

JOHN E. DOLBOW

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EDUCATION

1999 Ph.D., Theoretical and Applied Mechanics, Northwestern University
1998 M.S., Theoretical and Applied Mechanics, Northwestern University
1995 B.S., Mechanical Engineering, University of New Hampshire

PROFESSIONAL EXPERIENCE

2006– Associate Professor of Mechanical Engineering and Materials Science,
Duke University (secondary)
2006– Associate Professor of Civil and Environmental Engineering, Duke University (primary)
2004–2006 Assistant Professor of Mechanical Engineering and Materials Science,
Duke University (secondary)
1999–2006 Assistant Professor of Civil and Environmental Engineering, Duke University (primary)
1996–1999 Research Assistant, Northwestern University
1998 Visiting Research Assistant, Los Alamos National Laboratory
1994–1995 Research Assistant, University of New Hampshire

HONORS & AWARDS

- o Gallagher Young Investigator Award, United States Association for Computational Mechanics, July 2005
- o NSF Fellowship, Summer Institute on Nano Mechanics and Materials, Northwestern University, June 2005
- o Young Researcher Fellowship Award, First MIT Conference on Computational Fluid and Solid Mechanics, 2001

- Robert J Melosh Award for the Best Student Paper in Finite Element Analysis, Duke University, 1999
- Department of Energy Computational Science Graduate Fellow, 1997–1999
- Walter P. Murphy Graduate Fellowship, Northwestern University, 1995–1996
- Class Marshal and Valedictorian, University of New Hampshire, 1995
- ASME Regional Student Conference Highest Technical Content Award, 1995
- Presidential Scholar, University of New Hampshire, 1991–1995

GRANT AND CONTRACT SUPPORT

Support Obtained as Principal Investigator

- “Reduced Volume Fracture Toughness Characterization for Transport Polymers,” J.E. Dolbow (PI) & D.M. Stepp (co-PI), Army Research Office, \$395,331, October 2006-September 2011.
- “Coupling the Extended Finite Element Method and Surface Reconstruction Algorithms,” J.E. Dolbow (PI), Sandia National Laboratories, \$5,745, October 2006-September 2009.
- “Computational and Experimental Strategies for Investigating Failure in Emerging Soft-Wet Materials,” J.E. Dolbow (PI), National Science Foundation, \$99,635, September 2005-August 2007.
- “Computational Strategies for Phase Transitions Driven by Coupled Stress and Diffusion,” J.E. Dolbow (PI), Department of Energy, \$209,325, September 2005 - August 2008.
- “Computational and Modeling Strategies for Damping and Multi-Physics Coupling on Interfaces,” J.E. Dolbow (PI) & T.A. Laursen (co-PI), Sandia National Laboratories, \$322,086, October 2003 - September 2006.
- “The Robert J. Melosh Symposium in Finite Element Analysis,” J.E. Dolbow (PI), National Science Foundation, \$3,000, October 2004 - September 2005.
- “Collaborative Research: Surface and Actuation Kinetics of Stimulus-Responsive Hydrogels,” J.E. Dolbow (PI) & S. Zauscher (co-PI), National Science Foundation, \$226,610, September 2003 - August 2007.
- “The Robert J. Melosh Symposium in Computational Mechanics,” J.E. Dolbow (PI), Sandia National Laboratories, \$13,600, January 2003 - December 2008.
- “The Robert J. Melosh Medal Symposium,” J.E. Dolbow (PI), Elsevier, \$4,800, January 2003 - December 2007.
- “GOALI/Collaborative Research: Thermomechanical Investigations of High Speed Machining of Aluminum,” J.E. Dolbow (PI) & T.A. Laursen (co-PI), National Science Foundation, \$158,074 (with REU supplement), September 2002 - August 2006.
- “Towards Material Systems with Optimized Fracture Response,” J.E. Dolbow (PI), Lord Foundation of North Carolina, \$9,992, May 2001 - June 2002.
- “Parallel Cluster for Multi-Scale Simulations in Computational Mechanics and Groundwater Hydrology,” J.E. Dolbow (PI), T.A. Laursen (co-PI), & M. Medina (co-PI), Lord Foundation of North Carolina, \$60,000, May 2000 - June 2003.

Support Obtained as Co-Principal Investigator

“Development of Distributed State Simulators: A Critical New Approach to Modeling Biological Reactor Systems,” A. Schuler (PI) & J.E. Dolbow (co-PI), National Science Foundation, \$210,000, September 2006-August 2008.

“New Numerical Methods for Transient Interaction of Structures with Fluids and Soils,” T. A. Laursen (PI) & J. E. Dolbow (co-PI), Air Force Office of Scientific Research, \$307,426, January 2006-December 2008.

“Web-based Educational Framework for Analysis, Visualization, and Experimentation: WEAVE,” H. Gavin (PI), R. Clark (co-PI), J.E. Dolbow (co-PI), E. Dowell (co-PI), & T.A. Laursen (co-PI), National Science Foundation, \$341,285, May 2002 - April 2006.

“WEAVE - An Innovation Project,” H.Gavin & J. Dolbow, PIs, Duke Center for Instructional Technology, \$23,500, June 2001 - May 2002.

Pending Support

“Collaborative Research: Membrane Nanodomains–Prediction and Detection,” J.E. Dolbow (PI), National Science Foundation, \$205,943, January 2008-December 2010.

“Bubble dynamics and wall roughness: taking inspiration from plants,” J.E. Dolbow (co-PI), National Science Foundation, \$339,174, January 2008-December 2010.

PUBLICATIONS

Refereed Journal Articles

Dolbow, J., S. Mosso, J. Robbins, & T. Voth (2007), “Coupling Volume-of-Fluid Interface Reconstructions with the eXtended Finite Element Method,” *Computer Methods in Applied Mechanics and Engineering*, in press.

Korchagin, V., J. Dolbow, & D. Stepp (2007), “A Theory of Amorphous Viscoelastic Solids Undergoing Finite Deformations with Application to Hydrogels,” *International Journal of Solids and Structures*, **44**, 3973–3997.

Kim, T., J. Dolbow & E. Fried (2007), “A Numerical Method for a Second Gradient Theory of Fluid Flow,” *Journal of Computational Physics*, **223**, 551-570.

Chang, D., J. Dolbow & S. Zauscher (2007), “Switchable Friction of Stimulus-Responsive Hydrogels,” *Langmuir*, **23**, 250–257.

Mourad, H.M., J. Dolbow, & I. Harari (2007), “A Bubble-Stabilized Finite Element Method for Dirichlet Constraints on Embedded Interfaces,” *International Journal for Numerical Methods in Engineering*, **69**, 772-793.

Kim, T., J. Dolbow & T.A. Laursen (2007), “A Mortared Finite Element Method for Frictional Contact on Arbitrary Interfaces,” *Computational Mechanics*, **39**, 223-235.

Ji, H., H. Mourad, E. Fried, & J. Dolbow (2006), “Kinetics of Thermally-Induced Swelling of Hydrogels,” *International Journal of Solids and Structures*, **43**, 1878–1907.

- Mourad, H.M., J. Dolbow, & K. Garikipati (2005), “An Assumed Gradient Finite Element Method for the Level Set Equation,” *International Journal for Numerical Methods in Engineering*, **64**, 1009–1032.
- Sukumar, N., J. Dolbow, A. Devan, J. Yvonnet, F. Chinesta, D. Ryckelynck, P. Lorong, I. Alfaro, M.A. Martinez, E. Cueto, & M. Doblare (2005), “Meshless Methods and Partition of Unity Finite Elements,” *The International Journal of Forming Processes*, **8**(4), 409–427.
- Dolbow, J., E. Fried & H. Ji (2005), “A Numerical Strategy for Investigating the Kinetic Response of Stimulus-Responsive Hydrogels,” *Computer Methods in Applied Mechanics and Engineering*, **194**(42–44), 4447–4480.
- Dolbow, J., E. Fried, & A.Q. Shen (2005), “Point Defects in Nematic Gels: The Case for Hedgehogs,” *Archive for Rational Mechanics and Analysis*, **177**(1), 21–51.
- Ji, H., & J.E. Dolbow (2004), “On Strategies for Enforcing Interfacial Constraints and Evaluating Jump Conditions with the Extended Finite Element Method,” *International Journal for Numerical Methods in Engineering*, **61**(14), 2508–2535.
- Dolbow, J., E. Fried, & H. Ji (2004), “Chemically-Induced Swelling of Hydrogels,” *Journal of the Mechanics and Physics of Solids*, **52**(1), 51–84.
- Dolbow, J.E. & A. Devan (2004), “Enrichment of Enhanced Assumed Strain Approximations for Representing Strong Discontinuities: Addressing Volumetric Incompressibility and the Discontinuous Patch Test,” *International Journal for Numerical Methods in Engineering*, **59**(1), 47–67.
- Bellec, J. & J.E. Dolbow (2003), “A Note On Enrichment Functions for Modeling Crack Nucleation,” *Communications in Numerical Methods in Engineering*, **19**(12), 921–932.
- Dolbow, J.E. & J.C. Nadeau (2002), “On the Use of Effective Properties for the Fracture Analysis of Microstructured Materials,” *Engineering Fracture Mechanics*, **69**(14–16), 1607–1634.
- Ji, H., D.L. Chopp, & J.E. Dolbow (2002), “A Hybrid Extended Finite Element/ Level Set Method for Modeling Phase Transformations,” *International Journal for Numerical Methods in Engineering*, **54**(8), 1209–1233.
- Merle, R. & J. Dolbow (2002), “Solving Thermal and Phase Change Problems with the Extended Finite Element Method,” *Computational Mechanics*, **28**(5), 339–350.
- Dolbow, J.E. & M. Gosz (2002), “On the Computation of Mixed-Mode Stress Intensity Factors in Functionally Graded Materials,” *International Journal of Solids and Structures*, **39**(9), 2557–2574.
- Dolbow, J., N. Moës, & T. Belytschko (2001), “An Extended Finite Element Method for Modeling Crack Growth with Frictional Contact,” *Computer Methods in Applied Mechanics and Engineering*, **190**(51–52), 6825–6846.
- Dolbow, J., N. Moës, & T. Belytschko (2000), “Modeling Fracture in Mindlin-Reissner Plates with the Extended Finite Element Method,” *International Journal of Solids and Structures*, **37**(48–50), 7161–7183.
- Dolbow, J., N. Moës, & T. Belytschko (2000), “Discontinuous Enrichment in Finite Elements with a Partition of Unity Method,” *Finite Elements in Analysis and Design*, **36**(3–4), 235–260.

- Daux, C., N. Moës, J. Dolbow, N. Sukumar, & T. Belytschko (2000), “Arbitrary Branched and Intersecting Cracks with the Extended Finite Element Method,” *International Journal for Numerical Methods in Engineering*, **48**(12), 1741–1760.
- Dolbow, J. & T. Belytschko (1999), “Volumetric Locking in the Element-free Galerkin Method,” *International Journal for Numerical Methods in Engineering*, **46**(6), 925–942.
- Moës, N., J. Dolbow, & T. Belytschko (1999), “A Finite Element Method for Crack Growth without Remeshing,” *International Journal for Numerical Methods in Engineering*, **46**(1), 131–150.
- Dolbow, J. & T. Belytschko (1999), “Numerical Integration of the Galerkin Weak Form in Meshfree Methods,” *Computational Mechanics*, **23**(3), 219–230.
- Dolbow, J., & T. Belytschko (1998), “An Introduction to Programming the Meshless Element-free Galerkin Method,” *Archives of Computational Methods in Engineering*, **5**(3), 207–241.
- Belytschko, T., Y. Krongauz, J. Dolbow, & C. Gerlach (1998), “On the Completeness of Meshfree Particle Methods,” *International Journal for Numerical Methods in Engineering*, **43**(5), 785–819
- Gosz, M., J. Dolbow, & B. Moran (1998), “Domain Integral Formulation for Stress Intensity Factor Computation along Curved Three-Dimensional Interface Cracks,” *International Journal of Solids and Structures*, **35**(15), 1763–1783.
- Dolbow, J. & M. Gosz (1996), “Effect of Out-of-Plane Properties of a Polyimide Film on the Stress Fields in Microelectronic Structures,” *Mechanics of Materials*, **23**(4), 311–321.

Work Under Review or In Preparation

- Stanciulescu, I., J. Dolbow, & S. Zauscher (2007), “Computational Modelling of Surface Phenomena in Soft-Wet Materials,” in preparation.
- Chen, X., T. Kim, J. Dolbow, & E. Fried (2007), “Numerical Simulation of the spiral vortex model for the Navier-Stokes- $\alpha\beta$ equations,” in preparation.
- Dolbow, J., & L. Franca (2007), “Residual-free Bubbles for Embedded Dirichlet Problems,” submitted for publication.
- Kim, T., & J. Dolbow (2007), “An Edge-Bubble Stabilized Finite-Element Method for Fourth-Order Parabolic Problems,” submitted for publication.

Dissertations and Theses

- Dolbow, J. (1999), “An Extended Finite Element Method with Discontinuous Enrichment for Applied Mechanics,” Ph.D. Dissertation, Northwestern University.
- Dolbow, J. (1998), “Numerical Integration in Meshfree Methods”, M.S. Thesis, Northwestern University.

Refereed Conference Papers

- Devan, A. & J. E. Dolbow (2003), “An Enhanced Assumed Strain Method with Discontinuous Enrichment,” in *Proceedings of the 6th ESAFORM Conference on Material Forming*, 607–610.

- Dolbow, J. & R. Merle (2001), “Modeling Dendritic Solidification with the Extended Finite Element Method,” in *Computational Fluid and Solid Mechanics*, **2**, K.J. Bathe ed., Elsevier, London, 1135–1138.
- Belytschko, T., J. Dolbow & Y. Krongauz (1998), “Mesh-free Particle Methods,” in *Modeling & Simulation Based Engineering*, S.N. Atluri & P.E. O’Donoghue, eds., Tech Science Press, Palmdale, CA, 11–16.
- Gosz, M., B. Moran, & J. Dolbow (1996), “Interaction Integral Formulation for Computing Stress Intensity Factors Along Curved Bimaterial Interface Cracks,” in *Proceedings of the 1996 ASME International Mechanical Engineering Congress and Exposition*, **52**, 107-121.
- Gosz, M.R. & J.E. Dolbow (1995), “Influence of Out-of-Plane Insulator Properties on the Interfacial Stresses in Periodic Electronic Structures,” in *Proceedings of the 1995 ASME International Mechanical Engineering Congress & Exposition*.

Published Conference Abstracts

- Dolbow, J.E. (2003), “Enriched Finite Element Approximations: Interpretations of Variational Consistency,” in *USACM Seventh U.S. National Congress on Computational Mechanics: Conference Proceedings*.
- Dolbow, J., E. Fried & H. Ji (2003), “On the Evaluation of Configurational Forces with Enriched Finite Element Approximations Using Domain Integrals,” in *USACM Seventh U.S. National Congress on Computational Mechanics: Conference Proceedings*.
- Ji, H., J.E. Dolbow & E. Fried (2003), “Numerical Approaches for Modeling the Swelling Behavior of Hydrogels,” in *USACM Seventh U.S. National Congress on Computational Mechanics: Conference Proceedings*.
- Dolbow, J.E., H. Ji & D.L. Chopp (2002), “Recent Advances in the Hybrid Finite Element/ Level Set Method for Phase Transformations,” in *Fifth World Congress on Computational Mechanics: Book of Abstracts*, **1**, 200.
- Dolbow, J.E., H. Ji & D. Chopp (2001), “A New Hybrid Numerical Method for Modeling Phase Transformations and Dendritic Solidification,” in *USACM Sixth U.S. National Congress on Computational Mechanics: Abstracts*, Mechanical Engineering Department, University of Michigan, 481.
- Dolbow, J.E. & J.C. Nadeau (2001), “Microstructure Effects on Stress Intensity Factors in FGMs,” in *USACM Sixth U.S. National Congress on Computational Mechanics: Abstracts*, Mechanical Engineering Department, University of Michigan, 731.
- Dolbow, J.E. & N. Moës (2000), “Modeling Crack Growth and Frictional Contact with the Extended Finite Element Method,” in *ICTAM 2000 Chicago Abstract Book*, Technical Report No. 950, Department of Theoretical and Applied Mechanics, University of Illinois at Urbana-Champaign, 203.
- Belytschko, T., J. Dolbow & N. Moës (1999), “Crack Growth with Enriched Finite Elements for Mindlin-Reissner Plates,” in *Fifth U.S. National Congress on Computational Mechanics: Book of Abstracts*, University of Colorado, Boulder, Colorado, 32.

Editorials

Dolbow, J.E. (2005), "The Melosh competition," *Finite Elements in Analysis and Design*, **41**(7-8), 685.

Other Publications

Dolbow, J.E., M.A. Khaleel & J. Mitchell (2004), "Multiscale Mathematics Initiative: A Roadmap," Pacific Northwest National Laboratory Report 14966.

NATIONAL AND INTERNATIONAL PRESENTATIONS**Invited Lectures at Meetings**

"Computational and Modeling Strategies for Damping and Multi-Physics Coupling on Interfaces," National Science Foundation / Sandia National Laboratories Grantees Workshop, Albuquerque, New Mexico, January 6, 2006.

"Computational and Modeling Strategies for Damping and Multi-Physics Coupling on Interfaces," National Science Foundation / Sandia National Laboratories Grantees Workshop, Albuquerque, New Mexico, February 10, 2005.

"Extended Finite Element Approximations for Phase Transformations," (Invited Lecture), Nouvelles Tendances dans le Calculs par Elements Finis: Role du Maillage et Partition de l'Unite, Ecole Centrale de Nantes, Nantes, France, October 8, 2003.

"Enriched Finite Element Approximations: Interpretations of Variational Consistency," (Keynote Lecture), Seventh U.S. National Congress on Computational Mechanics, Albuquerque, July 28–July 30, 2003.

"An Enhanced Assumed Strain Method with Discontinuous Enrichment: Addressing Volumetric Incompressibility and the Discontinuous Patch Test," (Keynote Lecture), Sixth ESAFORM Conference on Metal Forming, Salerno, Italy, April 28–April 30, 2003.

"Modeling Dendritic Solidification and Phase Transformations with a Hybrid Extended Finite Element/ Level Set Method," (Keynote Lecture), First MIT Conference on Computational Fluid and Solid Mechanics, Boston, June 12–June 15, 2001.

"Modeling Crack Growth and Frictional Contact with the Extended Finite Element Method," ICTAM 2000–20th International Congress of Theoretical and Applied Mechanics, Chicago, Illinois, August 27–September 2, 2000.

Conference Talks Delivered

"On Techniques for Enforcing Constraints on Embedded Interfaces," Ninth U.S. National Congress on Computational Mechanics, San Francisco, CA, July 23–26, 2007.

"Enforcing Constraints on Embedded Interfaces," 14th International Conference on Finite Elements in Flow Problems, Santa Fe, NM, March 26–28, 2007.

"On Stabilized Methods for Enforcing Constraints on Embedded Interfaces," Seventh World Congress in Computational Mechanics, Los Angeles, California, July 16–22, 2006.

- “Computational Strategies for Sharp Interface Problems with Coupled Stress and Diffusion,” Eighth U.S. National Congress on Computational Mechanics, Austin, Texas, July 25–27, 2005.
- “Advances in Enriched Finite Element Methods for Evolving Interface Problems,” Eighth U.S. National Congress on Computational Mechanics, Austin, Texas, July 25–27, 2005.
- “A Sharp-Interface Theory for the Chemically-Induced Swelling of Stimulus-Responsive Hydrogels,” International Mechanical Engineering Congress and Exposition, New Orleans, Louisiana, November 17–22, 2002.
- “Modeling Point Defects (Hedgehogs) in Nematic Elastomers,” International Mechanical Engineering Congress and Exposition, New Orleans, Louisiana, November 17–22, 2002.
- “Recent Advances in the Hybrid Finite Element / Level Set Method for Phase Transformations,” Fifth World Congress in Computational Mechanics, Vienna, Austria, July 7–12, 2002.
- “Investigations of a Sharp-Interface Theory for Hydrogels Using the Extended Finite Element Method,” Fourteenth US National Congress of Theoretical and Applied Mechanics, Blacksburg, Virginia, June 23–28, 2002.
- “A Pilot Module for Web-Based Engineering Education: Synthesizing Models and Experiments,” Fourteenth US National Congress of Theoretical and Applied Mechanics, Blacksburg, Virginia, June 23–28, 2002.
- “Recent Advances in Modeling Phase Transitions with Finite Elements,” International Mechanical Engineering Congress and Exposition, New York, New York, November 11–16, 2001.
- “A New Hybrid Numerical Method for Modeling Phase Transformations and Dendritic Solidification,” Sixth U.S. National Congress on Computational Mechanics, Dearborn, Michigan, August 1–3, 2001.
- “Microstructure Effects on Stress Intensity Factors in Functionally Graded Materials,” Sixth U.S. National Congress on Computational Mechanics, Dearborn, Michigan, August 1–3, 2001.
- “Modeling Evolving Discontinuities, Singularities, and Interfaces with the Extended Finite Element Method,” Computational Science Graduate Fellowship Conference, Washington, D.C., July 18–21, 2001.
- “An Extended Finite Element Method for Nonlinear Constitutive Laws on Evolving Interfaces,” 36th Annual Technical Meeting of the Society for Engineering Science, Austin, Texas, October 25–27, 1999.
- “Crack Growth with Enriched Finite Elements for Mindlin-Reissner Plates,” Fifth U.S. National Congress on Computational Mechanics, Boulder, Colorado, August 4–6, 1999.
- “Volumetric Locking in Meshfree Methods,” International Conference on Computational Engineering Science, Atlanta, Georgia, October 5–9, 1998.

Other Presentations

- “Enhanced Finite Element Methods for Evolving Interface Problems,” invited seminar, University of Stuttgart, Stuttgart, Germany, April 25, 2007.
- “Enforcing Constraints on Embedded Interfaces with Finite Element Methods,” invited seminar, Department of Mathematics, University of Colorado, Denver, Colorado, March 12, 2007.

- “Emerging Numerical Methods for Evolving Interfaces,” invited seminar, AFOSR Workshop on Particulate Mechanics in Extreme Environments, Shalimar, FL, January 23–25, 2007.
- “The Extended Finite Element Method: Recent Progress and Applications,” invited seminar, Army Research Laboratory, Aberdeen, MD, June 5, 2006.
- “Enhanced Finite Element Methods for Evolving Interface Problems,” invited seminar, Washington University in St. Louis, St. Louis, MO, March 14, 2006.
- “On Enhanced Finite Element Methods for Flow Problems,” invited seminar, Sandia National Laboratories, Albuquerque, NM, January 5, 2006.
- “Computational and Modeling Strategies for Defect Mechanics,” Mechanics and the Environment Interdisciplinary Colloquia, Department of Civil and Environmental Engineering, Duke University, Durham, North Carolina, April 20, 2005.
- “Simulating Sharp Phase Transitions in Soft-Wet Materials,” invited seminar, Department of Mathematics, University of Colorado, Denver, Colorado, March 14, 2005.
- “Enhanced Finite Element Strategies for Evolving Interfaces,” Computational Science Seminar, Sandia National Laboratories, January 27, 2004.
- “Chemically-Induced Volume Transitions in Hydrogels,” invited seminar, Department of Aerospace and Mechanical Engineering, University of Notre Dame, South Bend, Indiana, January 20, 2004.
- “Extended Finite-Element Approximations for Fracture Mechanics and Phase Transformations: Interpretations on Variational Consistency,” invited seminar, Department of Mechanical and Aerospace Engineering, Washington University in St. Louis, St. Louis, Missouri, September 25, 2003.
- “Extended Finite-Element Approximations for Fracture Mechanics and Phase Transformations,” invited seminar, Center for Simulation of Advanced Rockets, University of Illinois at Urbana-Champaign, Urbana, Illinois, September 11, 2003.
- “Investigating the Swelling Kinetics of Stimulus Responsive Hydrogels,” invited seminar, Department of Mechanics, Materials, and Aerospace Engineering, Illinois Institute of Technology, Chicago, Illinois, September 10, 2003.
- “Hybrid Finite Element/Level Set Methods for Problems with Evolving Interfaces,” Telluride Workshop, Santa FE, New Mexico, January 22, 2003.
- “An Overview of the X-FEM for Nonlinear Failure Analysis: Toward Modeling the High-Speed Machining of Aluminum,” invited seminar, Alcoa Technical Center, Pittsburgh, Pennsylvania, July 31, 2002.
- “A New Finite Element Paradigm for Modeling Evolving Discontinuities,” invited seminar, Department of Applied Physics and Applied Mathematics, Columbia University, New York, New York, February 12, 2002.
- “Modeling Crack Growth in Functionally Graded Composites with the Extended Finite Element Method,” invited seminar, Department of Civil Engineering, North Carolina State University, Raleigh, North Carolina, November 19 2001.

- “Modeling Phase Transformations and Dendritic Solidification with the Extended Finite Element Method,” Mechanics and the Environment Interdisciplinary Colloquia, Department of Civil and Environmental Engineering, Duke University, Durham, North Carolina, April 4, 2001.
- “Modeling Evolving Discontinuities, Singularities, and Interfaces with the Extended Finite Element Method,” Applied Math Seminar, Duke University, Durham, North Carolina, March 26, 2001.
- “An Extended Finite Element Method for Phase Transformations,” Workshop on Meshfree Methods, University of Iowa, IA, November 4, 2000.
- “The Extended Finite Element Method for Applied Mechanics,” invited seminar, Department of Theoretical and Applied Mechanics, Cornell University, Ithaca, New York, March 1, 2000.
- “An Extended Finite Element Method with Discontinuous Enrichment,” invited seminar, Department of Mathematics, North Carolina State University, Raleigh, North Carolina, April 11, 2000.
- “Modeling Nonlinear Constitutive Laws on Arbitrary Interfaces with the Extended Finite Element Method,” Mechanics and the Environment Interdisciplinary Colloquia, Department of Civil and Environmental Engineering, Duke University, Durham, North Carolina, September 22, 1999.
- “Removing the Boundaries from the Finite Element Method,” invited seminar, Theoretical and Computational Physics Division, Los Alamos National Laboratory, Los Alamos, New Mexico, November 8, 1999.

STUDENT AND POST-DOCTORAL FELLOW SUPERVISION

Postdoctoral Fellows Supervised

- Dr. Youngjean Jung (co-advised with Tod Laursen), September 2006-present.
- Dr. Vladimir Korchagin (co-advised with Dr. David Stepp, Army Research Office), June 2005-present.
- Dr. Ilinca Stanciulescu, September 2005-May 2006.
- Dr. Hashem Mourad, September 2004-May 2006.

Doctoral Theses Supervised

- Tae Yeon Kim, *Numerical Methods for Fourth Order Partial Differential Equations: Incompressible Fluid Flow and Phase Separation*, Department of Civil and Environmental Engineering, Duke University, degree completed in May 2007.
- Huidi Ji, *A Numerical Strategy for Phase Transitions Driven by Coupled Stress and Diffusion: Application to the Kinetics of Stimulus-Responsive Hydrogels*, Department of Civil and Environmental Engineering, Duke University, degree completed in December 2004.

Masters Theses Supervised

- Justin Pogacnik, *Nonlinear Elasticity: Experimental Results and Finite Element Modeling of Failure in a Hard Neoprene Elastomer*, Department of Civil and Environmental Engineering, Duke University, degree expected in December 2007.
- Meredith Williams, *Fracture Mechanics of Stimulus Responsive Hydrogels*, Department of Mechanical Engineering and Materials Science, Duke University, degree completed in Summer 2006.

- Anandaraja Devan, *An Enhanced Assumed Strain Method with Discontinuous Enrichment for Nonlinear Failure Mechanics*, Department of Civil and Environmental Engineering, Duke University, degree completed in Summer 2002.

Independent Studies Supervised

- Alexander McKinnon, *Introductory Computational Fluid Dynamics*, Department of Mechanical Engineering and Materials Science, Duke University, Fall 2006.
- Meredith Williams, *Experimental Studies of Soft-Wet Material Failure*, Department of Mechanical Engineering and Materials Science, Duke University, Spring 2005.

Other Advisees at Duke University, Pratt School of Engineering

- Anand Embar, Ph.D. student (starting September, 2007). Thesis topic to be determined.
- Chandasekhar Annavarapu, Ph.D. student (starting September, 2007). Thesis topic to be determined.
- Philip Wolfe, Pratt Fellow, 2007-2008.
- Liza Crabtree, Pratt Fellow, 2007-2008.
- Justin Pogacnik, Ph.D. student (beginning September 2007). Thesis topic to be determined.
- Debby Chang, Ph.D. student (co-advised with S. Zauscher). Thesis: *Experimental Investigations of Hydrogel Surface Response*. Graduation anticipated in June 2008.
- Kasey Smith, NSF-REU fellow. Project: *Numerical Investigation of High Speed Machining of Aluminum Alloys*.

Stage Advisees from Mechanical Engineering at the ENS de Cachan, France

- Jerome Bressieux, Ph.D. student. Stage Project: *Investigations of A New Approach for Fluid-Structure Interaction*. Dates Advised: May 2002 - August 2002.
- Sebastien Gravier, Ph.D. student. Stage Project: *An Interaction Energy Integral Method for the Computation of Mixed-Mode Thermal Stress Intensity Factors in Functionally Graded Materials*. Dates Advised: May 2001 - August 2001.
- Jeremie Bellec, Ph.D. student. Stage Project: *Enrichment Functions for Crack Nucleation in the Extended Finite Element Method*. Dates Advised: May 2001 - August 2001.
- Renaud Merle, Ph.D. student. Stage Project: *Modeling Phase Transformations with the Extended Finite Element Method*. Dates Advised: May 2000 - August 2000.

PROFESSIONAL AND HONORARY MEMBERSHIPS

- Member, American Society of Mechanical Engineers.
- Professional Member, American Academy of Mechanics.
- Member, United States Association for Computational Mechanics.
- Member, Tau Beta Pi, The National Engineering Honor Society.

PROFESSIONAL SERVICE ACTIVITIES

- Minisymposium Organizer (with C.A. Duarte) and Session Chairman, Ninth U.S. National Congress on Computational Mechanics, San Francisco, CA, July 23–26, 2007. Minisymposium Title: Partition of Unity Finite Element and Meshless Methods: Advances and Engineering Applications.
- Minisymposium Organizer (with N. Moës), Seventh World Congress on Computational Mechanics, Los Angeles, CA, July 16–27, 2006. Minisymposium Title: Extended Finite Element Methods for Evolving Discontinuities and Interfaces.
- Minisymposium Organizer (with J. Chessa) and Session Chairman, Eighth U.S. National Congress on Computational Mechanics, Austin, TX, July 24–28, 2005. Minisymposium Title: Recent Advances in Enriched Finite Element Technology.
- Workshop Organizer (with J. Mitchell and M. Khaleel), Third DOE Multiscale Math Workshop, Portland, Oregon, September 21–23, 2004.
- Applicant reviewer for Computational Science Graduate Fellowship Program, Krell Institute, 2004–present.
- Chair, Committee on Meshfree Methods, US Association of Computational Mechanics, 2005–2007.
- Vice-chair, Committee on Meshfree Methods, US Association of Computational Mechanics, 2003–2004.
- Minisymposium Organizer (with J.S. Chen and P. Smolinski), Seventh U.S. National Congress on Computational Mechanics, Albuquerque, NM, June 27–31, 2003. Minisymposium Title: Computational Mechanics: An Honorary Minisymposium for Ted Belytschko’s 60th Birthday.
- Minisymposium Organizer (with T.A. Laursen) and Session Chairman, Sixth U.S. National Congress on Computational Mechanics, Dearborn, MI, August 1–3, 2001. Minisymposium Title: Computational Mechanics of Sharp Fronts and Interfaces.
- Minisymposium Organizer (with S. De and S. Idelsohn) and Session Chairman, First MIT Conference on Computational Fluid and Solid Mechanics, Boston, MA, June 12–15, 2001. Minisymposium Title: Meshless Techniques.
- Coordinator, Annual Robert J. Melosh Medal Competition for the Best Student Paper on Finite Element Analysis, 2001–present.
- Grant proposal reviewer for: National Science Foundation, Department of Energy, Army Research Office, Petroleum Research Fund.
- Reviewer for the following archival journals: *Computational Mechanics*, *Computer Methods in Applied Mechanics and Engineering*, *Computers and Structures*, *Engineering Fracture Mechanics*, *Finite Elements in Analysis and Design*, *International Journal for Numerical Methods in Engineering*, *International Journal of Numerical Methods in Fluids*, *International Journal of Solids and Structures*, *Journal of Applied Mechanics*.

COURSES TAUGHT

Undergraduate Courses

- CE/ME 175, Analytical and Computational Solid Mechanics (given in Spring 2004, Spring 2007).

- EGR 75L, Mechanics of Solids (given in Fall 1999, Fall 2000, Fall 2001, Fall 2002, Fall 2004, Fall 2005, Fall 2006, Fall 2007).

Graduate Courses

- CE 212, Fracture Mechanics (developed and given in Spring 2003).
- CE 256, Computational Methods for Evolving Discontinuities and Interfaces (developed and given in Spring 2002).
- CE 251, Engineering Analysis and Computational Mechanics (given in Fall 2001).
- CE 254, Introduction to the Finite Element Method (given in Spring 2000, Spring 2001, Spring 2005).
- CE 399, Linear Finite Element Analysis (given in Fall 2005).

UNIVERSITY SERVICE

University Activities

- Member, Academic Council, 2006–present.
- Faculty reviewer, Fifth Annual Graduate Student Research Day, March 30, 2005.
- Faculty reviewer, Fourth Annual Graduate Student Research Day, March 24, 2004.

Pratt School of Engineering Activities

- Chair, Engineering Faculty Council, 2007–present
- Member, Engineering Faculty Council, 2003–2004, 2006–present.
- Secretary, Engineering Faculty Council, 2003.
- Member, Information Technology Director Search Committee, 2000–2001.
- Member, Steering Committee for EGR 53, 1999–2000.

Departmental Activities

- Member, Environmental Engineering Faculty Search Committee, 2007–2008.
- Member, Mechanics and Structures Faculty Search Committee, 2005–2006.
- Member, Civil and Environmental Engineering Chair Search Committee, 2000–2001.
- Faculty Secretary, 2000.