

SEM XII International Congress & Exposition on Experimental & Applied Mechanics

Measurement Challenges for New Structures and Materials



June 11-14, 2012 • Hilton Orange County • Costa Mesa, CA

International Student Paper Competition

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SEM will hold its 21st International Student Paper Competition at the XII International Congress. Participation in the Competition is open to all graduate and undergraduate students, worldwide. Watch for the Competition announcement on the XII Congress page of the SEM Web site: <http://sem.org/CONF-AC-TOP.asp>

2012 SEM Exposition

Reserve your booth space now!

A comprehensive Exposition of testing and analysis equipment will be a highlight of the XII International Congress. Please contact Joni Normandin to reserve your booth today: (860) 484-4387 • joni@sem1.com

Abstracts Due: October 17, 2011

Track 1: **DYNAMIC BEHAVIOR OF MATERIALS**

Sponsored by: SEM Dynamic Behavior of Materials Technical Division

Organized by: Vijay Chalivendra, *University of Massachusetts Dartmouth*; Bo Song, *Sandia National Laboratories*; Daniel Casem, *U.S. Army Research Laboratory*

A growing number of military, industrial, and academic engineering problems are addressing the response of materials that have been subjected to dynamic loading. SEM continues to support this growing research area and is sponsoring this track to provide a forum for the open exchange of information among researchers interested in the dynamic behavior and response of materials. Technical contributions in the following general areas are sought:

- Dynamic Behavior of Composites (co-sponsored with Composites TD)
- Dynamic Behavior of Geo-materials
- Dynamic Fracture & Failure of Materials
- Dynamic Response of Brittle Materials
- Dynamic Testing of Micro Systems
- Inverse Techniques for Dynamic Fracture (co-sponsored with Inverse Methods TD)
- Low Impedance Materials
- Multi-Scale Modeling of Dynamic Behavior of Materials
- Novel Testing Techniques
- Optical Methods for High-strain Rate Testing (co-sponsored with Optical Methods TD)
- Shock and Blast Loading of Materials

CALL FOR PAPERS

Track 2: CHALLENGES IN MECHANICS OF TIME-DEPENDENT MATERIALS AND PROCESSES IN CONVENTIONAL AND MULTIFUNCTIONAL MATERIALS

Sponsored by: SEM Time Dependent Materials and Composite, Hybrid and Multifunctional Materials Technical Divisions

Organized by: Bonnie Antoun, *Sandia National Laboratories*; H. Jerry Qi, *University of Colorado*; Richard Hall, *Air Force Research Laboratory*; G.P. Tandon, *University of Dayton Research Institute*; Hongbing Lu, *University of Texas-Dallas*; Charles Lu, *University of Kentucky*

With weight and volume considerations driving most military as well as commercial aeronautical system developments, there is recent emphasis on the possibilities of performing multiple functions within a material system. Multifunctional material systems also hold promise to enable improved performance and perhaps cost benefits relative to larger systems possessing the same functionalities. Multifunctional materials may be viewed as an expansion of the concept of composite materials. Needs exist to design, manufacture and model such materials, as well as demonstrate their performance benefits relative to conventional composites and monolithic materials. Simultaneously, needs continue to exist to properly characterize the time-dependent behaviors of conventional materials, for use in product designs of various types. Recent developments have emphasized the importance of scale in both designing and modeling of material systems either applied at small scales or deriving critical properties from small scale attributes, often requiring modeling innovations to capture the associated larger-scale attributes. As an example, new aerospace vehicles of reduced (e.g. bird) size are being explored, with consequent materials challenges, and heretofore unexplored aerodynamic difficulties which create opportunities for new materials applications and performance characteristics.

We are soliciting papers involving constitutive, time (rate)-dependent behavior of all materials, including modeling of the mechanics of processing/fabrication. The materials systems' time-dependent mechanical responses should be non-negligible in cases involving non-mechanical fields.

Papers dealing with modeling and experimental aspects of the subject area are sought. A wide range of topics are solicited and organized. Papers in the following general technical research areas are included:

- Challenges in Time-dependent Behavior Modeling in Metallic and Polymeric Materials at Low, Moderate and High Strain Rates, and Effects of Frequency and Hysteretic Heating
- Challenges in Time-dependent Behavior Modeling in Composite, Hybrid and Multifunctional Materials—Viscoelastoplasticity and Damage
- Effects of Inhomogeneities on the Time-dependent Behaviors of Metallic, Polymeric and Composite Materials
- Effects of Interfaces and Interphases on the Time-dependent Behaviors of Composite, Hybrid and Multifunctional Materials
- Environmental and Reactive Property Change Effects on Thermomechanical and Multifunctional Behaviors
- Modeling and Characterization of Fabrication Processes of Conventional and Multifunctional Materials
- Time-dependent and Small-scale Effects in Micro/Nano-scale Testing

Possible topics include, but are not limited to: characterization and modeling of behavior at multiple scales; viscoelasticity, viscoplasticity; transport, chemically and electronically active processes; multiphase and biomaterial systems; thermodynamics; shape memory; mechanics of testing; dynamic rate-dependent behaviors; large deformations; residual stresses; time (rate)-dependent damage and failure; time (rate)-dependent polycrystalline, single crystal and nanocrystalline behaviors; multifunctional materials; mechanics of processing; design methods; environmental interactions; experimental methods and techniques; nanoindentation; linear and non-linear time-dependent behavior; time (rate)-dependent composite materials of all types; numerical analysis; physical aging; rheological properties; temperature, pressure, and moisture effects on time dependence; damping; related topics.

Track 3: IMAGING METHODS FOR NOVEL MATERIALS AND CHALLENGING APPLICATIONS

Sponsored by: SEM Optical Methods and Applied Photoelasticity, Thermomechanics & InfraRed Imaging, and Biological Systems & Materials Technical Divisions

Organized by: Helena Jin, *Sandia National Laboratories California*; Cesar Sciammarella, *Illinois Institute of Technology*; Cosme Furlong, *Worcester Polytechnic Institute*; Sanichiro Yoshida, *Southeastern Louisiana University*

With the advancement in the imaging instrumentation and lighting resources, as well as in the image processing technology, imaging methods have gained wide applications across the experimental mechanics society during the past decade. These applications include study of varieties of materials, such as metals, composites, MEMS, nanomaterials, soft and bio-materials. The measurements cover wide range of spatial and temporal resolutions. The imaging techniques have been developed using various light sources such as coherent light, infrared and X-ray in addition to white light.

As new materials and applications arise, conventional imaging methods often have certain limitations. Development of novel imaging methods is necessary to meet new challenges. The goal of this track is to provide a platform for researchers to exchange ideas and to encourage cross-fertilization of various disciplines. This track will cover a wide range of imaging techniques and their applications in different fields.

The following general topics are included:

- Advances in Imaging Technology
- Applied Photoelasticity
- Digital Holography and Experimental Mechanics
- Digital Image Correlation
- Imaging Methods Applied to Biomaterials and Soft Materials
- Imaging Methods for Thermomechanics Applications
- Modeling and Numerical Analysis in Optical Methods
- Optical Measurement Systems Using Polarized Light
- Optical Methods for Dynamic Tests
- Optical Metrology and Displacement Measurement at Different Scales
- Optical Techniques in MEMS and NEMS
- Three-dimensional Imaging and Volumetric Correlation

Track 4: EXPERIMENTAL AND APPLIED MECHANICS

Organized by: Carlos E. Ventura, *University of British Columbia*; Wendy C. Crone, *University of Wisconsin-Madison*; Cosme Furlong, *Worcester Polytechnic Institute*

Experimental and Applied Mechanics covers the wide variety of subjects that are related to the broad field of experimental or applied mechanics. Both research and application papers are requested. Papers will be organized into sessions based on a specific discipline. Technical contributions in the following general areas are sought:

- Applications
- Applied Photoelasticity
- Civil Structures Testing
- Composite Materials
- Education
- Fracture and Fatigue
- Hybrid Techniques
- Inverse Problems
- Measurements and Modeling
- Modal Analysis/Dynamic Systems
- Model Validation
- Optical Methods
- Research in Progress
- Residual Stress
- Sensors and Instrumentation
- Structural Testing
- Thermomechanics & InfraRed Imaging
- Uncertainty Quantification

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2nd INTERNATIONAL SYMPOSIUM ON THE MECHANICS OF BIOLOGICAL SYSTEMS AND MATERIALS

Sponsored by: SEM Biological Systems & Materials Technical Division

Organized by: Bart Prorok, *Auburn University*; François Barthelat, *McGill University*; Chad Korach, *State University of New York (SUNY) at Stony Brook*; K. Jane Grande-Allen, *Rice University*; Elizabeth Lipke, *Auburn University*; George Lykofatits, *University of Connecticut*; Pablo Zavattieri, *Purdue University*

This symposium is aimed at providing a forum to foster the exchange of ideas and information among scientists and engineers involved in the research and analysis of how mechanical loads interact with the structure, properties and function of living organisms and their tissues. The scope includes experimental, imaging, numerical and mathematical techniques and tools spanning various length and time scales. Establishing this symposium at the Annual Meeting of the Society for Experimental Mechanics provides a venue where state-of-the-art experimental methods can be leveraged in the study of biomechanics. A major goal of the symposium is for participants to collaborate in the asking of fundamental questions and the development new techniques to address bio-inspired problems in society, human health, and the natural world.

The organizers seek abstracts related to the potential session topics listed below.

- Bio Fluidics
- Bio-Inspired Education
- Bio-Inspired Materials and Biomimetic Composites
- Biological Kinematics
- Biomimetics
- Cell Mechanics
- DIC Methods for Soft Materials
- Fracture and Fatigue of Biomaterials
- Imaging Methods in Biological Materials
- Indentation Methods in Biological and Soft Materials
- Inverse Methods Applied to Biological Systems and Materials
- Materiomics
- Mechanics of Biomolecules
- Mechanics of Cardiovascular Materials
- Mechanics of Green Materials
- Mechanics of Hard Biological Tissues
- Mechanics of Hydrogels
- Mechanics of Natural Fibers and Fibrils
- Mechanics of Soft Biological Tissues
- Mechanics of Tissue Damage
- MEMS for Biological Applications
- Nanomechanics in the Natural World
- Simulation and Modeling in Biological Structures and Tissues
- Smart, Reconfigurable Biomaterials
- Tissue Engineering

13th INTERNATIONAL SYMPOSIUM ON MEMS AND NANOTECHNOLOGY

Sponsored by: SEM MEMS & Nanotechnology Technical Division

Organized by: Gordon A. Shaw, *National Institute of Standards and Technology*; Barton Prorok, *Auburn University*; LaVern A. Starman, *Air Force Institute of Technology*

Microelectromechanical systems (MEMS) and Nanotechnology are revolutionary enabling technologies. Spanning the size scale from single atoms and molecules to macroscopic integrated systems, these technologies merge the functions of sensing, actuation, and controls with computation and communication to affect the way people and machines interact with the physical world. This is done by integrating advances in various multidisciplinary fields to produce very small devices that use very low power and operate in many different environments. Today, developments in MEMS and Nanotechnology are being made at an unprecedented rate, driven by both technology and user requirements. These developments depend on micromechanical and nanomechanical analyses, and characterization of structures comprising nanophase materials.

To provide a forum for an up-to-date account of the advances in the fields of MEMS and Nanotechnology and to promote an alliance of governmental, industrial, and academic practitioners, SEM initiated a Symposium Series on MEMS and Nanotechnology. The 2012 Symposium will be the thirteenth in the series and will address pertinent issues relating to design, analysis, fabrication, testing, optimization, reliability, and applications of MEMS and Nanotechnology, especially as these issues relate to experimental mechanics of the microscale and nanoscale structures. Papers are sought in the following and related areas:

- Bio MEMS
- Design, Analysis, and Fabrication Methods
- In Situ and Self Test Methods
- MEMS and Nanotechnology for Medical Applications
- Measurement Challenges in Metrology and Standards for MEMS and Nanotechnology
- Metamaterials
- Micro/Nano Tribology
- Nanomechanics and Nanomechanics
- Nanoindentation
- Nanoindentation of Soft Materials
- Novel applications of MEMS and NEMS
- Novel materials, their characterization, and applications
- Optical Methods for MEMS and Nanotechnology
- Residual Stress
- Sensors and Actuators
- Single Molecule Mechanical Testing
- Size Effects in Metals
- Terahertz Components

1ST INTERNATIONAL SYMPOSIUM ON JOINING TECHNOLOGIES FOR COMPOSITES

Sponsored by: SEM Composite Materials Technical Division

Organized by: Eann Patterson, *University of Liverpool*; David Backman, *National Research Council Canada*; Gary Cloud, *Michigan State University*

As composite materials have moved from smaller scale applications to wider acceptance in larger scale application areas such as automotive or aerospace structures, the need for improved joining of composites has become increasingly important. While the design of the composite laminate is important, it is the ability to join sections of composite together that is the enabling technology for building larger structural elements.

Composite joining technologies in the past have been widely grouped into mechanical joining or adhesive joining. Increasingly, joint optimization has required combinations of the two methods as well as introducing innovative new methods such as composite welding that provide high strength and light weight. Hybrid composite joints which allow the joining of composites to monolithic or other classes of material are another important technology that will increase the use of composites in many application areas. Today, developments in composite joining technologies are being made at a rapid rate, driven by both technology and user requirements.

To provide a forum for an up-to-date account of the advances in the field of composite joining technologies and to promote an alliance between governmental, industrial, and academic practitioners, SEM has agreed to initiate a *Symposium Series on Joining Technologies for Composites*. The 2012 Symposium will be the first of a potential series and will address pertinent issues relating to design, analysis, fabrication, testing, optimization, reliability, and applications of composite joints, especially as these issues relate to experimental mechanics of both the macroscale and microscale structures.

Papers are sought in the following and related areas:

- Adhesive Joining of Composites
- Advanced Composite Joining Methods
- Composite Joint Failure Mechanisms
- Design, Analysis, and Fabrication Methods
- Fatigue and Fracture of Composite Joints
- Hybrid Joining Methods (composite to monolithic)
- Joining of Hybrid Composite Materials
- Macroscale Strain and Stress Measurements of Adhesive Interfaces in Composite Joints
- Mechanical Joining of Composites
- Structural Analysis of Full Scale Composite Structures
- Structural Performance of New Adhesive Bonding Systems
- Structural Performance of New Mechanical Joining Systems

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June 11-14, 2012

Location

SEM's XII International Congress & Exposition will be held at the Hilton Orange County/Costa Mesa in Costa Mesa, California, USA. Details about the location can be found on the SEM Web site, <http://sem.org>. Contact the hotel directly for reservations:

Hilton Orange County/Costa Mesa

3050 Bristol Street, Costa Mesa, CA 92626

tel: (714) 540-7000

fax: (714) 540-9176

www.orangecountycostamesa.hilton.com

Rates: single/double \$139+, triple \$149+, quad \$159+ (Taxes currently 8.11%)

Hotel Deadline: May 17, 2012

Hilton Orange County/Costa Mesa is located in the heart of Southern California's most popular attractions near excellent dining, famous beaches, championship golf, and world famous shopping. 3 miles from John Wayne Orange County Airport (SNA) • 20 miles from Long Beach Airport (LGB) • 39 miles from Los Angeles International Airport (LAX)

Complimentary Shuttle Service to John Wayne OC Airport • Complimentary Shuttle Service to South Coast Plaza Shopping Resort • 24 Hour Security • Pets up to 75 lbs are Welcome • Hilton Honors Program • 24 Hour Business Center • High Speed Wireless Internet in Guestrooms

Submit abstracts online by October 17, 2011

ELECTRONIC SUBMISSIONS

SEM accepts only electronic submissions. Details about submitting abstracts and the electronic submission form are on the SEM Web site: <http://sem.org>

Accepted papers will also be received electronically, per guidelines on the SEM Web site, and Conference Proceedings will be published electronically via Springerlink.

Please submit a short abstract of the paper (not more than 200 words) electronically by October 17, 2011. Do not include photos or equations in your abstract. Abstract submissions for the MEMS Symposium must include 5 keywords.

Please Note: Once you have successfully submitted your abstract, a confirmation message will appear on the screen. **YOU WILL ALSO RECEIVE AN EMAIL MESSAGE ACKNOWLEDGING YOUR SUBMISSION AND CONTAINING ADDITIONAL INFORMATION REGARDING CHANGES TO YOUR SUBMISSION.** If you have questions or concerns about abstract submittal, please contact SEM at 203-790-6373 or shari@sem1.com.

Authors will be notified, via email, whether the abstract has been accepted or not by December 16, 2011. Accepted authors will be required to submit the finished paper electronically by March 14, 2012. NOTE: If you have not received notification regarding your abstract by January 3, 2012 please contact Jen Tingets or Shari Matthews at 203-790-6373, or shari@sem1.com.

Presentation slots in the final program are guaranteed only for authors who submit a written paper by March 14, 2012.