Gary F. Dargush June 2018

Office:
Professor, Mechanical and Aerospace Engineering, 223 Bell Hall
University at Buffalo, State University of New York, Buffalo, NY 14260
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Education:
University at Buffalo, State University of New York
Ph.D., September 1987
Dissertation: Boundary Element Methods for the Analogous Problems of Thermomechanics and Soil Consolidation (P.K. Banerjee, Advisor)
M.S., January 1977
Thesis: Optimization of Cold-formed Steel Structural Members by Geometric Programming (W.E. Falby, Advisor)
Rensselaer Polytechnic Institute
B.S., June 1974

Positions:
University at Buffalo (UB), State University of New York (SUNY)
School of Engineering and Applied Sciences (SEAS)
Associate Dean for Graduate Education and Research (2014-2017)
Department of Mechanical and Aerospace Engineering (MAE)
Professor (2005-Present), Chair (2008-2014), Associate Chair (2007-2008)
Department of Civil, Structural and Environmental Engineering (CSEE)
Professor (2002-2005), Director of Graduate Studies (2003-2004)
Associate Professor (1998-2002), Assistant Professor (1996-1998)
Research Associate Professor (1990-1996), Research Assistant Professor (1987-1990)
Research Assistant (1985-1987), Teaching Assistant (1974-1977)
General Motors Corporation, Harrison Radiator Division
Senior Engineer (1982-1986); Project Engineer (1980-1982)
Ford Motor Company, Structural Analysis Department
Research Engineer B (1978-1980); Research Engineer C (1977-1978)

Professional Experience (Academia):

Research Impact

An improved understanding of multiscale, multiphysics phenomena can enable future advancement in micro- and nano-technology, biomedical engineering, advanced manufacturing and numerous other fields. With Dr. Alireza Hadjesfandiari, our mechanics group at UB has developed theoretical formulations for size-dependent continuum mechanics that resolve the issues of indeterminacy and inconsistency that have plagued all previous formulations for more than a century. The key discoveries in this work involve the definition of couple stresses and mean curvatures as skew-symmetric, energy conjugate measures. The corresponding boundary element, finite element and finite difference methods have been under development with doctoral students Bradley Darrall, Arezoo Hajesfandiari, Dipanshu Bansal, Guoqiang Deng, Sourish Chakravarty, Haoyu Zhang and Abhishek Pathak. Furthermore, all of these formulations extend in a natural way to a wide range of size-dependent coupled problems, such as those involving thermomechanics, poromechanics and piezoelectricity. Potential applications include embedded self-sensing, biological fluid flows and selective laser sintering, along with fundamental contributions to continuum defect modeling in solids and turbulence in fluids.

Professional Experience (Academia):
University at Buffalo, Department of Mechanical and Aerospace Engineering

Research Impact (continued)

In order to provide a consistent theoretical base for dissipative dynamical problems in science and engineering, a series of novel mixed variational methods are under development for a broad range of coupled phenomena. In particular, the concept of Mixed Convolved Action resolves a long-standing shortcoming of Lagrangian and Hamiltonian analytical mechanics by providing a single scalar functional for linear dissipative dynamical systems. This novel formulation involves fractional calculus and the convolution of convolutions to define an action that recovers all of the governing differential equations, initial conditions and boundary conditions of the problem, as the Euler-Lagrange equations. The corresponding discretized versions lead to Crank-Nicolson and Newmark algorithms for first and second order temporal systems, respectively, as the simplest members of a new family of discrete variational methods. Mixed Lagrangian Formulations (MLF) also have been developed with Dr. Georgios Apostolakis for dynamic thermomechanics, which bring these irreversible problems into a variational framework for the first time. Another focus is on defining robust variational methods for problems involving deterioration and damage in structures, solid mechanics and material science. Collaborators for this effort include Drs. Andrei M. Reinhorn, M.V. (Siva) Sivaselvan, Georgios Apostolakis, Oren Lavan, Jinkyu Kim, Bradley Darrall and Guoqiang Deng.

A mechanics-based approach was developed for passively damped structural systems. This approach provides an important theme for the book written with Dr. T.T. Soong entitled *Passive Energy Dissipation Systems in Structural Engineering* published by Wiley. The book includes both a synthesis and critique of existing work on a wide range of passive systems. Although emphasis is placed on a mechanics-based presentation of fundamentals, numerous design and implementation issues are addressed as well. Since its publication in 1997, this book has been cited numerous times in the archival literature and referenced by the engineering profession to develop passive seismic and wind design solutions for structures throughout the world. A Chinese translation was released in 2005. More recently, a new book co-authored with Drs. Zach Liang, George C. Lee and Jianwei Song, entitled *Structural Damping: Applications in Seismic Response Modification*, was published by Taylor & Francis in 2011 with a focus on the analysis and design of structures with enhanced dissipation.

Under support from NSF, novel geometric and material systems to alleviate damage from impulsive and vibrational loading have been developed in collaboration with Drs. Amjad Aref and Xiaobo Liu, along with former doctoral students Reza Rafiee Dehkharghani and Hosein Kerdar. These systems involve multiple layers, inclusions and, in some cases, electromagnets to tailor the dynamical response.

A large increment method has been developed with Drs. Amjad J. Aref and Wasim Barham for the efficient nonlinear analysis of structural systems under quasistatic loading. This new flexibility-based method relies upon the generalized inverse of a matrix. NSF provided initial funding.

Robust computational approaches have been developed for multi-hazard design and decision support based upon evolutionary methodologies. These new approaches explicitly account for environmental uncertainty and incorporate both engineering and sociotechnical aspects of the problem. One research thread of the current work focuses on the evolutionary seismic design and retrofit of structures using passive energy dissipation systems. A second innovative research thrust is directed toward the development of a general computational methodology for organizational modeling and complex decision processes. One application of this approach addresses seismic retrofit decisions in hospitals and other critical healthcare organizations. Collaborators have included engineers Drs. Georgios Apostolakis, Oren Lavan, Yufeng Hu, Seda Dogruel, Mark L. Green and Ramesh Sant, along with social scientists Drs. Daniel J. Alesch and William J. Petak, under funding from NSF and NYS.

Professional Experience (Academia):
University at Buffalo, Department of Mechanical and Aerospace Engineering

Research Impact (continued)

Innovative approaches have been developed with Dr. Mikhail Grigoriev for general-purpose computational fluid dynamics analysis, along with the associated problems of fluid-structure interaction. These new boundary element formulations have been successfully applied to low and medium Reynolds number Navier-Stokes flows. Advanced concepts based upon convective fundamental solutions and poly-region approaches have significant potential for higher speed regimes, especially when extended to include couple stresses.

The theory of boundary eigensolutions has been developed in collaboration with Dr. Alireza Hadjesfandiari. This theory provides an alternative view to characterize the solution of boundary value problems and creates a fundamental link between variational and integral equation methods. Moreover, several new computational mechanics formulations have been developed that are particularly attractive for the systematic solution of non-smooth problems involving cracks, notches and bimaterial interfaces. Boundary element methods for generalized fracture mechanics and multiscale analysis of engineering composites are presently under development, with application to dental adhesive systems and reinforced concrete connections exhibiting size-dependent behavior.

Boundary element and finite element methods have been developed to study coupled multiscale thermomechanics of dry sliding contact. Initially, this work with Dr. Andres Soom was funded by Delphi Harrison Thermal Systems to investigate the deformation and wear of magnetic compressor clutch systems. A subsequent more fundamental investigation of dry sliding was funded by NSF.

Multi-level boundary element methods (MLBEM) have been developed to achieve fast, accurate and memory-efficient solutions for a broad range of problems in engineering science and mathematical physics. In collaboration with Dr. Mikhail Grigoriev, we have addressed two-dimensional problems in steady-state heat conduction, periodic acoustics, elasticity, viscous flow, transient heat diffusion and coupled thermomechanics, under funding from NSF. For large problems, we achieve speedup factors greater than one million with no loss of accuracy compared to conventional boundary element methods.

General boundary element formulations were developed for linear and nonlinear thermomechanical analysis for United Technologies/Pratt & Whitney with Drs. P.K. Banerjee and D.P. Henry. The resulting software has been used within the engine design process at P&W for many years.

Advanced boundary element methods were created for manufacturing mechanics, including die casting and metal cutting. General Motors Corporation has employed the resulting computer code routinely for transmission mold design. Additionally, finite element formulations were developed for the thermomechanical analysis of manufacturing processes, including thermoforming.

An efficient substructure-based boundary element methodology was developed for time dependent thermomechanics with support from Daimler-Benz, General Motors, Braun and United Technologies.

Teaching Summary

Awards:
State University of New York Chancellor's Award for Excellence in Teaching, 2014
University at Buffalo President's Circle support for Active Learning Experiments in Dynamics, 2014

Professional Experience (Academia):
University at Buffalo, Department of Mechanical and Aerospace Engineering

Teaching Summary (continued)

Graduate Courses:
- Engineering Analysis 1 (MAE507)
  - Fall 2010, 2011; Enrollment: 48, 54
- Engineering Analysis 2 (MAE508)
  - Spring 2011; Enrollment: 13
- Finite Element Structural Analysis (MAE529, CIE526)
  - Fall 2007, 2008, 2016; Enrollment: 19, 46, 11
  - EngiNet Distance Learning Fall 2007
- Advanced Finite Element Analysis (CIE617, MAE513, MAE505AFE)
  - Spring 1997-2001, 2004-2007, 2009; Enrollment: 10, 13, 24, 24, 20, 22, 7, 17, 9, 19
  - EngiNet Distance Learning Spring 2001, 2006, 2007, Fall 2008
  - On-line Blackboard System beginning Spring 2004
  - Full electronic delivery beginning Spring 2005
  - Revised content to follow MAE529/CIE526 as sequence beginning Spring 2009
- Blast Engineering (CIE500B)
  - Spring 2007: Enrollment: 9
- Advanced Mechanics of Solids (CIE511, MAE505)
  - Fall 2001, 2005, 2006; Enrollment: 12, 26, 26
  - Full electronic delivery beginning Fall 2005
  - EngiNet Distance Learning Fall 2006
- Advanced Mathematics in Civil Engineering (CIE516)
  - Fall 1996-2001; Enrollment: 15, 35, 41, 35, 27, 33
  - EngiNet Distance Learning Fall 2001
- Boundary Element Methods (CIE645)
  - Spring 1990; Enrollment: 3

Undergraduate Courses:
- Engineering Principles (EAS140, EAS199)
  - Fall 2011, 2012, 2013, 2014, 2015, 2016; Enrollment: 79, 159, 82, 155, 142, 160
- Intermediate Dynamics (MAE345)
  - Spring 2017; Enrollment: 46; Active learning approach
- Applied Mathematics for Mechanical and Aerospace Engineers (MAE376)
  - Fall 2009, Summer 2010, 2011, 2013, 2104; Enrollment: 123, 9, 13, 23, 21
  - Active learning approach Summer 2013, Summer 2014
- Machines and Mechanisms 1 (MAE311)
  - Spring 2012, 2013; Enrollment: 180, 159
- Mechanics of Solids (EAS209)
  - Spring 2001, 2002; Enrollment: 139, 156
- Dynamics (EAS208)
  - Spring 1997-2000, Fall 2003, Spring 2005-2009, Summer 2013, Fall 2013, Spring 2014, Summer 2014, Spring 2015 (Coordinator only)
  - Enrollment: 85, 125, 129, 121, 26, 173, 215, 215, 109, 138, 40, 47, 120, 30, 302
  - On-line Blackboard System beginning Fall 2003
  - Full electronic delivery beginning Spring 2005
  - Active learning approach Summer 2013, Fall 2013, Summer 2014
  - Active and passive learning experiments Spring 2014, Spring 2015

Professional Experience (Academia):
University at Buffalo, Department of Mechanical and Aerospace Engineering

Teaching Summary (continued)

Undergraduate Courses (continued):
- Thermodynamics (MAE204)
  - Summer 2011, 2012; Enrollment: 18, 39
- Statics (EAS207)
  - Review Seminar Spring 2013; Enrollment: 173; Active learning approach
- Applied Mechanics I (EAS205)
  - Spring 1993; Enrollment: 126
- Applied Mathematics in Civil Engineering (CIE312)
  - Spring 1977; Enrollment: 20
- Modern Methods in Engineering Computation (EAS451)
  - Summer 1976; Enrollment: 25

Lectures Provided:
- Finite Element Structural Analysis (MAE529, CIE526)
- Advanced Finite Element Analysis (CIE617, MAE513)
- Analysis of Structures (MAE315)
- Product Design in a CAE Environment (MAE377)
- Heat Transfer (MAE336)
- Active and Semi-active Control (CIE500X)
- Civil Engineering Creations (CIE101)
- Probabilistic Analysis (CIE508)
- Advanced Solid Mechanics (CIE511)
- Passive and Active Structural Control (CIE626)
- Structural Analysis and Design (ARC460)

Graduate Student Advisement

Ph.D. Dissertations (advisor, in progress):
- Haoyu Zhang (J. Armstrong, co-advisor), "Experimental Size-dependent Mechanics," expected 2018.
- Abhishek Pathak (A.J. Aref, co-advisor), "Size-dependent Mechanics of Liquid Crystals," expected 2021
- Jose Lockhart, "Metamaterial Concepts for Aseismic Design," expected 2022.

Ph.D. Dissertations (advisor):
- Bradley T. Darrall, "True Variational Principles and Time-Space Finite Element Methods for Classical and Quantum Mechanics," June 2016.
  Current Position: Teaching Assistant Professor, University at Buffalo, SUNY
- Guoqiang Deng, "Mixed Finite Element Methods for Size-dependent Skew-symmetric Couple-Stress Mechanics," June 2016.
  Current Position: Consultant, Oak Ridge Associated Universities, Oak Ridge, TN.
- Sourish Chakravarty (S. Das, co-advisor), "Multiscale Material Modeling using Variational Principles and Random Matrix Theory," February 2016.
  Current Position: Postdoctoral Associate, Massachusetts Institute of Technology, Cambridge, MA.
- Dipanshu Bansal (A.J. Aref, co-advisor), "Quantifying and Understanding Anharmonicity of Engineering Materials in Real and Reciprocal Space," June 2015.
  Current Position: Postdoctoral Researcher, Duke University, Durham, NC.
- Arezoo Hajesfandiari, "Size-dependent Couple Stress Fluid Mechanics," February 2015.
  Current Position: Research Scientist, Rahkar Solutions LLC, Amherst, NY.

Professional Experience (Academia):
University at Buffalo, Department of Mechanical and Aerospace Engineering

Graduate Student Advisement (continued)

Ph.D. Dissertations (advisor):

Reza Rafiee Dehkharghani (A.J. Aref, co-advisor), "Stress Wave Scattering in Solids for Mitigating Impulsive Loadings," February 2015.
Current Position: Assistant Professor, University of Tehran, Tehran, IR.

Hosein Kerdar (A.J. Aref, A. Filiatrault, co-advisors), "Electromagnetic Vibration Isolation and Stabilization System: Theory and Simulation," September 2014.
Current Position: Project Engineer, Mar Structural Design, San Francisco, CA.

HyunSuk Lee, "Reduced Integral Order 3D Scalar Wave Integral Equation: Derivation and BEM Approach," June 2014.

Sumit Gogna (Z. Liang, co-advisor), "Bridge Health Monitoring for a Beam Bridge using Damage Model and Slope Sensors," June 2013.

Jinkyu Kim, "Mixed Action Principles: Theory and Applications to a Continuum," August 2011.
Current Position: Research Professor, Hanyang University, Ansan, South Korea.

Seda Dogruel, "Multi-Criteria Decision Support Framework for Optimal Multi-Hazard Design of Passively Damped Structures," June 2011.
Current Position: Senior Risk Consultant, Arup, London, UK.

Georgios Apostolakis, "A Lagrangian Approach for Thermomechanics Towards Damage and Deterioration of Structures," September 2010.
Current Position: Assistant Professor, University of Central Florida, Orlando, FL.

Dong Keon Kim, "A Cyclic Viscoplastic Damage Model with Application to Seismic Response of Metallic Plate Dampers," June 2010.
Current Position: Assistant Professor, Dong-A University, Pusan, South Korea.

Xiaobo Luo (A.J. Aref, co-advisor), "Development of Layered Elastic Stress Wave Attenuators for Mitigating Impulsive Loadings," February 2008.
Current Position: RISA Technologies, LLC, Foothill Ranch, CA.

Yufeng Hu, "Evolutionary Methodologies for Decision Support with Application to Seismic Retrofit of Hospitals," May 2007.
Current Position: Assistant Professor, Western Michigan University, Kalamazoo, MI.

Wasim Barham (A.J. Aref, co-advisor), "Large Increment Method for Solving Nonlinear Structural Systems," February 2006.
Current Position: Assistant Professor, Southern Polytechnic State University, Marietta, GA.

Yunli Wang, "Efficient Analysis and Evolutionary Optimization of Structural Protective Systems," February 2005.
Current Position: Senior Structural Engineer, Parsons Brinckerhoff, New York, NY.

Chao-Hua Wang, "Thermomechanics of Sliding Contact by Boundary Element Methods," September 2003.
Current Position: Research Engineer, China Steel Corporation, Taiwan.

Li Lin, "Dynamics of Cyclic Symmetric Structures with Application to Turbomachinery Components," February 2003.
Current Position: Senior Engineer, BAE Systems/United Defense, San Jose, CA.

Ramesh Sant, "Evolutionary Structural Optimization for Aseismic Design," May 2002.
Current Position: Structural Engineer, DMJM Harris, New York, NY.

Mikhail M. Grigoriev, "Polyregion Boundary Element Methods for Unsteady Convective Transport," August 2000. Current Position: Senior Research Engineer, Cameron, Buffalo, NY.

Alireza Hadjesfandiari, "Theoretical and Computational Concepts in Engineering Mechanics," December 1998. Current Position: Research Scientist, MAE, University at Buffalo, SUNY.

Professional Experience (Academia):
University at Buffalo, Department of Mechanical and Aerospace Engineering

Graduate Student Advisement (continued)

Ph.D. Dissertations (technical advisor)

Martin J. Stephenson (M.E. Ryan, advisor), "An Experimental and Theoretical Study of Sheet Sag in the Thermoforming Process," August 1997.

Jianming Chen (P.K. Banerjee, advisor), "Fundamental Solutions and Boundary Element Formulations for Dynamic Problems of Poroelasticity and Thermoelasticity," September 1992.
Current Position: Technical Director, Structural Engineering Integrated, Brooklyn, NY.

Manoj B. Chopra (P.K. Banerjee, advisor), "Linear and Nonlinear Analyses of Axisymmetric Problems in Thermomechanics and Soil Consolidation," February 1992.
Current Position: Professor, University of Central Florida, Orlando, FL.

M.S. Theses (advisor):

Akhilesh Pedgaonkar, "Mixed Couple Stress Finite Element Method for Linear Anisotropic Materials," September 2017.

Ron Heichman, "Numerical Solution to the Inverse Problem of the Calculus of Variations with Applications to Mechanics," June 2015.

Bradley T. Darrall, "Variational and 2D Finite Element Formulations for Size-dependent Elasticity and Piezoelectricity," June 2015.

Guoqiang Deng, "Mixed Lagrangian Multiplier Formulation for Size-dependent Couple Stress Elastodynamic Response," June 2015.

Anand Abraham, "Finite Element Analysis of Abdomen Cross-Section during Trocar Insertion," February 2013.

Amogh Ajay Mundhekar, "Numerical Investigation of NiTi Shape Memory Alloy Structures for Blast Mitigation Applications," September 2012.

Mandeep Singh, "Quantification of Multilayer and Multiwall Layer Gaps," September 2012.

Pouyan Nasiri, "Variational Integrators for Piezoelectricity," June 2012.

Glenn Rosner, "Boundary Element Analysis of Bi-Material Interfaces with Application to Adhesive Dentistry," June 2012.

Qaiser Jeelani Khan (Z. Liang, co-advisor), "Analysis and Design of a Quick Engage Clutch for Seismic Applications," February 2011.

Hosein Hamidekerdar, "Comparison of Multigrid Molecular Dynamics and Continuum Representations," February 2011.

Karthikeyan Senthilnathan, "Pseudoelastic Shape Memory Alloy Model with Stent Deployment Simulation," February 2010.

Nijo Alexander Abraham, "Slider Bearing for Seismic Isolation Using Material Combination," September 2009.

Ashish Goel, "Computational Design of Layered Barrier System for Vehicle Impact Attenuation," September 2008.

Sumit Bansal (A.J. Aref, co-advisor), "Implementation of the Large Increment Finite Element Method for Non-Linear Analysis of Structures," February 2007.

Georgios Apostolakis, "Evolutionary Aseismic Design of Self-Centering Post-Tensioned Energy Dissipating Steel Frames," September 2006.

Vasileios Barmpoutis, "A Localized Genetic Algorithm with Applications to Structural Engineering," September 2006.

Jimmy Lau, "Wavelet-based Response Metrics with Application for Structural Health Monitoring," February 2006.

Professional Experience (Academia):
University at Buffalo, Department of Mechanical and Aerospace Engineering

Graduate Student Advisement (continued)

M.S. Theses (advisor):
Shashi Kant Mishra, "Modeling Shape Memory Alloys with Applications to Seismic Design of Structural Systems," February 2006.
Seda Dogruel, "Application of Genetic Algorithms for Optimal Aseismic Design of Passively Damped Adjacent Buildings," September 2005.
Xin Xu, "Cubic Nonlinear Oscillation Control in the Frequency Domain," June 2005.
Edgard Escobar-Sandoval (A.S. Whittaker, co-advisor), "Bearing Stress Distribution in Unreinforced Concrete Loaded Concentrically through Steel Plates," June 2004.
Jose Lockhart, "Magnetic Damping: Application to Civil Engineering Structures for Seismic Motion Control," September 2004.
Li-Yuan Lin, "Evolutional Aseismic Design of the Structure with Viscoelastic Damper," September 2003.
Claudia Marin-Marin, "Approximate Limit Load Evaluation Using Linear Elastic Analysis with Modulus Variation," December 2002.
Xiangjie Zhao, "Evolutionary Aseismic Design of Structures with Supplemental Viscous Dampers," June 2002.
Sreeparna Sengupta, "A Comparative Analysis of Bi-Material Interfaces Using Boundary Element and Finite Element Analysis," June 2002.
Xujie Yang, "Thermomechanical Analysis of Sliding Rings by BEM," February 2001.
Rajesh Radhakrishnan, "Coupled Thermomechanical Analysis of Viscoelastic Dampers," May 2000.
Mikhail Grigoriev, "Poly-region Boundary Element Methods for Viscous Fluid Flows," May 1999.
Sin-Fan Tang, "Seismic Response of Tied Back Retaining Wall," August 1997.
Surya Banduvula, "Boundary Element Applications to Non-Destructive Evaluation of Concrete," May 1997.

M.S. Project (advisor):
Renette Jones, "Servo Controller Optimization Component Test Software," August 2013.
Jesus Marin, "Impact Test: Analysis of Hammer Tip Effect," June 2013.
Rengith Francis Xavier, "Fluid Structure Interaction on a Yacht Hull," September 2012.
Angad Vasant Patil (Z. Liang, co-advisor), "Design and Analysis of Non-linear Stiffness Mechanisms," September 2012.
Sri Sai Karan Mummoju, "Crack Analysis using Boundary Element Method," June 2012.
Santhosh Kumar Gandla, "Investigation of Flow Distribution in Axial PSA Prepurifiers for Air Separation Plants," June 2012.
Rahul Radhakrishna Pillai, "Performance of a Compressor using Fluid Structural Interaction," February 2012.
Shrevatsan Venkatesan, "CFD Modeling and Design of a Pressure Attenuating Fluid Flow Distribution System," February 2012.
Anagha Pradhan, "Improvement of the Design of Knee Brace Used for Osteoarthritis by Using Finite Element Analysis," September 2011.
Girish Mudigonda, "Partitioned Approach of Fluid Structure Interaction," September 2011.
Bargav Srinivasan, "Advances in On Board Diagnostics for Heavy Duty Diesel Engines," June 2011.
Vikraman Jagatheeswaran, "Design of High Speed Magnetic Coupling," June 2011.

Professional Experience (Academia):
University at Buffalo, Department of Mechanical and Aerospace Engineering

Graduate Student Advisement (continued)

M.S. Project (advisor):
- Akshat Chauhan, "Physical Testing and Numerical Simulation of a Twin Tube Shock Absorber for Automotive Applications," February 2011.
- Sreeganesh Sudhindra, "Linear Static and Nonlinear Dynamic Response Structural Optimization," September 2010.
- Kedar Ingle, "Investigation of Temperature and Stress Profiles in AA-2195 During Friction Stir Welding using Finite Element Modeling,' September 2010.
- Akshat Chauhan, "Physical Testing and Numerical Simulation of a Twin Tube Shock Absorber for Automotive Applications," February 2011.
- Sreeganesh Sudhindra, "Linear Static and Nonlinear Dynamic Response Structural Optimization," September 2010.
- Kedar Ingle, "Investigation of Temperature and Stress Profiles in AA-2195 During Friction Stir Welding using Finite Element Modeling,' September 2010.
- Girish Pallathadka, "Development of Finite Element Models for Problems involving Coupling between Electromagnetic Fields and Elastic Bodies," September 2010.
- Mugdha Soman, "Study of Stress Singularities and Their Elimination in Bi-material Plates," September 2010.
- Amit Kumar Bhattacharjee, "Disappearance of Stress Singularity and Critical Angle in Edge Bonded Elastic Bi-material Wedges, February 2010.
- Mark Mattson, "A Finite Element Study of Unreinforced Hollow Concrete Masonry Unit Walls Under Compression and Flexure," June 2009.
- Konstantinos Agrafiotis, "Comparison of Seismic Isolation Device Models for a Typical Bridge Structure," September 2006.
- Hemalkumar Golwala, "Electronic Data Exchange in Bridge Seismic Design Workflow," February 2006.
- Swapna Phadnis, "Optimal Seismic Design of Structural Systems with Metallic Dampers," September 2004.
- Alpesh Patel, "Development of Mechanistic Models to Study Cyclic Response of Structural Steel Connections," May 2003.

Ph.D. Dissertations (active committee member):
- Jongmin Seo (G.C. Lee, advisor), "Size Effects on Bond-Slip of Reinforced Concrete Connections," June 2011.
- Li-Yuan Lin (G.C. Lee, advisor), "Identification of Stiffness Degradation in Bridges Using Wavelet Analysis," September 2007.
- Swaminathan Sureshkumar (P.K. Banerjee, advisor), "Advanced Non-linear Finite Element Analyses of Manufacturing Processes and Construction," October 1997.
- Debashis Basu (P.K. Banerjee, advisor), "Numerical Simulation of Structural Acoustics Using Coupled Finite Element and Boundary Element Techniques," September 1997.
- Chengyong Yan (C. Basaran, advisor), "A Damage Mechanics Based General Purpose Interface/Contact Element," August 1997.
- Himanshu Gupta (T.T. Soong, advisor), "Active Aerodynamic Control of Structures," May 1997.
- Keith A. Honkala (P.K. Banerjee, advisor), "Boundary Element Methods for Two-Dimensional Coupled Thermoviscous Flow," February 1992.
- Yifei Shi (P.K. Banerjee, advisor), "Fundamental Solutions and Boundary Element Formulations for Convective Fluid Flow," January 1992.

Professional Experience (Academia):
University at Buffalo, Department of Mechanical and Aerospace Engineering

Graduate Student Advisement (continued)

Ph.D. Dissertations (active committee member):
Abu Syed Md. Israil (P.K. Banerjee, advisor), "Time-Domain Elastic and Inelastic Dynamic Analysis 2D Solids by Boundary Element Method," December 1990.
Anindya Deb (P.K. Banerjee, advisor), "Advanced Development of the BEM for Linear and Nonlinear Analyses of Anisotropic Solids," December 1990.
Saifuddin M. Mamoon (P.K. Banerjee, advisor), "Dynamic and Seismic Behavior of Deep Foundations," August 1990.

Ph.D. Dissertations (committee member):
Deepika Verma (S.Z. Hua, advisor), "Cytoskeletal Stresses – Driving Force for Focal Adhesion and Adherens Junction Remodelling in Epithelial Cells under Flow," September 2015.
Zahra Lotfian (M.V. Sivaselvan, advisor), "Solving Elastoplasticity and Poroelasticity Problems Using Optimization Approaches and Mixed Finite Elements," June 2015.
Yong Won Seo (T. Kesavadas, advisor), "Haptic Modeling of Trocar Insertion Procedure," February 2015.
Xiangtong He (J.Y. Fu, advisor), "Experimental Studies on Physical Deterioration and Electrical Fatigue Behavior in Ferroelectric Polymers," September 2014.
Amir Rezaei-Bazkiaei (A.S. Weber, advisor), "Horizontal Ground Source Heat Pump Modeling and Performance Enhancement via Employment of Tire Derived Aggregate to Form a Non-Homogenous Soil Profile," June 2014.
Jinwon Shin (A.S. Whittaker, advisor), "Air-Blast Effects on Civil Structures," June 2014.
Armin Masroor (G. Mosqueda, advisor), "Seismic Response of Base Isolated Buildings Considering Pounding to Moat Walls," September 2013.
Nicholas Oliveto (M.V. Sivaselvan, advisor), "Dynamics of Cable Structures – Modeling and Applications," September 2013.
Apostolos Sarlis (M.C. Constantinou, advisor), "Negative Stiffness Device for Seismic Protection of Structures," June 2013.
Yongchang Lee (C. Basaran, advisor), "A Multiscale Modeling Technique for Bridging Molecular Dynamics with Finite Element Method," June 2013.
Wei Yao (C. Basaran, advisor), "Damage Mechanics of Electromigration and Thermomigration in Electronic Packaging Solder Joints Under Time Varying Currents," June 2013.
Ding Ma (H. Meng, advisor), "Computer Modeling of Neurovascular Flow Diverter," June 2013.
Rohit Shivaswamy (A. Patra, advisor), "Integrating Data and Compute Intensive Workflows for Uncertainty Quantification in Large Scale Simulation Application to Model Based Hazard Analysis, February 2013.
Matthew McGurn (P.E. DesJardin, advisor), "Numerical Modeling and Simulation of Flame Spread Over Charring Materials," February 2013.
Dinesh Kumar (A. Patra, advisor), "Simulation of Granular Flows over Natural Terrain using Godunov Smoothed Particle Hydrodynamics," September 2012.
Petros Sideris (A.J. Aref, A. Filiatrault, advisors), "Seismic Effects of Prefabricated Superstructure Systems," September 2012.
Hongwei Cai (A.J. Aref, advisor), "Development of Optimized Hybrid Fiber Reinforced Polymeric Deck and Cable System for Cable-Stayed Bridges," September 2012.
Kiarash M. Dolatshahi (A.J. Aref, advisor), "Computational, Analytical and Experimental Modeling of Masonry Structures," February 2012.

Professional Experience (Academia):
University at Buffalo, Department of Mechanical and Aerospace Engineering

Graduate Student Advisement (continued)

Ph.D. Dissertations (committee member):

Bicheng Chen (C. Basaran, advisor), "High Sensitivity Moire Interferometry with Phase Shifting at Nano Resolution," June 2011.

Ioannis Christovasilis (A. Filiatrault, advisor), "Numerical and Experimental Investigations of the Seismic Response of Light-Frame Wood Structures," February 2011.

Changsong Luo (P.E. DesJardin, advisor), "Mathematical Modeling of Thermo-mechanical Damage of Polymer Matrix Composites in Fire," September 2010.

Tarek Ragab, (C. Basaran, advisor), A Multi-Scale Electro-Thermo-Mechanical Analysis of Single Walled Carbon Nanotubes," June 2010.

Shidong Li (C. Basaran, advisor), "A Multi-Scale Damage Mechanics Framework for Nano-electronics Interconnects and Solder Joints," February 2009.

Saeed Fathali (A. Filiatrault, advisor), "Seismic Protection of Vibration-Isolated Nonstructural Components in Buildings," September 2008.

Ioannis V. Kalpakidis (M.C. Constantinou, advisor), "Effects of Heating and Load History on the Behavior of Lead-Rubber Bearings," September 2008.

Saurabh Srivastava (A. Patra, advisor), "Mixed Discontinuous Galerkin Methods: Some Applications in Nonlinear Elastodynamics," February 2008.

Fei Ma (P.K. Banerjee, advisor), "An Efficient Implementation of BEM for Transient Analyses of Thermomechanics and Soil Consolidation," February 2008.

Dong Wang (A. Filiatrault, advisor), "Numerical and Experimental Studies of Self-Centering Post-Tensioned Steel Frames," February 2008.

Gian Paolo Cimarello (A.M. Reinhorn, advisor), "Improving Seismic Resilience of Structural Systems Through Integrated Design of Smart Structures," February 2008.

Macarena Schachter-Adaros (A.M. Reinhorn, advisor), "Three Dimensional Modeling of Inelastic Buckling in Frame Structures," September 2007.

Jaideep Chatterjee (P.K. Banerjee, advisor), "Nonlinear Deformation and Collapse Analysis by Boundary Element Method," February 2007.

Wael I. Alnahhal (A.J. Aref, advisor), "Structural Characteristics and Failure Prediction of Hybrid FRP-Concrete Bridge Deck and Superstructure Systems," February 2007.

Claudia Marin-Artieda (A.S. Whittaker, advisor), "Experimental and Analytical Study of the XY-Friction Pendulum Bearing for Bridge Applications," February 2007.

Minghui Lin (C. Basaran, advisor), "A Thermodynamic Framework for Damage Mechanics of Electromigration and Theromigration," September 2006.

Khalid Al-Gahtani (S. Mohan, advisor), "A Comprehensive Construction Delay Analysis Technique," September 2006.

Juan Gomez (C. Basaran, advisor), "Damage Mechanics of Micron Scale Solder Joints Using Strain Gradient Plasticity," February 2006.

Sungyeop Jung (M.P. Gaus, advisor), "Static and Viscoelastic Investigations of FRP Highway Bridge Desk Systems and Identification of Potential Problems," February 2006.

Dyah Kusumastuti (A.M. Reinhorn, advisor), "A Versatile Experimentation Model for Study of Structures Near Collapse: Applications to Seismic Evaluation of Irregular Structures," February 2005.

Methee Chiewanichakorn (A.J. Aref, advisor), "Intrinsic Method of Effective Flange Width Evaluation for Steel-Concrete Composite Bridges," February 2005.

Il-Sang Ahn (S.S. Chen, advisor), "Dynamic Ratcheting in Hysteretic Systems," February 2005.

Professional Experience (Academia):
University at Buffalo, Department of Mechanical and Aerospace Engineering

Graduate Student Advisement (continued)

Ph.D. Dissertations (committee member):

Benedikt Halldorsson (A.S. Papageorgiou, advisor), "The Specific Barrier Model: Its Calibration to Earthquakes of Different Tectonic Regions and the Synthesis of Strong Ground Motions for Earthquake Engineering Applications," September 2004.

Ani Natali Sigaher-Boyle (M.C. Constantinou, advisor), "Development, Testing and Modeling of Highly Effective Energy Dissipation System Configurations," September 2004.

Fangyin Zhang (A.S. Papageorgiou, advisor), "Site Response and Attenuation Analysis," September 2004.

Diego Lopez Garcia (T.T. Soong, advisor), "Separation Distance Necessary to Prevent Seismic Pounding between Adjacent Structures," September 2004.

Rahul Rana (T.T. Soong, advisor), "Analysis and Protection of Rotating Machinery under Seismic and Operational Vibrations," September 2004.

Hua Ye (C. Basaran, advisor), "Mechanical Behavior of Microelectronics Solder Joints under High Current Density: Analytical Modeling and Experimental Studies," June 2004.

Yujun Wen (C. Basaran, advisor), "Thermomechanical Analysis of Multilayered Microelectronics Packaging: Modeling and Testing," December 2003.

Eric D. Wolff (M.C. Constantinou, advisor), "Experimental Study of Seismic Isolation Systems with Emphasis on Secondary System Response and Verification of Accuracy of Dynamic Response History Analysis Methods," September 2003.

Quan Gan (G.C. Lee, advisor), "A Variable Hydraulic Damper for Vibration Reduction in Helicopter Blades," September 2003.

Zhenxi Chen (J.E. Atkinson, advisor), "Stratified Open Channel Flow with Rotation," September 2003.

Wooyoung Jung (A.J. Aref, advisor), "Seismic Retrofitting Strategies of Semi-Rigid Steel Frames Using Polymer Matrix Composite Materials," September 2003.

Kangmin Lee (M. Bruneau, advisor), "Seismic Vulnerability Evaluation of Axially Loaded Steel Built-up Laced Members," August 2003.

Mettupalayam V. Sivaselvan (A.M. Reinhorn, advisor), "Nonlinear Structural Analysis Towards Collapse Simulation – A Dynamical Systems Approach," February 2003.

Yasuo Kitane (A.J. Aref, advisor), "Hybrid FRP-Concrete Bridge Deck and Superstructure Systems," February 2003.

Wei Liu (G.C. Lee, advisor), "Optimization Strategy for Damper Configurations of Buildings Based on Performance Indices," February 2003.

Florentino Leyte (S. Ahmad, advisor), "Analysis of Dynamically Loaded Foundations in Anisotropic Soils," May 2002.

Yihong He (A.J. Aref, advisor), "Simplified Analysis and Optimum Design of Fiber Reinforced Polymer Web-Core Sandwich Bridge Deck Systems," May 2002.

Daan Liang (M.P. Gaus, advisor), "Improved Reliability and Economic Modeling for New and Retrofitted Low-Rise Structures Subjected to Extreme Wind Hazards," September 2001.

Shih-Yu Chu (T.T. Soong, advisor), "Integration Issues in Implementation of Active Structural Control Systems," July 2001.

Bingyan Zhao (M.P. Gaus, advisor), "Methodologies for Automating the Collection and Processing of GPS-GIS Information for Transportation Systems," May 2001.

Kyung-Ho Park (P.K. Banerjee, advisor), "Development of BEM for Transient Coupled Problems," February 2001.

Professional Experience (Academia):
University at Buffalo, Department of Mechanical and Aerospace Engineering

Graduate Student Advisement (continued)

Ph.D. Dissertations (committee member):

Ma-Tien Yang (P.K. Banerjee, advisor), "Development of a New Class of BEM Formulations for Steady State and Transient Analysis," August 2000.

David I. Schwartz (S.S. Chen, advisor), "Deterministic Interval Uncertainty Methods for Structural Analysis," September 1999.

Guoqing Lin (J.F. Atkinson, advisor), "Effects of Rotation on Turbulence in Free Surface Jets," September 1998.

Ph.D. Dissertations (outside reader):

James N. McCall (J.D. Felske, advisor), "Numerical Simulation of Contact, Impact and the Flowfield in a Safety Valve," Mechanical and Aerospace Engineering, 2005

Jeng-Hsiu Tsai (A. Patra, advisor), "Adaptive Space and Time Discretizations of Updated Lagrangian Formulations – Application to Shaped Elastoplastic Fiber Pullout using a Hybrid Interface Model," Mechanical and Aerospace Engineering, 2004.

Andrew C. Bauer (A. Patra, advisor), "Efficient Solution Procedures for Adaptive Finite Element Methods – Applications to Elliptic Problems," Mechanical and Aerospace Engineering, 2002.

Ta-Ming Shih (C-S. Liu, advisor), "Analysis of Nonlinear Normal Modes by Extended Normal Form Method," Mechanical and Aerospace Engineering, 2000.

Honglu Wang (J.D. Felske, advisor), "Thermomechanical Analysis of the Rotating Impeller Lobes of a Roots-Type Multi-Recompression Heater," Mechanical and Aerospace Engineering, 1999.

Catalin I. Serpe (A. Soom, advisor), "The Role of Contact Compliance in the Deformation, Wear and Elastic Stability of Metallic Sliding Rings," Mechanical and Aerospace Engineering, 1999.

T.A. Yomi Obidi (J.D. Felske, advisor), "Optimization of the Thermal Stress Relief of a Welded Solid Piece," Mechanical and Aerospace Engineering, 1999.

M.G. Thurston (A. Soom, advisor), "A Complete Structural Vibration Source Model for a Class of Rotating Machines with Internal Force Generating Mechanisms," Mechanical and Aerospace Engineering, 1998.

Professional Experience (Industry):

General Motors Corporation, Thermal Systems Division

Senior Engineer (1982-1986); Project Engineer (1980-1982)

Group leader for structural analysis.

Established the foundation for the structural analysis activity at Harrison by implementing the necessary analysis packages, training engineers in finite element analysis, and conducting seminars on structural analysis and design.

Performed finite element structural analysis and provided design recommendations for automotive radiators, heaters, and air conditioning compressors.

Conducted thermal and structural design/analysis investigations of high temperature heat exchangers including industrial gas turbine recuperators, fuel cell heat exchangers, and waste heat recuperators.

Directed experimental investigations of structural behavior including the utilization of holographic interferometry.

Supervised several General Motors Institute 5th Year Theses.

Ford Motor Company, Structural Analysis Department

Research Engineer B (1978-1980); Research Engineer C (1977-1978)

Performed large-scale finite element dynamic analysis of complex automotive body systems utilizing substructuring techniques. Analyzed buckling characteristics of sheet metal components. Responsible for Lincoln Mark VI body structural analysis.

Automated multilevel substructure finite element modeling and visualization for full body dynamics.

Trained engineers in use of computer graphics and NASTRAN for finite element analysis.

Professional Affiliations:

American Society of Civil Engineers
Continuing Education Committee (2003-2005)
Vice-President (2001-2002), Buffalo Section
Secretary (2000-2001), Buffalo Section
Treasurer (1999-2000), Buffalo Section
Director, Buffalo Section (1998-2002)
Member, Computational Mechanics Committee, Journal of Engineering Mechanics (1996-2000)
Faculty Advisor, University at Buffalo Student Chapter (1996-1998)
American Society of Mechanical Engineers
United States Association for Computational Mechanics

Professional Service:

Technical Referee
Journal of Heat Transfer (ASME); Journal of Tribology (ASME); Journal of Applied Mechanics (ASME); Journal of Engineering Mechanics (ASCE); Journal of Structural Engineering (ASCE); Journal of Computational Physics; Computer Methods in Applied Mechanics and Engineering; International Journal of Solids and Structures; International Journal for Numerical Methods in Engineering; International Journal of Numerical Methods in Fluids; International Journal for Computational Engineering Science; Communications in Numerical Methods in Engineering; Engineering Analysis with Boundary Elements; Finite Elements in Analysis and Design; Earthquake Engineering and Structural Dynamics; Journal of Soil Dynamics and Earthquake Engineering; Earthquake Spectra; Journal of Earthquake Engineering; IEEE Transactions on Evolutionary Computation; IEEE Transactions on Components, Packaging and Manufacturing Technology; Computer Physics Communications; Advances in Mechanical Engineering; Journal of Non-Newtonian Fluid Mechanics

International Mechanical Engineering Conference & Exhibition (IMECE), Session 12-10-3 Computational Simulation of Damage and Impacts, Session chair, Houston, TX, November 2015
International Mechanical Engineering Conference & Exhibition (IMECE), Session 16-33-6 on Multi-Physics Simulations and Experiments for Solids, Session chair, San Diego, CA, November 2013
International Mechanical Engineering Conference & Exhibition (IMECE), Sessions AMD-16, NCA-1B and NCA-2B, co-chair, Orlando, FL, November 2005
Tenth International Conference on Civil, Structural & Environmental Engineering Computing, Session CC.XLIV co-chair, Rome, Italy, September 2005
International Conference on Advances and New Challenges in Earthquake Engineering Research, Session co-chair, Structural Analysis and Design, Hong Kong, August 2002
KEERC-MCEER Joint Seminar on Contributions to Earthquake Engineering, Session chair, Buffalo, NY, August 2002
Seventh U.S. National Conference on Earthquake Engineering, Session chair AT-2 and AT-3, Advanced Technologies, Boston. MA, July 2002
Sixth U.S. National Congress on Computational Mechanics, Session chair, Boundary Element Methods, Dearborn, MI, August 2001
ASCE 13th Engineering Mechanics Conference, Theme session co-organizer, Boundary Element Methods, Baltimore, MD, June 1999
ASCE 12th Engineering Mechanics Conference, Session co-chair, Boundary Element Methods for Dynamic Analysis, La Jolla, CA, May 1998
ASCE/ASME/SES Engineering Mechanics Conference (McNU97), Session co-organizer and co-chair, Development of BEM for Nonlinear Problems, Northwestern University, Evanston, IL, June 1997

National Science Foundation - Panelist, Civil, Mechanical and Manufacturing Innovation, 1997, 2009, 2010, 2011, 2015; Reviewer, 2008
Binghamton University, SUNY, Mechanical Engineering, Graduate Program Review, 2011
U.S. Civilian Research and Development Foundation – Reviewer, 2002, 2004
Louisiana Board of Regents Research Competitiveness Program – Reviewer, 2003, 2005

University and Community Service:

Faculty Senate Academic Planning Committee, University at Buffalo (2001-2015)
Faculty Senate Executive Committee (2007)
Faculty Senate (2005-2007, 2008-2010)
Graduate School Executive Committee, University at Buffalo (2003-2004, 2014-2017)
Associate Deans Graduate Council (2015-2017)
Director Search Committee, Office of Educational Innovation and Assessment (2014)
Instructional Facilities Steering Committee (2014-2015)
Instructional Technology Specialist Search, Chair (2015)

SEAS Faculty Personnel Committee, University at Buffalo (1999-2002, MAE Alternate 2017-2020)
SEAS Engineering Library Committee, University at Buffalo (1996-2005)
SEAS Assistant Dean for Graduate Education Search, Chair (2015)

Undergraduate Studies Committee, MAE, University at Buffalo, Member (2005-2007)
Graduate Studies Committee, CSEE, University at Buffalo, Director (2003-2004), Member (1997-1998), Student Member (1975-1977)
Undergraduate Studies Committee, CSEE, University at Buffalo, Member (1998-2003)

MAE Chair Search Committee, University at Buffalo, Member (2007-2008)
MAE Faculty Search Committees, University at Buffalo
Materials and Mechanics, Chair (2014-2015, 2017-2018)
Fluids/Extreme Events, Member (2007-2008)
Materials/Integrated Nanostructured Systems, Chair (2007-2008)
MCEER Director Search Committee, University at Buffalo, Member (2003)
CSEE Faculty Search Committees, University at Buffalo, Member (1999, 2000, 2003, 2011), Chair (2004)

Buffalo Academy for Science Charter School (BASCS), Annual Science Fair Judge (2013, 2014, 2016)
Engineering Expressions Middle School Educational Program, ASCE Buffalo Section (2000-2007)
Engineering Opportunities High School Educational Program, Technical Societies Council (2003-2006)
Future City Competition Educational Program - Buffalo Region Organizing Committee (1999-2005); Engineering Mentor, Casey Middle School, Amherst, NY (1996-1998), Highgate Heights, Buffalo, NY (1999); Judge (2002, 2004, 2008)
Buffalo-area Engineering Awareness for Minorities (BEAM) - Harrison Development Team (1984-1986)

NCAA Varsity Basketball, Rensselaer Polytechnic Institute (1971-1974)
NCAA Freshman Basketball, Rensselaer Polytechnic Institute (1970-1971)

Scholastic Awards:

Rensselaer Scholarship (1970-1974)
New York State Regents Scholarship (1970-1974)
Dean's List, Rensselaer Polytechnic Institute (1970-1974)
Rensselaer Medal for Excellence in Mathematics, Kensington High School, Buffalo, NY (1970)

Grants:

Experiments in Active Learning for Dynamics; PI; UB President's Circle, 2014-2015, $72,000.

Development of Functionally Graded Protective Systems for Attenuation of Blast Loading; co-PI with A.J. Aref (PI); National Science Foundation, 2009-2014, $300,000.

Mechanical Behavior of Low Coordination Number Metallic Systems; PI; National Science Foundation, 2008-2012, $160,000.

Collapse Analysis of Structures; co-PI with M.V. Sivaselvan (PI) and A.M. Reinhorn (co-PI); CUREE-Kajima Phase VII Research Program, 2008-2010, $100,000.

Nonlinear Modeling and Analysis of High Efficiency High Torque WARP Motor; co-PI with A. Soom (PI), T. Singh (co-PI) and C.L. Bloebaum (co-PI); Sprung-brett/Navy STTR Phase II, 2007-2010, $277,000.

Dynamic Analysis of Deteriorating Structures under Extreme Loadings; PI with A.M. Reinhorn (co-PI); Multidisciplinary Center for Earthquake Engineering Research, National Science Foundation, 2006-2008, $52,500.

Evolutionary Methodologies for Decision Support; PI; Multidisciplinary Center for Earthquake Engineering Research, National Science Foundation, 2002-2008, $447,000.

Computational Analysis and Design of Die Cutting Press for Deflection Control, PI, Ttarp Industries and The Center for Industrial Effectiveness (TCIE), 2007, $3800.

Finite Element Analysis and Design of Exhaust Temperature Rake, PI, Conax Buffalo Technologies and The Center for Industrial Effectiveness (TCIE), 2006, $20,500.

Hamiltonian Methods for Dynamic Analysis of Deteriorating Structures in Multi-Hazard Environments; PI with A.M. Reinhorn (co-PI); Multidisciplinary Center for Earthquake Engineering Research, National Science Foundation, 2005-2006, $60,000.

Evaluation and Development of Analytical Tools for Collapse Analysis; co-PI with M.V. Sivaselvan (PI) and A.M. Reinhorn (co-PI); CUREE-Kajima Phase VI Research Program, 2005-2007, $120,000.

Tribological Thin Films on Rough Surfaces: Design, Analysis, Characterization, Fatigue and Wear; co-PI with A. Soom (PI); National Science Foundation, U.S.-France Cooperative Program (Travel Grant), 2002-2005, $20,000.

The Application of a Finite Element-Based Large Increment Method for Nonlinear Structural Problems; co-PI with A. Aref (PI); National Science Foundation, 2000-2004, $180,000.

Thermomechanical Modeling of Engineering Surfaces in Sliding Contact; co-PI with A. Soom (PI); National Science Foundation, 2000-2003, $150,000.

Computational Aseismic Design and Retrofit; PI; Multidisciplinary Center for Earthquake Engineering Research, National Science Foundation, 2000-2002, $134,000.

Grants: (continued)

Fragility of Passively-damped Structural Systems; PI; Multidisciplinary Center for Earthquake Engineering Research, National Science Foundation, 1998-2000, $176,000.

Active Aerodynamic Control of Civil Structural Systems; PI; National Science Foundation, 1997-2002, $210,000.

Compressor Startup Simulation; co-PI with A. Soom (PI); Delphi Harrison Thermal Systems, General Motors Corp., 1999-2000, $25,000.

Clutch Friction and Deformation; co-PI with A. Soom (PI); Delphi Harrison Thermal Systems, General Motors Corp., 1997-1999, $167,000.

Dynamic Analysis of Turbomachinery Impellers; PI; Praxair, Inc., 1996-1998, $38,000.

Computational Thermomechanical Design of Annealing Processes; PI; Strippit, Inc. and The Center for Industrial Effectiveness (TCIE), 1997-1998, $21,000.

Boundary Element Investigation of Turbomachinery Stress and Fracture; PI; Praxair, Inc., 1995-1996, $26,000.

Periodic and Transient Analysis of Fluid-Structure Systems in the Presence of Mean Flow; co-PI with P.K. Banerjee (PI); Office of Naval Research, 1992-1994, $163,000.

Nonlinear Analysis of Composite Structures; co-PI with P.K. Banerjee (PI), A.L. Russo (co-PI) et al.; NASA Contract NAS3-26491, CUBRC, 1992-1994, $270,000.

Development of BEM for Thermal Distortion in Casting Molds; co-PI with P.K. Banerjee (PI), D.P. Henry; General Motors Corporation, 1990-1991, $200,000.

Development of BEM for Ceramic Composites; co-PI with P.K. Banerjee (PI), D.P. Henry (co-PI); NASA Grant NAG3-888, CUBRC, 1988-1992, $312,000.

Development of Boundary Element Methods for Heat Transfer Analysis of Casting Molds; co-PI with P.K. Banerjee (PI); General Motors Corporation, 1987-1993, $470,000.

Development of an Integrated BEM for Hot Fluid Structure Interaction; co-PI with P.K. Banerjee (PI); NASA Grant NAG3-712, CUBRC, 1986-1992, $445,000.

Consulting Activities:

Extreme Events and Recovery Processes in Self-Organizing Systems, PI; Applied Analysis Group, LLC, 2005-2007, $25,000.

Development of BEM for Metal Cutting Applications; jointly with P.K. Banerjee; General Motors Corporation, 1992-1993, $50,000.

Development of a Substructured BEM for Time Dependent Thermoelasticity; jointly with P.K. Banerjee; Daimler-Benz, 1991, $75,000.

Graduate Students Supported on Grants (1996-Present):

Bradley Darrall, National Science Foundation, Graduate Research Fellowship, 2011-2014.
Bradley Darrall, UB President's Circle, 2014-2015.
Guoqiang Deng, Cameron Corporation and National Science Foundation eDesign Center, 2013.
Guoqiang Deng, UB President's Circle, 2015.
Matthias Schmid, UB President's Circle, 2015.
Arezoo Hajesfandiari, UB President's Circle, 2014.
Haoyu Zhang, UB President's Circle, 2014.
Reza Rafiee Dehkharghani, National Science Foundation, 2010-2014.
Hosein Hamidekerdar, National Science Foundation, 2009-2010.
James Sloan, National Science Foundation, 2008-2009
Seda Dogruel, National Science Foundation, 2006-2009.
Georgios Apostolakis, National Science Foundation, 2005-2008, Sprung-brett RDI, 2008-2009.
Ashish Goel, Sprung-brett RDI, 2007-2008.
Graeme Ballantyne, National Science Foundation, 2006-2007.
Praveen Ramadoss, Ttarp Industries, 2007.
Hyunsuk Lee, Conax Buffalo Technologies, 2006.
Yufeng Hu, National Science Foundation, 2003-2006.
Shashi Mishra, National Science Foundation, 2004-2005.
Xin Xu, National Science Foundation, 2004-2005.
Edgard Escobar-Sandoval, National Science Foundation, 2004.
Yunli Wang, National Science Foundation, 2000-2004.
Chao-Hua Wang, National Science Foundation and New York State, 2000-2003.
Claudia Marin-Marin, National Science Foundation, 2002.
Li-Yuan Lin, New York State, 2002.
Qihua Yu, National Science Foundation, 1999-2002.
Hanshin Cho, National Science Foundation, 1999-2001.
Mikhail Grigoriev, National Science Foundation, 1998-2000.
Ping Gu, National Science Foundation, 1998-2000.
Li Lin, Praxair and National Science Foundation, 1996-2000.
Ramesh Sant, National Science Foundation, 1998-2000.
Rajesh Radhakrishnan, National Science Foundation, 1999-2000.
Alireza Hadjesfandiari, Delphi Harrison Thermal Systems, 1997.
Rajesh Dasari, National Science Foundation, 1998.
Prasad Taluk, Strippit, 1997-1998.
Surya Banduvula, Praxair and Delphi Harrison Thermal Systems, 1996-1997.

Publications: Books

Liang, Z., Lee, G.C., Dargush, G.F., Song, J., *Structural Damping: Applications in Seismic Response Modification*, CRC Press, Boca Raton, FL, 2011.

Soong, T.T., Dargush, G.F., *Passive Energy Dissipation Systems in Structural Engineering*, John Wiley & Sons, Chichester, UK, 1997 (Chinese translation, 2005).

Publications: Monographs

Constantinou, M.C., Soong, T.T., Dargush, G.F., *Passive Energy Dissipation for Structural Design and Retrofit*, Multidisciplinary Center for Earthquake Engineering Research (MCEER) Monograph Series, University at Buffalo, Buffalo, NY, 1998.

Publications: Refereed Journal Papers

Hajesfandiari, A., Hadjesfandiari, A.R., Dargush, G.F., "Couple Stress Rayleigh-Bénard Convection in a Square Cavity," *J. Non-Newtonian Fluid Mech.*, **259**, 91-110 (2018).

Wetherhold, R.C., Dargush, G.F., Mhatre, T., "Effects of Free-edge Interface Angle on Bi-material Shear Strength," *Int. J. Mech. Sci.*, **144**, 262–273 (2018).

Darrall, B.T., Dargush, G.F., "Variational Principle and Time-Space Finite Element Method for Dynamic Thermoelasticity based on Mixed Convolved Action," *Euro. J. Mech. A Solids*, **71**, 351-364 (2018).

Chakravarty, S., Das, S., Hadjesfandiari, A.R., Dargush, G.F., "Variational Inequalities for Heterogeneous Microstructures based on Couple-Stress Theory," *Int. J. Multiscale Comp. Engrg.*, **16**, 119-137 (2018).

Rafiee-Dehkharghani, R., Bansal, D., Aref, A.J., Dargush, G.F., "Analysis and Optimal Design of Stress Wave Intensity Attenuation in Layered Structures," *Int. J. Struct. Stabil. Dyn.*, **18**, 1850015, 1-20 (2018).

Chakravarty, S., Hadjesfandiari, A.R., Dargush, G.F., "A Penalty-based Finite Element Framework for Couple Stress Elasticity," *Finite Elem. Anal. Design*, **130**, 65-79 (2017).

Apostolakis, G., Dargush, G.F., "Mixed Lagrangian Formalism for Temperature-Dependent Dynamic Thermoplasticity," *J. Engrg. Mech.*, ASCE, **143**, 04017094, 1-10 (2017).

Hajesfandiari, A., Hadjesfandiari, A.R., Dargush, G.F., "Boundary Element Formulation for Steady State Plane Problems in Size-dependent Thermoelasticity," *Engrg. Anal. Bound. Elem.*, **82**, 210-226 (2017).

Deng, G., Dargush, G.F., "Mixed Lagrangian Formulation for Size-dependent Couple Stress Elastodynamic and Natural Frequency Analyses," *Int. J. Numer. Meth. Engrg.*, **109**, 809-836 (2017).

Kim, J., Dargush, G.F., Roh, H., Ryu, J., Kim, D., "Unified Space-Time Finite Element Methods for Dissipative Continua Dynamics," *Int. J. App. Mech.*, **9**, 1750019 (2017).

Bansal, D., Aref, A.J., Dargush, G.F., Delaire, O., "Modeling Non-harmonic Behavior of Materials from Experimental Inelastic Neutron Scattering and Thermal Expansion Measurements," *J. Phys. Cond. Matter*, **28**, 385201, 1-7 (2016).

Publications: Refereed Journal Papers (continued)

Darrall, B.T., Dargush, G.F., "Mixed Convolved Action Variational Methods for Poroelasticity," *J. Appl. Mech.*, **83**, 091011-1-12 (2016).

Dargush, G.F., Apostolakis, G., Darrall, B.T., Kim, J., "Mixed Convolved Action Variational Principles in Heat Diffusion," *Int. J. Heat Mass Trans.*, **100**, 790-799 (2016).

Dargush, G.F., Soom, A., "Contact Modeling in Boundary Element Analysis Including the Simulation of Thermomechanical Wear," *Tribo. Intl.*, **100**, 360-370 (2016).

Deng, G., Dargush, G.F., "Mixed Lagrangian Formulation for Size-dependent Couple Stress Elastodynamic Response," *Acta Mech.*, **227**, 3451-3473 (2016).

Hajesfandiari, A., Hadjesfandiari, A.R., Dargush, G.F., "Boundary Element Formulation for Plane Problems in Size-dependent Piezoelectricity," *Int. J. Numer. Meth. Engrg.*, **108**, 667-694 (2016).

Kim, J., Dargush, G.F., Lee, H.S., "Extended Framework of Hamilton's Principle in Heat Diffusion," *Int. J. Mech. Sci.*, **114**, 166-176 (2016).

Rafiee-Dehkharghani, R., Aref, A.J., Dargush, G.F., "Stress Wave Attenuation in Non-collinear Structures Subjected to Impulsive Transient Loadings," *J. Engrg. Mech.*, ASCE, **142**, 04016014 (2016).

Dargush, G.F., Darrall, B.T., Kim, J., Apostolakis, G., "Mixed Convolved Action Principles in Linear Continuum Dynamics," *Acta Mech.*, **226**, 4111–4137 (2015).

Hajesfandiari, A., Dargush, G.F., Hadjesfandiari, A.R., "Size-dependent Fluid Dynamics with Application to Lid-driven Cavity Flow," *J. Non-Newt. Fluid Mech.*, **223**, 98-115 (2015).

Rafiee-Dehkharghani, R., Bansal, D., Aref, A.J., Dargush, G.F., "Interface Profile Optimization for Planar Stress Wave Attenuation in Bi-layered Plates," *Comp. B Engrg.*, **82**, 129-142 (2015).

Ahn, I-S., Chen, S.S., Dargush, G.F., Cheng, L., "Dynamic Ratcheting in SDOF Hysteretic Damping Systems Induced by Earthquake Excitations," *Engrg. Struct.*, **100**, 665-673 (2015).

Wetherhold, R.C., Dargush, G.F., "Improvement of Adhesive Strength at a Bi-material Interface by Adjusting the Interface Angles at the Free Edge," *Theoret. Appl. Fract. Mech.*, **77**, 69-73 (2015).

Rafiee-Dehkharghani, R., Aref, A.J., Dargush, G.F., "Planar Stress Wave Attenuation in Plates with Circular Voids and Inclusions," *Comp. B Engrg.*, **75**, 307–318 (2015).

Darrall, B.T., Hadjesfandiari, A.R., Dargush, G.F., "Size-dependent Piezoelectricity: A 2D Finite Element Formulation for Electric Field-Mean Curvature Coupling in Dielectrics," *Euro. J. Mech. A Solids*, **49**, 308-320 (2015).

Hadjesfandiari, A.R., Hajesfandiari, A., Dargush, G.F. "Skew-symmetric Couple-stress Fluid Mechanics," *Acta Mech.*, **226**, 871–895 (2015).

Rafiee-Dehkharghani, R., Aref, A.J., Dargush, G.F., "Characterization of Multi-Layered Stress Wave Attenuators Subjected to Impulsive Transient Loadings," *J. Engrg. Mech.*, ASCE, **141**, 04014137 (2015).

Publications: Refereed Journal Papers (continued)

Seo, J., Lee, G.C., Liang , Z., Dargush, G.F., "Configuration and Size Effects on Bond Stress-Slip and Failure Modes of Reinforced Concrete Connections," *J. Engrg. Mech.*, ASCE, **140**, 04014082 (2014).

Apostolakis, G., Dargush, G.F., Filiatrault, A., "Computational Framework for Automated Seismic Design of Steel Frames with Self-Centering Connections," *J. Comp. Civil Engrg*., ASCE, **28**, 170-181 (2014).

Campillo-Funolleta, M., Dargush, G.F., VanSlooten, R.A., Mollendorf, J.C., Kim, H., Makowka, S.R., "Size-dependent Strength of Dental Adhesive Systems," *Dental Materials*, **30**, e216-e228 (2014).

Darrall, B.T., Dargush, G.F., Hadjesfandiari, A.R. "Size-dependent Response in Skew-symmetric Couple Stress Planar Elasticity," *Acta Mechanica*, **225**, 195-212 (2014).

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"Highly Convective Flows Via Boundary Element Methods: Recent Advances and Challenges," Third MIT Conference on Computational Fluid and Solid Mechanics, Cambridge, MA, June 2005.

Selected Seminars and Presentations: (continued)

"Boundary Element Methods for Interface Cracks with Complex Stress Intensity Factors," Third MIT Conference on Computational Fluid and Solid Mechanics, Cambridge, MA, June 2005.

"Nonlinear Cyclic Analysis of Structures Using Large Increment Method," Joint ASME/ASCE/SES Conference on Mechanics and Materials (McMAT2005), Baton Rouge, LA, June 2005

"Evolutionary Methodologies for Decision Support," MCEER OSHPD Hospital Research & Retrofit Seminar, Sacramento, CA, February 2005.

"Evolutionary Aseismic Design and Retrofit," MCEER OSHPD Hospital Research & Retrofit Seminar, Sacramento, CA, February 2005.

"Evolutionary Decision Support," MCEER NSF Site Visit, Buffalo, NY, June 2004.

"Multi-level Boundary Element Methods for Stokes Flows," Seventh U.S. National Congress on Computational Mechanics, Albuquerque, NM, August 2003.

"Structural Dynamics for Computational Design within Uncertain Loading Environments," Second MIT Conference on Computational Fluid and Solid Mechanics, Cambridge, MA, June 2003.

"Multiscale Thermomechanical Analysis of Sliding Rings from Short-time Transients to Steady-state," 30th Leeds-Lyon Symposium on Tribology, Lyon, France, September 2003.

"Evolutionary Multi-hazard Design and Retrofit of Structural Systems," Extreme Loading 2003, Toronto, Canada, August 2003.

"Multi-Level Boundary Element Methods," Collins & Aikman Corporation, Ann Arbor, MI, October 2002.

"Evolutionary Aseismic Design of Passively Damped Structural Systems," International Conference on Advances and New Challenges in Earthquake Engineering Research, Harbin, China, August 2002.

"Transient Thermomechanical Contact of Rough Surfaces in Sliding Contact: Some Surprising Links between Micro-Roughness and Component Level Deformations," Poster (A. Soom and G.F. Dargush), Gordon Research Conference on Tribology, Bristol, RI, August 2002.

"Resilient Design Using a Complex Adaptive Systems Approach," MCEER Workshop on Lessons from the World Trade Center Terrorist Attack: Management of Complex Civil Emergencies and Terrorism-Resistant Civil Engineering Design, New York, NY, June 2002.

"Boundary Eigensolutions and the Mechanics of Advanced Composites," IMECE2001, ASME Winter Annual Meeting, New York, NY, November 2001.

"A Boundary Element Formulation for Transient Heat Diffusion with Singular Heat Flux," Sixth U.S. National Congress on Computational Mechanics, Dearborn, MI, August 2001.

"Research Communication," MCEER REU Communications Workshop, Buffalo, NY, August 2000, July 2001 and August 2002.

Selected Seminars and Presentations: (continued)

"Analysis of Bi-Material Interfaces and Boundary Eigensolutions," First MIT Conference on Computational Fluid and Solid Mechanics, Cambridge, MA, June 2001.

"A Poly-region Boundary Element Method for Buoyancy-driven Flows," First MIT Conference on Computational Fluid and Solid Mechanics, Cambridge, MA, June 2001.

"Thermomechanical Contact and Wear of Rough Surfaces in Sliding Contact," Poster (A. Soom and G.F. Dargush), ONR/AFOSR/NSF Tribology Program Review, Duck Key, FL, June 2001.

"Computational Design and Retrofit with Application to Passive Energy Dissipation Systems," Cannon Design, Grand Island, NY, October 2000.

"Multidisciplinary Aspects of the Modeling of Sliding Contacts," 3rd World Congress of Structural and Multidisciplinary Optimization, Buffalo, NY, May 1999.

"Active Aerodynamic Bi-directional Control of Structures," Second World Conference on Structural Control, Kyoto, Japan, June 1998.

"Seismic Response of Layered Poroelastic Media Using BEM," 12th ASCE Engineering Mechanics Conference, LaJolla, CA, May 1998.

"Boundary Element Methods for Viscous Flows," ASCE/ASME/SES Engineering Mechanics Conference (McNU97), Evanston, IL, June 1997.

"Application of Boundary Element Methods in Dynamic Analysis and Fracture Mechanics," Dept. of Civil Engineering, University at Buffalo, April 1997.

"Earthquakes and Structures: An Engineering Primer," NCEER Summer Seminar on Earthquake Information Resources for Teachers of Grades 7-12, Buffalo, August 1996.

"Engineering Analysis of Coupled Phenomena: A Computational Mechanics Approach," Dept. of Civil Engineering, University at Buffalo, April 1996.

"Boundary Element Methods: An Alternative Approach for Engineering Analysis," Dept. of Mathematics, University at Buffalo, October 1995.

"The Role of Computational Continuum Mechanics in Structural Control," Dept. of Civil Engineering, University at Buffalo, March 1995.

"A Generalized Boundary Element Formulation for Dynamic Analysis of Viscoelastic Systems," First World Conference on Structural Control, Pasadena, California, August 1994.

"Boundary Element Methods in Engineering Mechanics," Dept. of Civil Engineering and Geological Sciences, University of Notre Dame, May 1994.

"Periodic and Transient Analysis of Fluid-Structure Systems in the Presence of Mean Flow," Office of Naval Research, Review Meeting, Austin, TX, January 1994.

"Periodic and Transient Analysis of Fluid-Structure Systems in the Presence of Mean Flow," Office of Naval Research, Review Meeting, Arlington, VA, January 1993.

Selected Seminars and Presentations: (continued)

"Boundary Element Methods for Time-dependent Problems," Dept. of Civil Engineering, University at Buffalo, April 1990.

"Development of an Integrated BEM for Hot-Fluid Structure Interaction," ASME, Gas Turbine Conference and Exposition, Toronto, Canada, May 1989.

"Development of an Integrated BEM for Hot Fluid Structure Interaction," NASA Review Meeting, Cleveland, OH, March 1987.

"Thermal Response of an Industrial Waste Heat Recuperator," ASME Winter Annual Meeting, Chicago, IL, December 1980.

Selected Poster Presentations:

Dogruel, S., Dargush, G.F., "Evolutionary Multi-Hazard Mitigation: Optimized Design and Retrofit of Passively Damped Structures," 33rd Annual Hazards Research and Applications Workshop Boulder, CO, July 2008.

Soom, A., Dargush, G.F., Stenz, N.C., "Thermomechanical Wear of Dry Sliding Contacts," Gordon Research Conference on Tribology, Waterville, ME, July 2008.

Dogruel, S., Dargush, G.F., Lavan, O., "Multi-Hazard Mitigation: Optimizing Structural Resilience of Communities," Conference on Natural Disasters in Small Communities, Buffalo, NY, March 2008.

Short Courses:

"Finite Element Analysis," Short Course presented by G.F. Dargush, A.J. Aref, SUNY at Buffalo, EngiNet Professional Development Course, Amherst, NY, September 19-22, 2005.

"Finite Element Analysis of Structures," Short Course presented by A.J. Aref, G.F. Dargush, New York State Department of Transportation, Albany, NY, July 26-27, 2001.

"Boundary Element Methods in Engineering Mechanics," Short Course presented by P.K. Banerjee, G.F. Dargush, M.L. Green, NASA/Glenn, Cleveland, OH, November 27-29, 2000.

"Mathematical Modeling of Passive Devices and Systems," NCEER/EERC Short Course on Passive Energy Dissipation for Seismic/Wind Design and Retrofit, San Francisco (October 1996) and Los Angeles (February 1997).