FINAL PROGRAM

June 2–4, 2011
Northeastern University, Boston, MA
www.neu.edu/emi2011
EMI2011@neu.edu
Welcome to EMI2011

Thank you for attending the Engineering Mechanics Institute 2011 at Northeastern University. This conference provides a major forum for the exchange of ideas and discussion of recent developments in all fields of mechanics and materials. The technical sessions and symposia on fundamentals, tools and applications serve to highlight and promote educational needs, emerging thrusts, novel techniques, and innovative applications in areas that span across many engineering disciplines. The conference is comprised of six keynote lectures and 420 technical presentations, 3 student competitions, EMI committee meetings, and industry exhibitions. A broad spectrum of topics will be covered, including applied earthquake engineering, fundamental mechanics of biological materials, and theories that combine nonlinear mechanics and the chemistry of molecular mixtures. In addition, one short course was held on June 1 in conjunction with the conference, entitled “Identification and Diagnostics in Structural Engineering”. A workshop to promote diversity and gender balance of prospective faculty in engineering mechanics was also held before the conference. We hope that you enjoy the many opportunities this conference has to offer.

Conference Co-chairs:
Ming L. Wang, Dionisio P. Bernal, and Jerome F. Hajjar

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## Agenda

### Wednesday, June 1, 2011

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>9:00 am -- 5:00 pm</td>
<td>Future Faculty Workshop</td>
</tr>
<tr>
<td>2:00 -- 6:30 pm</td>
<td>Pre-conference Short Course on Identification and Diagnostics</td>
</tr>
<tr>
<td>6:30 -- 8:30 pm</td>
<td>Check in for EMI2011 conference</td>
</tr>
<tr>
<td>6:30 -- 8:30 pm</td>
<td>Reception</td>
</tr>
</tbody>
</table>

### Thursday, June 2, 2011

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7:30--8:15 am</td>
<td>Check in &amp; Continental Breakfast</td>
</tr>
<tr>
<td>8:15--8:45 am</td>
<td>Opening Ceremony</td>
</tr>
<tr>
<td>8:45--9:30 am</td>
<td>Keynote 1</td>
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<tr>
<td>9:30--10:15 am</td>
<td>Keynote 2</td>
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<tr>
<td>10:15--10:30 am</td>
<td>Coffee Break</td>
</tr>
<tr>
<td>10:30--12:00 pm</td>
<td>Sessions</td>
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<tr>
<td>12:00--1:15 pm</td>
<td>Lunch</td>
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<tr>
<td>1:15--2:45 pm</td>
<td>Sessions</td>
</tr>
<tr>
<td>2:45--3:15 pm</td>
<td>Coffee Break, Posters and Exhibitions</td>
</tr>
<tr>
<td>3:15--5:00 pm</td>
<td>Sessions</td>
</tr>
<tr>
<td>5:00--6:30 pm</td>
<td>Poster and Exhibition Reception</td>
</tr>
</tbody>
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### Friday, June 3, 2011

<table>
<thead>
<tr>
<th>Time</th>
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<tr>
<td>7:30--8:30 am</td>
<td>Check in &amp; Continental Breakfast</td>
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<tr>
<td>8:45--9:30 am</td>
<td>Keynote 3</td>
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<tr>
<td>9:30--10:15 am</td>
<td>Keynote 4</td>
</tr>
<tr>
<td>10:15--10:30 am</td>
<td>Coffee Break</td>
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<tr>
<td>10:30--12:00 pm</td>
<td>Sessions</td>
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<tr>
<td>12:00--1:15 pm</td>
<td>Lunch</td>
</tr>
<tr>
<td>1:15--2:45 pm</td>
<td>Sessions</td>
</tr>
<tr>
<td>2:45--3:15 pm</td>
<td>Coffee Break, Posters and Exhibitions</td>
</tr>
<tr>
<td>3:00--5:00 pm</td>
<td>Sessions</td>
</tr>
<tr>
<td>6:30 PM</td>
<td>Banquet</td>
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### Saturday, June 4, 2011

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<td>7:30--8:30 am</td>
<td>Check in &amp; Continental Breakfast</td>
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<td>8:45--9:30 am</td>
<td>Keynote 5</td>
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<tr>
<td>9:30--10:15 am</td>
<td>Keynote 6</td>
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<tr>
<td>10:15--10:30 am</td>
<td>Coffee Break</td>
</tr>
<tr>
<td>10:30--12:00 pm</td>
<td>Sessions</td>
</tr>
<tr>
<td>12:00--1:15 pm</td>
<td>Lunch</td>
</tr>
<tr>
<td>1:15--2:45 pm</td>
<td>Sessions</td>
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</tbody>
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## Contact Information

### Housing at International Village

David Vines  
774-254-0735  
[vines-cavanau.d@husky.neu.edu](mailto:vines-cavanau.d@husky.neu.edu)

### Transportation

David Vines  
774-254-0735  
[vines-cavanau.d@husky.neu.edu](mailto:vines-cavanau.d@husky.neu.edu)

### Foods

Yu Liu  
312-714-6272  
lui.yu2@neu.edu

### Facilities

Vitaliy Saykin  
781-521-3395  
v.saykin@neu.edu

### Check-in

Yiying Zhang  
617-981-9489  
zhyiying@gmail.com

### Coordinator

Yinghong Cao  
781-475-4952  
Yi.cao@neu.edu

### Campus Parking:

Renaissance Garage, $7/day, ticket available at check-in desk

### Internet:

Wire/wireless available at all campus buildings
Committees

International Advisory Board

Dr. Daniele Zonta (Italy), Dr. Laurent Mevel (France), Dr. Scott Cogan (France), Dr. Spilios Fassois (Greece), Dr. Costas Papadimitriou (Greece), Dr. Burcu Gunes (Turkey), Dr. Oguz Gunes (Turkey), Dr. Fabio Casiati (Italy), Dr. Lucia Faravelli (Italy), Alessandro DeStefano (Italy), Dr. Carmelo Gentile (Italy), Dr. Alfredo Guemes (Spain), Dr. John Mottershead (England), Dr. Bart Peeters, LMS, Belgium

Jirky Kullaa (Finland)

Bernd Kholer, Fraunhofer Institute, Dresden, Germany

Dr. Alex Pavic (England)

Dr. John Brownjohn (England), Dr. Guido DeRoeck (Belgium)

Dr. Gustavo Ayala (Mexico), DF

J. Lopez Diez, Aeroespaciales, University of Madrid

Luis Suarez, University of Puerto Rico

Wieslaw Ostachowicz, Poland

Claus Peter Fritzen, Germany

Local Organizing Committee

Luca Caracoglia, Northeastern University
Sanjay Arwade, University of Massachusetts, Amherst
Richard Christenson, University of Connecticut
Erik Hernandez, University of Vermont
Eduardo Kausel, Massachusetts Institute of Technology
Jame Hu, University of Rhode Island
Barbak Moaveni, Tufts
Masoud Sanayeil, Tufts

Eric Landis, University of Maine

Tahar El-Korchi, Worcester Polytechnic Institute
Zhikun Hou, Worcester Polytechnic Institute
Christopher Lee, Olin College
Peter Avitabile, University of Massachusetts Lowell

Coordinators:
Stacey Feldt, Administrative coordinator, NEU, s.feldt@neu.edu
Yinghong Cao, Senior Research Scientist, NEU, yi.cao@neu.edu
Mingzi Deng, Graduate Student, NEU, deng.m@husky.neu.edu

June 2-4, 2011, Northeastern University, Boston, MA
8:45-9:30, June 2, Active Vibration Control of Structures, Ballroom, Curry Center

John E Mottershead
Alexander Elder Professor, BSc, PhD, DEng
Center for Engineering Dynamics, University of Liverpool, UK
Email: J.E.Mottershead@liverpool.ac.uk

John Mottershead is the Head of the Centre for Engineering Dynamics. He is Associate Editor of Mechanical Systems and Signal Processing. Professor Mottershead’s research has been supported mainly by public funds from the UK Government Research Councils and the European Commission. Industrial collaborations include Rolls-Royce, QinetiQ, Westland Helicopters, Airbus UK, Ford, and BMW. His present interests include uncertainty analysis (especially stochastic model updating), image processing of full-field measurements (mode-shapes and strain patterns) as well as active vibration control by the receptance method.

9:30-10:15, Jun. 2, Intelligent Wireless Monitoring Technologies for Structural Health Monitoring of Civil Engineering Structures

Jerome P. Lynch
PhD, Associate Professor
Department of Civil and Environmental Engineering
Department of Electrical Engineering and Computer Science, University of Michigan
Email: jerlynch@umich.edu

Dr. Jerome Lynch holds a courtesy faculty appointment with the Department of Electrical Engineering and Computer Science. His current research interests are in the areas of wireless structural monitoring, feedback control systems, and damage detection algorithms. Some of Dr. Lynch’s more current research has been focused on the design of nanoengineered materials for smart structure applications including carbon nanotube-based thin film wireless sensors for structural health monitoring. Dr. Lynch was recently awarded the 2005 Office of Naval Research Young Investigator Award, 2007 University of Michigan Henry Russel Award, 2008 College of Engineering (University of Michigan) 1938E Award, 2009 NSF CAREER Award, 2009 Presidential Early Career Award for Scientists and Engineers (PECASE) and the 2010 Rackham Distinguished Faculty Award. He was also featured by Popular Science magazine in their 2009 “Brilliant 10” annual issue.

8:45-9:30, Jun. 3, The Tohoku Japan Earthquake and Tsunami of March 11, 2011

Wilfred D. Iwan
Emeritus Professor of Applied Mechanics, Emeritus Director of the Earthquake Engineering Research
California Institute of Technology, Pasadena, California.
Email: wdiwan@caltech.edu

Wilfred D. Iwan’s research deals with fundamental areas of mechanics, understanding and characterization of strong earthquake ground motion, analysis and monitoring of the response of structural systems subjected to extreme events, and disaster public policy. Professor Iwan is a Fellow of the American Society of Mechanical Engineers. He was the Founding President and currently serves as Vice-President of the Board of the Consortium of Universities for Research in Earthquake Engineering (CUREE). He was also the Founding President of the Engineering Mechanics Institute (EMI) of the American Society for Civil Engineers. He is currently President and a member of the Board of the Consortium of Strong Motion Observation Systems (COSMOS). He is also a Past-President and member of the Board of the International Association for Structural Control and Monitoring (IASC). He is a Founding Director of the World Seismic Safety Initiative (WSSI) and presently serves on the Board of that international non-profit organization. He has served as Chair of the California Seismic Safety Commission, the National Research Council Committee on Hazard Mitigation Engineering, and the National Research Council Board on Natural Disasters.

June 2-4, 2011, Northeastern University, Boston, MA
9:30-10:15, Jun. 3, Turning weakness to strength: From atoms to structures

Markus J. Buehler, Ph. D.
Associate Professor
Department of Civil and Environmental Engineering, Massachusetts Institute of Technology
E-mail: mbuehler@MIT.EDU,
Lab URL: http://web.mit.edu/mbuehler/www/

Markus J. Buehler research focuses on bottom-up simulation of structural and mechanical properties of biological, bioinspired and synthetic materials across multiple scales, with a specific focus on materials failure from a nanoscale and molecular perspective. Buehler’s work has identified the core principles that link atomistic-level chemical structures to functional scales by understanding how biological materials achieve superior mechanical properties through the formation of hierarchical structures, which has resulted in the development of novel biologically inspired materials. Buehler has published more than 150 articles on computational modeling of materials using various types of simulation techniques, authored one monograph, and given more than 170 invited, keynote and plenary talks. He is the founding chair of the Biomechanics Committee at the Engineering Mechanics Institute of ASCE, a member of the U.S. National Committee on Biomechanics, and participates actively in several committees at ASME.

8:45-9:30, Jun. 4, Poroelasticity of elastomeric gels—when mechanics meets chemistry

Zhigang Suo
Allen E. and Marilyn M. Puckett Professor of Mechanics and Materials
School of Engineering and Applied Science, Harvard University
Email: suo@seas.harvard.edu

Zhigang Suo joined the faculty of the University of California at Santa Barbara, and established a group studying the mechanics of small structures in 1989. The group moved to Princeton University in 1997, and to Harvard University in 2003. His work centers on the mechanical behavior of materials and structures. Basic processes include deformation, polarization, fracture, and transport of matter. Applications are concerned with thin film structures in microelectronics, large-area electronics, and active materials. Suo has coauthored over 200 archival papers. He co-founded iMechanica.org, the web of mechanics and mechanicians. Suo won the Pi Tau Sigma Gold Medal and the Special Achievement Award for Young Investigators in Applied Mechanics from the American Society of Mechanical Engineers (ASME). He is a recipient of the Humboldt Award. He is elected member of the US National Academy of Engineering.

9:30-10:15, Jun. 4, Piping Dynamics: A Review and New Developments

Michael P. Paidoussis
B.Eng, Ph.D., Thomas Workman Emeritus Professor
Thomas Workman Emeritus Professor
Department of Mechanical Engineering, McGill University, Montreal, QC, Canada
Email: michael.paidoussis@mcgill.ca

Michael P. Paidoussis has worked on various aspects of fluid-structure interactions and flow-induced vibrations and instabilities. He has published over 215 papers in refereed journals and 135 full papers in refereed conference proceedings. He is Fellow of IMechE, ASME, CSME, the American Academy of Mechanics, the Royal Society of Canada (Academy of Science), and the Canadian Academy of Engineering. He has served as Chairman of Division III of IAHR (1981-87), and has been active in various committees of the Pressure Vessels and Piping, Fluids Engineering and Applied Mechanics Divisions of ASME; he was the ASME Calvin Rice Lecturer for 1992, and was elevated to Life Fellow. As of 1986, he has been the Editor of the Journal of Fluids and Structures (Academic Press, now Elsevier) and serves on the Editorial Advisory Board of the Journal of Sound and Vibration (Elsevier).
Short Course

Identification & Diagnostics in Structural Engineering
June 1st, 9:00 am – 5:00 pm, 431 Stearns Center

Instructor

Dionisio Bernal is a Professor at Northeastern University in Boston. He is the recipient of the Moisseiff Award from the America Society of Civil Engineering (ASCE) for his work on dynamic instability and of the Martin W. Essigmann and the Hayes awards from Northeastern University. His research is in structural dynamics, earthquake engineering and structural monitoring. He is co-Author of a McGraw-Hill textbook on Reinforced Earth Concrete Design.

Course Content

1. Linear Systems – State Space and 2nd Order Formulation.
   Continuous time, sampled time and discrete time models. Continuous to discrete (c2D) and discrete to continuous (d2C) transfer. Modal model and the physical system matrices. Classical and arbitrary damping

2. Controllability and Observability.
   Observability and controllability gramians – use of these concepts in the selection of sensor layouts.

3. Identification – the Eigensystem Realization Algorithm (ERA)
   The Observer system, discrete time Markov parameters, balanced realizations

4. Perturbation approach to mode normalization in output only systems
   Basic schemes, the projection approach

5. An Introduction to fault detection and localization
   The Kalman filter as a fault detector – damage localization

Future Faculty Workshop

A workshop to promote diversity and gender balance of prospective faculty, June 1, 440 Egan Center

Northeastern ADVANCE Future Faculty Workshops (FFW) are designed for senior graduate students and post docs with interest in faculty careers. Future Faculty Workshops are themed in discipline clusters and held in conjunction with interdisciplinary workshops or conferences on campus or in the Boston area. In addition to attending a professional conference, invited participants will attend a one day workshop that provides information to stimulate professional growth. Past workshop topics have included:

- Making new contacts
- Interviewing
- Communicating and sharing ideas
- Negotiating a package
- Writing proposals
- Creating Education plans
- Discovery and synthesis of teaching resources
- Mentoring
- Network building
- A collaborative interdisciplinary environment

Link to the web for more upcoming information: http://www.northeastern.edu/advance/ffw/index.php

June 2-4, 2011, Northeastern University, Boston, MA
EMI’s biomechanics committee is organizing the inaugural Y.C. Fung best student paper competition in bio-mechanics in EMI 2011 conference. Submissions are invited in all areas of Biomechanics, Biophysics and Biomateriomics, including organ and tissue mechanics, cellular and molecular mechanics and covering all scales from nano to macro. Application areas broadly range from understanding biological systems and mechanisms, the design of biologically inspired structures and materials, to medical applications, biomaterials and regenerative medicine. Submissions in experimental, computational and theoretical approaches are encouraged. This student award recognizes excellence in research among graduate and undergraduate students to engage a new generation of biomechanics researchers in the various application areas.

Competition 2: Computational Mechanics

Organizer:
Loukas Kallivokas, The University of Texas at Austin

The Committee seeks contributions on any topic related to computational mechanics. The Committee will provide travel support of up to $300 for each of the finalists. The Committee will convene to select the best paper following the student presentations. The winner will be awarded a $500 prize at the conference banquet, and will be presented with an award certificate. All finalists will also be recognized at the conference banquet, and will be given certificates attesting to their finalist status.

Competition 3: Probabilistic Methods

Organizer:
Sanjay Arwade, University of Massachusetts, Amherst

The Probabilistic Methods Committee of ASCE/EMI is please to announce the second annual Student Paper Competition in Probabilistic Methods. The competition is open to any student author of a paper applying probabilistic methods to problems in engineering mechanics. The top five papers will be selected for presentation in a special session at the conference after which winners will be selected for receipt of a cash prize and a certificate.
# Technical Program

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>31-May</td>
<td>Tuesday</td>
<td>9:00 am - 5:00 pm</td>
<td>Check in for Future Faculty Workshop</td>
<td>Room 440, Egan Center</td>
</tr>
<tr>
<td>1-Jun</td>
<td>Wednesday</td>
<td>9:00 am - 5:00 pm</td>
<td>Pre-conference short course on Identification &amp; Diagnostics in Structural Engineering</td>
<td>Room 431, Stearns Center</td>
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<tr>
<td></td>
<td></td>
<td>2:00-8:30 pm</td>
<td>Check in for EMI2011</td>
<td>Lobby, 1st floor, International Village*</td>
</tr>
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<td></td>
<td></td>
<td>6:30-8:30 pm</td>
<td>EMI2011 Reception</td>
<td>Bamboo Garden, 2nd floor, International Village*</td>
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*In case of rain, Check in and reception will take place at 1st floor, Curry Student Center*
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30-8:15 am</td>
<td>Check in, breakfast</td>
<td>Reception Area, 1st floor, Curry Center</td>
</tr>
<tr>
<td>8:15-8:45 am</td>
<td>Opening Ceremony</td>
<td>Ballroom, 2nd floor, Curry Center</td>
</tr>
<tr>
<td>8:45-9:30 am</td>
<td>Keynote 1: John E. Mottershead: Active Vibration Control of Structures</td>
<td>Ballroom, 2nd floor, Curry Center</td>
</tr>
<tr>
<td>9:30-10:15 am</td>
<td>Keynote 2: Jerome P. Lynch: Intelligent Wireless Monitoring Technologies for Structural Health Monitoring</td>
<td>Ballroom, 2nd floor, Curry Center</td>
</tr>
<tr>
<td>10:15-10:30 am</td>
<td>Coffee break</td>
<td>Reception Area, 1st floor, Curry Center</td>
</tr>
<tr>
<td>10:30-12:00 pm</td>
<td>Presentation Sessions</td>
<td>All rooms in Curry Center</td>
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<tr>
<td>12:00-1:15 pm</td>
<td>Lunch</td>
<td>Dinning Room, 1st floor, International Village</td>
</tr>
<tr>
<td>1:15-2:45 pm</td>
<td>Presentation Sessions</td>
<td>All rooms in Curry Center</td>
</tr>
<tr>
<td>2:45-3:15 pm</td>
<td>Coffee break, Posters and Exhibitions</td>
<td>Reception Area, 1st floor, Curry Center</td>
</tr>
<tr>
<td>3:15-5:00 pm</td>
<td>Presentation Sessions</td>
<td>All rooms in Curry Center</td>
</tr>
<tr>
<td>5:00-6:30 pm</td>
<td>Posters and Exhibition Reception</td>
<td>Reception Area, 1st floor, Curry Center</td>
</tr>
</tbody>
</table>

Session 1-1: Dynamics and control
- Session 8-1: Multi-scale computational mechanics
- Session 12-1: Probabilistic mechanics
- Session 13-1: Stability
- Session 5-1: Concrete materials and mechanics
- Symposium 1-1: Multiscale behavior of damage and failure mechanics
- Symposium 2-1: Subsurface imaging, feature identification and damage detection
- Symposium 3-1: Identification, estimation, updating and monitoring
- Symposium 5-1: Biomaterials and biomechanics
- Symposium 6-1: Mechanics of geomaterials

Session 1-2: Dynamics and control
- Session 8-2: Multi-scale computational mechanics
- Session 12-2: Probabilistic mechanics
- Session 13-2: Stability
- Session 5-2: Concrete materials and mechanics
- Symposium 1-2: Multiscale behavior of damage and failure mechanics
- Symposium 2-2: Subsurface imaging, feature identification and damage detection
- Symposium 3-2: Identification, estimation, updating and monitoring
- Symposium 5-2: Biomaterials and biomechanics
- Symposium 6-2: Mechanics of geomaterials

Session 1-3: Dynamics and control
- Session 8-3: Multi-scale computational mechanics
- Session 12-3: Probabilistic mechanics
- Session 4: Pavement
- Session 5-3: Concrete materials and mechanics
- Symposium 1-3: Multiscale behavior of damage and failure mechanics
- Symposium 2-3: Subsurface imaging, feature identification and damage detection
- Symposium 3-3: Identification, estimation, updating and monitoring
- Symposium 5-3: Biomaterials and biomechanics
- Symposium 6-3: Mechanics of geomaterials

*Video preparation room: 433 Curry Center 10:30 am - 12:00 pm*
### 3-Jun Friday

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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<tbody>
<tr>
<td>7:30-8:30 am</td>
<td>Check in, breakfast</td>
<td>Reception Area, 1st floor, Curry Center</td>
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<tr>
<td>8:45-9:30 am</td>
<td>Keynote 3: Wilfred D. Iwan: The Tohoku Japan Earthquake and Tsunami of March 11, 2011</td>
<td>Ballroom, 2nd floor, Curry Center</td>
</tr>
<tr>
<td>9:30-10:15 am</td>
<td>Keynote 4: Markus J. Buehler: Turning weakness to strength: From atoms to structures</td>
<td>Ballroom, 2nd floor, Curry Center</td>
</tr>
<tr>
<td>10:15-10:30 am</td>
<td>Coffee break</td>
<td>Reception Area, 1st floor, Curry Center</td>
</tr>
<tr>
<td>10:30-12:00 pm</td>
<td>Presentation Sessions</td>
<td>Curry Center unless otherwise specified</td>
</tr>
<tr>
<td>Room 318</td>
<td>Room 320</td>
<td>Room 322</td>
</tr>
<tr>
<td>Session 24-1</td>
<td>Session 2-1 Sensors and health monitoring</td>
<td>Room 431 Snell Library</td>
</tr>
<tr>
<td>Coastal Hazards</td>
<td>Session 12-4 Probabilistic mechanics</td>
<td>Room 433 Library</td>
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<td>Session 25-1 Flow-induced vibration</td>
<td>Room 440</td>
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<td></td>
<td>Symposium 9-1 Multiscale behavior of damage and failure mechanics</td>
<td>Room 442</td>
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<tr>
<td></td>
<td>Symposium 1-4 Subsurface imaging, feature identification and damage detection</td>
<td>Room 444</td>
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<tr>
<td></td>
<td>Symposium 2-4 Identification, estimation, updating and monitoring</td>
<td>Room 448</td>
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<tr>
<td></td>
<td>Symposium 3-4 Biomaterials and biomechanics</td>
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<td></td>
<td>Symposium 6-4 Mechanics of geomaterials</td>
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<tr>
<td>12:00-1:15 pm</td>
<td>Lunch</td>
<td>Dinning Room, 1st floor, International Village</td>
</tr>
<tr>
<td>1:15-2:45 pm</td>
<td>Presentation Sessions</td>
<td>Curry Center unless otherwise specified</td>
</tr>
<tr>
<td>Room 318</td>
<td>Room 320</td>
<td>Room 322</td>
</tr>
<tr>
<td>Session 24-2</td>
<td>Session 2-2 Sensors and health monitoring</td>
<td>Room 431 Snell Library</td>
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<td>Session 12-5 Probabilistic mechanics</td>
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<td>Session 25-2 Flow-induced vibration</td>
<td>Room 440</td>
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<td></td>
<td>Symposium 9-2 Multiscale behavior of damage and failure mechanics</td>
<td>Room 442</td>
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<td></td>
<td>Symposium 1-5 Nano-mechanics</td>
<td>Room 444</td>
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<td></td>
<td>Symposium 3-5 Identification, estimation, updating and monitoring</td>
<td>Room 448</td>
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<tr>
<td></td>
<td>Symposium 5-5 Biomaterials and biomechanics</td>
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<td></td>
<td>Symposium 4-1 Stability of composite structure</td>
<td></td>
</tr>
<tr>
<td>2:45-3:15 pm</td>
<td>Coffee break, Posters and Exhibitions</td>
<td>Reception Area, 1st floor, Curry Center</td>
</tr>
<tr>
<td>3:15-5:00 pm</td>
<td>Presentation Sessions</td>
<td>Curry Center unless otherwise specified</td>
</tr>
<tr>
<td>Room 318</td>
<td>Room 320</td>
<td>Room 322</td>
</tr>
<tr>
<td>Session 24-3</td>
<td>Session 2-3 Sensors and health monitoring</td>
<td>Room 431 Snell Library</td>
</tr>
<tr>
<td>Coastal Hazards</td>
<td>Session 20-1 Micromechanics of porous materials</td>
<td>Room 433 Library</td>
</tr>
<tr>
<td></td>
<td>Session 16-1 Earthquake engineering</td>
<td>Room 440</td>
</tr>
<tr>
<td></td>
<td>Symposium 9-3 Multiscale behavior of asphaltic materials at multiple scales</td>
<td>Room 442</td>
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<tr>
<td></td>
<td>Symposium 7-1 Workshop on state of the art experimental approaches for wind engineering and wind energy</td>
<td>Room 444</td>
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<tr>
<td></td>
<td>Session 17-1 Elasticity and plasticity</td>
<td>Room 448</td>
</tr>
<tr>
<td></td>
<td>Session 19-1 Granular material</td>
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<tr>
<td></td>
<td>Symposium 4-2 Stability of composite structure</td>
<td></td>
</tr>
<tr>
<td>6:30-8:30 pm</td>
<td>Banquet and award ceremony</td>
<td>Back Bay Hilton Hotel</td>
</tr>
</tbody>
</table>

**Video preparation room:** Ballroom, Curry Center 10:30 am - 2:45 pm
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30-8:30 am</td>
<td>Check in, breakfast</td>
<td>Reception Area, 1st floor, Curry Center</td>
</tr>
<tr>
<td>8:45-9:30 am</td>
<td>Keynote: Zhigang Suo—Poroelasticity of elastomeric gels—when mechanics meets chemistry</td>
<td>Ballroom, 2nd floor, Curry Center</td>
</tr>
<tr>
<td>9:30-10:15 am</td>
<td>Keynote: Michael P. Paidoussis—Piping Dynamics: A Review and New Developments</td>
<td>Ballroom, 2nd floor, Curry Center</td>
</tr>
<tr>
<td>10:15-10:30 am</td>
<td>Coffee break</td>
<td>Reception Area, 1st floor, Curry Center</td>
</tr>
<tr>
<td>10:30-12:00 pm</td>
<td>Presentation Sessions</td>
<td>All rooms in Curry Center</td>
</tr>
</tbody>
</table>

### Session 10-1
- **Experimental Mechanics**
- **Session 10-1**
- **Session 21-1** Mechanics and adhesion of thin membranes
- **Session 20-2** Micromechanics of porous materials
- **Session 16-2** Earthquake engineering
- **Symposium 9-4** Fundamental characterization of asphaltic materials at multiple scales
- **Symposium 7-2** Workshop on state of the art experimental approaches for wind engineering and wind energy
- **Symposium 6-1** Biomaterial and biomechanics
- **Session 17-2** Elasticity and plasticity
- **Session 19-2** Granular material
- **Symposium 4-3** Stability of composite structure

### Session 10-2
- **Experimental Mechanics**
- **Session 10-2** Mechanics and adhesion of thin membranes
- **Session 21-2** Micromechanics of thin deformable materials, layers and interfaces
- **Session 16-3** Earthquake engineering
- **Symposium 8** Poromechanics of thin deformable materials, layers and interfaces
- **Symposium 9-5** Fundamental characterization of asphaltic materials at multiple scales
- **Symposium 7-3** Workshop on state of the art experimental approaches for wind engineering and wind energy
- **Symposium 6-2** Biomaterial and biomechanics
- **Session 17-3** Elasticity and plasticity
- **Session 19-3** Granular material
- **Symposium 4-4** Stability of composite structure

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**Video preparation room:** 342 Curry Center
### Student Competitions

<table>
<thead>
<tr>
<th>No.</th>
<th>Competition</th>
<th>Coordinator</th>
<th>Date</th>
<th>Time</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Computational Mechanics</td>
<td>Loukas Kallivokas</td>
<td>Thursday, June 2</td>
<td>1:15-2:45 pm</td>
<td>433 Curry</td>
</tr>
<tr>
<td>1</td>
<td>Biomechanics, Biophysics and Biomateriomics</td>
<td>Shaofan Li</td>
<td>Friday, June 3</td>
<td>1:30-3:30 pm</td>
<td>431 Stearns</td>
</tr>
<tr>
<td>3</td>
<td>Probabilistic Methods</td>
<td>Sanjay Arwade</td>
<td>Friday, June 3</td>
<td>3:15-5:00 pm</td>
<td>Ballroom Curry</td>
</tr>
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</table>

### EMI Committee Meetings

<table>
<thead>
<tr>
<th>No.</th>
<th>Committee</th>
<th>Chair</th>
<th>Date</th>
<th>Time</th>
<th>Room</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Granular Materials</td>
<td>Tang Tat</td>
<td>Thursday, June 2</td>
<td>1:00-4:00 pm</td>
<td>340 Egan</td>
</tr>
<tr>
<td>2</td>
<td>Stability</td>
<td>Pizhong Qiao</td>
<td>Thursday, June 2</td>
<td>1:00-5:00 pm</td>
<td>440 Egan</td>
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<tr>
<td>3</td>
<td>Structural Health Monitoring</td>
<td>Jerry Lynch</td>
<td>Thursday, June 2</td>
<td>4:00-5:30 pm</td>
<td>340 Egan</td>
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<tr>
<td>4</td>
<td>Turbulence</td>
<td>Keh-Han Wang</td>
<td>Thursday, June 2</td>
<td>5:30-11:00 pm</td>
<td>340 Egan</td>
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<tr>
<td>5</td>
<td>Publications</td>
<td>Kaspar Willam</td>
<td>Thursday, June 2</td>
<td>5:30-7:00 pm</td>
<td>440 Egan</td>
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<tr>
<td>6</td>
<td>Probabilistic Method</td>
<td>Sankaran Mahadevan</td>
<td>Thursday, June 2</td>
<td>5:30-9:30 pm</td>
<td>431 Stearns</td>
</tr>
<tr>
<td>7</td>
<td>Experimental Analysis &amp; Instrumentation</td>
<td>Asad Esmaeily</td>
<td>Friday, June 3</td>
<td>8:00am-12:00pm</td>
<td>340 Egan</td>
</tr>
<tr>
<td>8</td>
<td>Modeling Inelasticity &amp; Multiscale Behavior</td>
<td>Lizhi Sun</td>
<td>Friday, June 3</td>
<td>12:00-2:00 pm</td>
<td>340 Egan</td>
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<tr>
<td>9</td>
<td>Biomechanics</td>
<td>Markus Buehler</td>
<td>Friday, June 3</td>
<td>4:00-6:00 pm</td>
<td>431 Stearns</td>
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### SATURDAY

<table>
<thead>
<tr>
<th>No.</th>
<th>Committee</th>
<th>Chair</th>
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<tr>
<td>10</td>
<td>Elasticity</td>
<td>Kam T Chau</td>
<td>Saturday, June 4</td>
<td>12:00-1:15 pm</td>
<td>340 Egan</td>
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<tr>
<td>11</td>
<td>Poromechanics</td>
<td>Christian Hellmich</td>
<td>Saturday, June 4</td>
<td>1:30 - 3:30 pm</td>
<td>340 Egan</td>
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### SUNDAY

<table>
<thead>
<tr>
<th>No.</th>
<th>Committee</th>
<th>Chair</th>
<th>Date</th>
<th>Time</th>
<th>Room</th>
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</thead>
<tbody>
<tr>
<td>12</td>
<td>Board of Governors</td>
<td>Alex Cheng</td>
<td>Sunday, June 5</td>
<td>8:00am-5:00pm</td>
<td>431 Stearns</td>
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</tbody>
</table>
# Keynote Lecture List

45 minutes for each presentation, including questions and answers
All keynote presentations will be held in the Ballroom of Curry Student Center

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<tr>
<th>Thursday, June 2</th>
<th>Chair: Prof. Dionisio Bernal, Northeastern University</th>
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</thead>
<tbody>
<tr>
<td>8:45 - 9:30 am</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td><strong>Active Vibration Control of Structures</strong></td>
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<tr>
<td></td>
<td>by John E Mottershead</td>
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<tr>
<td></td>
<td>Alexander Elder Professor of Applied Mechanics at the</td>
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<td></td>
<td>University of Liverpool and Head of the Centre</td>
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<td></td>
<td>for Engineering Dynamics (United Kingdom)</td>
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<tr>
<td>9:30 - 10:15 am</td>
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<tr>
<td>2</td>
<td>**Intelligent Wireless Monitoring Technologies for</td>
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<tr>
<td></td>
<td>Structural Health Monitoring of Civil Engineering</td>
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<tr>
<td></td>
<td>Structures</td>
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<tr>
<td></td>
<td>by Jerome P. Lynch</td>
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<tr>
<td></td>
<td>Associate Professor of Civil and Environmental</td>
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<tr>
<td></td>
<td>Engineering at the University of Michigan</td>
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<thead>
<tr>
<th>Friday, June 3</th>
<th>Chair: Prof. Jerome Hajjar, Northeastern University</th>
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</thead>
<tbody>
<tr>
<td>8:45 - 9:30 am</td>
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<tr>
<td>3</td>
<td>**The Tohoku Japan Earthquake and Tsunami of March</td>
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<tr>
<td></td>
<td>11, 2011</td>
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<tr>
<td></td>
<td>by Wilfred D. Iwan</td>
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<tr>
<td></td>
<td>Emeritus Professor of Applied Mechanics, and Emeritus</td>
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<td></td>
<td>Director of the Earthquake Engineering Research</td>
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<td></td>
<td>Laboratory at the California Institute of Technology</td>
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<tr>
<td>9:30 - 10:15 am</td>
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<tr>
<td>4</td>
<td>**Turning weakness to strength: From atoms to</td>
</tr>
<tr>
<td></td>
<td>structures**</td>
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<tr>
<td></td>
<td>by Markus J. Buehler</td>
</tr>
<tr>
<td></td>
<td>Associate Professor in the Department of Civil and</td>
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<tr>
<td></td>
<td>Environmental Engineering at the Massachusetts</td>
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<td></td>
<td>Institute of Technology</td>
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<thead>
<tr>
<th>Saturday, June 4</th>
<th>Chair: Prof. Ming Wang, Northeastern University</th>
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</thead>
<tbody>
<tr>
<td>8:45 - 9:30 am</td>
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<tr>
<td>5</td>
<td>**Poroelasticity of elastomeric gels—when mechanics</td>
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<tr>
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<td>meets chemistry**</td>
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<tr>
<td></td>
<td>by Zhigang Suo</td>
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<td></td>
<td>Allen E. and Marilyn M. Puckett Professor of Mechanics</td>
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<tr>
<td></td>
<td>and Materials in the School of Engineering and</td>
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<td></td>
<td>Applied Sciences at Harvard University</td>
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<tr>
<td>9:30 - 10:15 am</td>
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<tr>
<td>6</td>
<td><strong>Piping Dynamics: A Review and New Developments</strong></td>
</tr>
<tr>
<td></td>
<td>by Michael P. Paidoussis</td>
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<tr>
<td></td>
<td>Thomas Workman Emeritus Professor of the Department</td>
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<tr>
<td></td>
<td>of Mechanical Engineering of McGill University</td>
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</table>
### General Sessions Presentation List

15 minutes for each presentation, including questions and answers

#### Session 1: Dynamics and control

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Presenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun. 2</td>
<td>10:30-12:00</td>
<td>1-1</td>
<td>Free Vibration Analyses of Bridge Pile Foundation Considering Water-Structure interaction</td>
<td>Kai Wei, Wancheng Yuan, Tongji University, Shanghai, China Chih-Chen Chang, Hong Kong University of Science and Technology, Kowloon, Hong Kong, China</td>
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<tr>
<td></td>
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<td></td>
<td>Study of Dynamic Service Load of Slender Long-Span Bridges</td>
<td>Suren Chen, Jun Wu, Yufen Zhou, Colorado State University, Fort Collins, Colorado</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Impact and Thermal Analyses of a Frame-Membrane Structure</td>
<td>Thomas Gionet, and Ramesh B. Malla, University of Connecticut, Storrs CT</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Geographically Distributed Real-Time Hybrid Simulation of a MR Damper Controlled Building Model</td>
<td>Sung Jig Kim, Brian Phillips, University of Connecticut, Storrs, CT Richard Christenson, B.F. Spencer, Jr, University of Illinois at Urbana-Champaign, Urbana, IL</td>
</tr>
<tr>
<td></td>
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<td>Velocity based semi-active turbo Lyapunov control algorithm for seismically excited nonlinear smart structures</td>
<td>Young-Jin Cha, and Agrawal Anil K., The City University of New York, New York, NY</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>A Comparative Study of Decentralized Structural Control using Wireless Sensing Feedback</td>
<td>Yang Wang, Georgia Institute of Technology, Atlanta, GA K. H. Law, Stanford University Stanford, CA C.-H. Loh, S.-K. Huang d, and P.-Y. Lin, National Taiwan University Taipei 106, Taiwan</td>
</tr>
<tr>
<td>Jun. 2</td>
<td>1:15-2:45</td>
<td>1-2</td>
<td>On dynamic amplifier factors for progressive failure</td>
<td>Mijia Yang, the University of Texas at San Antonio, San Antonio, TX</td>
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<td></td>
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<td>Approximate Solutions to Nonlinearly-Constrained Optimal Control Problems</td>
<td>Philip S. Harvey, and H. P. Gavin, Duke University</td>
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<td></td>
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<td></td>
<td>Real-Time Hybrid Simulation of a MR Damper Controlled</td>
<td>Sung Jig Kim, Zhaoxuun Jiang, Shelley Plude, Richard Christenson, University of Connecticut, Storrs, CT</td>
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<tr>
<td></td>
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<td>Decentralized Wireless Control of Coupled Structures with Magnetoroheological Dampers</td>
<td>Michael B. Kane, and Jerome P. Lynch, University of Michigan, Ann Arbor, MI</td>
</tr>
<tr>
<td></td>
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<td>Sensitivity Analysis for Single Pile Subjected to a Lateral Impact Load</td>
<td>Ailereza Miramadodi, Jean-Louis Briaud, Jose Roesset, Texas A&amp;M University, College Station, TX</td>
</tr>
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<td></td>
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<td>Effects of Structural Damping on Dynamic Behavior in Model Building</td>
<td>Chen-Yuan Chung, Junliang Tao and Xiong (Bill) Yu, Case Western Reserve University, Cleveland, OH</td>
</tr>
<tr>
<td>Jun. 2</td>
<td>3:15-5:00</td>
<td>1-3</td>
<td>A Comparative Study on Control Strategies of High-rise Building</td>
<td>Ryan Mitchell, Yeeseok Kim, B. Cassie, and W. Woodington, Worcester Institute, Worcester, MA Young-Jin Ch, The City College of the City University of New York, New York, NY</td>
</tr>
<tr>
<td></td>
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<td>Equivalent Fatigue Damage Load of Existing Bridges Considering Vehicle Speed and Road Surface Conditions</td>
<td>Wei Zhang and C.S. Cai, Louisiana State University, Baton Rouge</td>
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<tr>
<td></td>
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<td>A Kalman filter error covariance sensor placement strategy</td>
<td>Nestor Polanco, Dionisio Bernal, Northeastern University, Boston, MA</td>
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<tr>
<td>Date</td>
<td>Time</td>
<td>Session</td>
<td>Chair</td>
<td>Venue</td>
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<tr>
<td>Jun. 3</td>
<td>10:30-12:00</td>
<td>2-1: Sensors and health monitoring</td>
<td>Prof. Andrew Smyth, Columbia University, New York, NY</td>
<td>Room 320 Curry Center</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thermal Imaging for Quantitative Assessment of subsurface Corrosion</td>
<td>Masoud Ghandehari, Alexey Sidelev, New York University Polytechnic Institute</td>
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<tr>
<td></td>
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<td>Modal Parameter Estimation with Distributed Mass Dampers and Eigensystem Realization Algorithm</td>
<td>Tat S. Fu, University of New Hampshire, Durham, New Hampshire Erik A. Johnson, University of Southern California, Los Angeles, California</td>
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<tr>
<td></td>
<td></td>
<td>Structural Health Monitoring of a Cable-stayed Bridge Using Wireless Smart Sensor Network</td>
<td>Soojin Cho, Hongki Jo, Sung Han Sim, Kirill Mechitov, and Bille F. Spencer, Jr., University of Illinois at Urbana-Champaign, Urbana, IL Jongwoong Park, Hyung-Jo Jung, Chung-Bang Yun, KAIST, Daejeon, South Korea</td>
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<td>Comparative Study of Cable Tension Measurement Methods by Field Tests on a Cable-stayed Bridge under Construction</td>
<td>Soojin Cho, University of Illinois at Urbana-Champaign, Urbana, IL Jin-Suk Yim, Intelligent Instrument System Inc., Burr Ridge, IL Sung Woo Shin, Pukyung National University, Busan, South Korea Hyung-Jo Jung, Chung-Bang Yun, KAIST, Daejeon, South Korea Ming L. Wang, Northeastern University, Boston, MA</td>
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<tr>
<td></td>
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<td>Structural Identification of a Super-Tall Tower by GPS and Accelerometer Data Fusion</td>
<td>Eleni N. Chatzi, ETH Zürich, Zürich, Switzerland Clemente Fuggini, D’Appolonia S.p.a. Raed AlSale, University of Pavia, via Ferrata 1, 27100, Pavia, Italy</td>
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<tr>
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<td>Transmissibility Function-Based Damage Detection using Mobile Sensor Data</td>
<td>D. Zhua, X. Yi, Yang Wang, Georgia Institute of Technology, Atlanta, GA</td>
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<tr>
<td>Jun. 3</td>
<td>1:15-2:45</td>
<td>2-2: Sensors and health monitoring</td>
<td>Prof. Chung-Bang Yun, KAIST, Daejeon, South Korea</td>
<td>Room 320 Curry Center</td>
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<tr>
<td></td>
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<td>High Performance, Low Power RADAR for Pavement Condition Evaluation</td>
<td>Dan Busuioc, DBC Group Inc. Ralf Birken, Ming Li, Shawn Beghun, Ming Wang, Northeastern University, Boston, MA</td>
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<td>Recent Upgrades and Expansions of Connecticut’s Long-Term Bridge Monitoring Network</td>
<td>Shelley E. Plude, Richard Christenson, John DeWolf, University of Connecticut, Storrs, CT Alineza Jamalipour, Connecticut Department of Transportation, Rocky Hill, CT</td>
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<td>Detection of Gas Leaks in the Subsurface Environment</td>
<td>Masoud Ghandehari, Alexey Sidelev, New York University Polytechnic Institute Gamal Khalil, Chromosense LLC</td>
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<td>Filtering of Acoustic Emission Data Using ARMA Models</td>
<td>Boris Zárate, Juan Coicedo, Paul Ziehl, and Jianguo Yu, University of South Carolina, Columbia SC</td>
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<tr>
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<td>A Robust Diagnosing method for Bayesian Compressive Sensing Technique in Structural Health Monitoring</td>
<td>Yang Huang, Hui Li, Harbin Institute of Technology, Harbin, China James L. Beck, Stephen Wu, California Institute of Technology, Pasadena, CA</td>
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<tr>
<td></td>
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<td>Vision-Based Crack Detection and Quantification for Condition Assessment of Structures</td>
<td>Mohammad Reza Jahanshahi and Sami F. Masri, University of Southern California, Los Angeles, CA</td>
<td></td>
</tr>
<tr>
<td>Jun. 3</td>
<td>3:15-5:00</td>
<td>2-3: Sensors and health monitoring</td>
<td>Prof. Armen Der Kiuregian, University of California, Berkeley, CA</td>
<td>Room 320 Curry Center</td>
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<tr>
<td></td>
<td></td>
<td>Decentralized Ambient System Identification Using Wavelet Transforms</td>
<td>Ayan Sadhu, B. Hazra and S. Narasimhan, University of Waterloo, Waterloo, Canada</td>
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<tr>
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<td>Integrated Pavement Monitoring and Assessment System</td>
<td>Wenjing Xue, Cristian Druta and Linbing Wang, Virginia Tech, Blacksburg, VA</td>
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<td></td>
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<td>Uncertainty Quantification and Propagation Using Controlled Substructure Identification</td>
<td>Charles DeVore, and Erik A Johnson, University of Southern California</td>
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<tr>
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<td></td>
<td>Pavement Detection Using Support Vector Machine</td>
<td>David Vines-Cavanaugh, Yinhong Cao, and Ming Wang, Northeastern University, Boston, MA</td>
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<td>Laser Projection Measurement System</td>
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</table>
### Session 4: Pavements

**Jun. 2, 3:15-5:00**

<table>
<thead>
<tr>
<th>Room 435 Curry Center</th>
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<td><strong>Chair:</strong> Prof. Samer Dessouky, University of Texas San Antonio, San Antonio, TX</td>
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</table>

**System Identification of Smart Pavements**

- **Bao-Liang Chen**, Yeesock Kim, Rajib Mallick, Worcester Polytechnic Institute, Worcester, MA
- Sankha Bhowmick, University of Massachusetts, Dartmouth, MA

**Rehological Evaluation of Asphalt bitumen blended with Antioxidants to control aging**

- **Samer Dessouky**, Contreras D. and Papagiannakis A.T, University of Texas San Antonio, San Antonio, TX

**Simulations of infrastructure granular materials using combined FEM/DEM/MD analysis**

- Foteini Vasilikou, Sun, W.J. and Wang, L.B., Virginia Polytechnic Institute, VA

**Fracture Mechanics-Based Design of Unbonded Concrete Overlays**

- **Minmao Liao**, Roberto Ballarini and Lev Khazanovich, University of Minnesota

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### Session 5: Concrete materials and mechanics

**Jun. 2, 10:30-12:00**

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<tr>
<td><strong>Chair:</strong> Prof. Juan Caicedo, University of South Carolina, Columbia SC</td>
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</tbody>
</table>

**An Analytical Model of Bond between Coated Reinforcement and Concrete**

- C. L. Wu and G.D. Chen, Missouri University of Science and Technology, Rolla, Missouri

**Optimal a posteriori prestress of arch structures**

- **Petr Prochazka**, Czech Technical University in Prague, Czech Republic

**Multiscale Modeling of Concrete Structures through a Coarse-Grained Meso-Scale Model**

- Gianluca Cusatis, Mohammed Al-Naggar, and Roozbeh Rezakhani, Rensselaer Polytechnic Institute, Troy, NY

**Sensing High pH and ionic transport in Cementitious Materials**

- Masoud Ghandehari, Alexey Sidelev, New York University Polytechnic Institute, New York, NY
- Christian Brückner, Pedro Daddario, Kimberly S. F. Lau, Sayed Imtiaz, Michelle King, University of Connecticut, Storrs
- Gamal E. Khalil, Chromosense LLC

**Temperature and cure monitoring in mass concrete**

- Masoud Ghandehari, Alexey Sidelev, Weihua Jin, New York University Polytechnic Institute, New York, NY
- Christian Bruckner, University of Connecticut, Storrs
- Gamal Khalil, Chromosense LLC

**Multi-Ionic Coupled Diffusion in Recycled Aggregate Concrete**

- Nattapong Damrongwiriyanupap, University of Phayao, Thailand
- Yu-Chang Liang, Yunping Xi, University of Colorado at Boulder

**Jun. 2, 1:15-2:45**

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<tr>
<td><strong>Chair:</strong> Prof. George Deodatis, Columbia University, New York, NY</td>
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</table>

**Lattice Discrete Particle Model for Fiber Reinforced Concrete**

- Edward A. Schauffert, Gianluca Cusatis, Rensselaer Polytechnic Institute, Troy, NY

**Influence of Compressive Stresses on the Concrete Cone Breakout Capacity of Cast-in-Place Headed Anchors**

- Roberto Piccinin, University of Minnesota, Minneapolis, MN
- Sara Cattaneo, Politecnico di Milano, Milan, Italy

**Punching shear strength and slab in-plane action in progressive collapse analysis**

- Yaser Mirzoei, Mehrdad Sasoani, Northeastern University, Boston, MA
Experimental characterization and numerical investigation of delamination in FRP-reinforced masonry columns and concrete specimens

Luigi Biolzi, Massimiliano Bociarelli, Sara Cattaneo, Paola Condoele, Roberto Fedele, Gabriele Milani, Politecnico di Milano, Milan, Italy

Numerical Modeling and Experimental Study of GFRP Tube Encased Concrete Subjected to Axial Monotonic and Cyclic Loading

Nasim Moghadasi, Zhang. Y., University of Maryland, College Park, MD

A Hybrid Topology Optimization Model for Reinforced Concrete Design

Andrew Gaynor, James K. Guest, Johns Hopkins University, Baltimore, MD

Cris Moen, Virginia Tech, Blacksburg, VA

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<th>Jun. 2, 3:15-5:00</th>
<th>5-3: Concrete materials and mechanics</th>
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<td>Chair: Prof. Lizhi Sun, University of California, Irvine, CA</td>
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Quick life extension of locally damaged bridge superstructure

Jacob McNutt, P.K. Basu, Adrian A. Bennett, Ozgur Yaprak Vanderbilt University, Nashville, Tennessee

Three-dimensional determination of linear viscoelastic poisson’s ratio and coefficient of thermal expansion of hma using digital image

Marcelo S. Medeiros Jr., Jo Sias Daniel, University of New Hampshire, Conway, NH

Three Dimensional Cyclic Modeling of Masonry Structures and Interaction of In-Plane and Out-of-Plane Deformation of Masonry Walls

Kiarash Dolatshahi, Amjad J. Aref, University of Buffalo-The State University of New York, NY

Modeling the Thermal and Electrical Improvements of Cementitious Materials with Embedded Carbon Nanotubes

Bryan M. Tyson, R. K. Abu Al-Rub, Texas A &M University, College, TX

Session 6: Biomaterials and bio-mechanics

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<th>6-1: Biomaterials and bio-mechanics</th>
<th>Room 440 Curry Center</th>
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<td>Chair: Prof. Alireza Sarvestani, University of Maine, Orono, ME</td>
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Mathematical Modeling of Coupled Drug and Drug-encapsulated Nanoparticle Transport in Patient-Specific Coronary Artery Walls

Shaolie Hossain, Thomas Hughes, University of Texas at Austin, Austin, TX

Syed Hossainy, Abbott Vascular Inc., Santa Clara, CA

Yuri Bazilevs, University of California, San Diego, CA

Victor Calo, King Abdullah University of Science & Technology, Thuwal, Kingdom of Saudi Arabia

Modeling the Effect of Substrate Rigidity on Cellular Migration

Alireza Sarvestani, University of Maine, Orono, ME

Deformation of electrospun magneto-sensitive silk mats

Justin Binder, Luis Dorfmann, Tuft University, Boston, MA

Quantification of soft tissue biomechanics using a novel nonlinear viscoelastic model

Chung Cheuk Wang, LIM Chwee Teck, Martin Lindsay Buist, National University of Singapore, Singapore

Activity of psoralen-functionalized nanoscintillators against cancer cells upon X-ray excitation

Molly K. Gregas, University of Toronto, Toronto, Ontario, Canada

J. Scaffidi, B. Lauly, Y. Zhang, T. Vo-Dinh, Duke University, Durham, NC

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<th>Jun. 4, 1:15-2:45</th>
<th>6-2: Biomaterials and bio-mechanics</th>
<th>Room 440 Curry Center</th>
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<td>Chair: Prof. David Smith, University of Western Australia, Perth, WA, AU</td>
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Human Fall Detection: Estimation of Impact Energy

Benjamin T. Davis, Juan M. Caicedo, University of South Carolina, Columbia, SC

Traumatic brain injury evaluation using brain CT images and finite element analysis

Babak Seyed Aghazadeh, Ramana Pidaparti, Virginia Commonwealth University, Richmond, VA

Febrile Temperature Leads to Higher Adhesion Force of Malaria Infected Erythrocytes to Endothelial Receptor CSA

Rou Zhang, C.T. Lim, National University of Singapore, Singapore

M. Diez-Silva, M. Dao, Massachusetts Institute of Technology, Cambridge, MA
Sequence-structure correlations and size effects in silk nanostructure: Poly-Ala repeat of N. clavipes MaSp1 is naturally optimized  

Graham H. Bratzel, Markus J. Buehler, Massachusetts Institute of Technology, Cambridge, MA

Receptor-ligand separation distance dependence of GPIb-VWF association governs the flow-enhanced platelet adhesion  

Lining Ju, Georgia Institute of Technology, Atlanta, GA

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**Session 8: Multi-scale computational mechanics**

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<td>Jun. 2, 10:30-12:00</td>
<td>8-1: Multi-scale computational mechanics</td>
<td>Room 320 Curry Center</td>
<td>Chair: Prof. Bernhard Pichler, Vienna University of Technology, Austria</td>
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**Cohesion Force Statistics of Honeycomb Material**  
Jouni Freund, Aalto University, FI, Espoo, Finland

**Transversal Response of a Rigid Circular Foundation Embedded on a Transversely Isotropic Bi-material Interface**  
J. Labaki, Euclides Mesquita, University of Campinas, Brazil; R. K. N. D. Rajapakse, Simon Fraser University, BC, Canada

**Mode I propagation of cohesive microcracks through elasto-brittle media**  
Bernhard Pichler, Vienna University of Technology, Austria; Luc Dormieux, Université Paris-Est, France

**Probing Cross-Property Bounds Through Design: Tailoring Material Microstructures using Topology Optimization**  
James K. Guest, Johns Hopkins University, Baltimore, MD; Vivien J. Challis, Joseph F. Grotowski, and Anthony P. Roberts, The University of Queensland, Brisbane, Australia

**Modeling Large Scale Ductile Fracture in Welded Aluminum Structures Using a Cohesive Zone**  

**Modeling of Interfaces: A Continuum to Atomistic Approach**  
Denvid Lou, C. Tuaktab, O. Büyükköztürk and M. J. Buehler, Massachusetts Institute of Technology, Cambridge, MA

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<td>8-2: Multi-scale computational mechanics</td>
<td>Room 320 Curry Center</td>
<td>Chair: Prof. Jerome Hajjar, Northeastern University, Boston, MA</td>
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**Modeling Hollow Sphere Cellular Metals as a Random Microstructure**  
Brooks H. Smith, Arwade, S. R., University of Massachusetts, Amherst, Amherst, MA; Szymiszewski, S., Schafer, B. W., Johns Hopkins University, Baltimore, MD; Hajjar, J. F. Northeastern University Boston, MA

**A Multiscale Continuum-Molecular Dynamics**  
Shaofan Li, University of California, Berkeley, CA

**A new framework for computation multiscale modeling of proteins and solvents using molecular dynamics simulations and principal component analysis**  
Tao Wu, New Jersey Institute of Technology, Newark, NJ; Sheldon Wang, Midwestern State University, Wichita Falls, TX; Barry Cohen, New Jersey Institute of Technology, Newark, NJ

**A Novel Method to Model the Reduction in the Load Carrying Capacity of Multiple Wire Strands due to Wire Breaks Induced by Corrosion**  
Arturo Montoya, Haim Waisman, Raimondo Betti, Columbia University, New York, NY

**Postprocessing Finite Element Methods for Linear Transient Heat Conduction Problems: The Fully Discrete Case**  
Delin Wang, Theofanis Strouboulis, Texas A&M University, College Station, TX; Ivo Babuška, The University of Texas at Austin, TX

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<tr>
<td>Jun. 2, 3:15-5:00</td>
<td>8-3: Multi-scale computational mechanics</td>
<td>Room 320 Curry Center</td>
<td>Chair: Dr., Jouni Freud, Aalto University, FI, Espoo, Finland</td>
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**Optimal Design of Trusses with Geometric Imperfection: Accounting for Global Instability**  
Mehdi Jalalpour, Tak Igusa, James K. Guest, Johns Hopkins University, Baltimore, MD

**Stress concentratations in plates with rectangular openings: A semi analytical approach**
### Session 9: Nano-mechanics

**Nanoindentation and Environmental Scanning Electron Microscopy Investigation of the Crack Tip Process Zone of Carrara Marble**  
*Zenzile Brooks, F-J. Ulm, and H.H. Einstein, Massachusetts Institute of Technology, Cambridge, MA*

**Time-Dependent Mechanical Response of Single-Walled Carbon Nanotube-based Films**  
*Yingjun Zhao, Bryan R. Loyola, Kenneth J. Loh, University of California, Davis, CA*

**Wave propagation in double-walled carbon nanotubes on a novel analytically nonlocal Timoshenko-beam model**  
*Yang Yang, C.W. Lim, City University of Hong Kong, Hong Kong, P.R.China*

**In Silico Nano-Mechanics of Cement Hydrates**  
*Mohammad Javad Abdolhosseini, Pellenq R., Ulm F.J., Massachusetts Institute of Technology, Cambridge, MA*

**Tunable Mechanical Properties of Graphene Oxide Through Interlayer Hydrogen Bond Distribution**  
*Steven W. Cranford, Massachusetts Institute of Technology, Cambridge, MA; Owen C. Compton, Karl W. Putz, L. Catherine Brinson, SonBinh T. Nguyen, Northwestern University, Evanston, IL; Markus J. Buehler, Massachusetts Institute of Technology, Cambridge, MA*

**A Computational Approach to Enhance the Understanding of Novel, Hybrid Graphene / Rubber Nanocomposites**  
*Mahmoodul Haq, Wannian Liu, Eann Patterson, and Lawrence Drzal, Michigan State University, Lansing, MI*

### Session 10: Experimental mechanics

**RKPM Formulation of the Size Effect for an Elliptic Nano-inhomogeneity in Anti-plane Couple Stress Elasticity**  
*Hassein M. Shodja, Sharif University of Technology, Tehran, Iran; Saba T. Yaghoubi, Sharif University of Technology, Kish Island, Iran*

**Mixed-mode fracture of wood/adhesive interfaces**  
*Josh Gianfriddo and Peter Kotowski, University of Massachusetts Dartmouth, North Dartmouth, MA*

**Toughening and Strengthening the Bonded Joints by Interface Shape Alteration**  
*Mahdi Ashrafi, Shihhung Chiu, Nima Rahbar, Hamid Nayeb-Hashemi and Ashkan Vaziri, Northeastern University, Boston, MA*

**Experimental Investigation of Model-Based Acceleration Control Technique for Shake Tables**  
*Narutoshi Nakata, Johns Hopkins University, Baltimore, MD*

**Adhesively Bonded Composite Pi/T-joints: Damage Modeling and Digital Image Correlation Studies**  
*Mahmoodul Haq, Andrew Conway, Xinran Xiao, Lawrence Drzal and Eann Patterson, Michigan State University, Lansing, MI*

**Mechanical Behavior of Soil Nail Bar Composites with Laboratory Tests**  
*Shao-Peng Fan, Zhong-Qi Yue, The University of Hong Kong, Hong Kong, China*
Hollow Cylinder Test for the Young's Modulus Distribution and the Ultimate Strength of Bamboo
Po-Hua Lee, Huiming Yin and Marty Odlin, Columbia University, New York, NY

Jun. 4, 1:15-2:45 10-2: Experimental mechanics Room 318 Curry Center
Chair: Prof. Asad Esmaeily, Kansas State University, Manhattan, Kansas

Non-destructive evaluation of damaged composites
Hamid Nayed-Hashemi, Ashkan Vaziri, Northeastern University, Boston, MA

Delamination Behaviour of 220 & 600 GMCC Fiber Reinforced Composite with EPOXY Laminates using DCB Method
Murugesan Jeevanandham, Hemanathan, C. Abdul Hakeem College of Engineering & Technology, Melvisharam

Large-Tonnage Load Test for Bridge Pile Foundations
Xuefeng Zhang, Song Chunxia and Ma Ye, Research Institute of Highway Ministry of Transport, Beijing, China

Advanced Ultrasonic Technology for Characterizing the Properties of Pore Spaces in Concrete
Ye Sun, Zhen Liu, Xiong Yu and Yan Liu, Case Western Reserve University, Cleveland, OH

Session 12: Probabilistic mechanics

Jun. 2, 10:30-12:00 12-1: Probabilistic mechanics Room 322 Curry Center
Chair: Prof. Sankaran Mahadevan, Vanderbilt University, Nashville, TN

Calibration and Validation of Fatigue Crack Growth Prediction under Uncertainty
Shankar Sankaranaraman, You Ling, Sankaran Mahadevan, Vanderbilt University, Nashville, TN

Random Fields and Mechanics
Martin Ostoja-Starzewski, University of Illinois at Urbana-Champaign, Champaign, IL
E. Porcu, Georg-August-Universität, Göttingen, Germany

Stochastic Variability of Homogenized Effective Properties via the Generalized Variability Response Function
Kirubel Tefera, George Deodatis, Columbia University, New York, NY
Sanjay Arwade, University of Massachusetts at Amherst, Amherst, MA

Wavelet Based Linearization of Duffing Oscillator Subjected to Non-Stationary Excitation
Arunasis Chakraborty, Prateek Mittal, Indian Institute of Technology Guwahati, Assam, India

Application of game theory to optimal maintenance of ageing railway bridges with random objective functions
Shantanu Hati, Baidurya Bhattacharya, Indian Institute of Technology, Kharagpur, WB, India

Effect of relative failure consequences in reliability based dual performance design
Gunjan Agrawal, Baidurya Bhattacharya, Indian Institute of Technology, Kharagpur, WB, India

Jun. 2, 1:15-2:45 12-2: Probabilistic mechanics Room 322 Curry Center
Chair: Prof. Martin Otoja Startzewski, University of Illinois at Urbana-Champaign, Champaign, IL

Estimation of Extreme-Value Distribution of Crosswind Response for Wind-Excited Flexible Structures
Xinzhong Chen, Texas Tech University, Lubbock, TX

A Scalable Parallel Iterative Solver For Stochastic Finite Element Method
Woo Subber, A. Sarkar, Carleton University, Canada

Probabilistic Prediction of Dynamic Instability from Subcritical Measurement Data: Application to Flutter Analysis
Mohammad Khali, A. Sarkar, Carleton University, Canada
D. Poirer, Royal Military College of Canada, Kingston, Ontario, Canada

Generalized Variability Response Functions for Two-Dimensional and Non-Linear Problems
Kirubel Tefera, George Deodatis, Columbia University, New York, NY

A Computational Framework for Probabilistic Evaluation of Corrosion Process in Reinforced Concrete Structures
Azadeh Alipour, Masanobu Shinozuka, University of California, Irvine, CA

Optimal Deployment of Construction Equipment Using Linear Programming with Fuzzy Coefficients
1. Determining Evolutionary Reduced Order Functionally Graded Exascale Single-loop Approach for Reliability-Based Design and Topology Optimization


3. Evaluation of stochastic-simulation-based methodologies for estimation of relative information entropy

4. Variability Response Function for Critical Force

5. Reduced-Order Approximations of Random Functions with Mean Square Optimal Properties

6. Multiplicative Polynomial Dimensional Decomposition for Stochastic Analysis of High-Dimensional Complex Systems

7. A translation-based methodology for simulation of multi-variate strongly non-Gaussian stochastic processes

8. Characterization and Probabilistic Modeling of Three Dimensional Voids in Parallel Strand Lumber

9. Robust Topology Optimization Via Heaviside Projection Methodand Polynomial Chaos Expansion

10. Roadmap to Exascale Uncertainty Quantification

11. Nonlinear Stochastic Dynamic Analysis in Frequency Domain Using Tail-Equivalent Linearization


13. Global Sensitivity Analysis by Polynomial Dimensional Decomposition

14. Determining Evolutionary Spectra for Non-Stationary Fields from Correlation Functions: Application to Functionally Graded Materials

15. A validation methodology for a mesoscale probabilistic model of materials with microstructure
### Session 13: Stability

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<td>Jun. 2</td>
<td>10:30-12:00</td>
<td>13-1: Stability</td>
<td>435 Curry Center</td>
<td>Prof. Mortez Torkamani, University of Pittsburgh, Pittsburgh, PA</td>
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</table>

Instability of cracked pipes with and without an elastomeric liner  
Babak Haghpahan Jahromi, Yoon-Tae Kim, Ashkan Vaziri, Northeastern University, Boston, MA

Simulation of Geometric Imperfections in Thin-walled Members  
Vahid M. Zeinoddini, Benjamin W. Schafer, Johns Hopkins University, Baltimore, MD

Global and Localized Features of Shell Deformation and Instability  
Ashkan Vaziri, Amin Ajdari, Northeastern University, Boston, MA

Sensitivity analysis of buckling behavior of variable density steel foam C-channels using Sobol' decomposition  
Mohammadreza Moradi, Sanjar Arwade, University of Massachusetts, Amherst, MA

On the Application of Optimization Methods to Cold-formed Steel Cross-section Strength of Column  
Jiazhen Leng, Benjamin W. Schafer, James K. Guest, Johns Hopkins University, Baltimore, MD

Applications of Modal Identification in Finite Element Models of Thin-Walled Members  
Zhanjie Li, B.W. Schafer, Johns Hopkins University, Baltimore, MD

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<td>1:15-2:45</td>
<td>13-2: Stability</td>
<td>435 Curry Center</td>
<td>Ashkan Vaziri, Northeastern University, Boston, MA</td>
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System Stability and Post-Buckling Deformation of Elastic Plane Truss Structures Using Higher-Order Stiffness Matrices  
Morteza A. M. Torkamani, Jyh-Hung Shieh, University of Pittsburgh, Pittsburgh, PA

Buckling of column and Flexural Torsional Buckling of Beam with Elastic Restraint  
Shahin Nayeri Amiri, Hayder Rasheed, Kansas State University, Manhattan, KS

Nondestructive Method to Predict the Buckling Load in Spherical Shells  
Shahin Nayeri Amiri, Hayder Rasheed, Kansas State University, Manhattan, KS

Stabilization by Parametric Excitation with Arbitrary Frequency: General Method and Application to Buckled Columns  
Alexei A. Mailybaev, A.P. Seyranian, Lomonosov Moscow State University, Moscow, Russia

### Session 16: Earthquake engineering

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<td>Jun. 3</td>
<td>3:15-5:00</td>
<td>16-1: Earthquake engineering</td>
<td>31 Snell Library</td>
<td>Prof. Ronald Pak, University of Colorado, Boulder, CO</td>
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</table>

Performance-based control design for large-scale smart 3-D nonlinear building structure using fluid viscous dissipative bracing system  
Cha Young-Jin, Agrawal Anil K., The City College of the City University of New York, New York, NY

Modeling of Rolling Equipment Isolation Systems  
Henri P. Gavin, P.S. Harvey, Duke University, Durham, NC

Estimation of Soil Structure Interaction Effects on Long Embedded Structures  
S.Ali Ashrafi, Thornton Tomasetti, New York, NY

Seismic Risk Analysis for Bulgaria, Greece, Romania and Turkey Part I: Uniform Vulnerability Assessment Framework  
Tao Lai, Vineet Katiyar, Arash Nasseri, Yuchuan Tang, AIR Worldwide Corporation, Boston, MA

Seismic Risk Analysis for Bulgaria, Greece, Romania and Turkey-Part II: Development of Risk Map  
Vineet Katiyar, Arash Nasseri, Yuchuan Tang, Tao Lai, AIR Worldwide Corporation, Boston, MA

Elastodynamics of a Bi-Zonal Half-Space for Surface Foundations  
Ronald Y. S. Pak, Jacob Mitchell, University of Colorado, Boulder, CO

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<td>Jun. 4</td>
<td>10:30-12:00</td>
<td>16-2: Earthquake engineering</td>
<td>346 Curry Center</td>
<td>Henri Gavin, Duke University, Durham, NC</td>
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On the mechanism of collapse of tall steel moment frame buildings under earthquake excitation  
Swaminathan Krishnan, Matthew Muto, California Institute of Technology, Pasadena, CA
Modeling Reserve System Performance for Low-Ductility Braced Frames
Eric M. Hines, Maryam Aboosaber, Hannah J. Robinson, Tufts University, Medford, MA

Modeling of the three dimensional rocking problem
Emmanouil N. Chatzis, Andrew W. Smyth, Columbia University, New York, NY

Cyclic Evolution of Beam-column Interaction Strength of Concrete-Filled Steel Tube Beam-Columns
Mark D. Denavit, University of Illinois at Urbana-Champaign, Urbana, IL
Jerome F. Hajjar, Northeastern University, Boston, MA
Tiziana Perea, Universidad Autónoma Metropolitana, Mexico DF, Mexico
Roberto T. Leon, Georgia Institute of Technology, Atlanta, GA

ICF Walls Resistance to Simulated Seismic Loads
M. Haroun, Yosra El-Maghraby, M. Abdel-Mooty, E. Fahmy, M. Abou-Zeid, The American University in Cairo, New Cairo, Egypt

Seismic Response of Soil-Structure Interaction by Centrifuge Simulation
Mahdi Soudkhah, Ronald Y. S. Pak, University of Colorado, Boulder, CO

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<td>Chair: Prof. Alexandros Taflanidis, University of Notre Dame, Notre Dame, IN</td>
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</table>

Assessment and probabilistic sensitivity analysis for life-cycle seismic repair cost
Alexandros A. Taflanidis, Alexandros Lamprou, Christopher Vetter, University of Notre Dame, Notre Dame, IN

Seismic analysis of cable-stayed bridge with CFRP cable and ultra high performance concrete (UHPC) girder
Fenghong Fan, Zhi Fang, C.S. Cai, Louisiana State University, LA

Quasi-static Analysis of Rocking Wall Systems
Douglas Seymour, Simon Laflamme, Massachusetts Institute of Technology, Cambridge, MA

Attenuation of Blast Loading Using Functionally Graded Protective Systems
Reza Rafiee Dehkharghani, Amjad J. Aref, Gary F. Dargush, The State University of New York, Buffalo, NY

Cellular Structures with Irregular Structural Organization
Amin Ajdari, Sahab Babaei, Hamid Nayeby-Hashemi, Ashkan Vaziri, Northeastern University, Boston, MA

Analysis of Plane-Strain Crack Problems (Mode-I & Mode-II) in the Presence of Surface Elasticity
Peter Schiavone, C.I. Kim, C-Q. Hu, University of Alberta, Alberta, Canada

Slip-plane Plasticity Using the Theory of Material Evolution
Ben Nadler, University of Alberta, Edmonton, Canada

Potential Methods for a Crack Problem in Three-Dimensional Classical Elasticity
Stanislav Potapenko, E. Attroshchenko, G. Glinka, University of Waterloo, Waterloo, Canada

Analytical Solution of Ring on Elastic Subgrade Subjected to Point Loads
Shahin Nayeri Amiri, Hayder Rasheed, Kansas State University, Manhattan, KS

An Arbitrary Shaped Inclusion with Imperfect Interface in Antiplane Shear
Les J. Sudak, University of Calgary, Calgary, Canada

Metal Foam Computational Models for New Class of Structural Applications
Stefan Szyndzieszewski, Benjamin W. Schafer, Johns Hopkins University, Baltimore, MD
Jerome F. Hajjar, Northeastern University, Boston, MA
Sanjay R. Arwade, Brooks H. Smith, University of Massachusetts at Amherst, Amherst, MA

A Study of Cutting Temperatures in Turning Carbon-Fiber-Reinforced Plastics (CFRP) Composites with Worn Tools
Chung-Shin Chang, National Ilan University, Yilan County, Taiwan

Numerical Solution for Shearband Growth Using Mixed Finite Elements
Colin McAuliffe, Haim Waisman, Columbia University, New York, NY

Numerical Modelling for Temperature and Stress Field in GFRP Hollow Sandwich Panel
Bo Kong, C.S. Cai, Louisiana State University, Baton Rouge, LA
Multi-scale modeling of heterogeneous materials and homogenization of elastic properties of solder materials

Andreas Brandmaier, Christina Voellmecke, Wolfgang H. Mueller, Technische Universität Berlin, Germany

Fatigue behaviour of welded circular hollow section joints with concrete-filled chords (CHS-CFCHS) T-joints under axial loading

Ke Wang, University of Hong Kong, Hong Kong, China
Le-Wei Tong, Tongji University, Shanghai, China

Jun. 4, 1:15-2:45 17-3: Elasticity and plasticity Room 442 Curry Center
Chair: Prof. K.T. Chau, Hong Kong Polytechnic University, Hong Kong, China

Stress Analyses for Nonhomogeneous Soil Layer on a Buried Thrust Fault

K. T. Chau, Hong Kong Polytechnic University, Hong Kong, China
J.R. Rice, Harvard University, Cambridge, MA

Fracture Spacing in Layered Rocks: an analytical explanation based on elastic boundary-value problems

Pablo Prieto-Munoz, Zifeng Yuan, Huiming Yin, Columbia University, New York, NY

The Online Assessment Tool

Andrew MacMillan, Juan Caicedo, University of South Carolina, Columbia, SC

Dispersion of plane waves propagating along a non-principal direction in a pre-stressed elastic layer

Priya Kayestha, Anil C. Wijeyewickrema, Kikuo Kishimoto, Tokyo Institute of Technology, Tokyo, Japan

Analysis Method for the Capacity of Super-long Bored Pile Foundation

Ye Ma, Xuefeng Zhang, Chunxia Song, Research Institute of Highway Ministry of Transport, Beijing, China

Session 19: Granular materials

Jun. 3, 3:15-5:00 19-1: Granular materials Room 444 Curry Center
Chairs: Priyanti M. Amarasinghe, Johns Hopkins University, Baltimore, MD
Prof. Tang-Tat Ng, University of New Mexico, Albuquerque, NM

Multiscale modeling of particle removal impact on granular materials behavior

Pierre-Yves Hicher, Luc Scholtès, Luc Sibille, Université de Nantes, France

Mechanics of Bi-disperse granular materials

Tang-Tat Ng and S. Ali Yousefi, University of New Mexico, Albuquerque, NM

Molecular Dynamic Study of Interaction Between Clay Minerals and Electrolyte

Priyanti M. Amarasinghe and A. Anandarajah, Johns Hopkins University, Baltimore, MD

Effects of Force Field in Molecular Mechanics Simulation of Geo-Materials

Chung R. Song, Weidong Wu, and Ahmed Al-Ostaz, The University of Mississippi, University, MS

Microstructural investigations of clay particle orientation in clayey materials after triaxial loading

Mahdia Hattab, Université Paul Verlaine, Metz, France

A Micro-Mechanical Analysis of a Saturated Granular Soil-Pile System

Mourad Zeghal, Rensselaer Polytechnic Institute, Troy, NY
T. Dessalgen, C. Rizzo Assoc. Inc. Monroeville, PA
U. El Shamy, Southern Methodist University, Dallas, TX

Jun. 4, 10:30-12:00 19-2: Granular materials Room 444 Curry Center
Chairs: Prof. Hayley Shen, Clarkson University, Potsdam, NY
Prof. Anil Misra, the University of Kansas, Lawrence, KS

Rolling and Friction in Discrete Element Simulations

Matthew R. Kuhn, University of Portland, Portland, OR

Scale dependent stress-displacement relationship of rough surface contact under combined normal-shear loading

Sheping Huang and Anil Misra, the University of Kansas, Lawrence, KS

Mapping of Nucleation Mechanisms for Regime Separated Granulation

Heather N. Emady, Debye Kayrak-Tolay, James D. Litster, Purdue University, West Lafayette, IN
William C. Schwerin, UOP, a Honeywell Company, Des Plaines IL

Particle Size and Boundary Effects in an Annular Shear Cell

Hayley Shen and Andres D. Orlando, Clarkson University, Potsdam, NY
DEM Simulation on the Grain Shape-Forming Process of Granular Materials
Takao Ueda, T. Matsushima and Y. Yamada, University of Tsukuba, Tsukuba, Ibaraki Prefecture, Japan

Stress-Strain Modeling for Silty-Sand
Ching S. Chang, Mehrashk Meidani, University of Massachusetts, Amherst, MA

Length Scale Characterization in Localized Granular Shear
Sara Abedi, Amy L. Rechenmacher, University of Southern California, Los Angeles, CA

Analysis of Soil-Foundation-Structure Interaction using DEM Simulations
Natasha Zamani and Usama El Shamy, Southern Methodist University, Dallas, TX

Relation between packing density and coordination number of granular assemblies studied by X-ray CT and DEM
Takashi Matsushima and Jun Katagiri, University of Tsukuba, Tsukuba, Ibaraki Prefecture, Japan

Migration of heavy metals in saturated clays: a microstructural approach
K.F. Liu, N. Saiyouri, P.-Y. Hicher, Ecole Centrale de Nantes, Nantes cedex 3, France

Biopolymer scaffolds with organomodified noanclays for bone tissue engineering applications
Kalpana S. Katti, D. R. Katti and A. H. Ambre, North Dakota State University, Fargo, ND

From clays to concrete at nano- and meso-scale: a chemo-mechanical continuum
Henri Vandamme, Université Paris-Est, IFSTTAR, Paris, France; ESPCI-ParisTech, France

Session 20: Micromechanics of porous materials

Multiscale Modeling of Clay Soils
David Smith, Peter Pivonka, and Stefan Scheiner, University of Western Australia, Perth, WA, AU

Role of water in cell walls of the hierarchical composite & quot; softwood & quot; a poroelastic analysis
Christian Hellmich, Thomas Bader, Karin Hofstetter, Josef Eberhardsteiner, Vienna University of Technology, Vienna, Austria

Poromechanics of fractal media
Martin Ostoja-Starzewski, University of Illinois at Urbana-Champaign, Champaign, IL

Composite sphere assemblage models and application to effective poroelastic properties of oolitic rocks
Albert Giraud, Ngoc. Bien Nguyen, Dragan Grgic, LAEGO-ENSG, Vandoeuvre-les-Nancy Cedex, France

Micromechanical modelling of carbonate geomechanical properties during acid gas injection
Minh-Tuan Nguyen, Elisabeth Bemer, IFP Energies Nouvelles, Rueil-Malmaison, France
Luc Dormieux, Ecole des Ponts ParisTech, France

A micromechanical plastic damage model for saturated quasi brittle materials
Jianfu Shao, Lille University of Science and Technology, Villeneuve-d'Ascq, France
Ni Xie, Lihua XU, Wuhan University, Wuhan, China
Qizhi Zhu, University of Paris EST, Marne la Valée, France

Kerogen in Green River Oil Shale
Dinesh R. Katti, Kalpana S. Katti and Kristin N. Alstadt, North Dakota State University, Fargo, ND

Micromechanics analysis of the effect of water-to-cement ratio on the thermo-poro-elastic properties of hardened cement paste
Siavash Ghabezloo, Laboratoire Navier-CERMES, Ecole des Ponts ParisTech, France

Upscaling compressive strength of cement paste and mortar
Bernhard Pichler, Christian Hellmich, Vienna University of Technology, Vienna, Austria

Microscale experimental investigation of deformation and damage of argillaceous rocks under cyclic hydraulic loads
Linlin Wang, Diansen Yang, Eva Héripré, LMS, Ecole Polytechnique, Palaiseau Cedex, France
**Review of Steel Foams: Processing, Properties and Applications**
Sanjay R. Arwade, Smith, B. H., University of Massachusetts, Amherst, Amherst, MA
Szymisiewski, S., Schafer, B. W., Johns Hopkins University, Baltimore, MD 21218
Hajjar, J. F., Northeastern University, Boston, MA 02115

**Unit Cell Studies of Void Evolution in Metals**
Ravi Kiran, and Kapil Khandelwal, University of Notre Dame, South Bend, IN

**On Energy Partitioning In Metallic and Polymeric Open-cell Foams under Finite Deformations**
R. Harba, E. Taciragilub, N. Ghonien, University of California Los Angeles, Los Angeles, CA
A. Prakash, Purdue University, West Lafayette, IN 47907-2051

### Session 21: Mechanics and Adhesion of Thin Membranes

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<tbody>
<tr>
<td>Jun. 4, 10:30</td>
<td>12:00</td>
<td>Adhesion Behavior of A Cylindrical Shell in Presence of Secondary Energy Minimum Potential</td>
<td>Kai-Tak Wan, Jiayi Shi, Xin Wang, Sinan Müftü, April Gu Northeastern University, Boston, MA</td>
<td>Room 320 Curry Center</td>
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<tr>
<td></td>
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<td>Statistical Mechanics of Bio-membrane Adhesion to Flexible Substrates</td>
<td>Alireza Sarvestani, University of Maine, Orono, ME</td>
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<td>Thermal Buckling Of Rectangular FGM Plate with Variation Thickness</td>
<td>Raki Mostafa, Fatemeh Ghadimipoor and Maryam Raki, Islamic Azad University, Branch of Ahwaz, Iran</td>
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<tr>
<td>Jun. 4, 1:15</td>
<td>2:45</td>
<td>Polymer Thin Film Buckling: Wrinkling and Strain Localizations</td>
<td>Yuri Ebata, A.J. Crosby, University of Massachusetts, Amherst, MA</td>
<td>Room 320 Curry Center</td>
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<td>A. B. Croll, North Dakota State University, Fargo, ND</td>
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<td>Adhesion and Interfacial Fracture in Drug Eluting Stents</td>
<td>Nima Rahbar, Wole Soboyejo, University of Massachusetts, Dartmouth, North Dartmouth, MA</td>
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<td>Juan Meng, Princeton University, Princeton, NJ 08540</td>
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<td>Steady State Equilibrium Analysis of a Cylindrical Shell Adhering with a Stretched Membrane Using Explicit Finite Element Method</td>
<td>Jiayi Shi, Sinan Müftü and Kai-Tak Wan Northeastern University, Boston, MA</td>
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<td>Adhesion Measurement of Graphene Using Standard Blister model</td>
<td>Guangxi Li, Zong Zong, Mehmet Dokmeci and Kai-Tak Wan, Northeastern University, Boston, MA</td>
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### Session 24: Coastal hazards

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<tbody>
<tr>
<td>Jun. 3, 10:30</td>
<td>12:00</td>
<td>Numerical modeling of nonlinear water waves with sigma coordinate</td>
<td>Qin Chen, Ling Zhu, Qi Fan and Xiaoliang Wan Louisiana State University, Baton Rouge, LA</td>
<td>Room 318 Curry Center</td>
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<td>Modeling Flow Field and Non-Equilibrium Sediment Transport in Channels</td>
<td>Keh-Han Wang, University of Houston, Houston, TX</td>
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<td>Jean-Fernand Krou, URS Corporation, Houston, TX</td>
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<td>Periodic Nonlinear Shallow-Water Waves Induced Uplift Forces on a Horizontal Deck</td>
<td>Keh-Han Wang, Xing Lu, University of Houston, Houston, TX</td>
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<td>A robust modeling tool to assess risk due to storm surge flooding in coastal areas</td>
<td>Himangshu Das, Hooshin Jung, Jackson State University, Jackson, MS</td>
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<td>Long wave propagation in emergent coastal vegetation</td>
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### Session 25: Flow-Induced Vibration

#### 25-1: Flow-Induced Vibration
**Chair:** Prof. Luca Caracoglia, Northeastern University, Boston, MA

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<th>Room 318 Curry Center</th>
<th>Jun. 3, 1:15-2:45</th>
<th>25-2: Flow-Induced Vibration</th>
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<tbody>
<tr>
<td><strong>Assessment of Wind Turbine Loading based on Conditionally Simulated Inflow Wind Field</strong></td>
<td>Delong Zuo, Texas Tech University, Lubbock, TX</td>
<td><strong>Vortex Induced Vibrations of Inclined Cylinders in Flow</strong></td>
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<tr>
<td>Jason McNeill, Wind Science and Engineering Research Center, Texas Tech University</td>
<td><strong>A Numerical Procedure for Estimating the Covariance Matrix of Flutter Derivatives from Wind Tunnel Tests</strong></td>
<td>Anil Jain, Yahya Modarres-Sadeghi, University of Massachusetts, Amherst, MA</td>
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<tr>
<td><strong>Modeling Transitions from Laminar to Turbulent Flow by Level Cuts of Gaussian Random Fields</strong></td>
<td>Richard V. Field, Jr., Sandia National Laboratories, Albuquerque, NM</td>
<td><strong>A Numerical Model for Simulating Unilateral Response in Cross-Ties during Free Vibration of “Cable-Cross-Tie Systems”</strong></td>
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<td>M. Grigoriu, Cornell University, Ithaca, NY</td>
<td><strong>Stochastic Simulation of Wind-Induced Response of a Tall Building Affected by Lateral Loading Errors</strong></td>
<td>Gian Felice Giaccu, University of Cagliari, Cagliari, Italy</td>
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<td>Luca Caracoglia, Northeastern University, Boston, MA</td>
<td><strong>A Numerical Procedure for Estimating the Covariance Matrix of Flutter Derivatives from Wind Tunnel Tests</strong></td>
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Instability of Cantilevered Pipes Conveying Fluid with Base Excitation

Gary Han Chang, Yahya Modarres-Sadeghi, University of Massachusetts, Amherst, MA

Effects of an Initial Vertical Gust on the Trajectory of Wind-Borne Compact Debris in Horizontal Winds

Farid Moghim, Luca Caracoglia, Northeastern University, Boston, MA

Wind Induced Oscillations of Open-Grown Deciduous Trees

Lakshmi Ramanujam, Mark Reiland, Yahya Modarres-Sadeghi and Brian Kane, University of Massachusetts, Amherst, MA

Torsional Flutter Velocity Estimation using Experimentally-Derived (Co)-Variances of Aeroelastic Coefficients

Dong-Woo Seo, Luca Caracoglia, Northeastern University, Boston, MA
**Symposium Presentation List**

15 minutes for each presentation, including questions and answers

### Symposium 1: Multiscale Behavior of Damage and Failure Mechanics

**1-1**

| Co-Chairs: | Prof. Lizhi Sun, University of California, Irvine, CA  
Prof. George Z. Voyiadjis, Louisiana State University, Baton Rouge, LA |
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<td><strong>June 2 10:30am-12pm, Room 333 Curry Center</strong></td>
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<tr>
<td>Parameterization of models for dynamic failure of brittle materials</td>
<td>Lori Graham-Brady, James Guest, Seth Tibbits and Cynthia Zingale, Johns Hopkins University, Baltimore, MD</td>
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<td>Computational models of brittle materials based on local homogenization</td>
<td>Lori Graham-Brady and Junwei Liu, Johns Hopkins University, Baltimore, MD</td>
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<tr>
<td>Fracture and Failure of a Coated Wire Subject to a Tension</td>
<td>Huiming YinYin and Pablo Prieto-Muñoz, Columbia University, New York, NY</td>
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<tr>
<td>Micromechanical Modeling of the Bridging Effects of Carbon Nanotubes on the Mechanical Properties of Cementitious Materials</td>
<td>Tyson, B.M., and Abu Al-Rub, Texas A &amp; M University, College Station, TX</td>
</tr>
<tr>
<td>Microstructure to Macro-Scale using Gradient Plasticity with Temperature and Rate Dependent Length Scales</td>
<td>George Z. Voyiadjis and Danial Faghihi, Louisiana State University, Baton Rouge, LA</td>
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</table>
| Thermal Spalling of Concrete, an Issue of Materials Mismatch | Kaspar J. Willam, University of Houston, TX  
G. Xotta and V.A. Salomoni, University of Padova, Italy |

**1-2**

| Co-Chairs: | Prof. George Z. Voyiadjis, Louisiana State University, Baton Rouge, LA  
Prof. Markus Buehler, Massachusetts Institute of Technology, Cambridge, MA |
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<tr>
<td>Multiscale Damage Mechanisms of Protein Materials in the Context of Disease and Injury: Learning from Failure-Part I</td>
<td>Markus J. Buehler, Massachusetts Institute of Technology, Cambridge, MA</td>
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<tr>
<td>Multiscale Damage Mechanisms of Protein Materials in the Context of Disease and Injury: Learning from Failure-Part II</td>
<td>Markus J. Buehler, Massachusetts Institute of Technology, Cambridge, MA</td>
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<td>Computational Modeling of Polyurea-Coated Composites Subjected to Blast</td>
<td>Caglar Oskay, Tong Hui, Vanderbilt University, Nashville, TN</td>
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<td>Multiscale Modeling of Failure under Cyclic Loading in Composite Materials</td>
<td>Robert Crouch and Caglar Oskay, Vanderbilt University, Nashville, TN</td>
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<td>Fully Nonlinear Analysis of the State of Stress and Deformation in the Vicinity of an Initiating Crack</td>
<td>R. Merchant, K. D. Papoulia, and R. N. Dubey, University of Waterloo, Water Loo, ON</td>
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**1-3**

| Co-Chairs: | Prof. Alan J. Levy, Syracuse University, Syracuse, NY  
Prof. George Z. Voyiadjis, Louisiana State University, Baton Rouge, LA |
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<tr>
<td><strong>June 2 3:15pm-5:00pm, Room 333 Curry Center</strong></td>
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</table>
| On the theoretical and computational aspect of damage and healing simulation | George Z. Voyiadjis, Amir Shojaei, Louisiana State University, Baton Rouge, LA  
Amir Shojaei and Guoqiang Li, Southern University, Baton Rouge, LA |
| An Exact Analysis of Interfacial Decohesion in the Trilayer Elastic Composite | |
Discrete Damage Zone Model for Mixed Mode Fracture Initiation and Propagation

Xia Liu and Haim Waisman, Columbia University, New York, NY

Modeling Microstructurally Small Fatigue Cracking Processes in Aluminum Polycrystals with the PPR Cohesive Zone Model

Albert Cerrone, Paul Wawrzenie, and Anthony Ingraffea, Cornell University, Ithaca, NY
Gerd Heber, HDF Group, Champaign, IL
Glaucio Paulino, University of Illinois at Urbana-Champaign, Urbana, IL

Stochastic Modeling of Damage Evolutions for Heterogeneous Materials

Shajie Zeng and J. Li, Tongji University, Shanghai, China
J. Li, Tongji University, Shanghai, China

Co-Chairs: Prof. Eric N. Landis, University of Maine, Orono, ME
Prof. Shaofan Li, University of California, Berkeley, CA

June 3 10:30am-12pm, Room 333 Curry Center

A Multiscale Cohesive Zone Model and Simulations of Fracture

Shaofan Li, University of California, Berkeley, CA

Understanding Damage and Failure by Integrating 3D Imaging with Numerical Simulation

Eric N. Landis, University of Maine, Orono, ME
John E. Bolander, University of California Davis, Davis, CA

A Temperature Dependent Creep Damage Model for Polycrystalline Ice

Ravindra Duddu and Haim Waisman, Columbia University, New York, NY

Failure analysis of notched concrete beams under sequential loading and the multistage strength degradation theory for fatigue

Zhai Shi, Yukari Nakamura and Masaaki Nakano, Tsukuba-shi, Ibaraki, Japan

Interaction of Damage and Progressive Collapse Using Multi-Scale Material Model

Ali Najafi and Masoud Rais-Rohani, Mississippi State University, Mississippi State MS

Co-Chairs: Prof. Lizhi Sun, University of California, Irvine, CA
Prof. Farid Abed, American University of Sharjah, United Arab Emirates

June 3 1:15pm-2:45pm, Room 333 Curry Center

Energy-Based Damage Modeling in Structural Steel

Reem Al-Himaree, Farid Abed and Adil Tamimi, American University of Sharjah, United Arab Emirates

Modeling the Thermal and Electrical Improvements of Cementitious Materials with Embedded Carbon Nanotubes

Tyson, B.M., and Abu Al-Rub, R.K., Texas A& M University, College Station, TX

Maximum Likelihood Based Calibration and Application of the Cyclic Void Growth Model

Andrew T. Myers, A.M. Kanvinde, G.G. Deierlein and J.W. Baker, University of California-Davis, Stanford University

Reactive transport in granular media: coupled internal erosion with heavy metal transport modelling

T. Khalil, N. Sayouri and P.Y.Hicher, Centrale Nantes, Nantes, France

Field-dependent ferromagnetic nanocomposites filled with carbon nanotubes

Rui Li and Lizhi Sun, University of California, Irvine, CA

Experimental characterization of bond strength in FRP-reinforced concrete specimens

Massimiliano Bocciarelli, Sara Cattaneo, Paola Condoleo, Roberto Fedele, Gabriele Milani, Technical School of Milan, Milan, Italy

Symposium 2: Subsurface Imaging, Feature Identification and Damage Detection

2-1 GPR and Co-Chairs: Prof. Ming Wang, Northeastern University, Boston, MA
### 2-2 Acoustic and Elastic Wave Methods

**Co-Chairs:** Prof. Dryer Houston, University of Vermont, Burlington, VT  
Prof. Steve Cai, Louisiana State University, Baton Rouge, LA

**June 2, 1:15pm-2:45pm, Room 440 Curry Center**

- **Advances in Stress Wave Scanning of Decks and Pavements**  
  Yajai Tinkey, Ph.D., P.E., Larry D. Olson, P.E. and Matthew Hergert, Olson Engineering, Inc., Wheat Ridge, CO
- **Damage Characterization of Glass Fiber Reinforced Plastics by Applying Pattern Recognition Techniques to Acoustic Emission Data**  
  Archana Nair and Chunsheng Cai, Louisiana State University, Baton Rouge, LA
- **MTD Monitoring through the Noise Generated by Tire-Pavement Interaction**  
  Vitaliy Saykin, Yinghong Cao, Ming L. Wang, Northeastern University, Boston, MA
- **Air-coupled SASW in Pavement Profile Detection**  
  Yiyang Zhang, Yinghong Cao, Yifeng Lu and Ming L. Wang, Northeastern University, Boston, MA  
  Greg McDaniel, Boston University, Boston, MA
- **Tire Noise in Pavement Debonding Identification using HHT**  
  Yifeng Lu, YingHong Cao, Ming L. Wang, Northeastern University, Boston, MA  
  J. Gregory McDaniel, Boston University, Boston, MA

### 2-3 Bridges and Roadways

**Co-Chairs:** Dr. Ralf Birken, Northeastern University  
Dr. Kenneth Maser, Infrasense, Inc.

**June 2, 3:15pm-5:00pm, Room 440 Curry Center**

- **Characterization and Detection of Bridge Deck Deterioration**  
  Kenneth Maser, Infrasense, Inc.  
  Jeff Doughty and Ralf Birken, Northeastern University, Boston, MA
- **Corrosion Detection and Monitoring of a Reinforced Concrete Slab by Periodic Multi-Sensor Non-Destructive Testin**  
  Ralf W. Arndt, Rutgers University, Piscataway, NJ  
  Cui, J. and Huston, D., University of Vermont, Burlington VT
- **Fast Damage Detection of Bridge Structures from Dynamic Response of a Passing Vehicle**  
  Xuan Kong and C.S.Cai, Louisiana State University, Baton Rouge, LA
- **Unifying Roadway Defect and Deterioration Models**  
  Alyson Stuer, Sara Wadia-Fascetti and Ming Wang, Northeastern University, Boston, MA

### 2-4 Subsurface

**Co-Chairs:** Prof. Ralf W. Arndt, Rutgers University, Piscataway, NJ
### Symposium 3: Identification, Estimation, Updating and Monitoring

#### 3-1 IM1

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**Co-Chairs:** Prof. Oreste S. Bursi, University of Trento, Trento, Italy  
Prof. Dionisio Bernal, Northeastern University, Boston, MA

**Reference-free Delamination Detection, Localization and Quantification using a Matching Pursuit Technique**  
Yun-Kyu An, Hyung Jin Lim, Jin Yoel Yang and Hoon Sohn, KAIST, Daejeon, South Korea

**A Stress-development Prediction Method and its Application on Stress Assessment of Existing Bridges**  
Wen Xiong and C.S. Cai, Louisiana State University, Baton Rouge, LA  
Wen Xiong, Xue Tu and Rucheng Xiao, Tongji University, Shanghai, China  
C.S. Cai, Changsha University of Science and Technology Changsha, Hunan

**Interferometric Profilometry and Morphological Characteristics for Three Dimensional Analysis of Aggregate Particles**  
Wenjuan Sun and Linbing Wang, Virginia Tech, Blacksburg, VA

**Laser and Plasma Elastic Wave Generation with Subsurface Detection**  
David Hurley and Dryver Huston, University of Vermont, Burlington, VT

#### 3-2 IM2

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**Co-Chairs:** Prof. Genda D. Chen, Missouri University of Science and Technology  
Prof. Dionisio Bernal, Northeastern University, Boston, MA

**Temperature Effects on Finite Element Model Updating of the Dowling Hall Footbridge**  
Iman Behmanesh and Babak Moaveni, Tufts University, Medford, MA

**A Hilbert Transform Based Signal Decomposition of Narrowband Time Series with Closely-Spaced Frequency Components for System Identification**  
Genda D. Chen and Z. C. Wang, Missouri University of Science and Technology

**A Meta-modeling Procedure for Updating the Finite Element Model of Large-scale Structures**  
Yang Liu, Harbin Institute of Technology, Harbin; Ministry of Communication, China  
Zhongdong Duan, Harbin Institute of Technology, Harbin, China

**Separating hysteretic from viscous dissipation in seismic response**  
Kenny Kwan Yang and Dionisio Bernal, Northeastern University, MA

**Identifying Multiple Solutions in Structural Model Updating**
**Online Damage Detection Using Extended Kalman Filter**

*Gustavo Ospina*, Muslum Kilinc and Dr. Juan Caicedo, University of South Carolina, Columbia, SC

*Yalcin Bulut* and Dionisio Bernal, Northeastern University, Boston, MA

| 3-3 IM3 | Co-Chairs: Prof. Fabio Casciati, University of Pavia, Pavia, Italy  
Prof. Dionisio Bernal, Northeastern University, Boston, MA | June 2, 3:15pm-5:00pm, Room 442 Curry Center |
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<tr>
<td></td>
<td>System Identification and Damage Detection of Support-excited Structures based on Subspace Identification Methods</td>
<td>Junhee Kim and Jerome P. Lynch, University of Michigan, Ann Arbor, MI</td>
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<tr>
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<td>System Identification of Smart Buildings</td>
<td>Ryan Mitchell, Yeesock Kim and Tahar El-Korchi, Worcester Polytechnic Institute, Worcester, MA</td>
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</table>
|  | Identifying Bridge Foundation Impedance from Seismic Records | Ariel Irizarry and Luis Suarez, University of Puerto Rico, Mayaguez, PR  
Dionisio Bernal, Northeastern University, Boston, MA |
|  | System Identification of High-Rise Structures with Piecewise Continuous Modeling | Lotfi Gargab and Ray Ruichong Zhang, Colorado School of Mines, Golden, CO |
|  | Short-time Modal Identification of Nonlinear Systems with Hysteretic Behavior | Eliyar Asgarieh and Babak Moaveni, Tufts University, Medford, MA |
|  | Identification of Elasto-Plastic Constitutive Parameters by Self-Optimizing Inverse Method: Experimental Verifications | Shen Shang and Gun Jin Yun, University of Akron, Akron, OH |

| 3-4 IM4 | Co-Chairs: Prof. Eric M. Hernandez, University of Vermont, Burlington, VT  
Prof. Dionisio Bernal, Northeastern University, Boston, MA | June 3, 10:30am-12:00am, Room 442 Curry Center |
| --- | --- | --- |
|  | Identification, Updating and Monitoring of the Twin Deck Curved Cable-stayed Foot/Bridge “Ponte Del Mare” | Oreste S. Bursi, Alessio Bonelli, Nicola Tondini and Alessia Ussia, University of Trento, Trento, Italy  
Rosario Ceravolo, Politecnico Torino, Torino, Italy |
|  | Statistical Subspace-Based Model-Free Damage Localization | Dionisio Bernal, Northeastern University, Boston, MA  
Michael Döhler and Laurent Mevel, INRIA Centre de Recherche Rennes - Bretagne Atlantique, France |
|  | Bio-inspired Control of Smart Buildings | Yeesock Kim, Worcester Polytechnic Institute, Worcester, MA |
|  | Innovative Prototype Designs for a Bio-inspired Flow Sensor | Junliang Tao, Xiong (Bill) Yu and Jim Berilla, Western Reserve University, Cleveland, OH |
|  | Local Positioning Accuracy | Fabio Casciati and Lijun Wu, Universty of Pavia, Pavia, Italy |

| 3-5 IM5 | Co-Chairs: Prof. Lucia Faravelli, University of Pavia, via Ferrata, Pavia, Italy  
Prof. Dionisio Bernal, Northeastern University, Boston, MA | June 3, 1:15pm-2:45pm, Room 442 Curry Center |
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<td>The Effect of Structural Stiffness Degradation in Modal Characteristics</td>
<td>Michael Fernandez, Juan M. Caicedo, Paul Ziehl and Aaron Larosche, University of South Carolina, Columbia, SC</td>
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|  | Propagation of Mode Shape Errors in Structural Identification | Suparno Mukhopadhyay, Ah Lum Hong and Raimondo Betti, Columbia University, New York, NY  
Hilmi Lus, Bogazici University, Turkey |
Application of Seismic Recordings in Evaluation of Nonlinear Static Analysis Procedures (NSP)

Arash Nasseri, AIR-WorldWide Boston, MA
Dionisio Bernal, Northeastern University, Boston, MA

Post Earthquake Damage Detection in Instrumented Buildings Using Identified Dissipated Energy

Eric M. Hernandez, University of Vermont, Burlington, VT

Frequency Correlation-Based Damage Detection in Bridges Under Thermal Influence of Environment

Harsh Nandan, Virginia Tech, Blacksburg, VA
M. P. Singh, Hazard Mitigation and Structural Engineering, Arlington, VA

Symposium 4: Stability of Composite Structures

4-1 Column Co-Chairs: Prof. Pizhong Qiao, Washington State University, Pullman, WA
Prof. Challamel Noël, LGCGM_INSA of Rennes, France

June 3, 1:15pm-2:45pm, Room 448 Curry Center

Buckling Loads of Two-layer Composite Columns with Interlayer Slip and Stochastic Material Properties

Simon Schnabl, Goran Turk, Igor Planinc, University of Ljubljana, Slovenia, Europe

Explicit Local Buckling Analysis of Thin-Walled Composite Structures

Jifeng Xu, Pizhong Qiao, Beijing Aeronautical Science and Technology Research Institute, Commercial Aircraft Corporation of China Ltd., Beijing, China

On a geometrically exact theory of the post-buckling of partially composite beam-columns

Challamel Noël, LGCGM_INSA of Rennes, France

Compressive Buckling of Composite Wood I-Joist with Sinusoidal Web Geometry

Bradley McGraw, An Chen, and Julio F. Davalos, West Virginia University, Morgantown, West Virginia

Stability of non conservative systems under two kinematic constraints and second order work criterion

Jean Lerbet, J. Lerbet, M.Aldowaji, N. Challamel, F. Nicot, F. Prunier, F. Darve
IBISC, UEVE, Evry, France
LGMGC, INSA, Rennes, France
ETNA Geomechanics group, CEMAGREF, Grenoble, France
INSA, Lyon, France
L3S, UJF-INPG-CNRS, Grenoble, France

Stability Analysis of a Non-Local Column with Long- Range Interactions

Massimiliano Zingales, Mario DiPaola, Dip. di Ingegneria Civile, Aerospaziale, Ambientale, Università di Palermo, Italy

4-2 Beam Co-Chairs: Jifeng Xu, Assistant Chief Engineer, Commercial Aircraft Corporation of China, Ltd., China
Prof. Pizhong Qiao, Washington State University, Pullman, WA

June 3, 3:15pm-5:00pm, Room 448 Curry Center

A nonlocal forced vibration model for nanobeams

Cheng Li, C. W. Lim, and Jilin Yu,
Department of Building and Construction, City University of Hong Kong
USTC-CityU Joint Advanced Research Centre
Department of Modern Mechanics, University of Science and Technology of China

Analytical Solution for Buckling of Delaminated Pre-twisted Composite Beams

Ales Krofič, M. Saje, I. Planinc and O. Zupan, University of Ljubljana, Ljubljana, Slovenia

Buckling of Stiffened Antisymmetric Laminated Plates

Issam Harik, Liecheng Sun, University of Kentucky, Lexington, KY

Flexural-Torsional Buckling of Composite Wood I-Joist with Sinusoidal Web Geometry

Bradley McGraw, An Chen, and Julio F. Davalos, West Virginia University, Morgantown, West Virginia

Explicit Web Local Buckling Analysis of FRP Structural Shapes under Transverse Loading
### Symposium 4: Three and Four-Layered Composite Elements

| 4-3 Layered and Composite Elements | Co-Chairs: Prof. Challamel Noël, LGCGM-INSA of Rennes, France  
Jifeng Xu, Assistant Chief Engineer, Commercial Aircraft Corporation of China, Ltd., China  
|  
| June 4, 10:30am-12:00pm, Room 448 Curry Center  
|  
| Finite Element Analysis of Buckling of Pretwisted Columns  
Farid Abed, Samer Barakat and Mohammad Al Hamaydeh, American University of Sharjah, United Arab Emirates  
|  
| Improved Vibration Analysis of Delaminated Bi-layer Beams  
Fangliang Chen and Pizhong Qiao, Washington State University, Pullman, WA  
|  
| Efficient Buckling and Postbuckling Analysis of Stiffened Composite Panels  
Jifeng Xu and Pizhong Qiao, Beijing Aeronautical Science and Technology Research Institute, Commercial Aircraft Corporation of China Ltd., Beijing, China  
|  
| Stability Of Non Conservative Systems Under Two Kinematic Constraints And Second Order Work Criterion  
J. Lerbet, M.Aldowaji, N. Challamel, F. Nicot, F. Prunier, F. Darve  
IBISC, UEVE, Evry, France  
LGMGC, INSA, Rennes, France  
ETNA Geomechanics group, CEMAGREF, Grenoble, France  
INSA, Lyon, France  
L3S, UJF-INPG-CNRS, Grenoble, France  
|  
| Modelling the nonlinear elastic instability phenomena of laminated composite panels and sandwich structures  
Christina Voellmecke, Stylianos Yiatros and M. Ahmer Wadee  
LKM, Institute of Mechanics, TU Berlin, Germany  
Department of Civil Engineering, Brunel University, Uxbridge, UK  
Dept of Civil & Environmental Engineering, Imperial College London, UK  
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### Symposium 5: Mechanics of Biological and Biologically Inspired Materials

| 5-1 Biomolecule | Co-Chairs: Prof. Kalpana S. Katti, North Dakota state University, Fargo, ND  
| June 2, 10:30am-12:00pm, Room 444 Curry Center  
|  
| A Meshfree Method for Mechanics and Conformational Change of Biomolecules and Their Assemblies  
Ankush Aggarwal, Jiun-Shyan Chen and William S. Klug, University of California, Los Angeles, CA  
|  
| POD-based Model Order Reduction for Molecular Dynamics (MD) Systems with RBF Approximate Force Fields  
Chung-Hao Lee and J.S. Chen, University of California, Los Angeles, CA  
|  
| CanDo: Computer-aided engineering for DNA origami  
|
**Blast Wave Simulations on Myelin Membranes**  
Rahul Bhowmik, Richard Pastor and Jeffrey T. Mason, Defense and Veterans Brain Injury Center, rockville, MD  
Defense and Veterans Brain Injury Center, Armed Forces Institute of Pathology Annex  
Laboratory of Computational Biology, National Institute of Health  
Department of Biophysics, Armed Forces Institute of Pathology.

**DNA/RNA Decorated Single-walled Carbon Nanotubes for Gas Sensing Applications**  
Yu Liu, Ming L. Wang and Mehmet R. Dokmeci  
Northeastern University, Boston MA  
Boston University, Boston, MA

**An Insight into the Mechanics of Collagen Molecules**  
D. R. Katti, K. S. Katti, S. M. Pradhan, North Dakota state University, Fargo, ND

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<th>5-2 Structure</th>
<th>Co-Chairs: Prof. Chris Paetsch, Tufts University, Medford, MA</th>
<th>June 2, 1:15pm-2:45pm, Room 444 Curry Center</th>
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| Study of Edge Tracking Behavior of Rolling HL60 Cells on Asymmetric P-selectin Patterns | Chia-Hua Lee, Suman Bose, Krystyn J. Van Vliet, Jeffrey M. Karp and Rohit Karnik  
Massachusetts Institute of Technology, Cambridge, MA |
| HST Center for Biomedical Engineering and Harvard Stem Cell Institute, Brigham and Women's Hospital and Harvard Medical School, Cambridge, MA |
| Size and geometry effects on the nanomechanics of biological material systems | Sinan Keten, Zhiping Xu, Britni Ihle and Markus J. Buehler  
Northwestern University, Evanston, Illinois 60208-3109 |
| Massachusetts Institute of Technology, Cambridge, Massachusetts 02139  
The Pennsylvania State University, PA |
| Bone fibrillogenesis and mineralization: quantitative analysis and implications for tissue elasticity | Jenny Vuong and Christian Hellmich, Vienna University of Technology, Austria |
| Nanomechanical Behavior of Human Cells on Engineered Materials | Kolpana S. Katti, D. R. Katti and A. H. Ambre, North Dakota state University, Fargo, ND |

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<th>5-3 Tissue</th>
<th>Co-Chairs: Prof. Zhao Qin, Massachusetts Institute of Technology, Cambridge, MA</th>
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<tr>
<td>Biomechanical Properties of Abdominal Aortic Tissues Based on Uniaxial and Planar Biaxial Testing</td>
<td>F. Pancheri, W. Lin and L. Dorfmann, Tufts University, Medford, MA</td>
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<tr>
<td>Atomistic modeling and mechanics of self-assembled organic nanotubes</td>
<td>Luis Ruiz and Sinan Keten, Northwestern University, Evanston, IL</td>
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<tr>
<td>Effect of low-frequency modulation on the acoustic radiation force in soft tissues</td>
<td>Egor V. Dontsov and Guzina, B. B., University of Minnesota, Minneapolis, MN</td>
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<tr>
<td>The Effect of Different Material Combinations on Wear of an Artificial Cervical Disc as Standalone vs. Placed in</td>
<td>Sanghaj Bhattacharya and Goel V.K, University of Toledo, Toledo, OH</td>
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| 5-4 Fiber | Co-Chairs: Prof. Christian Hellmich, Vienna University of Technology, Austria | June 3, 10:30am-12:00pm, Room 444 Curry Center |
Water-covered crystal interfaces as source for bone viscoelasticity: arguments from a multiscale approach

Christian Hellmich and Lukas Eberhardsteiner, Vienna University of Technology, Austria

Fracture Toughness of Prefabricated Root Canal Post Interfaces

Renata Melo and Nima Rahbar
University of Massachusetts Dartmouth, North Dartmouth, MA
São Paulo State University (UNESP), São José dos Campos, São Paulo, Brazil

Structure and mechanics of intermediate filament protein materials from the molecular to macroscale

Zhao Qin and Markus J. Buehler, Massachusetts Institute of Technology, Cambridge, MA

Fibronectin forms the most extensible biological fibers displaying switchable force-exposed cryptic binding

Boston University, Boston, MA
Eidgenössische Technische Hochschule (ETH) Zürich, Zürich, Switzerland;
Institute of Robotics and Intelligent Systems, Zurich, Switzerland

Fiber Reinforced Strong Hydrogels

Animesh Agrawal, Nima Rahbar and Paul Calvert, University of Massachusetts Dartmouth, North Dartmouth, MA

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5-5 Evaluation
Co-Chairs: Prof. Justin Binder, Luis Dorfmann, Tufts University, Boston, MA
June 3, 1:15pm-2:45pm, Room 444 Curry Center

Microfluidic Western Blotting: Rapid and Automated Assessment of Disease Biomarker

Mei He and Amy E. Herr, University of California, Berkeley, CA

Atomistic and Coarse-Grain Modeling of a Collagen Type I Fibril

Alfonso Gautieri, Simone Vesentini, Alberto Redaelli and Markus J. Buehler
Politecnico di Milano, Milano, Italy.
Massachusetts Institute of Technology, Cambridge, Massachusetts

Image-based Meshfree Modeling of Cardiac Electrophysiology

Shankarjee Krishnamoorthi and William S. Klug, University of California, Los Angeles, CA

Biaxial mechanical evaluation of swine’s abdominal aorta

Wenjian Lin and Francesco Pancheri, Tufts University, Medford, MA

Mechanical behavior of arterial elastin with glycation effect

Yu Zou, Lawrence Ziegler and Yanhang Zhang, Boston University, Boston, MA

Permeability of Environmental Fluids through Swelling Clays

Dinesh R. Katti and K. S. Katti, North Dakota State University, Fargo, ND

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Symposium 6: Mechanics of Geomaterials

6-1 Soil
Co-Chairs: Prof. Majid T. Manzari, George Washington University, Washington, DC
Prof. Beena Sukumaran, Rowan University, Glassboro, NJ
June 2, 10:30am-12:00pm, Room 448 Curry Center

Using Surface Texture Measurements and Other Characteristics of Particle Morphology in Discrete Element Modeling

Stephen Thomas, Casey Hurt, John Kopmann, Nivedita Das, Alaa K. Ashmawy, Ali Daojudji and Beena Sukumaran
Rowan University, Glassboro, NJ
Weidlinger Associates, Inc., Cambridge, MA
School of Engineering, American University in Dubai, Dubai, UAE.
Laboratoire d’Etude des Microstructures et de Mécanique des Matériaux (LEMS) - UMR CNRS 7239, Université Paul Verlaine – Metz, Ile du Saucy, Metz, France.

Simulating the Grain Crushing of Gravelly Soils with Generalized Plasticity and Critical State Soil Mechanics
### 6-2 Model

**Co-Chairs:** Prof. Ching S. Chang, University of Massachusetts, Amherst, MA  
Prof. Laureano R. Hoyos, University of Texas at Arlington, Arlington, Texas  

**June 2, 1:15pm-2:45pm, Room 448 Curry Center**

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<tbody>
<tr>
<td>Thermomechanics-based constitutive models for soils</td>
<td>J. Yang and Q. Zhao, University of Hong Kong, Hong Kong, China</td>
</tr>
<tr>
<td>Modeling of Granular Material under Principal Stress Rotation</td>
<td>Ching S. Chang, Anil Misra and Kane C. Bennett</td>
</tr>
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</table>
|                                                                     | University of Massachusetts, Amherst, MA  
|                                                                     | University of Kansas, Lawrence, KS                                                                               |
| Generalized Failure Envelope for Plate Anchor under Combined In-plane Translation and Torsion | Hamidreza Nouri, Giovanna Biscontin and Charles Aubeny, Texas A&M University, College Station, TX |
| A Refined Approach to Constitutive Modeling of Unsaturated Soils    | Laureano R. Hoyos and Diego D. Pérez-Ruiz  
|                                                                     | University of Texas at Arlington, Arlington, Texas  
|                                                                     | Universidad Javeriana, Cali, Colombia                                                                             |
| A Time-dependent Anisotropic Bounding Surface Model for Clays        | Jianhong Jiang, Hoe I. Ling and Victor N. Kaliakin  
|                                                                     | Columbia University, New York, NY  
|                                                                     | University of Delaware, Newark, DE                                                                                |
| Multiscale Chemo-Thermo-Hydro-Mechanical Modeling of Early Stage Cement | Zhen Liu and Xiong (Bill) Yu, Case Western Reserve University, Cleveland, OH |

### 6-3 Analysis

**Co-Chairs:** Prof. Richard Regueiro, University of Colorado at Boulder, Boulder, CO  
Prof. Paul N. Demmie, Sandia National Laboratories, Albuquerque, NM  

**June 2, 3:15pm-5:00pm, Room 448 Curry Center**

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<tr>
<td>Peridynamic Theory: An Approach to Computational Mechanics without Spatial Derivatives</td>
<td>Paul N. Demmie, Sandia National Laboratories, Albuquerque, NM</td>
</tr>
<tr>
<td>Analysis of Undrained Cylindrical Cavity Expansion in Modified Cam Clay Critical State Soil</td>
<td>Shenali Chen and Younane N. Abousleiman, University of Oklahoma, Norman, OK</td>
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<td>Coupled Analysis of the Stress Change around the Wellbore</td>
<td>Shunde Yin, University of Wyoming, Laramie, WY</td>
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<tr>
<td>Small strain biphasic and triphasic linear and nonlinear coupled plane strain finite element analysis of partially saturated elastic soils with various effective stress definitions</td>
<td>Richard Regueiro and Jaehong Kim, University of Colorado at Boulder, Boulder, CO</td>
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A hybrid explicit-implicit algorithm for dynamic loading of jointed and particulate systems

Oleg Vorobiev and Eric B. Herbold, Lawrence Livermore National Laboratory, Livermore, CA

A Simple Method of Estimating Soil Pore Structure

Shengyan Gao, Jay N. Meegoda, and Liming Hu
New Jersey Institute of Technology, Newark, NJ
Tsinghua University, Beijing, P.R. CHINA

Symposium 7: Workshop on State of the Art Experimental Approaches for Wind Engineering and Wind Energy

7-1 Building
Co-Chairs: Prof. Suren Chen, Colorado State University, Fort Collins, CO
Prof. Arindam Gan Chowdhury, Florida International University, Miami, FL

June 3, 3:15pm-5:00pm, Room 333 Curry Center

Impact of Pore Size Distribution on Soil Suction of Clays

Annalingam Anandarajah and Priyanthi M. Amarasinghe, Johns Hopkins University, Baltimore, MD

Gas-driven subcritical crack propagation during the conversion of oil to gas

Zhigang Fan, S. E. Johnson and Z.-H. Jin, University of Maine, Orono, ME

Incorporation of the effective stress based anisotropic elastoplastic model in FLAC3D and its application in the

Sudarshan Adhikari, M. ASCE, Chung R. Song M. ASCE, Alexander H.D. Cheng F. ASCE and Ahmed Al-Ostaz M. ASCE, University of Mississippi, University, MS

Granular element method (GEM): Inferring inter-particle contact forces from advanced experimentation

Jose E. Andrade, Carlos F. Avila and Phong Le, California Institute of Technology, Pasadena, CA

Anisotropic Characterization of Pavement Foundations

Reza Ashtiani, Applied Research Associates Inc., Panama City, Florida
Dallas N. Little, Texas A&M University, College Station, Texas

Effects of Roofing Materials on Low-Rise Building Roof Peak Pressures

Ruilong Li, Arindam Gan Chowdhury, Amir Mirmiran, Florida International University, Miami, FL

The Effect of Opening Failures on Wind Loads of Residential Low-rise Building

Fang Pan, C.S. Cai, Mott Girouard, and Wei Zhang, Louisiana State University, Baton Rouge, LA

Effect of Building Morphology on Energy and Structural Performance of Mid-Rise Office Buildings

Mohamed Ali Milad Krem, Sanjay Arwade and Simi Hoque, Umass, Amherst, MA

Aerodynamic Experiments and Development of Computational Fluid Dynamics for Structural Design

DongHunYeo, Frank Lombardo, Dilip Banerjee, and Emil Simiu, National Institute of Standards and Technology, Gaithersburg, MD

A Wireless Sensors System for Measurement of Hurricane Wind Effects on Residential Structures

Chelakara Subramanian, Jean-Paul Pinelli, Ivica Kostanic, Gabriel Lapilli, Florida Institute of Technology, Melbourne, FL
High-Resolution Simulation of Dynamic Wind Pressure on Large-Scale Building Component and Cladding Systems

Yan Shen, Forrest J. Masters, University of Florida, Gainesville, FL

7-2 Bridges, Vehicle, Smart Structures

Co-Chairs: Prof. Steve Cai, Louisiana State University, Baton Rouge, LA
         Prof. Girma Bitsuamlak, Florida Intl. University, Miami, FL

June 4, 10:30am-12:00pm, Room 333 Curry Center

Time-Domain Aeroelastic Loads and Response of Flexible Bridges in Gusty Wind: Prediction and Experimental Validation

Partha P. Sarkar, and Bochao Cao, Iowa State University, Ames, IA

Experimental investigation of aerodynamic performance of long-span bridge with stochastic traffic

Suren Chen, Colorado State University, Fort Collins, CO

On the Rain-wind Induced Vibrations: A Theoretical Analysis

Shouying Li, Human University, Changsha, China & University of Notre Dame, Notre Dame, IN;
Z. Q. Chen, Hunan University, Changsha, China; A. Kareem, University of Notre Dame, Notre Dame, IN

Estimation of Aerodynamic Forces and Moments on Bridge Decks Based on Two Dimensional Velocity Fields

Wei Zhang, Louisiana State University, Baton Rouge;
Y.J. Ge, Tongji University, Shanghai, China; Steve Cai, Louisiana State University, Baton Rouge, LA

Effect of Varying Actuation Frequencies of Macro-Fiber Composites to Control Vortex-Induced Vibrations

Gustavo Munoz and Sungmoon Jung, Florida A & M University-Florida State University, Tallahassee, FL

Mobile Wind Data Acquisition with Geospatial Testing Technology and Experimental Verification

Feng Chen, Suren Chen, Colorado State University, Fort Collins, CO

7-3 Facility Development and Topics on Wind Energy

Co-Chairs: Prof. Partha P. Sarkar, Iowa State University, Ames, IA
         Dr. DongHun Yeo, National Institute of Standards and Technology, Gaithersburg, MD

June 4, 1:15pm-2:45pm, Room 333 Curry Center

Wind-Driven Rain Generation at the Wall of Wind Testing Facility

Thomas Baheru, Arindam Gan Chowdury, Girma Bitsuamlak, Florida Intl. University, Miami, FL

Wall of Wind Facility: Low-Rise Buildings Roof Pressure Validation

Tuan Chun Fu, Arindam Gan Chowdury, Girma Bitsuamlak, Ruilong Li, Aly Mousaad Aly, Florida Intl. University, Miami, FL;

Aerodynamic Analysis of a Flexible Rotating Blade

Yousef Bichiou, M. Ghommem, Virginia Tech, Blacksburg, VA;
A. Nuhait, King Al-Saud University, Riyadh, KSA;
M. R. Hajj, Virginia Tech, Blacksburg, VA

Wind Energy Harvesting using Piezoaeroelastic Systems

Abdessatar Abdelkefi, Virginia Polytechnic Institute and State University, Blacksburg, VI

Analysis and Control of Unsteady Flows past a Rotating Blade

Mehdi Ghommem, Ali H Nayfeh, and Muhammad R Hajj, Virginia Tech, Blacksburg, VA

Optimal Wind Farm Turbine Placement and Selection

Girma Bitsuamlak, Juan G. Londono-Lozano, Maryam Asghari Mooneghi, Florida Intl. University, Miami, FL

Transition Prediction in LPT Using Gamma Theta Model & Passive Control of Separation

Muhammad Aqib Chishty, Sijal Ahmed, Research Center for Modeling and Simulation, NUST, Islamabad, Pakistan

Symposium 8: Poromechanics of Thin Deformable Porous Materials, Layers, and Interfaces
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| 8       | Co-Chairs: Prof. Richard Regueiro, University of Colorado at Boulder  
          Prof. Franck Vernerey, University of Colorado at Boulder | June 4, 1:15pm-2:45pm, Room 322 Curry Center |
|         | Interaction of an Acoustic Fluid with a Poroelastic Plate-like Structure | Loris Nagler, Martin Schanz, Graz University of Technology, Graz, Austria |
|         | Finite strain biphasic poromechanical solid-shell finite element formulation | Richard Regueira, University of Colorado, Boulder, CO |
|         | Effective Elastic Moduli of Materials Containing Fluid-Filled Spheroidal Pores | Robert W. Zimmerman, Emmanuel C. David, Imperial College, London, UK |
|         | On the mechanics of interfaces in deformable porous media | Franck J. Vernerey, Louis Foucard, University of Colorado, Boulder, CO |
| 9       | Symposium 9: Fundamental Characterization of Asphaltic Materials at Multiple Scales | June 3, 10:30am-12:00pm, Room 33 Snell Library |
| 9-1     | Key-Note Address | Dallas Little, Texas A&M University, College Station, TX |
|         | 2D and 3D Microstructural Modeling of the Time-dependent, Rate-dependent, and Temperature-dependent Damage Response of Asphalt Concrete | Rashid K. Abu Al-Rub, Toesun You, Eyad A. Masad, Dallas N. Little, Texas A&M University, College Station, TX |
|         | Near-Surface Cracking Analysis due to Various Combinations of Non-Uniform Tire-Pavement Contact Stresses Using the Generalized Finite Element Method (GFEM) | Hasan Ozer, Imad L. Al-Qadi, Carlos A. Duarte, and Hao Wang, University of Illinois at Urbana-Champaign, Urbana, IL |
|         | A Physio-Mechanical Healing Model for Bitumen | Tom Scarpas, T. Pauli, N. Kringos and A. Schmets, Program of Mechanics of Infrastructure Materials, TU Delft |
| 9-2     | Moderator: Prof. M. Emin Kutay, Michigan State University, East Lansing, MI | June 3, 1:15pm-2:45pm, Room 33 Snell Library |
|         | Innovative Method of Analyzing Fracture Data from Asphalt Concrete | Andrew F. Braham, Caleb J. Mudford, University of Arkansas, Fayetteville, AR |
|         | Simulation of Micro-Crack Behavior of Asphalt Materials with EXTended Finite Element Method and Image Analysis | Kenny Ng, Qingli Dai, Michigan Technological University, Houghton, MI |
|         | Modeling to Simulate Fracture Damage in Heterogeneous and Inelastic Asphalt Mixtures Based on Rate-Dependent Cohesive Zone Fracture | Francisco Thiago S. Aragão, Yong-Rak Kim, and Mohammad H. Javaherian, University of Nebraska-Lincoln, Lincoln, NE |
|         | Development Quality Control Test Procedure for Characterizing Fracture Properties of Asphalt Mixtures | Shadi Saadah, Omer Eljairi, California State University, Long Beach, CA; Brian C. Kramer, Twining Laboratories, Long Beach, CA; Elie Y. Hajj, Western Regional Superpave Center, Reno, NV |
|         | Low Temperature Cracking of Asphalt Pavements: Fracture Initiation and Saturation | Huiming Yin, Columbia University, New York, NY |
| 9-3     | Moderator: Prof. Jo Daniel, University of New Hampshire, Conway, NH | June 3, 3:15pm-5:00pm, Room 33 Snell Library |
| 9-3 AC Mixture Performance | | |
### 9-4 AC Binder/Mastic Behaviors

**Moderator:** Yongrak Kim, University of Nebraska, Lincoln, Nebraska  
**Date:** June 4, 10:30am-12:00pm, Room 340 Snell Library

<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigation of Moisture Dissipation in Warm Mix Asphalt Using Synchrotron-Based X-Ray Microtomography</td>
<td><em>M. Emin Kutay, Hande I. Ozturk, Michigan State University, East Lansing, MI</em></td>
</tr>
<tr>
<td>Evaluation of Influential Parameters on Overlay Tester Results</td>
<td><em>James Richard Willis, Adam J. Taylor, Nam Tran, National Center for Asphalt Technology, Auburn, AL</em></td>
</tr>
<tr>
<td>Modeling Flexural Fatigue Behavior using Viscoelastic Continuum Damage Mechanics Principles</td>
<td><em>Aroind Krishna Swamy, Jo Sias Daniel, University of New Hampshire, Durham, NH</em></td>
</tr>
<tr>
<td>Characterization of the Nonlinear Viscoelastic and Viscoplastic Behavior of Asphalt Mixtures Using Repeated Creep and Recovery Tests</td>
<td><em>Chien-Wei Huang, Texas A&amp;M at Qatar, Doha-Qatar; Masoud Darabi, Rashid Abu Al-Rub, Eyad Masad, and Dallas Little, Texas A&amp;M University, College Station, TX</em></td>
</tr>
<tr>
<td>A Continuum-Based Micro-Damage Healing Model for Asphalt Concrete</td>
<td><em>Masoud K. Darabi, Rashid K. Abu Al-Rub, Texas A&amp;M University, College Station, TX; Eyad A. Masad, Texas A&amp;M University at Qatar, Doha, Qatar; Dallas N. Little, Texas A&amp;M University, College Station, TX</em></td>
</tr>
<tr>
<td>Numerical Investigation of Graded Linear Viscoelastic Materials Using Depth-Sensing Indentation</td>
<td><em>Adam Zofka, Jingle Li, Alexander Bernier, Jeong-Ho Kim, University of Connecticut, Storrs, CT</em></td>
</tr>
</tbody>
</table>

### 9-5 Pavement Performance

**Moderator:** Prof. Amit Bhasin, The University of Texas at Austin, Austin, TX  
**Date:** June 4, 1:15pm-2:45pm, Room 340 Snell Library

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>A Constitutive Model for Asphalt that Combines Linear and Nonlinear Viscoelastic Models</td>
<td><em>Philip Park, Alan Wineman, and Sherif El-Tawil, University of Michigan, Ann Arbor, MI</em></td>
</tr>
<tr>
<td>Modeling Three Dimensional Effects on the Viscoelastic Response of Asphalt Binders</td>
<td><em>Arash Motamed, Amit Bhasin, The University of Texas, Austin, TX</em></td>
</tr>
<tr>
<td>Recent Developments in Measuring and Improving Resistance of Asphalt Binders to Permanent Deformation</td>
<td><em>Hussain Bahia, Amir Golalipour, and Nima Roohi, University of Wisconsin Asphalt Group</em></td>
</tr>
<tr>
<td>Experimental Investigation into the Behavior of Asphalt Concrete at Different Length Scales</td>
<td><em>B. Shane Underwood, Y. Richard Kim, North Carolina State University, Raleigh, North Carolina</em></td>
</tr>
<tr>
<td>A micro-scale method to associate the fatigue properties of asphalt binder, mastic and mixture</td>
<td><em>Dong Wang, Linbing Wang, Virginia Tech, Blacksburg, VA</em></td>
</tr>
<tr>
<td>Estimating HMA Pavement Performance under Non-Standard Stress Distributions</td>
<td><em>Peter E. Sebaaly, Elie Y. Hajji, University of Nevada, Reno, NV</em></td>
</tr>
<tr>
<td>Investigation of Shear Stress and Field Bond Strength between Asphalt Layers to Establish Bond Strength Requirement</td>
<td><em>Nam Tran, Richard Willis, Randy West, National Center for Asphalt Technology, Auburn, AL</em></td>
</tr>
<tr>
<td>Nonlinear Anisotropic Modeling of Granular Base under a Viscoelastic Asphaltic Layer</td>
<td><em>Hao Wang, Imad L. Al-Qadi, Jaime A. Hernandez, University of Illinois at Urbana-Champaign, Urbana, IL</em></td>
</tr>
<tr>
<td>Variation in Moduli of Unbound Layer of Flexible Pavement with Moisture: toward Long Term Pavement Performance Prediction</td>
<td><em>Rosnawati Buhari, University of Nottingham, UK</em></td>
</tr>
<tr>
<td>Determination an Efficient Flexible Pavement Primary Response by Using Influence Function and Peak</td>
<td><em>Rosnawati Buhari, University of Nottingham, UK</em></td>
</tr>
<tr>
<td>Micromechanical Viscoelasto-Plastic Modeling of Rate-Dependent Permanent Deformation of Asphalt Materials</td>
<td><em>Qingli Dai, Michigan Technology University, Houghton, MI</em></td>
</tr>
</tbody>
</table>
## Student Competition Finalists

### Competition 1: Biomechanics, Biophysics and Biomaterials

**Coordinator:** Shaofan Li, The University of California, Berkeley  
**Jun. 3, 1:30-3:30 pm, 431 Stearns Center**

1. Structure and mechanics of intermediate filament protein materials from the molecular to macroscale  
   *Zhao Qin, and Markus J. Buehler, MIT, Boston, MA qinzha@mit.edu*

2. A thermodynamical model for stress-fiber organization in contractile cells  
   *Louis Foucard, University of Colorado, Louis.Foucard@Colorado.EDU*

3. Poroelasticity of Cartilage at the Nanoscale  
   *Hadi Tavakoli Nia, MIT, Boston, MA, htnia@mit.edu*

4. Mechanical behavior of arterial elastin with glycation effect  
   *Yu Zou, Lawrence Ziegler, and Yanhang Zhang, Boston University, Boston, MA, zou@bu.edu*

5. Effect of low-frequency modulation on the acoustic radiation force in soft tissues  
   *E. Dontsov, University of Minnesota, donts002@umn.edu*

6. The osteoid-bone transformation: implications for tissue elasticity  
   *Jenny Vuong, Christian Hellmich, Vienna University of Technology, Austria, jenny.vuong@tuwien.ac.at*

   *Chris Paetsch, and A. Dorfmann, Tufts University, Medford, MA, Christopher.Paetsch@tufts.edu*

### Competition 2: Computational Mechanics

**Coordinator:** Loukas Kallivokas, The University of Texas at Austin  
**Jun. 2, 1:15-2:45 pm, 433 Curry Center**

1. Multiscale fatigue life prediction model for heterogeneous materials  
   *Jacob Fish and Mahesh Baillekkanavar, Columbia University, mrb2217@columbia.edu*

2. Predicting Size and Interfacial Effects in Metallic Thin Films and Micro/Nano Pillars Using Thermodynamically Consistent Nonlocal Gradient Plasticity Theories  
   *Masoud K. Darabia, Mahmood Ettehadb, Rashid K. Abu Al-Rub, Texas A&M University, masoudbrb@neo.tamu.edu*

3. The mechanics of SWCNT aggregates studied by a novel incremental constrained minimization  
   *Lan Mengyu, and Haim Waisman, Columbia University, ml3065@columbia.edu*

4. Mesh Insensitive Formulation for the Initiation and Growth of Shear Bands  
   *Colin McAuliffe, Haim Waisman, Columbia University, New York, NY, cjm2176@columbia.edu*

5. A Simplified Contact-Friction Approach for Modeling the Deterioration Mechanism of Suspension Bridge Cables due to Corrosion in its Wires  
   *Arturo Montoya, Haim Waisman, and Raimondo Betti, Columbia University, New York, NY, ahm2113@columbia.edu*

### Competition 3: Probabilistic Methods

**Coordinator:** Sanjay Arwade, University of Massachusetts, Amherst  
**Jun. 3, 3:15-5:00 pm, Ballroom Curry Center**

Finalists TBD
Curry Student Center

Presentation Rooms

4

3

Presentation Rooms

Ballroom

Check-in

Food Rount

Other Buildings:

Jun. 1 Check-in
Lobby, 1st floor, International Village

Jun. 1 Reception:
Bamboo Garden, 2nd floor, International Village

Lunch:
Cafeteria, 1st floor, International Village

Parking:
Renaissance Garage

June 2–4, 2011, Northeastern University, Boston, MA
1. **Boston harbor islands**

The Boston Harbor Islands national park on islands within 10 miles of downtown Boston. With its many natural and cultural attractions, the park offers tourists as well as Boston residents’ unparalleled opportunities for play and learning in a spectacular ocean setting. [http://www.bostonislands.org/](http://www.bostonislands.org/)

<table>
<thead>
<tr>
<th>Start &amp; Destination</th>
<th>Route to start</th>
<th>Time to start</th>
<th>Time from start to end</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Long Wharf ferry to 2 or more islands</td>
<td>Orange line to state, switch blue line to aquarium, walk</td>
<td>25min</td>
<td>one day (Ferry 9am~4pm every hour, 35 min on boat)</td>
<td>Adult $14, Child $8</td>
</tr>
</tbody>
</table>

2. **Old town trolley tours**

Old Town Trolley Tours has provided sightseeing tours highlighting the best of Boston. The tour covers all the major areas including Downtown, Beacon Hill, Back Bay, the Theater District, and the Waterfront District. Stand on the very ground where Samuel Adams, James Otis, and other revolutionary leaders urged their fellow colonials to fight for liberty in Faneuil Hall. See the spot where the Boston Massacre occurred just outside the Old State House. Walk along the Boston Harbor where the Redcoats marched ashore in 1768. [http://www.trolleytours.com/boston/](http://www.trolleytours.com/boston/)

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<th>Time from start to end</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>Start from Faneuil Hall, 14 stops, return to Boston Common</td>
<td>Orange line to state, switch blue line to aquarium, walk</td>
<td>25min</td>
<td>One day (9am~5pm)</td>
<td>Adult $36, Child $13</td>
</tr>
</tbody>
</table>

3. **Freedom trail**

The Freedom Trail is a 2.5 mile red-brick walking trail that leads you to 16 nationally significant historic sites, everyone an authentic American treasure. Preserved and dedicated by the citizens of Boston in 1958, when the wrecking ball threatened, the Freedom Trail today is a unique collection of museums, churches, meeting houses, burying grounds, parks, a ship, and historic markers that tell the story of the American Revolution and beyond. [https://store.thefreedomtrail.org/index.asp?PageAction=VIEWCATS&Category=2](https://store.thefreedomtrail.org/index.asp?PageAction=VIEWCATS&Category=2)

Interactive map: [http://www.iboston.org/FT.htm#trailStart](http://www.iboston.org/FT.htm#trailStart)

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<th>Time from start to end</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>1. From Boston Common to Faneuil Hall; 2. From Faneuil Hall to Boston Common; 3. From Boston Harbor and North End</td>
<td>1. Orange line to downtown crossing, walk; 2. Orange line to state, walk; 3. Orange line to state, walk</td>
<td>20min</td>
<td>90 min each; 1. 11 am, 12 Noon, 1 pm, 3:30 pm and 4:30 pm Daily; 2. 10:30 am Daily; 3. 1:30 pm Daily</td>
<td>Adult $12, Child $6 (do not include admission fee to Freedom Trail sites)</td>
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</tbody>
</table>

4. **Duck Tours**

You’ve never toured Boston in anything that comes close to Boston Duck Tours. The fun begins as soon as you board your “DUCK”, a W.W.II style amphibious landing vehicle. First, you’ll be greeted by one of our legendary tour ConDUCKtors, who’ll be narrating your tour. Then you’re off on a journey like you’ve never had before. You’ll cruise by all the places that make Boston the birthplace of freedom and a city of firsts, from the golden-domed State House to Bunker Hill and the TD Banknorth Garden, Boston Common and...
Copley Square to the Big Dig, Government Center to fashionable Newbury Street, Quincy Market to the Prudential Tower, and more. And, as the best of Boston unfolds before your eyes, your ConDUCKtor will be giving you lots of little known facts and interesting insights about our unique and wonderful city.


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<tr>
<th>Start &amp; Destination</th>
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<th>Time to start</th>
<th>Time from start to end</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>1. Start from and end at Prudential Center, 36 sites; 2. Start from and end at Museum of Science, 36 sites; 3. Evening tour: Start from and end at New England Aquarium, 22 sites</td>
<td>1. green line to Prudential; 2. green line to Science Park; 3. Orange line to state, switch blue line to aquarium</td>
<td>10–20min</td>
<td>1. 80 min; 2. 80 min; 3. 55 min</td>
<td>Adult $29.95 Child $20 For Evening Tour: Adult $25.95 Child: $17</td>
</tr>
</tbody>
</table>

5. Whale watching
Boston Harbor Cruise’s Whale Watch cruise is both an unforgettable and educational experience. Our professional researchers from the Whale Center of New England, the region’s foremost authority on whale populations, are onboard for every trip to provide narration. They’ll teach you about everything from whale behavior and migration patterns to the local ecology so you can better understand our deep-sea friends.

http://www.bostonharborcruises.com/boston-whale-watch/default.aspx?gclid=CN7j7diYyZoCFQ0lFPodln3y2w

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<tr>
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<th>Time from start to end</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Start from and end at Long Wharf ferry</td>
<td>Orange line to state, switch blue line to aquarium</td>
<td>25min</td>
<td>3 hours</td>
<td>$39.95 $31.95</td>
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<td></td>
<td></td>
<td></td>
<td>Weekdays - 10:00AM &amp; 12:00PM</td>
<td>Adult $39.95 Child $31.95</td>
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<td></td>
<td></td>
<td>Saturdays - 10:30AM, 12:30PM, 2:30 PM &amp; 5:30 PM</td>
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<td></td>
<td></td>
<td></td>
<td>Sundays - 8:30AM, 10:30AM, 12:30 PM &amp; 2:30 PM</td>
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Number 6 to number 11 are included in the City Pass. The price for adult is $44 and for child is $28.

6. New England Aquarium
Step inside the New England Aquarium and Experience more than 70 exhibits, featuring animals from around the world. Stand in awe of the four-story, 200,000-gallon Giant Ocean Tank, home to everything from sea turtles to sharks to tropical fish. Cradle a sea star, horseshoe crab or sea urchin at the Edge of the Sea Tide pool. Experience an unforgettable IMAX 3D film on Boston’s largest screen.

<table>
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<tr>
<th>Route to start</th>
<th>Time to start</th>
<th>Address and Website</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>Orange line to state, switch blue line to aquarium</td>
<td>25min</td>
<td>Address: Central Wharf Boston, MA 02110 <a href="http://www.neaq.org/">http://www.neaq.org/</a> index.php</td>
<td>Adult $19.95 Child $11.95</td>
</tr>
</tbody>
</table>

7. Museum of Fine Arts
Come to Museum of Fine Arts, Boston and see masterpieces from around the world and across the ages. At every turn, you’ll find breathtaking works of art – from masterworks of American painting to icons of Impressionism, and from exquisite Asian scrolls to ancient Egyptian mummies. There are thousands of reasons to visit.

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<th>Cost</th>
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<tbody>
<tr>
<td>Walk 1 mile</td>
<td>20min</td>
<td>Address: Ave of the Arts 465 Huntington Ave, Boston, MA 02115, <a href="http://mfa.org/">http://mfa.org/</a></td>
<td>Adult $17 Child $6.5</td>
</tr>
</tbody>
</table>
Tour Information

8. Museum of Science
Science comes alive with over 700 interactive exhibits, live animal presentations, science demonstrations, ever-changing exhibits, the breathtaking Theater of Electricity, and more. Other features at the Museum of Science (requiring separate admission) include a brand new 3D Digital Cinema, the Butterfly Garden, the Charles Hayden Planetarium, and the Mugar Omni Theater – New England’s only 180 degree IMAX dome screen.

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<tbody>
<tr>
<td>Green line to Science Park</td>
<td>20min</td>
<td>Address: Science Park Boston, MA 02114 <a href="http://www.mos.org/">http://www.mos.org/</a></td>
<td>Adult $19</td>
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<td>Child $16</td>
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</table>

9. Skywalk Observatory
The Skywalk Observatory is Boston’s only sky-high vantage point for sweeping 360 degree views of Greater Boston and beyond. Offering the best view of the city, the Skywalk Observatory is the ideal place to begin your tour of Boston. The Skywalk is located on the 50th floor of the Prudential building in the heart of Boston’s Back Bay. Acquaint yourself with all of Boston’s neighborhoods from 750 feet in the air! Your Antenna Audio Tour will guide you through your visit, teaching you about all of Boston’s interesting facts and historical landmarks.

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<tbody>
<tr>
<td>green line to Prudential</td>
<td>10min</td>
<td>Address: 800 Boylston St, Boston, MA 02115 <a href="http://www.topofthehub.net/">http://www.topofthehub.net/</a></td>
<td>Adult $12</td>
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<td>Child $8</td>
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</table>

10. Harvard Museum of Natural History
Explore 12,000 specimens from around the globe, including dinosaurs, meteorites, gemstones and hundreds of animals—all at Harvard University’s most-visited museum. Get close to the world’s only mounted Kronosaurus, a 42 ft-long marine reptile. See a 1,642-lb. amethyst geode and whale skeletons. Don’t miss the world famous exhibit of 3,000 “Glass Flowers”.

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<tbody>
<tr>
<td>Orange line to downtown crossing, switch to red line to Harvard Square, Walk</td>
<td>40min</td>
<td>Address: 26 Oxford St, Cambridge, MA 02138 <a href="http://hmnh.harvard.edu/">http://hmnh.harvard.edu/</a></td>
<td>Adult $9</td>
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<td>Child $6</td>
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11. John F. Kennedy Presidential Library and Museum
At the John F. Kennedy Presidential Library and Museum, step back into the re-created world of the early 1960s and experience first-hand the life and legacy of John and Jacqueline Kennedy through 25 exhibits, 3 theaters and 20 video presentations. Designed by I.M. Pei, the national memorial offers panoramic views of Boston’s skyline and Harbor islands.

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<th>Cost</th>
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<tbody>
<tr>
<td>Orange line to downtown crossing, red line to JFK/UMASS, Shuttle bus</td>
<td>40min</td>
<td>Address: Columbia Point, Boston, MA 02125 <a href="http://www.jfklibrary.org/">http://www.jfklibrary.org/</a></td>
<td>Adult $12</td>
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<td>Child free</td>
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Tour Information

June 2-4, 2011, Northeastern University, Boston, MA
The Organizing Committee thanks our Exhibitors for their support, and urges all participants to visit the Exhibits and to discuss the Exhibitors’ products and services with them.

LeMessurier Consultants
http://www.lemessurier.com

INFRASENSE, Inc.
http://www.infrasense.com/

OZ Optics
http://www.ozoptics.com/

Campbell
http://www.campbellsci.com/

ADMET
http://www.admet.com/

Geokon, Inc.
http://www.geokon.com/

Kessler Soils Engineering (KSE)
http://www.kesslerdcp.com

Trilion Quality Systems
http://www.trilion.com/

Olson Instruments, Inc.
http://www.olsoninstruments.com/

Instron®
http://www.instron.com/