 1999 ASME Mechanics and Materials Conference (2 papers), Blacksburg, VA.
 NASA Ames, Rotorcraft Dynamics Branch, Moffett Field, CA, 1998.
 1997 ASME Design Engineering Technical Conferences (5 papers), Sacramento, CA.
 IUTAM Symposium on Applications of Nonlinear and Chaotic Dynamics in Mechanics, Ithaca, NY, invited keynote speaker, 1997.
 1997 SAE Noise and Vibration Conference and Exposition, Traverse City, MI.
 1996 Winter Annual Meeting, Atlanta, GA.
 Second European Non-Linear Oscillations Conference, Prague, 1996, invited sectional lecture.
 The Panther CAE Experience, Ford Motor Co., Dearborn, MI, 1995, invited..
 Advanced Research Workshop on Nonlinear Dynamics, Aberdeen, Scotland, 1995, invited.
 NSF Workshop on Nonlinear Dynamics in Manufacturing, La Jolla, CA, 1995, invited.
 1994 ASME Winter Annual Meeting, Chicago, invited.
 31st Annual Meeting of the Society of Engineering Science, College Station, TX, 1994.
 International Symposium on Asymptotics in Mechanics, St. Petersburg, Russia, 1994.
 Twelfth U.S. National Congress of Applied Mechanics, Seattle, 1994.
 1992 ASME Winter Annual Meeting, Anaheim, CA, invited.
 XVIIIth International Congress of Theoretical and Applied Mechanics, Haifa, Israel, 1992.
 ASME Summer Applied Mechanics Conference, Scottsdale, AZ, 1992.
 Fourth ARO Workshop on Rotorcraft Dynamics, College Park, MD, 1991, invited.
 Bifurcation and Chaos: Analysis, Algorithms, and Applications, Wurzburg, Germany, 1990, invited.
 Chaos: Applications in Engineering and Science, University College London, 1990, one of six invited speakers.
 26th Annual Meeting of the Society of Engineering Science, Ann Arbor, 1989, invited.
 IUTAM Symposium on Nonlinear Dynamics in Engineering Systems, Stuttgart, FRG, 1989, invited.
 8th Symposium on Trends in the Application of Mathematics to Mechanics, Hollabrunn, Austria, 1989, invited.

ASME/ASCE Mechanics Conference, San Diego, 1989, invited.
SIAM Conference on Control in the 90's, San Francisco, 1989, invited.
Applied Mechanics and Engineering Sciences Conference, Berkeley, 1988.
AFOSR/ARO Workshop on Nonlinear Vibrations, Stability, and Dynamics of Structures and Mechanisms, Blacksburg, VA, 1987.
Engineering Foundation Workshop on Nonlinear Dynamics, Henniker, NH, 1986, invited.
23rd Annual Meeting of the Society of Engineering Science, Buffalo, 1986, invited.
IEEE Conference on Decision and Control, Ft. Lauderdale, 1985, invited.
22nd Annual Meeting of the Society of Engineering Science, State College, PA, 1985, invited.
19th Midwest Mechanics Conference, Columbus, 1985.
American Mathematical Society Summer Conference on Multiparameter Bifurcation Theory, Arcata, CA, 1985.
ASME/ASCE Mechanics Conference, Albuquerque, 1985, 2 papers.
XVIth International Congress of Theoretical and Applied Mechanics, Lyngby, Denmark, 1984.
ASME Winter Annual Meeting, Boston, 1983.
Ninth U.S. National Congress of Applied Mechanics, Ithaca, NY, 1982.

Other Meetings Attended:

SIAM Conference on Dynamical Systems, Snowbird, UT, 2009.
Structural Dynamics 2000, Workshop on the future of structural dynamics, invited participant, Los Alamos, 1999.
SAE Noise and Vibration Conference and Exposition, Traverse City, MI, 1995.
ASME Summer Conference, Columbus, OH, 1991.
SIAM Conference on Dynamical Systems, Orlando, FL, 1990.
Twentieth Midwestern Mechanics Conference, West Lafayette, IN, 1987.
ASME Winter Annual Meeting, Anaheim, CA, 1986.
NSF Workshop on Research Needs in Theoretical Dynamics, Buffalo, NY, 1986, invited participant.
First IBM/University Symposium on Impact Printing, Yorktown Heights, NY, 1985 invited participant.
Army Research Office Workshop on Chaos in Nonlinear Dynamical Systems, Research Triangle Park, NC, 1983.
Chaos in Dynamical Systems, College Park, MD, 1983.

GRADUATE STUDENTS

Current: Nicolas Miller, dual Ph.D. in ME and Physics, joint with M. Dykman, Physics, MSU
B. Scott Strachan, Ph.D.
Brendan Vidmar, Ph.D., joint with B. Feeny
Thomas Theisen, M.S., joint with B. Feeny
Michael Farmer, M.S., joint with B. Feeny
Pavel Polunin, M.S.

Past: Ryan Monroe, Ph.D., MSU, 2011
Hein van Beek, 2010, visiting student from TU-Eindhoven, advisor: H. Nijmeijer
Brendan Vidmar, M.S., MSU, 2009 (thesis), joint with B. Feeny

Jeffrey Rhoads, Ph.D., MSU, 2007
 Nicholas Miller, M.S., MSU, 2007 (thesis)
 Mark Orłowski, M.S., MSU, 2007 (thesis)
 Brian Olson, Ph.D., MSU, 2006
 Jeffrey Rhoads, M.S. MSU, 2003 (thesis)
 Dongying Jiang, Ph.D., UM, 2003, joint with C. Pierre
 Polarit Apiwattanalungarn, Ph.D., MSU, 2003, joint with C. Pierre
 Tyler Nester, M.S. MSU, 2002 (thesis)
 Brian Olson, M.S., MSU, 2001 (thesis)
 Gábor Csernák, 1999, visiting student, TU-Budapest U. of Technology, advisor: G. Stépán
 Abdallah Alsuwaiyan, Ph.D., MSU, 1999
 Eric Pesheck, Ph.D., UM, 1999, joint with C. Pierre
 Chang-Po Chao, Ph.D., MSU, 1997
 Vishal Garg, M.S., MSU, 1996 (thesis)
 Shyh-Leh Chen, Ph.D., MSU, 1996
 Cheng-Tang Lee, Ph.D., UM, 1994
 Nicholas Boivin, Ph.D., UM, 1995, joint with C. Pierre
 Changben Jiang, Ph.D., UM, 1995, joint with A. Troesch
 L. Steven Gunsiore, M.S., MSU 1995, (project)
 Haider Arafat, M.S.E., UM, 1993 (project)
 Anthony Boardman, M.S.E., UM, 1993 (project)
 Rosamond Dolid, M.S.E., UM, 1993 (project)
 Charisse Russell, M.S.E., UM, 1993 (project), joint with N. Perkins
 John Miller, M.S.E., UM, 1992 (project), joint with C. Pierre
 Faramarz Farahanchi, M.S., MSU, 1991 (thesis)
 Shang-Rou Hsieh, Ph.D., MSU, 1991
 Jinsiang Shaw, Ph.D., MSU, 1989
 Mehrnam Sharif-Bakhtiar, Ph.D., MSU, 1989
 Doug Moore, M.S., MSU, 1987 (thesis)
 Pi-Cheng Tung, Ph.D., MSU, 1987

UNDERGRADUATE STUDENT SUPERVISION (all since 2007)

Brian Wagonecht, Thomas Theisen, Ashley Kulczycki, Brian Rockwell, Jelena Paripovic, Kyle Justis, J.T. Whitman

EXTERNAL FUNDING (* indicates current project)

- * “GOALI: Vibration Absorbers for Multi-Frequency Excitation,” NSF. PIs: S. W. Shaw, B. F. Feeny (MSU), and B. Geist, (Chrysler Group, LLC), June 2011-June 2014, \$350K.
- * “DEFYS: Dynamics Enabled NEMS Oscillators,” subcontract from Caltech, DARPA prime, MSU PI: M. I. Dykman, co-PI: S. W. Shaw; Caltech PI: M. Roukes; July 1, 2010-June 30, 2013, \$3.9M total (MSU portion \$740K).
- * “Collaborative Research: Noisy Nonlinear Microscale Oscillators for Novel Applications,” NSF. PIs: S. W. Shaw, M. I. Dykman (MSU), and H. B. Chan (U. of Florida), July 1, 2009-June 30,

2012, \$424K total (MSU portion \$295K).

- * “Collaborative Research: Novel Microscale Resonant Sensors for Chemical and Biological Detection,” NSF PIs: S. W. Shaw and K. L. Turner (UCSB), Aug 16, 2008-Aug. 15, 2011, \$436K (MSU portion \$180K, plus a \$6K RUE supplement in 2009).
 - * “GOALI: Transient Dynamics of Torsional Vibration Absorbers,” NSF. PIs: S. W. Shaw, A. G. Haddow (on leave), B. F. Feeny (MSU), and B. Geist, (Chrysler Group, LLC), Sept. 2007-Aug. 2010, \$350K, plus a \$6K RUE supplement in 2009, and a \$3K travel supplement in 2009.
- “Pendulum Vibration Absorber to Expand MDS Operating Range,” Chrysler Challenge Fund. PIs: S. W. Shaw and B. F. Feeny, July 2010-June 2011, \$50K.
- “Pendulum Vibration Absorber to Expand MDS Operating Range,” Chrysler Challenge Fund. PIs: A. G. Haddow and S. W. Shaw, July 2008-June 2009, \$50K.
- “Pendulum Vibration Absorber to Expand MDS Operating Range,” Chrysler Challenge Fund. PIs: A. G. Haddow and S. W. Shaw, July 2007-June 2008, \$50K.
- “Vibration Absorbers for Systems with Cyclic Symmetry,” NSF, Collaborative Grant. PIs: S. W. Shaw and A. G. Haddow (MSU), C. Pierre (McGill University), Aug. 2004-July 2008 (including a one-year, no-cost extension), \$300K total (MSU portion \$170K).
- “Dynamics of Microbeam Sensor Arrays,” NSF SST (Small Sensors Team). PIs: K. Turner (UCSB), S. W. Shaw, J. Moehlis (UCSB), Sept. 2004-Aug. 2007, \$400K total (MSU portion \$110K).
- “Improved Control Authority in Flexible Structures Using Stiffness Variation,” AFOSR, PIs: R. Mukherjee (MSU) and S. W. Shaw, Feb. 2004-Aug. 2007, \$271K.
- “Pendulum Vibration Absorber to Expand MDS Operating Range,” Chrysler Challenge Fund. PIs: A. G. Haddow and S. W. Shaw, Jan. 2006-Jan. 2007, \$50K.
- “Improved Performance for MEMS-based Filters,” AFOSR, PIs: K. Turner (UCSB) and S. W. Shaw, Jan. 2002-June 2005, \$289K.
- “Model Reduction Techniques for Large-Amplitude Vibrations of Complex Nonlinear Structures,” ARO, PIs: S. W. Shaw and C. Pierre (U. of Michigan), May 2001-Dec. 2004, \$210K.
- “The Dynamic Performance of Nonlinear Vibration Absorbers,” NSF, Dynamic Systems and Control Program. PIs: S. W. Shaw and A. Haddow (MSU), Sept. 2000-Aug. 2004, \$235K.
- “Improved Control Authority Using Variable Stiffness,” AFOSR, PIs: R. Mukherjee and S. W. Shaw, March 2003-Feb. 2004, \$47K.
- “The Dynamics of Systems with Tuned Substructures,” NSF, with A. Haddow, Aug. 1997-Aug. 2001, \$240K.

“Nonlinear Modal Analysis and Component-Mode Synthesis of Large-Scale Structural Systems,” Army Research Office, with C. Pierre, Jan. 1997-Dec. 2000, \$257K.

“Real-Time Automotive Sensing and Control,” NSF, PI: F. Salam, Co-PIs: S. Shaw, H. Khalil, C. Radcliffe, L. Tummala, Aug. 1997-Aug. 2000, \$420K.

“Risk Analysis of Commercial Fishing Vessels Operating in Extreme Seas,” Michigan Sea Grant College Program, with A. Troesch, Sept. 1997-Aug. 2000, \$180K.

“A Nonlinear Probabilistic Approach to the Problem of Fishing Vessel Capsize,” Michigan Sea Grant Program, with A. Troesch, Sept. 1993-Aug. 1996, \$180K.

“Modal Analysis Techniques for Nonlinear, Large-Scale Systems,” Army Research Office, with C. Pierre, Jan. 1993-Dec. 1996, \$257K.

“An Invariant Manifold Approach to Modal Analysis of Nonlinear Structural Systems,” NSF, Grant MSS-9201815 (at UM) and MSS-9496271 (at MSU), with C. Pierre, Sept. 1992-Jan. 1997, \$283K.

“A Nonlinear Probabilistic Approach to the Problem of Fishing Vessel Capsize,” Michigan Sea Grant Program, with A. Troesch, Sept. 1991-Aug. 1993, \$120K.

“Nonlinear Dynamics of Mechanical Systems,” NSF, Grant MSS-8915453, Feb. 1990-July 1993, \$181K.

“Dynamic Signal Analyzer,” NSF Engineering Research Equipment Grant, Co-PI,P.I.: A. G. Haddow, 1988, \$40K (with \$37K MSU matching funds).

“Nonlinear Dynamics,” DARPA, with S. N. Chow, A. Novick-Cohen, B. Drachman, S. Dragosh, L. Ni and K. Mischaikow. Jan. 1988-Dec. 1990, \$1,306K. (moved to Georgia Tech with S. N. Chow in Sept., 1988).

“Dynamics of Nonlinear Mechanical Systems,” NSF, Grant MSM-8613294, Jan. 1987- Dec. 1989, \$152K.

“National Intelligence Mathematics and Multiprocessing Project,” DARPA, 1985-87, with S. N. Chow, B. Drachman, T.Y. Li, L.M. Ni and L.S. Young, \$741K.

“Forced Vibrations of Mechanical Systems Having Amplitude Constraints,” NSF Research Initiation Grant, MEA-8421248, 1984-86, \$48K.