Conference on Smart Materials, Adaptive Structures & Intelligent Systems (SMASIS)

September 19-21, 2012
Stone Mountain, Georgia

PROGRAM
Dear SMASIS Attendee,

We welcome you to the fifth annual meeting of the ASME Smart Materials, Adaptive Structures, and Intelligent Systems Conference (SMASIS). As in the years past, our goal is to provide a friendly, casual forum for the exchange of ideas and latest results. Our sincere appreciation goes to all the presenters for choosing to share their very best work at this conference.

SMASIS is divided into eight symposia which span basic research, applied technological design and development, and industrial and governmental integrated system and application demonstrations:

• SYMP 1 Development and Characterization of Multifunctional Materials
• SYMP 2 Mechanics and Behavior of Active Materials
• SYMP 3 Modeling, Simulation and Control of Adaptive Systems
• SYMP 4 Integrated System Design and Implementation
• SYMP 5 Structural Health Monitoring/NDE
• SYMP 6 Bio-inspired Materials and Systems
• SYMP 7 Energy Harvesting
• SYMP 8 Structural and Materials Logic

Each year we strive to grow and offer new experiences. This year we are excited to introduce a new symposium on Energy Harvesting, which has quickly matured from a special track in previous years to an independent symposium for the first time. The subject cuts across fields by studying different materials, ranging from piezoelectrics to electroactive polymers, as well as by emphasizing different energy sources from wind to waves and ambient vibrations. Modeling, experimental studies, and technology applications all belong to the symposium topics.

This conference also features a special symposium dedicated to DARPA’s Structural and Materials/Logic program. The program seeks to enable structural systems to adapt to varying loads and simultaneously exhibit both high stiffness and high damping. Symposium 8 will include presentations of results in four dedicated sessions.

We have two sessions to honor the ASME Adaptive Structures Prize winner, Norman Wereley of the University of Maryland, who will deliver his award presentation along with related papers in those sessions.

We believe in sustaining our best practices, so back by popular demand is the Networking Luncheon where you can renew connections with old friends and establish new networks with old and young alike, and the Smart Trivia Lunch where you can put your pub-style skills to the test! We also have exhibits on Wednesday with participating companies including Parker Hannifin Corp., Dynalloy, Inc., GE Global Research and SAGE Publications Ltd. Thursday night’s “Georgia on my Mind” pioneer banquet is in a very special location: the Georgia Aquarium in Atlanta. Apart from great food, the dinner will feature spectacular views of aquatic wildlife through large viewing windows surrounding our banquet room. We hope that these social events provide you the opportunity to expand your own personal community and broaden your horizons.

One of the on-going strengths of SMASIS is the strong Student and Young Professional Development group. Highlights of their symposium are the two student competitions on Wednesday with the Best Paper Competition in the morning and Hardware Competition in the afternoon. Additionally, several student events are planned to provide networking opportunities including the Student Mentoring Luncheon, Line Dancing and Game Night. We are very proud that our students and young professionals are always seeking ways to give back to the community. This year they are reaching out to students from three local high schools, who will be introduced to the field of smart materials and inspired by the Hardware Competition exhibits. The students are also organizing the Smart Trivia and Bingo Lunches. Please take advantage of these opportunities to see our rising stars, and to meet your future colleagues and our future leaders!

The planning for this conference has been a significant team effort by two technical committees, the ASME Aerospace Division Adaptive Structures and Material Systems Branch and the AIAA Adaptive Structures Technical Committee. Our executive committee provided tremendous support and guidance and we could not have proceeded without all the contributions of the symposium chairs, co-chairs, and organizing committees. Our thanks go to them for assembling such outstanding technical programs. We also recognize all the authors, keynote and invited speakers, and panel participants who are the major contributors to the success of SMASIS. Finally, we have received generous support from our sponsors: General Motors, Dynalloy, Inc., Parker Hannifin, Teledyne Scientific & Imaging, IOP Publishing, Sage Publishing, NextGen Aeronautics, National Science Foundation, Air Force Office of Scientific Research and GE Global Research, all of which is sincerely appreciated.

We want to thank each of you for participating in this event and coming back each year with your best work. To those of you we know personally, we look forward to seeing you again. And to those of you we have yet to meet, we look forward to making your acquaintance and to insightful technical discussions.

Sincerely,

Stefan Seelecke
General Conference Chair

Nancy Johnson
Technical Chair

Andrei Zagrai
Technical Co-Chair
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ACKNOWLEDGEMENT

The ASME Conference on Smart Materials, Adaptive Structures, and Intelligent Systems is sponsored by the Aerospace Division of the American Society of Mechanical Engineers with cooperating support from the American Institute of Aeronautics and Astronautics, Inc.

HOTEL

Experience a Georgia Resort only 16 miles from downtown Atlanta and a million miles from ordinary at the stunning Evergreen Marriott Stone Mountain Resort. Nestled in the delicate beauty of Stone Mountain Park. Surrounded by 3,200 acres of natural wooded splendor, this AAA 4 diamond resort allows guests to enjoy exciting recreational activities from championship golf to 4D Theater shows. Encounter pure tranquility as you indulge in rejuvenating Atlanta resort spa treatments or take in the picturesque scenery of Stone Mountain Park from spacious accommodations. Discover a sense of personal adventure from the majestic beauty of Stone Mountain Park.

REGISTRATION

Registration is located in the Foyer. The hours are:

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NAME BADGES

Please wear your name badge at all times. Admission to all conference functions is on a badges-only basis (unless noted otherwise). Your badge also provides a helpful introduction to other attendees.

TICKETED FUNCTIONS/ITEMS

You can gain entrance to all social functions by wearing your conference badge. Additional tickets purchased for your spouse and/or guests can be found in your registration packet.

CONFERENCE CD

The 2012 SMASIS Conference CD is included in your registration fee. Please be sure to pick up your copy when you check in at the registration table.

TAX DEDUCTIBILITY

The expenses of attending a professional meeting, such as registration fees and costs of technical publications, are tax deductible as ordinary and necessary business expenses for US citizens. However, recent changes in the tax code have affected the level of deductibility.

HANDICAPPED REGISTRANTS

Whenever possible, we are pleased to make arrangements for handicapped registrants. Advance notice may be required for certain requests. For on-site assistance, please visit the registration area and ask to speak with a conference representative.

HAVE QUESTIONS ABOUT THE MEETING?

If you have any questions or need assistance, speak to an ASME representative, located in the registration area.
BREAKFAST
Daily 7:00am–8:00am  
SALON FOYER

Each morning prior to the start of the technical sessions, breakfast will be held and all conference attendees are welcome! Immediately following the breakfast, will be the daily keynote presentation. See the Keynote Section of this program for more details about the individual plenary sessions taking place.

EXHIBITS
Wednesday, September 19  
7:30am–6:00pm  
SALON D

Take advantage of the opportunity to visit the booths of the leading industries in the field that are making it happen! Experts will be on hand to talk with you from Parker Hannifin, GE Global Research, Dynalloy, Inc, and SAGE Publications Ltd.

PANEL DISCUSSION
Wednesday, September 19  
9:00am–10:30am  
RHODODENDRON

Collaborating for Accelerated Solutions  
Chair: Rashi Tiwari, Dow Chemical

Collaboration has become an integral and crucial factor for personal as well as professional growth. Both industry and academia are moving towards collaborative projects and research for accelerated growth. This session brings together leaders from industry and academia to share their experiences and discuss tools and techniques for collaboration.

LUNCH
Networking Lunch  
Wednesday, September 19  
12:30pm–2:00pm  
WATERSIDE RESTAURANT

Come and network with your colleagues from around the world. Students will be given the opportunity to have lunch with professionals from academia, government, and industry who can answer questions and provide guidance in taking the right steps leading to a rewarding and successful future career.

Bingo Lunch  
Thursday, September 20  
12:15pm–1:45pm  
WATERSIDE RESTAURANT

Test your knowledge of the energy sector with Energy Bingo. The relaxed lunch will highlight the new symposium on energy harvesting with a casual game of Energy Bingo led by the Students and Young Professionals.

SMART Trivia Lunch  
Friday, September 21  
12:30pm–2:00pm  
Deck & Rotunda

Participate in a Spiritedly Memorable Amazingly Riveting non-Technical (SMART) trivia lunch led by the Students and Young Professionals. Participants are encouraged to form multicultural, inter-generational teams by sitting at the same lunch table. A quizmaster will guide the teams through a multi-round “Pub” style trivia competition which covers a wide array of non-technical topics.

INTO THE WOODS RECEPTION
Wednesday, September 19  
6:00pm–8:00pm  
DECK/ROTUNDA

Join us by going Into the Woods at the exotic Evergreen Marriott Stone Mountain Resort.

GEORGIA ON MY MIND PIONEER BANQUET
Thursday, September 20  
6:00pm–10:00pm (buses depart 4:45pm–5:00pm)  
GEORGIA AQUARIUM

Take part in a wonderful dinner while touring the world’s largest aquarium. With more than 10 million gallons of water, the Georgia Aquarium has more aquatic life than any other aquarium. The six distinct galleries within Georgia Aquarium depict different aquatic habitats, ranging from arctic to tropical waters, featuring the largest collection of aquatic animals.

The ASME Adaptive Structures and Material Systems Technical Committee will honor their 2012 award recipients along with the best student papers and hardware from the SMASIS conference.

The aquarium is located in downtown Atlanta. Bus transportation will be provided which will depart from the Evergreen Marriott between 4:45pm and 5:00pm. Upon the conclusion of the banquet buses will return to the hotel.

Note: A ticket is required for guests/spouses.

GAME NIGHT
Thursday, September 20  
10:00pm–12:00am  
STONEWALL’S LOUNGE/POOL AREA

Keep the party going at the post-banquet game night. Everyone is welcome to mingle while playing board, outdoor chess, and card games at the Evergreen Marriott Resort. Hosted by the Students and Young Professionals.
Micropatterned Artificial “Gecko” Surfaces: A Path to Switchable Adhesive Function

**Eduard Arzt**

INM – Leibniz Institute for New Materials and Saarland University
Saarbrücken, Germany

Wednesday, September 19, 2012
8:00am–9:00am SALON D

**Keynote Abstract:** 3D micropatterning of surfaces signifies a recent paradigm change for control of surface functionalities: the exploitation of cleverly designed surface protrusions, “fibrils” and other features at the micron scale – as in insects, spiders and geckos – to create fundamentally new degrees of freedom for mechanical and other surface functions. We have over the last decade investigated the natural example in real geckos and derived the main principle of temporary adhesion: that of “contact splitting” according to which fine microcontacts increase adhesion by intermolecular forces. Our current emphasis is on controlling adhesion and friction, which is of great potential interest in microfabrication, biomedical industry, construction industry, and sports equipment. This talk will summarize our recent developments in producing bio-inspired micropatterned polymer surfaces: i) fundamental effects of feature size, shape and materials parameters, ii) design of active surfaces that exploit a transition from an adhesive to non-adhesive state and iii) first implementation in active pick-and-place systems. Our overall objective is to develop, by experiment and theory, new surface materials with innovative properties, e.g. for active adhesive, medical, optical and tactile (haptic) functions.

**Biography:** Eduard Arzt is scientific director and chairman of INM – Leibniz Institute for New Materials in Saarbrücken, Germany, and Professor for New Materials at Saarland University. A native of Austria, he studied physics and mathematics at the University of Vienna, Austria, and obtained his PhD there in 1980. After a postdoctoral fellowship at Cambridge University, UK, and leading a research group in Stuttgart, Germany, he became director at the Max Planck Institute for Metals Research with a joint appointment as Professor of Metals Physics at the University of Stuttgart (1990-2007). He was visiting professor at Stanford University (1989) and at the Massachusetts Institute of Technology (1996) and has spent sabbaticals at the University of California, Santa Barbara and San Diego. His research fields range from basic metals physics, high-temperature alloy development, mechanics of small-scale materials and components to bio-inspired systems especially micro/nanopatterning of polymer surfaces. Arzt is the recipient of many awards, including the Max Planck Research Award (with W. D. Nix of Stanford University), the Acta Materialia Outstanding Paper Award, and the Leibniz Prize, the highest German science award. Recently, he has delivered the John Dorn Lecture at Northwestern University, the Lee Hsun Lecture at the Chinese Academy of Sciences in Shenyang and the Pollak Science Lecture at the Technion – Institute of Technology, Haifa, Israel. He is a corresponding member of the Austrian Academy of Science and member of the German Academy of Science Leopoldina. The Institute for Scientific Information lists him as a highly cited materials scientist.

The Diverse and Growing Family of Carbon Nanotube and Related Artificial Muscles

**Ray H. Baughman**

The Alan G. MacDiarmid NanoTech Institute
University of Texas at Dallas

Thursday, September 20, 2012
8:00am–9:00am SALON D

**Keynote Abstract:** Collaborative work with colleagues at the University of Texas at Dallas, the University of Wollongong, the University of British Columbia, and Hanyang University has expanded the family of carbon nanotube artificial muscles from our original double-layer driven tensile muscles to pneumatic muscles, fuel driven muscles, giant stroke aerogel muscles, and even muscles that provide torsional actuation. These muscles, as well as carbon nanotubes muscles demonstrated by others, are here described. Extreme performance is demonstrated, like for our aerogel muscles that generate giant strokes and stroke rates of 220% and 3.7 x 104 %/s, respectively, from near 0 K to over 1900 K; electrochemical muscles that generate a hundred times the tensile stress of natural muscle; and torsional muscles that rotate at up to 600 revolutions per minute and provide a hundred times higher rotation per unit length than previous torsional muscles. The properties of these electrically powered muscles, and related fuel powered muscles, are described and theoretically explained.

**Biography:** Ray Baughman became the Robert A. Welch Professor of Chemistry and Director of NanoTech Institute at the University of Texas in Dallas in August 2001, after 31 years in industry. He is a Member of The National Academy of Engineering and The Academy of Medicine, Engineering and Science of Texas; a Fellow of the American Physical Society and the Royal Society of Chemistry; an Academician of The Russian Academy of Natural Sciences; an Honorary Professor of four universities in China; and is on editorial or advisory boards of Science, Materials Research Letters, the International Journal of Nanoscience, and the Encyclopedia of Nanoscience and Nanotechnology. Ray has 68 issued US patents and over 330 refereed publications with over 19,600 citations. He has received the Chemical Pioneer Award of the American Institute of Chemists (1995), the Cooperative Research Award in Polymer Science and Engineering (1996), the New Materials Innovation Prize of the Avantex International Forum for Innovative Textiles (2005), Nano 50 Awards from Nanotech Briefs Magazine for Carbon Nanotube Sheets and Yarns (2006) and for Fuel Powered Artificial Muscles (2007), the NanoVic Prize from Australia (2006), the Scientific American Magazine 50 recognition for outstanding technological leadership (2006), the CSIRO Metal for Research Achievement (2006), the Chancellor’s Entrepreneurship and Invention Award (2007), 21 for the 21st Century Award (2007), the Alumni Distinguished Achievement Award of Carnegie Mellon University (2007), the Kapitza Medal of the Russian Academy of Natural Sciences (2007), the honorary 2010 Grafen Lectureship of the American Carbon Society, the Tech Titans award in education (2011), and Time Magazines “50 Best Inventions of the Year” (2011). Listed 30th in the Top 100 Material Scientists of the Decade (2000-2010). In 2010, he became the Honorable Yang Shixiang Professor of Nankai University and the Honorable Tang Aoqing Professor of Jilin University.
The Direct Conversion of Heat to Electricity using Multiferroic Materials with Phase Transformations

Richard James
University of Minnesota

Friday, September 21, 2012
Time: 8:00am–9:00am

Keynote Abstract: We present a new method for the direct conversion of heat to electricity using the recently discovered multiferroic Heusler alloy, Ni45Co5Mn40Sn10. This alloy undergoes a martensitic phase transformation from a nonmagnetic martensite phase to a strongly ferromagnetic austenite phase upon heating. The method rests on two scientific developments: a) a general alloying strategy to achieve exceptionally low hysteresis in materials that undergo big first order phase transformations, and b) a growing understanding on how to achieve an abrupt change of a magnetoelectric property at a phase transformation. When the alloy Ni45Co5Mn40Sn10 is biased by a permanent magnet, heating through the phase transformation causes a sudden increase of the magnetic moment to a large value. As a consequence of Faraday’s law of induction, this drives a current in a surrounding circuit. No separate electrical generator is needed. Theory predicts that under optimal conditions the performance compares favorably with the best thermoelectric devices. The method is adapted to energy conversion at small ∆T, suggesting a possible route to the conversion of the vast amounts of energy stored on earth at small temperature difference.

Biography: Richard D. James is Distinguished McKnight University Professor at the University of Minnesota. He has a Sc.B. in Engineering from Brown University and a Ph.D. in Mechanical Engineering from the Johns Hopkins University. He has authored or co-authored over 100 articles, has given 35 plenary and named lectureships, and was awarded the Humboldt Senior Research Award (2006/7), the Warner T. Koiter Medal from ASME (2008), the William Prager Medal from the Society of Engineering Science, and the Brown Engineering Alumni Medal (2009). James’ current research concerns the study of “Objective Structures”, an alternative way of looking at the structure of matter, and the direct conversion of heat to electricity using phase transformations in multiferroic materials.
SYMPOSIUM 1: DEVELOPMENT AND CHARACTERIZATION OF MULTIFUNCTIONAL MATERIALS

Description: This symposium presents recent advances in the development of multifunctional materials, such as polymers, ceramics, metals, composites, multiferroics, nanostructured materials, new materials systems, etc. Specifically, the focus is on materials that play a structural role and simultaneously exhibit a non-structural functionality such as sensing, actuation, memory, self-healing. New formulations and enhancement of multifunctional properties of existing active materials such as ferroelectric, electrostrictive, shape memory, magnetostrictive, photostrictive, chemosctrictive and others will revolutionize a wide field of applications in aerospace, transportation, energy, communications and biomedical sectors. The symposium seeks to provide cross-disciplinary forum for academic, government, and industry professionals to share and contribute to understanding of physical, chemical, mechanical, electrical and biological properties and phenomena of multifunctional materials.

Chair: Zoubeida Ounaies, Texas A&M University
Co-Chair: Hani E. Naguib, University of Toronto
Co-Chair: Henry A. Sodano, University of Florida

Organizing Committee: Pavel Chaplya (SNL), Mehrdad Gasemi Nejhad (University of Hawaii), Hiroshi Asanuma (Chiba University), Kam Leang (UNR), Kwang Kim (UNR), Karla Mossi (VCU), Don Leo (VA Tech), Nakhiah Goulbourne (Univ. Michigan), Vishnu Baba Sundaresan (VCU), Henry Sodano (Univ. Fl)

INVITED LECTURES

Enabling Nanoparticle Networking in Semi-Crystalline Polymer Matrices

Meisha L. Shofner
Georgia Institute of Technology

Wednesday, September 19
9:50am–10:30am SALON F

Abstract: Among the physical and chemical attributes of the nanocomposite components and their interactions that contribute to the ultimate material properties, nanoparticle arrangement in the matrix is a key contributing factor which has been targeted through materials choices and processing strategies in numerous previous studies. Often, the desired nanocomposite morphology contains individually dispersed and distributed nanoparticles. In this research, a phase segregated morphology containing nanoparticle networks was studied. A model nanocomposite system composed of calcium phosphate nanoparticles and a poly(3-hydroxybutyrate) matrix was produced to understand how polymer crystallization and crystal structure can facilitate the formation of a phase segregated morphology containing nanoparticle networks. The nanocomposites were characterized to establish the effects of component interactions on the polymer structure. The results of this research suggest that when the nanocomposite components are not strongly interacting, polymer crystallization may be used as a forced assembly method for nanoparticle networks.

Biography: Dr. Meisha L. Shofner is an Assistant Professor in the School of Materials Science and Engineering at Georgia Institute of Technology, joining the faculty following post-doctoral training at Rensselaer Polytechnic Institute. She received her B.S. in Mechanical Engineering from The University of Texas at Austin and her Ph.D. in Materials Science from Rice University. Prior to beginning graduate school, she was employed as a design engineer at FMC in the Subsea Engineering Division, working at two plant locations (Houston, Texas and the Republic of Singapore), and she is a registered Professional Engineer in Georgia. Dr. Shofner currently serves as the secretary of the TMS Composite Materials Committee and as a member of ASME’s Nanotechnology for Energy and Sustainability Steering Committee. At Georgia Institute of Technology, Dr. Shofner’s research group is concerned with structure-property relationships in polymer nanocomposite materials and with producing structural hierarchy in these materials for structural and functional applications. This research has been recognized by the Ralph E. Powe Jr. Faculty Enhancement Award from Oak Ridge Associate Universities and the Solvay Advanced Polymers Young Faculty Award.
Recent Developments in Polymer/Carbon Nanotube Composite Films and Fibers

Satish Kumar
Georgia Institute of Technology

Wednesday, September 19
2:00pm–2:40pm SALON F

Abstract: Polymer/carbon nanotube composite films and fibers have been processed using polymers such as polyacrylonitrile (PAN), polyvinyl alcohol (PVA), poly (methyl methacrylate) (PMMA), poly(ether ether ketone) (PEK) and biopolymers such as DNA, silk, and cellulose. Single wall carbon nanotubes, multi wall carbon nanotubes, as well as vapor grown carbon nano fibers have been used in these studies. Composite films have been processed that contain up to 90% carbon nanotubes and continuous fibers have been processed that contain up to 30 wt% carbon nanotubes. Carbon fibers from PAN/CNT precursors containing 1 wt% CNT have been processed that show 50% improvement in tensile modulus and strength as compared to the fibers containing no CNTs. Carbon nanotubes act as a template for polymer orientation and nucleating agent for polymer crystallization. Broader implications of this observation in polymer and fiber processing are just beginning to be realized. Polymer/CNT films and fibers are also being evaluated for their thermal and electrical conductivity, as well as for their energy storage capacity as electrochemical supercapacitor electrode.

Biography: Satish Kumar, Professor of Materials Science and Engineering at Georgia Institute of Technology. He received his Ph.D. degree from Indian Institute of Technology, New Delhi, India and obtained his post-doctoral experience in Polymer Science and Engineering under the tutelage of Professor R. S. Stein at University of Massachusetts, Amherst. He conducted research as a foreign collaborator at C.E.N.G., Grenoble France. During 1984-89, he was associated with the Polymer Branch at the Air Force Research Laboratory, WPAFB OH as an onsite contractor through Universal Research Institute. He joined Georgia Institute of Technology in 1989. His current research and teaching interests are in the areas of structure, processing, and properties of polymers, fibers, and composites with an emphasis on polymer-carbon nanotube nano-composites. He has conducted fiber processing and structure-property studies on a broad range of polymers including synthetic and natural polymers, as well as carbon fibers. Areas of research interest also include carbon nanotubes ability to nucleate polymer crystallization as well as its ability to template polymer orientation. He is also conducting research on carbon based electrochemical supercapacitors, with the objective of enhancing their energy density.

Active Microvascular Composites: Shape Memory Polymers

Nakhiah Goulbourne
University of Michigan

Friday, September 21
10:00am–10:40am SALON F

Abstract: In recent years, supramolecular chemistry has been utilized to tune the intermolecular interactions of soft polymers. Of significant interest, is the coupling of distinct physical fields with a mechanical response particularly large deformations and conformational changes. Soft shape memory polymers (SMPs) are active materials that undergo very large deformations to form different shapes in response to various external stimuli. Most notably, the ‘memory’ function enables the material to go from a temporary shape to a recalled original shape, recovering nearly 100% of the deformation. To date both chemically cross-linked and physically cross-linked polymer systems have been synthesized. Chemically crosslinked polymers consisting of a combination of two networks, involving a supramolecular crosslink and a reversible chemical crosslink, provide a mechanism to change molecular conformation and shape with the delivery of ions, pH change, or light in a reversible fashion. Biological systems have highly vascularized networks that deliver internal triggers to activate a variety of processes. This observation has been leveraged to date to investigate synthetic interpenetrating vascular channels for self-healing and active cooling in passive polymers. We introduce a class of novel active materials that use vascular networks containing physically or chemically functionalized fluids to enable polymer activation i.e. shape change. The vascular networks can be used to both heat and cool the polymer during a shape memory cycle. We have demonstrated internal activation of shape memory polymers by means of an interpenetrating network. This work illustrates the potential of vascular networks to revolutionize the area of active materials by leveraging molecular scale activity to the macroscale. An integrated mechanism via an embedded vascular network can functionalize and selectively activate stimuli responsive polymers. Efforts to model shape memory behavior have taken a macroscopic continuum approach to date. In this talk, a new physics-based approach is combined with molecular dynamics simulations to describe polymer behavior in the rubbery regime. We show that the model is able to capture finite deformation behavior with a simple analytical form and only three parameters.

Biography: Dr. Nakhiah Goulbourne has been an Assistant Professor at the University of Michigan since 2009. Previously, she was a faculty member at Virginia Polytechnic Institute and State University. Dr. Goulbourne is the director of the Soft Materials Research Lab at the University of Michigan. Her group has specific focus on the mechanics of soft polymers, biological membranes, and hybrid composites with the ultimate goal of providing feedback for material synthesis through early integration of science and engineering. She has made important contributions in the area of electroactive polymers through her work on dielectric elastomers, ionic polymer transducers, and more recently shape memory polymer composites. She has authored 15 journal publications, over 25 conference papers and a book chapter. She has garnered significant support for her research, which includes receiving the NSF CAREER award in 2008. She has a Bachelor’s degree in Physics from Middlebury College and received her M.S. and Ph.D. degrees from the Pennsylvania State University.
SYMPOSIUM 2: MECHANICS AND BEHAVIOR OF ACTIVE MATERIALS

Description: The symposium on “Active Materials, Behavior and Mechanics” focuses on experimental characterization, modeling, and application of field coupled material behavior, typically used for actuation and sensing purposes. Materials and effects considered include ferroelectric, electrostrictive, ferromagnetic, magnetostriective, electro-optic materials, electroactive polymers and electrets, liquid crystal polymers, thermo-mechanical and ferromagnetic shape memory alloys, shape memory polymers, multiferroic composite materials, and any other type of material exhibiting multi-field coupling, may they be solid or liquid, bulk or thin film, monolithic or composites. Methods, experimental and theoretical, covered by the symposium include advanced constitutive measurements, micro- and nano-characterization, micromechanical modeling, phase field modeling, multi-scale and multi-physics material models, finite element implementations, as well as atomistic and ab-initio modeling techniques. Typical issues are improved understanding of properties, enhancement of performance and design, reliability, such as aging, fatigue, and fracture as well as novel applications. The particular intent of this symposium is to provide a broad umbrella for an enhanced mutual transfer of experimental research results, modeling methods, and experience among different fields of application.

Chair: John Huber, University of Oxford
Co-Chair: Travis Turner, NASA Langley Research Center
Co-Chair: Iain Anderson, Auckland Bioengineering Institute, New Zealand

Organizing Committee: Kaushik Bhattacharya (CalTech), Marcelo Dapino (Ohio State), Christian Elsaesser (Aachen), John Huber (University of Oxford), Yongzhong Huo (UCLA), Dimitris Lagoudas (Texas A&M), Chad Landis (University of Texas), Jiangyu Li (University of Washington), Chris Lynch (UCLA), Etienne Patoore (ENSAM Metz), Klaus Prume (aixACCT Aachen), Srinivasan Sivakumar (IIT Madras), Wenbin Yu (Utah State Unv), Akhilesh Jha (Next Gen)

INVITED LECTURES

Diffraction of Ferroelectrics During Electric Field Application: Comprehensive Results of Lattice Strain, Domain Wall and Interphase Boundary Motion in Traditional and Emerging Compositions

Jacob L. Jones
University of Florida

Wednesday, September 19
2:00pm–2:40pm SALONA

Abstract: In situ X-ray and neutron scattering measurements have seen recent pervasive application in the field of ferroelectrics. This is largely attributed to the development of new diffraction instruments, data acquisition electronics, and ancillary equipment at scattering facilities throughout the world. In this talk, we review recent experimental results using these approaches to study domain wall and lattice responses during application of weak electric fields similar to those applied during measurement of property coefficients. In all cases, direct measurements of the average contribution from the lattice (e.g., piezoelectric) and the motion of intragranular interfaces (e.g., domain walls, phase boundaries) are used to interpret the electromechanical coupling behaviour under high fields (strain-field hysteresis) and weak fields (property coefficients).

It is first observed that the electric-field-induced lattice strain in donor-modified lead zirconate titanate (PZT) is dominated by domain wall motion contributions, suppressing piezoelectric distortions of the lattice. In contrast, the response of acceptor-modified PZT and tetragonal BaTiO3 under similar conditions is not as strongly dominated by domain walls. The lead-free composition Ba(Zr0.2Ti0.8)O3-x(Ba0.7Ca0.3)TiO3 is shown to exhibit significantly enhanced domain wall motion contributions at compositions approaching the morphotropic phase boundary (i.e., 0.5), correlating with the very high d33 of 620 pC/N. The high-temperature piezoelectric ceramic 0.36PbTiO3-0.64Bi4ScO11 (BS-64PT) also exhibits significant domain wall motion, contributing to the high d33 of 460 pC/N. In BS-64PT, we also demonstrate several additional structure-property relationships including an explanation for the origin of the field-amplitude- and frequency-dependence of the property coefficients and characterization of deaging, or a progressive movement of the average degree of domain alignment backwards during the property measurements.

Experiments were completed at the European Synchrotron Radiation Facility, and Advanced Photon Source, the Spallation Neutron Source at ORNL, and OPAL at the Australian Nuclear Science and Technology Organisation. Support from the National Science Foundation under award numbers DMR-0746902 and OISE-0755170 and the U.S. Department of the Army under W911NF-09-1-0435 are gratefully acknowledged.

Biography: Jacob Jones is an Associate Professor in the Department of Materials Science and Engineering at the University of Florida with research interests in ferroelectric and piezoelectric ceramics, mechanical behavior of materials, and crystallography. He has published over 70 papers on these topics since 2004 and his research has been supported by the National Science Foundation, the Army Research Office and various industrial and other laboratory.
Emergent SPM Modes and Their Application to Energy and Memory Materials

Sergei V. Kalinin
Oak Ridge National Laboratory

Wednesday, September 19
4:00pm–4:40pm SALON A

Abstract: Piezoresponse Force Microscopy (PFM) has emerged as a powerful tool to characterize piezoelectric, ferroelectric and multiferroic materials on the nanometer level. Much of the driving force for the broad adoption of PFM has been the intense research into piezoelectric properties of thin films, nanoparticles, and nanowires of materials as dissimilar as perovskites, nitrides, and polymers. Recently, electromechanical detection was also demonstrated in imaging ionic materials for energy conversion and storage and non-volatile memory applications, a technique referred to as electrochemical Strain Microscopy (ESM). Recent recognition of limitations of single-frequency PFM and ESM, notably topography-related cross-talk, has led to development of novel solutions such as band-excitation (BE) methods. In parallel, the need for quantitative probing of polarization dynamics has led to emergence of complex time- and voltage spectroscopies, often based on acquisition and analysis of multidimensional data sets. In this perspective, we discuss the recent developments in multidimensional PFM, and offer several examples of spectroscopic techniques that provide new insight into polarization dynamics in ferroelectrics and multiferroics. We further discuss potential extension of PFM/ESM for probing ionic phenomena in energy generation and storage materials and devices, including reversible ionic dynamics in solid-oxide fuel cell materials and batteries and irreversible phenomena in Li-ion electrolytes and LAO-STO systems. Notably, many of the bias phenomena can be observed in “classical” perovskites, and guidelines for differentiating piezoelectric and electrochemical phenomena are discussed for materials such as TiO$_2$ and SrTiO$_3$. Finally, future developments based on in-situ electron microscopy combined with PFM/ESM are discussed.
Dielectric Elastomers for Giant Voltage-Induced Deformation of Actuation and Renewable Energy Harvesting

Christoph Keplinger
Harvard University

Friday, September 21
9:00am–9:40am

Abstract: Dielectric elastomer actuators are developed for a wide range of applications, including artificial muscles, electrically deformable lenses for tunable optics and Braille displays. Due to superior or complementary properties compared to parallel technologies, dielectric elastomer generators show promise for harvesting of mechanical energy from small to large scales. The first part of the presented work is focused on the most conspicuous feature of dielectric elastomer actuators: giant voltage-induced deformation of actuation. The deformation of elastic membranes induced by voltage is limited to about 60% in terms of area strain by an electromechanical instability normally leading to electric failure of the device. Two methods to exceed this limit are presented: Firstly, electrode free dielectric elastomer actuators are introduced. They are operated with electrical charges, which are sprayed onto the elastomer surface originating from a high voltage corona discharge. This technique avoids the electromechanical instability. Experimental evidence of giant voltage-induced deformation is provided. The absence of electrodes allows for transparent designs and applications in optics, which is demonstrated with an electrically tunable lens. Secondly, a principle is introduced that allows for exceeding the deformation limits of the electromechanical instability with conventional voltage controlled actuators based on off-the-shelf materials. The developed principle of operation allows for safely harnessing electromechanical instabilities. With a commercially available acrylic elastomer, voltage-induced expansion of area by 1692% is demonstrated, well beyond the largest value reported in the literature. The second part of the presented work is focused on dielectric elastomer generators. One of the most essential and urgent challenges for research is to identify or design materials with ideally suited properties. Therefore a theoretical description of dielectric elastomer generators is established that allows for accurately assessing the aptitude of different materials for energy harvesting applications. In a comparison of a commonly used elastomer with natural rubber, the cheap, abundant and sustainable rubber is revealed to have favorable properties, especially for energy harvesting applications where the maximum strain of operation is limited due to durability considerations. Natural rubber is subject to further analysis with an experimental setup that is developed to measure the specific electrical energy generated per cycle, the mechanical to electrical energy conversion efficiency and the specific average power of different materials. In a comparison between a commonly used acrylic elastomer (3M™ VHB™ 4910) and a commercially available natural rubber membrane (Zrunek™ZruElast™A1040), the natural rubber outperforms the acrylic membrane with respect to each monitored figure of merit.

Biography: Christoph Keplinger is a Postdoctoral Research Fellow at Harvard University, where he is a member of the Suo and Whitesides Research Groups. His current research interests include renewable energies, sustainability, soft active materials (particularly dielectric elastomer actuators and generators) and soft robots. Dr. Keplinger earned his Ph.D. degree in Physics from the Johannes Kepler University of Linz in the Department of Soft Matter Physics, headed by Prof. Siegfried. His awards include the Award of Excellence (2011) and the Award for Outstanding Young Scientists (2011) both from Austrian government agencies and the Wilhelm Macke Award (2009) from the Wilhelm Macke Foundation.

Bioinspired Electroactive Skin

Xuanhe Zhao
Duke University

Friday, September 21
4:00pm–4:40pm

Abstract: In this talk, we will present novel polymer skins (or coatings) that can dynamically change their morphology under applied electrical voltages. The working mechanism for the polymer skins is a new type of voltage-induced instability recently discovered in our group. Subject to an electric voltage, a substrate-bonded polymer film initially remains flat and smooth. Once the voltage reaches a critical value, regions of the polymer surface locally fold against themselves, giving a variety of patterns including creases, craters and lines. The dynamic interactions of the patterns with environment can lead to novel applications such as antifouling, transfer printing and camouflage. Inspirations from biological systems are particularly helpful in studying the electroactive skins and their applications, and thus will be shared with the audience.

Biography: Xuanhe Zhao received his PhD in Mechanical Engineering from Harvard University in 2009, MS in Materials Engineering from University of British Columbia in 2006, and BE in Electrical Engineering from Tianjin University in 2003. Upon finishing a postdoctoral training in Biomedical Engineering at Harvard, in 2010, Zhao joined the faculty of Duke University, and established the Soft Active Materials Laboratory (SAMs Lab). Prof. Zhao’s research is motivated by new materials and phenomena emerging on the interface between engineering and biology.
SYMPOSIUM 3: MODELING, SIMULATION AND CONTROL OF ADAPTIVE SYSTEMS

Description: This symposium discusses dynamic modeling, simulation, and control aspects of smart material systems and structures. Topics include modeling, analysis, control, and experiments for active/passive dynamic and static structural systems in the presence of dissipative, gyroscopic, or nonlinear effects. Structural vibration, damping and acoustics of diverse application areas in aeronautical, space, marine, transportation, and civil structures are covered. Control of integrated systems consisting of structures coupled with advanced actuators, sensors, and processing can be achieved through passive, active, and hybrid approaches. The scope of the symposium ranges from system level dynamics and control of smart structures to development and modeling of new actuation, motion control and sensing techniques for integrated systems and recent advances in dynamic modeling and vibration control issues in micro/nanoscale smart structures and systems (MEMS and NEMS).

Chair: Ralph Smith, North Carolina State University
Co-Chair: Alper Erturk, Georgia Institute of Technology
Co-Chair: Eugenio Dragoni, University of Modena and Reggio Emilia – DISMI

Organizing Committee: Siamak Arzanpour (Simon Fraser University Canada), Mohammad Ayoubi (Santa Clara University), Giovanni Berselli (University of Bologna Italy), Frederick T. Calkins (Boeing), Alexander Czechowicz (Ruhr-University Bochum Germany), Mohamed Daqaq (Clemson University), Eugenio Dragoni (University of Modena and Reggio Emilia Italy), Alper Erturk (Georgia Institute of Technology), Jae-Hung Han (KAIST Korea), Fernando Goncalves (Lord Corporation), Haluk Karaca (University of Kentucky), Jeong-Hoi Koo (Miami University), The Nguyen (University of Minnesota), Eric Ruggiero (GE Global Research), Michael Seigler (University of Kentucky), Rocco Vertechy (University of Pisa Italy), Eric Williams (Virginia Polytechnic Institute and State University).

INVITED LECTURES

Recent Development of Shape Memory Alloys and Engineering Actuator Applications

**Francesco Butera**
SAES Getters SpA

Wednesday, September 19
4:00pm–4:40pm SALONE

**Abstract:** Shape Memory Alloys present a mature technology serving a lot of industrial applications, especially in the automotive, consumer electronics, household appliances and building automation sectors. Many products show the intrinsic advantages of this smart material, such as miniaturization, simplification, high performance, structural integration and cost reduction. In the last 2 years industrial applications have increased dramatically and nowadays engineers are starting to design using this technology as a good alternative as controllable actuators. In this review several commercial products will be presented. For further expanding the market of the engineering products, the main challenges for the near future is the continuous improvement of the alloys; especially high temperature deformable alloys are needed to be developed for future micro-actuators. Recent development of such high temperature alloys will be also reviewed.

**Biography:** Francesco Butera has a degree in electronics engineering at the University of Palermo, specializing in microelectronics at IRST in Trento. Until 2005 he was responsible for the Mechatronics group at Fiat Research Centre. During that period he carried out activities on development of active components based on smart materials for automotive and industrial applications. In 2006 he was in charge of Saes Getters as project manager of the Shape Memory Alloys business area. His responsibility was related to the industrialization of Shape Memory Alloys and the product development phase from research to industrial component. Since 2008 he has been business manager of the SMA business unit for industrial applications in the SAES Getters Group and since 2011 he has been chief commercial officer of Actuator Solutions GmbH, a joint venture between SAES and AlfaMere, aiming at SMA devices development and production for high volume applications. In the last 5 years he filed more than 30 patents in the area of components based on smart materials. He attends several international conferences and symposia on shape memory alloys and actuators, and is an invited speaker and chair at the SMST – Shape Memory and Superelastic Technology conference.
Wireless Mechanical Adaptivity: Photomechanical Effects in Azobenzene-Functionalized Polymeric Materials

Timothy J. White
Air Force Research Laboratory

Abstract: Employing light to direct functional responses in photoresponsive polymeric materials and composites is potentially advantageous as it is wireless and extremely rapid. Furthermore, the intensity, phase, and polarization of light can be easily modulated into complex spatial patterns with holography (intensity or polarization) or masking (intensity or phase). Deriving from these foundational properties of light, photoresponsive macromolecular systems exhibit exceptional potential to yield rapid and highly engineered macroscopic as well as spatially selectable mechanically adaptive responses useful as soft actuators or topographical surfaces in aerospace, automotive, and biomedical applications. This talk will discuss our recent work generating both shape fixing (shape memory) and shape restoring (elastic) responses in a variety of photoresponsive polymeric materials. Particular emphasis will be placed on the generation of topographical features in liquid crystalline polymer networks.

Biography: Timothy J. White received a B.A. in Chemistry in 2002 from Central College and a Ph.D. in Chemical and Biochemical Engineering in 2006 from the University of Iowa. He currently is a research engineer for the U.S. Air Force at the Air Force Research Laboratory in the Materials and Manufacturing Directorate. His research currently focuses on photoresponsive materials, including cholesteric liquid crystals and liquid crystal polymers.

Adaptive Sparse Grid Generalized Stochastic Collocation Methods for UQ of High-Dimensional Predictive Simulations

Clayton G. Webster
Oak Ridge National Laboratory

Abstract: Our modern treatment of predicting the behavior of physical and engineering problems relies on mathematical modeling followed by computer simulation. The modeling process becomes the prediction of statistical moments (mean value, variance, covariance, etc.) or even the whole probability distribution of some responses of the system (quantities of physical interest), given the probability distribution of the input random data. For higher accuracy, the computer simulation must increase the number of random variables (stochastic dimensions), and expend more effort approximating the quantity of interest within each individual dimension. The resulting explosion in computational effort is a symptom of the curse of dimensionality. Adaptive sparse grid generalized stochastic collocation (gSC) techniques yield non-intrusive methods to discretize and approximate these higher dimensional problems with a feasible amount of unknowns leading to usable methods.

It is the aim of this talk to survey the fundamentals and analysis of an adaptive sparse grid (gSC) method utilizing both global polynomial approximations and local multi-resolution wavelet decompositions. We will present both a priori and a posteriori approaches to adapt the anisotropy of the sparse grids to applications of both linear and nonlinear stochastic PDEs. Rigorously derived error estimates, for the fully discrete problem, will be described and used to compare the efficiency of the method with several other techniques. Numerical examples illustrate the theoretical results and are used to show that, for moderately large dimensional problems, the adaptive sparse grid gSC approach is extremely efficient and superior to all examined methods, including Monte Carlo.

Biography: Clayton Webster is a mathematician at the level of Senior Research Scientist at Oak Ridge National Laboratory. He is also jointly appointed in the Department of Computational Science at Florida State University. Previously, Dr. Webster was the Manager of Quantitative Analysis at NextEra Energy Resources, Power Trading LLC. Before that, he was awarded the John von Neumann Fellowship by the Department of Energy at Sandia National Laboratories. Clayton currently leads the Uncertainty Quantification effort at ORNL in the Computer Science and Mathematics Division and is also affiliated with the Consortium for Advanced Simulation of Light Water Reactors (CASL). He and his collaborators have published several of the most cited numerical analysis papers in the field of uncertainty quantification. Clayton currently serves on the editorial board of both the International Journal for Uncertainty Quantification and the SIAM Journal on Uncertainty Quantification.
**SYMPOSIUM 4: INTEGRATED SYSTEM DESIGN AND IMPLEMENTATION**

**Description:** This symposium focuses on the design, development and implementation of adaptive structures and material systems for a wide range of prototypical and/or commercializable applications. Research in the fundamental understanding and characterization of smart materials, with a particular emphasis on improving design capabilities and/or commercial viability, are encouraged. Novel and emerging technologies enabling the design and development of prototypical and integrated systems are a key focus. These technologies may include devices (sensors and actuators), multifunctional system elements, and architectural elements (such as packaging or control algorithms). Papers focused on existing and emerging applications of smart materials and devices, as well as advanced technologies for integrated systems applications for automotive, aerospace, industrial, civil, and consumer products, are encouraged.

**Chair:** Norman Wereley, University of Maryland  
**Co-Chair:** Eric Ruggiero, GE Global Research

**Organizing Committee:** Alan Browne (General Motors), Dan Clingman (Boeing), Chris Henry (HRL), Jonathan Luntz (University of Michigan), Charles Seeley (General Electric), Porter Davis (Honeywell), Greg Reich (Air Force Research Lab), Ron Barrett (University of Kansas).

**INVITED LECTURES**

**A Lightweight Thermal Energy Recovery System Based on Shape Memory Alloys: A DOE ARPA-E Initiative**

**Alan L. Browne**  
**GM R&D**

Friday, September 21  
10:00am–10:40am  
SALON G

**Abstract:** Over 60% of energy that is generated is lost as waste heat with close to 90% of this waste heat being classified as low grade being at temperatures less than 200ºC. As an example of the magnitude of this energy loss, automobiles consume nearly 13 million barrels of oil daily in the U.S. alone with nearly 50% of the fuel energy being expelled as waste heat in the exhaust and coolant streams. Many technologies such as thermoelectric have been proposed as means for harvesting this lost thermal energy. Among them, that of SMA heat engines, appears to be a strong candidate for converting low grade thermal output to useful mechanical work given that its operating temperature range matches that of low grade waste heat. Unfortunately, though proposed initially in the late 1960's and the subject of significant development work in the 1970's, significant technical roadblocks have existed preventing this technology from moving from a scientific curiosity to a practical reality. This paper/presentation provides an overview of work performed on SMA heat engines under the US DOE ARPA-E initiative. It begins with a review of the previous art, covers the identified technical roadblocks to past advancement, presents the solution path taken to remove these roadblocks, and describes significant breakthroughs made during the just completed two year contract. The presentation concludes with details of the current functioning prototype, which, being able to operate in air as well as fluids, dramatically expands the operational envelop and makes significant strides towards the ultimate goal of commercial viability.

As indicated, included in this presentation will be details of our specific approach and advances that have been achieved. On a higher level, in this project we developed a shape memory alloy (SMA) heat engine capable of providing over 1 W/g of SMA, which is a significant advancement over the state of the art in solid-state thermal energy recovery systems (e.g. a 10 times improvement over thermoelectrics). It is felt that our heat engine design improves on past designs through better understanding of material behavior, the use of system and material analytical models, the use of recent and continuing improvements in narrow hysteresis SMA, and the design of an innovative energy conversion element that improves convective heat transfer to increase operating frequency. In terms of specifics, a rotary thermal engine was developed based on heating SMA looped around pulleys. SMA heat engines convert thermal energy directly into mechanical work. The alloy functions as a solid-state energy conversion element by recovering strain on the order of 4% through a reversible thermal phase transformation. Thermal contraction of the SMA creates torque from which power can be extracted by a generator.

Of importance, application is in no way limited to the capture of automotive waste heat. This technology can be spun off to other sectors, harvesting thermal energy from any sources, whether commercial, residential, or environmental, where small temperature differences exist, even down to 10 to 20°C and is sufficiently simple in execution to be retrofitted readily to existing waste heat sources.

**Biography:** Dr. Browne received his A.B. degree magna cum laude from Harvard College in 1966 and a PhD degree in Mechanical Engineering from Northwestern University in 1971. He has been employed as a research engineer at GM R&D for 41 years and has over 100 technical publications and 164 issued US Patents. He currently is a GM Technical Fellow and for the most recent 10 years his research efforts have been focused primarily on developing automotive applications of smart materials such as MR fluids, SMA’s, SMP’s, and EAP’s. Most recently he has just finished serving for two years as the Principal Investigator on a just completed ARPA-E contract focused on developing a green technology, specifically a Shape Memory Alloy based Waste Heat Recovery System. His professional society involvement includes membership in ASTM, SAE, ASME (Fellow), and the American Society of Composites (Fellow).
Adaptive MR Seat Suspensions for Enhanced Occupant Protection

Gregory J. Hiemenz
Techno-Sciences Inc.
Thursday, September 20
3:25pm–4:10pm SALON B

Abstract: The use of magnetorheological (MR) dampers in a semi-active seat suspension system has been explored through numerous collaborative programs between Techno-Sciences, Inc. and the University of Maryland. Such efforts include vibration isolating and adaptive crash attenuating seats for rotorcraft, adaptive shock attenuating seats for IED blast protection in military ground vehicles, and adaptive mitigation of repetitive shock for high speed watercraft. In this presentation, challenges in designing such systems will be discussed and novel solutions are presented. In addition, this presentation will highlight key results and successes resulting from these collaborative efforts, which include 90% attenuation of helicopter floor vibration, unparalleled IED blast protection, and 50% improvement in repetitive shock protection over conventional passive seat suspensions.

Biography: Dr. Gregory J. Hiemenz is the Vice President of the Advanced Technology Division at Techno-Sciences Inc. He graduated Summa Cum Laude with a Bachelor's in Mechanical Engineering at Catholic University of America, and subsequently earned his Master's in Aerospace Engineering at the University of Maryland (UMD) under a Graduate School Fellowship. He then joined Northrop Grumman Oceanic & Naval Systems Division, where he served as a technical specialist in the areas of structural dynamics, shock and vibration analysis, and systems integration for major U.S. Navy programs including the Advanced Seal Delivery System, the CVNX Main Turbine Generator, and a myriad of successful special defense projects. Dr. Hiemenz then returned to UMD while concurrently working with Techno-Sciences Inc. and completed his Ph.D. in Aerospace Engineering. His studies concentrated on structural dynamics, shock and vibration mitigation, semi-active control, and magnetorheological fluid technology. Because of his research successes, he was awarded a Vertical Flight Foundation scholarship from AHS and the AIAA Hal Andrews Young Engineer of the Year Award in 2008. Dr. Hiemenz is currently serving as Principal Investigator on several development programs focusing on protecting seated occupants from extreme shock and vibration environments and is an expert in occupant protection. He is a member of AHS, AIAA, and ASME.

The Potential Role of Smart Structures in Gas Turbines

Eric J. Ruggiero
GE Global Research
Friday, September 21
3:00pm–3:40pm SALON G

Abstract: Gas turbines fly us from point A to point B, and are used to generate power for billions of people around the world. The environment inside a gas turbine is more than a challenging one – high pressures, high temperatures, and large transients between the rotor and stator challenge the limits of materials, controllers, and the like to push the overall gas turbine efficiency beyond the 60% mark. In this presentation, the nuances of gas turbine operation and design will be presented, and the potential role of smart materials introduced.

Biography: Dr. Eric Ruggiero received his Ph.D. from Virginia Polytechnic Institute and State University in Mechanical Engineering in 2005 from the Center for Intelligent Material Systems and Structures and is currently a Lab Manager at GE Global Research in the Turbine Heat Transfer Technologies Laboratory. In his current role, Dr. Ruggiero leads global teams on the innovation, design, test, and validation of advanced cooling schemes for gas turbines at GE Aviation and GE Energy. In his prior role, he led a multi-million dollar development effort for GE in the area of advanced seals. Dr. Ruggiero is a previous National Science Foundation graduate research fellow. He has published over 30 peer-reviewed manuscripts, filed 14 patent applications, and has received numerous awards from AIAA and ASME.
SYMPOSIUM 5: STRUCTURAL HEALTH MONITORING

Description: The potential applications of structural health monitoring systems and benefits of this emerging technology are well documented. It is known that for complex structural and material systems, the ability to diagnose and predict structural failures through embedded sensing, actuation and data management can reduce operating costs while increasing safety. The key commercialization drivers for the technology are life cycle cost, avoidance of catastrophic failure and inspection of hard to reach places. As of now, aerospace, ground and sea vehicles are driving the development of the technology. Alternatively, continuous or on-demand inspection of bridges, buildings, off-shore structures and oil drilling machinery are likely to be among the first non-aerospace applications. Remarkable research and development in the structural health monitoring field has been reported in aeronautical, automotive, and civil engineering. Even so the technology still needs further maturation for widespread use. The system level developments in SHM/NDE are addressed in this symposium. The specific focus is on algorithms, sensor networks, data management and experimental studies relevant to SHM/NDE. Papers demonstrating industrial applications and implementations are also included. This conference explores the current state-of-the-art technologies that enable operation based inspection and repair. Technologies for a variety of aerospace, mechanical and civil applications will be presented.

Chair: Oliver Myers, Mississippi State University
Co-Chair: Kenneth J. Loh, University of California, Davis
Co-Chair: Andrew Swartz, Michigan Technological University

Organizing Committee: Charles R. Farrar (Los Alamos National Laboratory), Sridhar Krishnaswamy (Northwestern University), Victor Giurgiutiu (University of South Carolina), Ratan Jha (Clarkson Laboratory), Aditi Chatopadhyay (Arizona State University), Dr. Teng K. Ooi (U.S. Army), Aaron Corder (U.S. Army), Douglas Adams (Purdue University), Jerome P. Lynch (University of Michigan)

INVITED LECTURES

Structural Health Monitoring: Current and Future Perspective

Kishor Mehta
National Science Foundation

Wednesday, September 19
11:00am–11:40am SALON C

Abstract: The National Science Foundation program in Hazard Mitigation and Structural Engineering (HMSE) in the Directorate of Engineering encompasses the research component of structural health monitoring for buildings and structures. Development of sensors and sensor systems and development of structural materials are in different programs; however monitoring of structural health and making decisions on repair or demolition based on the recorded data are part of HMSE. There are several facets of structural health monitoring including state of structure after a damaging event (e.g. earthquake or windstorm), potential damage to a structure due to material deterioration (e.g. corrosion), fatigue damage under service loading, or progression of damage over a period of time due to a combination of factors. There are research projects in progress or recently completed that are funded by the NSF.

Looking into the future, continuous monitoring of structural health for important and critical buildings and structures will be part of structural engineering. Continuous monitoring of structural health will permit provisions of structural control, risk assessment, and prognosis of life of buildings and structures. Major research and development needs for structural health monitoring are robust sensors that survive hostile environments, sensors and recording systems that provide credible data, algorithms that coalesce the data in the meaningful results, and selection of range of actions that needs to be pursued for resiliency and sustainability of structures.

A key element in structural engineering is the economics. It is possible to design a structure robust enough to resist all service loads and most extreme loads. However, if the designs and/or repairs are not cost effective, society is not willing to accept them. Structural engineering and economics (or cost-effectiveness) go hand-in-hand. We design all structures to be cost effective consistent with their reliability. In order to implement results of new research or new structural system, it is necessary to show cost-effectiveness of the system. Structural health monitoring is a tool that can assist in making structures resilient and sustainable in a cost-effective manner.

Biography: Kishor Mehta received his B.S. and M.S. degrees from the University of Michigan and Ph.D. in Civil Engineering from the University of Texas at Austin. He joined the National Science Foundation as Director for Hazard Mitigation and Structural Engineering (HMSE) Program within the Division of Civil, Mechanical and Manufacturing Innovation (CMMI) in the Engineering Directorate in September 2011. Prior to that date he was P.W. Horn Professor of Civil Engineering and former Director of the Wind Science Engineering (WISE) Research Center at Texas Tech University. He is a Member of the National Academy of Engineering (2004) and Distinguished Member of ASCE (2002). He chaired the wind load subcommittee of ASCE 7 during development of ANSI A58.1-1982, ASCE 7-88 and ASCE 7-95. He directed the 10-year long, NSF funded Cooperative Program on Wind Engineering (with Colorado State University) and the NIST/TTU Cooperative Program of Windstorm Mitigation Initiative. He has devoted the last forty-one years teaching, conducting research, offering short courses and seminars, and consulting for problems relating to wind loads and wind damage.
Materials under Extreme Dynamic Environments: Health Monitoring and Stress Wave Mitigation

James Ayers
US Army Research Laboratory

Wednesday, September 19
4:40pm–5:20pm SALON C

Abstract: A brief overview of the structural mechanics and material development conducted at the US Army Research Laboratory will be presented. Specifically, periodic and graded metamaterials can be assembled for extreme anisotropy and phononic band gaps produced from cellular, lattice topology and material composition. The anisotropy and band-gaps can be exploited to alter the path of propagation of high amplitude stress waves. Within open literature and the Department of Defense, much work has been demonstrated for unit cell optimization for harmonic loads. Hence, the presented research is focused on the initial stage of understanding how to tailor periodic lattices for highly concentrated impact and blast loads, which generally produce a broad-band frequency response, and yield only partial band gaps. Specific attention is given to square, hexagonal, re-entrant, and modified re-entrant topologies. A fundamental framework for such an analysis is presented and corresponding numerical simulations of selected topologies, under low-velocity and ballistic loading regimes are evaluated. Finally, results from four independent experiments that utilize embedded sensors under extreme loading conditions is provided. A 1D test setup utilizing the well known compression Hopkinson bar is followed by a discussion of the time history and frequency results. Next, projectile-impact experiments are performed on metallic and polycarbonate (PC) using a compressed air gun to compare 2D strain histories of Fiber Bragg Grating (FBG) Sensors with Digital Image Correlation and resistive strain gages. Finally, blast loading experiments are examined on welded steel plates, where time-history and frequency results from FBG Sensors are analyzed.

Biography: Dr. James Ayers is currently engaged in understanding the warfighter platforms at the US Army Research Laboratory in the Vehicle Technology Directorate. Specific interests lie in developing guided wave damage detection techniques for complex structural geometry that are confirmed by innovative discretization simulation and experimental methods, such as the Spectral Finite Element methods (SFEM), 1D-3D Laser Vibrometry, and digital signal processing methods. A recipient of the SMART Scholarship in 2008, Dr. Ayers has published over 25 international journal and conference papers regarding structural health monitoring (SHM) techniques, ultrasonic guided waves, and is the joint-holder of one US patent. He has participated in projects funded by AFOSR, ONR, and ARO. Prior to coming to ARL, Dr. Ayers received his B.S. and M.S. in Mechanical Engineering from Brigham Young University, with a focus on the hydrodynamic drag testing of IsoTruss lattice structures. He then worked as a structural analyst for a composite airframe company for 2 ½ years, and analyzed the successful design and testing of the composite V-Tail for the UAV Predator B and composite waste and water tanks for the Boeing 787. He returned to academia and completed his Ph.D. in Aerospace Engineering at Georgia Institute of Technology.

SYMPOSIUM 6: BIO-INSPIRED MATERIALS AND SYSTEMS

Description: While bio-inspired materials and structures may or may not employ biological constructs directly, they do tend to be inherently multifunctional, adaptive, and hierarchical. Further, effective development of bio-inspired concepts requires multidisciplinary contributions as well as in depth understanding of the underlying biological systems. This symposium seeks to both facilitate the creation of multidisciplinary interaction in this novel research area as well as showcase novel bio-mimetic and bio-inspired programs. Topics include synthesis and modeling of bio-mimetic and bio-inspired multifunctional materials and structures.

Chair: Mike Philen, Virginia Polytechnic Institute and State University
Co-Chair: Vishnu Baba Sundaresan, Ohio State University
Co-Chair: Richard Trask, University of Bristol

Organizing Committee: Donald Leo (Virginia Polytechnic Institute and State University), Stephen Andrew Sarles (University of Tennessee), Ephrahim Garcia (Cornell), William S. Gates (Florida State University), Rajesh Naik (Air Force Research Laboratory)

INVITED LECTURES

Creative Interdisciplinary Education through a Biologically-inspired Design Curriculum

Jeanette Yen
Georgia Institute of Technology

Wednesday, September 19
9:10am–9:50am SALON B

Abstract: Biologically inspired design (BID) represents a powerful and logical bridge to multidisciplinary education. Biologists implicitly understand general principles relevant to function and design of biological objects, and have explicit knowledge embodied by a rich set of natural examples of organisms that successfully solve specific challenges. Engineers have explicit knowledge of quantitative assessment of function, and are accustomed to selecting design criteria and designing objects with specific functions. Thus both biologists and engineers face the problem of identifying design criteria, yet each approaches the problem from a unique perspective. Mixing upper level undergraduates majoring in engineering with those majoring in biology, we have devised a BID class that provides increased content knowledge and practical training in methods and techniques. These areas of concentration facilitate the identification and translation of biological principles into solutions for human challenges. Our course also was motivated by a desire to develop teaching practices that address persistent problems in science, technology, math and engineering (STEM) education. Thus-our program utilizes the connection between biological and engineering functions to develop problem solving, critical thinking, and research and inquiry skills in an interdisciplinary setting. This is addressed by fostering the development of, and assessing progress towards five learning goals that are informed by our cognitive science studies of student learning in a BID context: (1) novel techniques for creative design, (2) interdisciplinary communication skills, (3) knowledge about domains outside of their
Since 2000, School of Biology and has been at the Georgia Institute of Technology, Jeannette Yen’s Ph.D. is in biological oceanography where she studies how fluid mechanical and chemical cues transported at low Re flow serve as communication channels for aquatic organisms, primarily plankton: the base of aquatic food webs. She is a Professor in the School of Biology and has been at the Georgia Institute of Technology since 2000.

**Biography:** Jeannette is the Director of Georgia Institute of Technology's Center for Biologically Inspired Design. Along with co-directors Marc Weissburg, Craig Tovey, Bert Bras and Ashok Goel, the Center brings together a group of interdisciplinary biologists, engineers and physical scientists who seek to facilitate research and education for innovative products and techniques based on biologically-inspired design solutions. Biologically inspired design can be used to develop new materials, new sensing and locomotive systems, more efficient chemical processes, and more environmentally conscious design and manufacturing systems. This unique method trains scientists and engineers and designers to ask, “what problems does this biological system solve?” At the Georgia Institute of Technology, the goal of the Center for Biologically Inspired Design is to facilitate, develop infrastructure for, and promote interdisciplinary research and education. The participants of Georgia Institute of Technology’s Center for Biologically-Inspired Design believe that science and technology are increasingly hitting the limits of approaches based on traditional disciplines, and Biology may serve as an untapped resource for design methodology, with concept-testing having occurred over millions of years of evolution. Experiencing the benefits of Nature as a source of innovative and inspiring principles encourages us to preserve and protect the natural world rather than simply to harvest its products.

Jeannette Yen's Ph.D. is in biological oceanography where she studies how fluid mechanical and chemical cues transported at low Re flow serve as communication channels for aquatic organisms, primarily plankton: the base of aquatic food webs. She is a Professor in the School of Biology and has been at the Georgia Institute of Technology since 2000.

**Biography:** Professor Ian Bond is currently the Head of the Department of Aerospace Engineering at the University of Bristol, UK. He gained his PhD in 1995 and has published more than 100 peer-reviewed papers, given over 30 keynote, plenary or invited lectures, and has graduated 18 PhD and MSc students.

His research interests are to develop, characterize and optimize a variety of innovative and ingenious approaches which provide functionality to fibre reinforced polymer composite materials and take them beyond their structural role. This includes bio-inspired and biomimetic approaches. Functionalities such as self-healing, electromagnetic response, and shape change (morphing) within fibre reinforced polymer composite materials it offers an alternative to applying conservative damage tolerant design and potentially could remove the need to perform temporary repairs to damaged structures.

The concept of an autonomic self-healing composite material, where initiation of repair is integral to the material, is now being considered for many engineering applications. This bio-inspired concept offers the designer an ability to incorporate secondary functional materials capable of counteracting service degradation while still achieving the primary, usually structural, requirement. Most materials found in nature are themselves self-healing composite materials.

This presentation will consider self-healing technologies currently being developed for fibre reinforced polymeric composite materials, most of which take a bioinspired approach. Current work at Bristol to develop self-healing fibre reinforced composites will be discussed, highlighting the different approaches taken and the various challenges faced. A key element is the on demand supply of a healing agent which can effect repair to a damage site which meets the practical requirements of high performance engineering. Finally, the potential to further develop the self-healing concept to provide regenerative capabilities within an engineering material will also be considered.

**Biography:** Professor Ian Bond is currently the Head of the Department of Aerospace Engineering at the University of Bristol, UK. He gained his PhD in 1995 and has published more than 100 peer-reviewed papers, given over 30 keynote, plenary or invited lectures, and has graduated 18 PhD and MSc students.

His research interests are to develop, characterize and optimize a variety of innovative and ingenious approaches which provide functionality to fibre reinforced polymer composite materials and take them beyond their structural role. This includes bio-inspired and biomimetic approaches. Functionalities such as self-healing, electromagnetic response, and shape change (morphing) within fibre reinforced composites are currently being developed, alongside research into creating novel hierarchical architectures and improving damage tolerance via innovative means.

Professor Bond belongs to the Advanced Composites Centre for Innovation and Science (ACCIS), based in the Department of Aerospace Engineering, which has an internationally leading reputation for composites research and teaching. ACCIS brings together a team of over 100 researchers spanning cutting edge fundamental science through to application, in collaboration with its global industrial partners, and the University of Bristol led UK National Composites Centre. ACCIS has strong international links, with researchers from around the world.
This symposium focuses on modeling, simulations, experiments, and potential applications of energy harvesting by using smart materials. The goal in this research field is to generate low-power electricity to enable self-powered electronic devices particularly for wireless applications (such as the wireless sensor networks used in structural health monitoring). The potential sources of energy in this context include but are not limited to ambient vibrations and other forms of kinetic energy (such as rigid body motions), aquatic and wind energy, as well as structure-borne and air-borne wave energy. The scope of the symposium ranges from linear and nonlinear electromechanical modeling to system-level applications of energy harvesting using smart materials, such as piezoelectric and magnetostriective materials; dielectric, ferroelectric, and ionic electroactive polymers, among others.

Chair: Alper Erturk, Georgia Institute of Technology
Co-Chair: Mohammed Daqaq, Clemson University

**INVITED LECTURES**

**Harvesting Energy from Noisy Environments**

**Brian Mann**
Duke University

**Abstract:** While the research over the past decade has primarily focused on inertial generators that operate in a linear regime, recent work suggests that designing a harvester to operate in a nonlinear regime can improve the harvester’s performance. More specifically, several research groups are now investigating the use of nonlinearities to extend the bandwidth, broaden the frequency spectrum, and/or to facilitate tuning. These efforts take aim at overcoming the limitations associated with the use of a linear oscillator, which can only perform well over a narrow band of frequencies.

This talk will consider the performance and robustness of energy harvesters with linear or nonlinear restoring forces, i.e., hardening, softening, and bistable systems. Tuning the nonlinear harvesters to outperform their linear counterpart is an area of primary interest. I will discuss results for harmonic and random excitation.

**Biography:** Dr. Brian Mann is an endowed Associate Professor of Mechanical Engineering at Duke University. He received his BS degree in 1996 from the University of Missouri prior to accepting a position with McDonnell Douglas Corporation. Three years later, he accepted a position in the automotive industry with DaimlerChrysler and earned a M.S. degree at Washington University in St. Louis. Upon deciding to return for his D.Sc. degree, he was awarded the National Defense Science and Engineering Graduate Fellowship. He completed his D.Sc. degree at Washington University in 2003 and has held faculty positions at the University of Florida, University of Missouri, and Duke University. He has received several prestigious early career awards, such as the NSF CAREER Award from the National Science Foundation, the 2007 SAE Ralph Teetor Educator Award, and the Office of Naval Research Young Investigator Award. His current research interests include innovative applications of nonlinear systems theory, energy harvesting, and investigating the stabilizing/destabilizing influence of time delays in systems.

**Mechanically Nonlinear MEMS Electrostatic Energy Harvesters**

**Einar Halvorsen**
Vestfold University College, Horten, Norway

**Wednesday, September 19**
1:45pm–2:25pm  
**Salon G**

**Abstract:** Resonant energy harvesters can be problematic to operate successfully in an environment where the vibrations have a wide band spectrum or a spectrum that can vary substantially over time or between locations. How to deal with this challenge is therefore receiving considerable attention in the energy harvesting community. One technique that has shown some promise is the use of mechanical nonlinearities or other means to modify the stiffness of the proof mass suspension and thereby shape the response of the device. Furthermore, if unwanted parasitic mechanical damping within the device is successfully suppressed, displacement limits can become a performance-limiting factor. The question then arises if one can somehow exploit the internal proof mass impacts on end-stops.

This talk gives some fundamental theoretical considerations on when and how one can expect benefits from the use of nonlinear springs or internal impacts on end-stops. Then some recent experimental results on MEMS electrostatic energy harvesters employing either nonlinear beams or internal impacts on transducer structures are presented.

**Biography:** Einar Halvorsen received the Siv.Ing. (M.Sc.) degree in physical electronics from the Norwegian Institute of Technology (NTH), Trondheim, Norway, in 1991, and the Dr.Ing. (Ph.D.) degree in physics from the Norwegian University of Science and Technology (NTNU), Trondheim, Norway, in 1996. The thesis subjects were hole scattering in Gallium Arsenide (Siv.Ing.) and statistical mechanics of strongly correlated electron systems (Dr.Ing.). During 1995 and 1996 he also worked on ultrasound wave propagation in heterogeneous tissue at the Department of Physiology and Biomedical Engineering, NTNU. He subsequently spent two years as a postdoc with the Department of Physics at the University of Oslo working on the electronic structure of broken gap quantum wells. From 1999 to 2004 he worked on design and modeling of surface acoustic wave devices at Alcatel Space Norway AS and AME Space AS. Since 2004, he has been with the Department of Micro and Nano Systems Technology at Vestfold University College, Horten, Norway. His current research interest is in the theory, design, and modeling of microelectromechanical devices, in particular vibration energy harvesters.
SYMPOSIUM 8: STRUCTURAL AND MATERIAL LOGIC

DARPA’s Structural Logic program seeks to enable structural systems that make up the basis for modern military platforms and buildings to adapt to varying loads and simultaneously exhibit both high stiffness and high damping. By demonstrating the ability to combine stiffness, damping, and adaptive dynamic range in a single structure, the Structural Logic program will enable the design of military platforms with the ability to continually change their properties to match the demands of a broad range of dynamic environments.

Chair: Aaron Lazarus, DARPA

INVITED LECTURE

DARPA’s Structural Logic and Material Logic Programs

Aaron Lazarus
Thursday, September 20
9:10am–9:50am RHODOCENDRON

Abstract: The Defense Advanced Research Projects Agency (DARPA) has been closely involved in the development of smart structures and materials. Several programs have been completed in the past, and include the Smart Wing Program, the Morphing Aircraft Structures Program, and the Nastic Materials Program. Much of the agency’s effort in the area of smart structures and materials has focused on active systems, which are directly or indirectly actuated by a power source and leverage separate sensors, and control logic. This earlier approach strongly contrasts to the strategy used under the Structural Logic and Materials Logic Programs, which are focused on developing and demonstrating the benefits, and capabilities of passive systems. The concept is to leverage the change in performance associated with a range of novel phenomena and innovative materials and microstructures to effectively act as structural “logic gates”. By configuring these “logic gates” in a manner that when the structure is loaded it responds differently and distinctly depending on the force amplitude, rate and/or frequency, a passive adaptability effect is achieved that does not require active sensors or control logic.

The Structural Logic Program is investigating innovative element and sub-assembly designs that exhibit both high stiffness and high damping by leveraging the non-linear behavior associated with phenomena like negative stiffness, inertial resonators and targeted energy transfer. The program has already demonstrated that these high stiffness and high damping designs are achievable, and that the elements and sub-assemblies can be configured in a manner to enable passive adaptability. In addition, the Material Logic Program is investigating innovative materials and microstructures to create a class of high stiffness and high damping composites that exceed the performance obtained by conventional materials. Passive adaptability and increasing stiffness and damping response have been demonstrated through hierarchical microstructural configurations, advanced material processing and novel non-linear phenomena.

The specific problem the Structural Logic and Material Logic Program desires to address is the relatively poor dynamic performance of modern military structures. While the evolution of advanced materials and design methodologies has dramatically improved the specific stiffness of military structural systems, the corresponding structural loss values are still extremely low. The goal moving forward is to apply the technology to the design of a high-speed naval planning boat, and demonstrate this unique approach to dynamic structural control on a realistic and representative platform.

Biography: Dr. Lazarus joined DARPA in October of 2007 as a program manager for the Strategic Technology Office. At DARPA, Dr. Lazarus has led a number of programs focused on multifunctional structures and advanced energy systems, in particular the structural and material logic programs that seek to enable structural systems for modern military platforms and buildings to adapt to varying loads and simultaneously exhibit both high stiffness and high damping. Dr. Lazarus’s primary interests are in ocean hydrodynamics, and advanced material and structural systems. Dr. Lazarus received his Bachelor of Science in Naval Architecture and Marine Engineering from Webb Institute, and his Master of Science in Engineering and Doctorate in Civil Engineering from Johns Hopkins University.

SYMPOSIUM 9: STUDENT AND YOUNG PROFESSIONAL DEVELOPMENT

As a professional community it is important that we invest in our student participants who will be our future colleagues and professionals in our field. The SMASIS Student Events Committee has planned several activities for students attending the SMASIS Conference. The activities are designed to increase awareness of quality scholarly research, promote interaction with members from the scientific community (industry and academia), and provide a mechanism to develop long term social and professional relationships with fellow students. Students are active leaders of this symposium helping to plan and organize activities.

Chair: LeAnn Faidley, Wartburg College
Co-Chair: Whitney Reynolds, Air Force Research Lab Space Vehicles

Young Professional Coordinator: Rashi Tiwari, Dow Chemical
Graduate Student Coordinators: Aimy Wissa, University of Maryland
Brian Lester, Texas A&M University
Nicole Lewis, Saarland University

Organizing Committee: Cornelia Altenbuchner, (University of Maryland), Yashwanth Tummala, (Pennsylvania State University), Jason Walker, (University of Toledo), David Pisani, (University of California Los Angeles), Chris Blower, (George Washington University), Tizoc Cruz-Gonzalez, (University of Michigan), Sam Goljahi, (University of California Los Angeles)
STUDENT EVENTS

**Best Student Paper Competition**
Wednesday, September 19
9:20am–12:00pm SALON G

The ASME Adaptive Structures and Material Systems Branch organized the Paper Competition as part of SMASIS. Entrants were judged by a committee of smart materials and structures experts. Finalists are required to present their papers at the Best Student Paper Sessions on Wednesday, September 19. All finalists will be honored during the Pioneer Banquet, Thursday September 20.

**Best Student Hardware Competition**
Wednesday, September 19
2:00pm–5:40pm SALON D

The ASME Adaptive Structures and Material Systems Branch organized the Hardware Competition as part of SMASIS. Entrants in the competition will be judged by a committee of smart materials and structures experts and a list of finalists will be determined based upon their technical paper. Finalists are required to present their papers at a regular conference session and must participate in a special exhibit session on Wednesday, September 19 to demonstrate hardware operation and present a poster explaining the nature of the project. All finalists will be honored during the Pioneer Banquet on Thursday, September 20.

**Student Outing**
Wednesday, September 19
8:00pm-11:30pm DECK/ROTUNDA

Discover new friendships and meet future colleagues during the student line dancing event and other activities outside at the Evergreen Marriott resort.

**High School Student Outreach**
Wednesday, September 19
2:00pm-5:40pm RHODODENDRON

To encourage high school students to pursue careers in engineering, graduate students have arranged a unique outreach to introduce local high school talent to the exciting field of smart materials and structures. Activities include conducting hands-on experiments, attending a technical talk, talking to professionals in the field and exploring the hardware competition.

**Student Mentoring Lunch**
Wednesday, September 19
12:30pm–2:00pm WATERSIDE RESTAURANT

During our Networking Luncheon, students will be given the opportunity to have lunch with professionals from academia, government, and industry who can answer questions and provide guidance in taking the right steps leading to a rewarding and successful future career. Students will be seated at reserved tables during the luncheon.

**Bingo Lunch**
Thursday, September 20
12:15pm–1:45pm WATERSIDE RESTAURANT

The Students and Young Professionals are leading this fun lunch. Come test your knowledge at the Energy Sector. Prizes will be awarded.

**Game Night**
Thursday, September 20
8:00pm–10:30pm STONEWALL’S LOUNGE/POOL AREA

Keep the party going at the post-banquet game night. Everyone is welcome to mingle while playing board and card games at the Evergreen Marriott Resort.

**SMART Trivia Lunch**
Friday, September 21
12:30pm–2:00pm WATERSIDE RESTAURANT

Participate in a Spiritedly Memorable Amazingly Riveting non-Technical (SMART) trivia lunch led by the Students and Young Professionals. Participants are encouraged to form multicultural, inter-generational teams by sitting at the same lunch table. A quizmaster will guide the teams through a multi-round “Pub” style trivia competition which covers a wide array of non-technical topics.
ASME 2012 ADAPTIVE STRUCTURES & MATERIALS SYSTEMS PRIZE

Norman Wereley
University of Maryland

Dr. Wereley is Professor and Chair of the Dept. of Aerospace Engineering at the University of Maryland. He has a B.Eng. in Mechanical Engineering from McGill University, and M.S. and Ph.D. in Aeronautics and Astronautics from MIT. His research interests are in dynamics and control of smart structures applied to helicopters and other aerospace and automotive systems, with emphasis on active and passive vibration isolation, shock mitigation (especially occupant protection systems), and actuation systems. Dr. Wereley has published over 150 journal articles, 10 book chapters, and over 250 conference articles. Dr. Wereley is an inventor on ten patents and over a dozen patents pending. Dr. Wereley is Editor of the Journal of Intelligent Material Systems and Structures and associate editor of Smart Materials and Structures and AIAA Journal. He is Chair (2012-2013) of the SPIE Symposium on Smart Structures/NDE. Dr. Wereley has several awards including the AIAA National Capital Section Engineer of the Year (2009), and the AIAA Sustained Service Award (2011). Dr. Wereley is a Fellow of AIAA (2012), ASME (2008), and the Institute of Physics (2001).

Description
The ASME Adaptive Structures and Materials System Prize is presented to a member of the technical community who has made significant contributions to the advancement of the sciences and technologies associated with adaptive structures and/or material systems. The $1,000 cash award and certificate are meant to recognize scientific contributions as measured by leadership, technical publications, and advances made.

ASME ASMS TC GARY ANDERSON AWARD

William S. Oates
Florida State University

William S. Oates is an associate professor in the Department of Mechanical Engineering at Florida State University. His research focuses on the mechanics of functional materials and adaptive structures. He obtained his PhD in 2004 from the Georgia Institute of Technology under the advisement of Professor Christopher Lynch. He was a post doctorate researcher at North Carolina State University under the advisement of Professor Ralph Smith from 2004 to 2006.

Description
The Gary Anderson Early Achievement Award is given for notable contribution(s) to the field of Adaptive Structures and Material Systems. The prize is awarded to a young researcher in his or her ascendancy whose work has already had an impact in his/her field within Adaptive Structures and Material Systems. The winner of the award must be within seven years of terminal degree at the time of nomination.
ASME ASMS TC 2012 BEST PAPER AWARDS

There are two best-paper awards established by the ASME Adaptive Structures and Materials Systems Technical Committee (ASMS TC): 1) Materials and Systems Best Paper Award and 2) Structural Dynamics and Control Best Paper Award. Papers published in journal publications relevant to smart materials and structures and conference proceedings sponsored by the ASMS committee are eligible for the best-paper competition. Nominated papers are sent out for review. The winners of this year’s awards are listed below.

2012 Best Paper in Structural Dynamics and Control

Benjamin Woods
Swansea University
Dr. Woods recently completed his PhD studies at the Alfred Gessow Rotorcraft Center at the University of Maryland (UMD). He is currently a Research Officer at Swansea University developing morphing concepts for fixed wing, rotorcraft, and wind turbine applications.

Curt S. Kothera
Techno-Sciences, Inc.
Dr. Kothera is a Principal Engineer at Techno-Sciences, Inc. where he is the Principal Investigator on pneumatic and hydraulic artificial muscles for rotorcraft flap actuation and various adaptive structures technologies.

Norman Wereley
University of Maryland
Dr. Wereley is the Minta Martin Professor and Chair of the Department of Aerospace Engineering at UMD. He is also Director of the Smart Structures Laboratory in the Alfred Gessow Rotorcraft Center.

2012 BEST PAPER IN MATERIALS AND MATERIAL SYSTEMS

Fei Gao
CGGVeritas
Fei Gao earned her PhD from the University of Pittsburgh in 2010 in the area of theoretical and experimental characterization of ionic polymers. Following a postdoctoral position at the University of Michigan she joined CCGVeritas in Houston, TX.

Lisa Weiland
University of Pittsburgh
Lisa Weiland is an Associate Professor of Mechanical Engineering and Materials Science at the University of Pittsburgh, where she is also a Mascaro Center for Sustainable Innovation faculty member and chair/founder of the Engineering for Humanity Certificate program. Her research focus is mechanics of active materials with application emphasis on creation of adaptive and sustainable structures.

COMMITTEE MEETING SCHEDULE

Wednesday, September 19, 2012
AIAA Technical Committee on Adaptive Structures 12:30pm–2:00pm WILLOW
Casmart Member Meeting 12:30pm–2:00pm CHERRY
ASME Branch on Adaptive Structures and Material Systems 7:30pm–10:00pm ROTUNDA
Thursday, September 20, 2012
ASME ASMS Technical Committee Meetings 12:15pm–1:45pm ROTUNDA
Journal of Intelligent Material Systems and Structures 12:15pm–1:45pm WILLOW
Friday, September 21, 2012
Aerospace Division Executive Meeting 12:30pm–2:00pm WILLOW
Saturday, September 22, 2012
Casmart Member Meeting 8:00am–12:00pm BALSAM
Parker Hannifin Corporation
BioCare Business Unit
8145 Lewis Rd
Golden Valley, MN 55427

Parker BioCare is a Business Unit located in Minneapolis, Minnesota as part of the Quick Coupling Division/Fluid Connector Group. BioCare offers custom engineered system and component solutions for the medical device industry. This includes system design, manufacturing and assembly of components, sub-systems and complete turn-key systems for the life sciences market. BioCare leverages the breadth of Parker’s technologies and products to improve their customer’s time-to-market and overall cost. BioCare is ISO 13485 & 9001 certified with a class 10,000 clean room for product assembly and test.

With annual sales exceeding $12 billion in fiscal year 2011, Parker Hannifin is the world’s leading diversified manufacturer of motion and control technologies and systems, providing precision-engineered solutions for a wide variety of mobile, industrial and aerospace markets. The company employs approximately 58,000 people in 47 countries around the world. Parker has increased its annual dividends paid to shareholders for 55 consecutive fiscal years, among the top five longest-running dividend-increase records in the S&P 500 index. For more information, visit the company’s website at www.parker.com.

DYNALLOY, Inc.
14762 Bentley Circle
Tustin, CA 92780

Dynalloy, Inc. has been in business over 20 years manufacturing shape memory alloy (SMA) wire to be used as actuators, trade named FLEXINOL®. When heated (typically done electrically) well above room temperature, Flexinol® performs work by contracting 3% to 5% of its length, like a muscle.

Dynalloy also uses state-of-the-art materials, analytical tools, and techniques to guide companies to successful use of SMAs in their electrically actuated products in industries such as electronics, medical, automotive, appliance, toys, and many more! Dynalloy involvement subsequently reduces the years of R&D commonly encountered when launching a new project with this technology. In addition, Dynalloy specializes in helping its customers terminate the SMAs by using standard crimping techniques to develop fully automated attaching solutions.

GE Global Research
One Research Circle
Niskayuna, NY 12309

GE Global Research is the hub of technology development for all of GE’s businesses. Our scientists and engineers redefine what’s possible, drive growth for our businesses and find answers to some of the world’s toughest problems.

We innovate 24 hours a day, with sites in Niskayuna, New York; Bangalore, India; Shanghai, China; and Munich, Germany. Visit GE Global Research on the web at www.ge.com/research. Connect with our technologists at http://edisonsdesk.com and twitter.com/edisonsdesk.

SAGE Publications Ltd
1 Olivers Yard
55 City Road
London, UK

Published by SAGE, The Journal of Intelligent Materials Systems and Structures is an international peer reviewed journal that publishes the highest quality original research reporting the results of experimental or theoretical work on any aspect of intelligent materials systems and/or structures.

Impact Factor: 1.953
Ranked: 64 out of 231 in Materials Science, Multidisciplinary
Source: 2011 Journal Citation Reports ® (Thomson Reuters, 2012)
# WEDNESDAY, SEPTEMBER 19, 2012

## 7:00am–8:00am - Breakfast

**Location:** SALON FOYER, LOBBY LEVEL

## 8:00am–9:00am - Keynote

**Speaker:** Eduard Arzt, Leibniz Institute for New Materials, Saarbrücken, Germany

**Location:** SALON D

## 9:00am–9:10am - Coffee Break

**Location:** SALON FOYER, LOBBY LEVEL

<table>
<thead>
<tr>
<th>SYMP 1-1</th>
<th>Nano - and Micro-filled Polymers I</th>
<th>SALON F</th>
</tr>
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<tbody>
<tr>
<td><strong>Session Organizer:</strong> Zoubeida Ounaies, Pennsylvania State University, State College, PA, United States</td>
<td><strong>Session Co-Organizer:</strong> Hani Naguib, University of Toronto, Toronto, ON, Canada</td>
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## SYMP 2-1 | MR & Polymeric Fluids | SALON A

**Session Organizer:** Dirk Güth, Ostwestfalen-Lippe University of Applied Sciences, Lemgo, Germany

**Session Co-Organizer:** Ilya Peshkov, École Polytechnique de Montréal, Montreal, Canada


SMASIS2012-7967: Combined Squeeze-Shear Properties of Magnetorheological Fluid: Effect of Pressure Technical Publication. Andrea Spaggiari, Eugenio Dragoni, University of Modena and Reggio Emilia - DISMI, Reggio Emilia, Italy

SMASIS2012-8047: Pre-Yield Shearing Regimes of Magnetorheological Fluids Technical Publication. Waad Nassar, École Polytechnique and CEA-LIST, Palaiseau, France, Xavier Boutillon, CNRS and École Polytechnique, Palaiseau, France, José Lozada, CEA-LIST, GIF-sur-Yvette Cedex, France


### All technical sessions take place on Lobby Level.
### SYMP 3-1: SMA Applications & Models I

**Session Organizer:** Eugenio Dragoni, University of Modena and Reggio Emilia - DISMI, Reggio Emilia, Italy  
**Session Co-Organizer:** Travis Turner, NASA Langley Research Center, Hampton, VA, United States

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
<th>Institution</th>
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<tbody>
<tr>
<td>9:00</td>
<td>Elastic Compensation of Linear Shape Memory Alloy Actuators Using Compliant Mechanisms Technical Publication.</td>
<td>Giovanni Scirè Mammano, Eugenio Dragoni, University of Modena and Reggio Emilia - DISMI, Reggio Emilia, Italy</td>
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<tr>
<td>9:30</td>
<td>Force-Deflection Characteristics of SMA-Based Belleville Springs Technical Publication.</td>
<td>Carmine Maletta, University of Calabria, Arcavacata di Rende, Cosenza, Italy, Emanuele Sgambiterra, Franco Furgiuele, University of Calabria, Rende, Cosenza, Italy</td>
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<tr>
<td>9:50</td>
<td>Modeling of a Shape Memory Alloy Circular Bar under Combined Axial-Torsional Loading Technical Publication.</td>
<td>Masood Taheri Andani, Ahmadreza Eshghinejad, Mohammad Elahinia, The University of Toledo, Toledo, OH, United States, Amin Alipour, Isfahan University of Technology, Esfahan, Iran</td>
<td></td>
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<tr>
<td>10:10</td>
<td>Investigations on the Amplitude-dependent Damping Behavior of Superelastic Shape Memory Alloys Technical Publication.</td>
<td>Jonas Boettcher, Marcus Neubauer, Joerg Wallaschek, Leibniz Universität Hannover, Hannover, Germany</td>
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### SYMP 5-1: Systems & Structures I: Measurement and Quantification

**Session Organizer:** Michael Todd, University of California San Diego, La Jolla, United States  
**Session Co-Organizer:** Chun H. Wang, RMIT University, Bundoora, Victoria, Australia

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<th>Time</th>
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<tr>
<td>9:50</td>
<td>Gas Accumulation Detection in a Water Tank Using Lamb Waves Technical Publication.</td>
<td>Lingyu Yu, Zhenhua Tian, Liuxian Zhao, University of South Carolina, Columbia, SC, United States</td>
<td></td>
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<tr>
<td>10:10</td>
<td>The Quantification of Uncertainty in SHM Features Derived from Transmissibility Estimation Technical Publication.</td>
<td>Zhu Mao, Michael Todd, University of California San Diego, La Jolla, CA, United States</td>
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All technical sessions take place on Lobby Level.
### SYMP 6-1 Bioinspired Sensors I

Session Organizer: Vishnu Baba Sundaresan, Virginia Commonwealth University, Richmond, VA, United States  
Session Co-Organizer: Michael Philen, Virginia Polytechnic Institute and State University, Blacksburg, VA, United States

<table>
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<tr>
<th>Session Title</th>
<th>Presenters</th>
<th>Location</th>
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</table>
| SMASIS2012-8263: Creative Interdisciplinary Education through a Biologically-Inspired Design Curriculum | Invited Speaker Presentation Only.  
Jeannette Yen, Georgia Institute of Technology, Atlanta, GA, United States | SALON B  |
Nima Tamaddoni, Andy Sarles, University of Tennessee, Knoxville, TN, United States | SALON B  |
Eric Freeman, Donald Leo, Michael Philen, Virginia Polytechnic Institute and State University, Blacksburg, VA, United States | SALON B  |

### SYMP 9-1 Best Student Paper Competition I

Best Student Paper Competition I  
9:10–10:30am  
SALON G, LOBBY LEVEL

#### Panel Discussion: Collaborating for Accelerated Solution

9:10–10:30am  
RHODODENDRON

Collaboration has become an integral and crucial factor for personal as well as professional growth. Both industry and academia are moving towards collaborative projects and research for accelerated growth. This session brings together leaders from industry and academia to share their experiences and discuss tools and techniques for collaboration.

### Coffee Break

10:30am–10:50am  
SALON FOYER, LOBBY LEVEL

All technical sessions take place on Lobby Level.
### SYMP 1-2: Nano- and Micro-filled Polymers II

**Session Organizer:** Jonghwan Suhr, University of Delaware, Newark, DE, United States  
**Session Co-Organizer:** Jayasimha Atulasimha, Virginia Commonwealth University, Richmond, VA, United States

<table>
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<tr>
<td>SMASIS2012-8021: Synthesize and Characterization of PVDF-Based SWNT/GO Hybrid Films Technical Publication.</td>
<td>Nirmal Shankar Sigamani, Pennsylvania State University, University Park, PA, United States, Zoubeida Ounaies, Pennsylvania State University, State College, PA, United States, Henry A. Sodano, University of Florida, Gainesville, FL, United States</td>
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<tr>
<td>SMASIS2012-8004: Air-Brushed Carbon Nanotube (CNT) and Inkjet-Printed Silver and PEDOT: PSS Layer as Alternative Electrodes for Piezoelectric Polymer Transducer Technical Publication.</td>
<td>Sven-Oliver Seidel, Bert Fischer, Nicole Stahlberg, Michael Wegener, Fraunhofer IAP, Potsdam, Germany</td>
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<tr>
<td>SMASIS2012-8085: Ceramic Siloxane Composite as a Future Elastomer Dielectric for Micro-Actuator Realisation Technical Publication.</td>
<td>Sofiane Soulimane, Henri Camon, LAAS-CNRS, Toulouse, France (Metro), Marc Vedrenne, Service de RMN-Université Paul Sabatier, Toulouse, France, Wen-Pin Shih, National Taiwan University, Taipei, Taiwan, China</td>
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### SYMP 2-2: Ferroelectrics: Modeling

**Session Organizer:** Jiangyu Li, University of Washington, Seattle, WA, United States  
**Session Co-Organizer:** Sang-Joo Kim, University of Seoul, Seoul, Korea (Republic)

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<tr>
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<tbody>
<tr>
<td>SMASIS2012-7903: Simulation of the Poling Process of Ferroelectric Devices Taking into Account Weak Electric Conductivity Technical Presentation Only.</td>
<td>Holger Schwab, Karlsruhe Institute of Technology (KIT), Baden Württemberg, Germany, Marco Deluca, Materials Center Leoben Forschung GmbH, Leoben, Austria, Peter Supancic, Montanuniversität Leoben, Leoben, Austria, Marc Kamlah, Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany</td>
</tr>
<tr>
<td>SMASIS2012-8193: Equilibrium Conditions and Evolution of Needle Domain Arrays in Ferroelectric Single Crystals Technical Publication.</td>
<td>Dorinamaria Carka, Chad Lands, The University of Texas at Austin, Austin, TX, United States</td>
</tr>
<tr>
<td>SMASIS2012-7950: M-Integral Analysis of the Electric Creep for a Hole in an Unpoled PZT under Purely Electric Field Technical Publication.</td>
<td>Liu Qida, Xi'an Jiaotong University, Xi'an, China</td>
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<tbody>
<tr>
<td><strong>SYMP 3-2</strong></td>
<td><strong>Control Theory &amp; Implementation I</strong></td>
<td><strong>Session Organizer:</strong> Mark Balas, University of Wyoming College of Engineering and Applied Science Department of Electrical Engineering, Laramie, WY, United States <strong>Session Co-Organizer:</strong> Jerry McMahan, North Carolina State University, Raleigh, NC, United States</td>
<td>SMASIS2012-7921: Adaptive Control of Non-minimum Phase Systems Using Sensor Blending with Application to Launch Vehicle Control Technical Publication. Mark Balas, University of Wyoming College of Engineering and Applied Science Department of Electrical Engineering, Laramie, WY, United States</td>
<td>SMASIS2012-7944: Adaptive Disturbance Tracking Control with Wind Speed Reduced Order State Estimation for Region II Control of Large Wind Turbines Technical Publication. Mark Balas, University of Wyoming College of Engineering and Applied Science Department of Electrical Engineering, Laramie, WY, United States, Kaman Thapa Magar, University of Wyoming, Laramie, WY, United States, Susan A. Frost, NASA Ames Research Center, Moffett Field, CA, United States</td>
<td>SMASIS2012-7945: Sliding Mode Control for Inverse Compensated Hysteretic Smart Systems Technical Publication. Jerry McMahan, Ralph Smith, North Carolina State University, Raleigh, NC, United States</td>
<td>SMASIS2012-7930: Indirect Intelligent Sliding Mode Control Using Hysteretic Recurrent Neural Networks with Application to a Shape Memory Alloy Actuated Beam Technical Publication. Jennifer Hannen, Gregory Buckner, North Carolina State University, Raleigh, United States</td>
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| **SYMP 5-2** | **Systems & Structures II: SHM and Sensing** | **Session Organizer:** Kenneth Loh, University of California, Davis, Davis, CA, United States **Session Co-Organizer:** Andrew Swartz, Michigan Technological University, Houghton, MI, United States | SMASIS2012-8251: Structural Health Monitoring: Current and Future Perspective Invited Speaker Presentation Only. Kishor Mehta, National Science Foundation, Arlington, VA, United States | SMASIS2012-7923: Passive Frequency Doubling Antenna Sensor for Wireless Strain Sensing Technical Publication. Xiaohua Yi, Benjamin S. Cook, Chunhee Cho, James Cooper, Rushi Vyas, Yang Wang, Manos M. Tentzeris, Georgia Institute of Technology, Atlanta, GA, United States, Roberto T. Leon, Virginia Polytechnic Institute and State University, Blacksburg, VA, United States | SMASIS2012-7954: Wireless Strain Sensors Using Electromagnetic Resonators Technical Publication. Ali Daliri, Sabu John, Chun H. Wang, RMIT University, Burwood, VIC, Australia, Amir Galehdar, Wayne S.T. Rowe, Kamran Ghorbani, RMIT University, Melbourne, Victoria, Australia |

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<td>SYMP 6-2 Bioinspired Sensors II</td>
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<td>11:20</td>
<td>SMASIS2012-8170: Integrated Bioderived-Conducting Polymer Membrane Nanostructures for Energy Conversion and Storage Technical Publication. Vishnu Baba Sundaresan, Sergio Salinas, Virginia Commonwealth University, Richmond, VA, United States</td>
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<td>11:40</td>
<td>SMASIS2012-8101: Detection of Botulinum Neurotoxin/A Insertion using an Encapsulated Interface Bilayer Technical Publication. Graham Taylor, Andy Sarles, University of Tennessee, Knoxville, Knoxville, TN, United States, Donald Leo, Virginia Polytechnic Institute and State University, Blacksburg, VA, United States</td>
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<tr>
<td>12:00</td>
<td>SMASIS2012-8121: Designing Active Surface Structures to Regulate Heat Transport in Microchannels Technical Publication. Zachary Mills, Basat Aziz, Alexander Alexeev, Georgia Institute of Technology, Atlanta, GA, United States</td>
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<td>12:40</td>
<td>SYMP 9-2 Best Student Paper Competition II</td>
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<td>SYMP 9-2 Best Student Paper Competition II</td>
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<td>11:00</td>
<td>Networking Lunch</td>
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<td>11:20</td>
<td>AIAA Adaptive Structures Technical Meeting</td>
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<td>Casmart Member Meeting</td>
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| 2:00 | **SMASIS2012-8280**: Recent Developments in Polymer/Carbon Nanotube Composite Films and Fibers  
*Invited Speaker Presentation Only.*  
Satish Kumar, Georgia Institute of Technology, Atlanta, GA, United States |
*Technical Publication.*  
Ka Yeung Terence Lee, Hani Naguib, Elaine Biddiss, Keryn Lian, University of Toronto, Toronto, ON, Canada |
*Technical Presentation Only.*  
Nazarin Bassiri-Gharb, Yaser Bastani, Georgia Institute of Technology, Atlanta, GA, United States |
| 3:00 | **SMASIS2012-8208**: Preliminary Experiments on Multiferroic Nanomagnetic Logic Devices for Ultralow Power Computing  
*Technical Presentation Only.*  
Noel D'Souza, Mohammad Salehi Fashami, Jayasimha Atulasimha, Kuntal Roy, Supriyo Bandyopadhyay, Virginia Commonwealth University, Richmond, VA, United States |

### SYMP 2-3: Ferroelectrics: Characterization

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| 2:00 | **SMASIS2012-7929**: Diffraction of Ferroelectrics during Electric Field Application: Comprehensive Results of Lattice Strain, Domain Wall and Interphase Boundary Motion in Traditional and Emerging Compositions  
*Invited Speaker Presentation Only.*  
Jacob Jones, University of Florida, Gainesville, FL, United States |
| 2:20 | **SMASIS2012-8012**: Evolution of Linear Moduli and Nonlinear Responses of a PZT Wafer under Electric Field at Room and High Temperatures  
*Technical Publication.*  
Najae Lee, Dae Won Ji, Sang-Joo Kim, University of Seoul, Seoul, Korea (Republic), Yong Soo Kim, Defense Agency for Technology and Quality, Seoul, Korea (Republic) |
| 2:40 | **SMASIS2012-8034**: Strain Actuation Behavior Of Barium Titanate Single Crystal Loaded Electromechanically In Non-Variant [110] Direction  
*Technical Publication.*  
Jay Shieh, Yen-Nan Lin, Yi-Chung Shu, National Taiwan University, Taipei, Taiwan |
| 3:00 | **SMASIS2012-8102**: Strain Actuation Behavior Of Barium Titanate Single Crystal Loaded Electromechanically In Non-Variant [110] Direction  
*Technical Publication.*  
Jay Shieh, Yen-Nan Lin, Yi-Chung Shu, National Taiwan University, Taipei, Taiwan |

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<th>Session Organizer</th>
<th>Session Co-Organizer</th>
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</table>
| 2:00 | SYMP 3-3 | Control Theory & Implementation II | John Crews, North Carolina State University, Raleigh, NC, United States | Ryan Robinson, University of Maryland, College Park, MD, United States | SALON E | SMASIS2012-8249: Use of the Intrinsic Electrical Resistance Change in Shape Memory Alloy as a Temperature Sensor Technical Presentation Only. Guillermo Herrera, Geoffrey McKnight, HRL Laboratories, LLC, Malibu, CA, United States, Nancy Johnson, Xiujie Gao, Alan Browne, General Motors Research & Development, Warren, MI, United States  
SMASIS2012-7999: Control of Oscillations of a Wing Subjected to 3D Unsteady Subsonic Aerodynamic Loads Using Piezoelectric Actuators Technical Publication. Tahereh Mirmohammadi, Arun K. Misra, Dan Mateescu, McGill University, Montreal, QC, Canada  
SMASIS2012-7924: Robust Adaptive Control of Mildly Nonlinear Systems with Time Varying Input/Output Delays Technical Publication. James P. Nelson, Mark Balas, University of Wyoming College of Engineering and Applied Science Department of Electrical Engineering, Laramie, WY, United States, Richard S. Erwin, Air Force Research Laboratory Space Vehicles Directorate, Kirtland AFB, NM, United States |
| 2:20 | SYMP 3-3 | Control Theory & Implementation II | John Crews, North Carolina State University, Raleigh, NC, United States | Ryan Robinson, University of Maryland, College Park, MD, United States | SALON E | SMASIS2012-8084: Model-Based Feedforward Control of a Robotic Manipulator with Pneumatic Artificial Muscles Technical Publication. Ryan Robinson, Norman M. Wereley, University of Maryland, College Park, United States, Curt Kothera, Techno-Sciences Inc., Beltsville, MD, United States |
| 2:40 | SYMP 4-1 | Multifunctional Structures | Marcelo J. Dapino, The Ohio State University, Columbus, OH, United States | Jeong-Hoi Koo, Miami University, Oxford, OH, United States | SALON G | SMASIS2012-8075: Cellular Honeycomb-Like Structures with Internal Inclusions in the Unit-Cell Technical Publication. Michael E. Pontecorvo, Silvestro Barbarino, Farhan Gandhi, Rensselaer Polytechnic Institute, Troy, NY, United States  
SMASIS2012-8254: Thermomechanical Behavior of Low CTE Metal-Matrix Composites Fabricated through Ultrasonic Additive Manufacturing Technical Publication. Ryan Hahnlen, Marcelo J. Dapino, The Ohio State University, Columbus, OH, United States  
| 3:00 | SYMP 4-1 | Multifunctional Structures | Marcelo J. Dapino, The Ohio State University, Columbus, OH, United States | Jeong-Hoi Koo, Miami University, Oxford, OH, United States | SALON G | SMASIS2012-8289: Combined Magnetic and Mechanical Sensing of Magnetorheological Elastomers Technical Publication. Nima Ghaforianfar, Xiaojie Wang, Faramarz Gordaninejad, University of Nevada, Reno, Reno, Nevada |
| 3:20 | SYMP 4-1 | Multifunctional Structures | Marcelo J. Dapino, The Ohio State University, Columbus, OH, United States | Jeong-Hoi Koo, Miami University, Oxford, OH, United States | SALON G | SMASIS2012-8028: AFRL Investigations into Electromagnetic Multi-functional Materials for Space Structures Technical Publication. Derek Doyle, Air Force Research Lab, Kirtland AFB, Albuquerque, NM, United States |
| 3:40 | SYMP 4-1 | Multifunctional Structures | Marcelo J. Dapino, The Ohio State University, Columbus, OH, United States | Jeong-Hoi Koo, Miami University, Oxford, OH, United States | SALON G | SMASIS2012-8289: Combined Magnetic and Mechanical Sensing of Magnetorheological Elastomers Technical Publication. Nima Ghaforianfar, Xiaojie Wang, Faramarz Gordaninejad, University of Nevada, Reno, Reno, Nevada |

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<td><strong>SYMP 5-3</strong> Systems &amp; Structures III: Signal Processing and Detection</td>
<td><strong>SALON C</strong></td>
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<td>Session Organizer: Ying Zhang, Georgia Institute of Technology, Savannah, GA, United States</td>
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<td>Session Co-Organizer: Bryan Loyola, Sandia National Laboratories, Livermore, CA, United States</td>
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<td>SMASIS2012-8153: Automatic Extraction of Hyperbolic Signatures in Ground Penetrating Radar Images Technical Publication. Zhenhua Xie, Xiangmin Wei, Ying Zhang, Georgia Institute of Technology, Savannah, GA, United States</td>
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<td>SMASIS2012-8154: An Investigation on The Detectability of Deeper Rebar Layer in Concrete Bridge Decks using GPR Technical Publication. Xiangmin Wei, Zhenhua Xie, Ying Zhang, Georgia Institute of Technology, Savannah, GA, United States</td>
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<td>SMASIS2012-7939: Wave Propagation in Multi-layered Elastic Beam Technical Publication. Ahmet Unal, Gang Wang, University of Alabama in Huntsville, Huntsville, AL, United States</td>
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<td>SMASIS2012-8241: Guided Wave Based Fatigue Crack Detection and Localization in Aluminum Aerospace Structures Technical Publication. Kevin Hensberry, Narayan Kowali, Kuang Liu, Aditi Chattopadhyay, Antonia Papandreou-Suppappola, Arizona State University, Tempe, AZ, United States</td>
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<td>2:20</td>
<td><strong>SYMP 6-3</strong> Biomimetic Aquatic Vehicles</td>
<td><strong>SALON B</strong></td>
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<td>Session Organizer: Adam Wickenheiser, George Washington University, Washington, DC, United States</td>
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<td>Session Co-Organizer: Andy Sarles, University of Tennessee, Knoxville, Knoxville, TN, United States</td>
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<td>SMASIS2012-8099: A Biomimetic Jellyfish-inspired Jet Propulsion System Using an Iris Mechanism Technical Publication. Kenneth Marut, Colin Stewart, Alex Villanueva, Dragan Avrovik, Shashank Priya, Virginia Polytechnic Institute and State University, Blacksburg, VA, United States</td>
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<td>SMASIS2012-8129: Underwater Tracking and Size-Estimation of a Moving Object Using an IPMC Artificial Lateral Line Technical Publication. Ahmad T. Abdulsadda, Xiaobo Tan, Michigan State University, East Lansing, MI, United States</td>
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<td>SMASIS2012-8068: Preliminary Investigation of a Fishbone Active Chamber Concept Technical Publication. Benjamin K.S. Woods, Michael I. Friswell, Swansea University, Swansea, Wales, United Kingdom</td>
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<td>SMASIS2012-8167: Fish-Like Self Propulsion Using Flexible Piezoelectric Composites Technical Publication. Lejun Cen, Alper Erturk, Georgia Institute of Technology, Atlanta, GA, United States</td>
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<td><strong>SYMP 9-3</strong> Best Student Hardware Competition I</td>
<td><strong>SALON D, LOBBY LEVEL</strong></td>
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<td>High School Student Outreach</td>
<td><strong>RHODODENDRON, LOBBY LEVEL</strong></td>
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<td>Coffee Break</td>
<td><strong>SALON FOYER, LOBBY LEVEL</strong></td>
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#### SYMP 1-4  Novel Multifunctional Composites

**Session Organizer:** Geoffrey Slipher, U.S. Army Research Laboratory, Aberdeen Proving Ground, Aberdeen, MD, United States  
**Session Co-Organizer:** Reza Rizvi, University of Toronto, Toronto, Canada

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<tr>
<td>SMASIS2012-8195: Load-Initiated Two-Way Effect of Shape Memory Alloys in Composite Structures and a Phenomenological Modelling Approach</td>
<td>Martin Gurka, Moritz Huebler, Sebastian Schmeer, IVW Kaiserslautern, Kaiserslautern, Germany, Ul P. Breuer, Institute for Composite Materials, Kaiserslautern, Germany</td>
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<tr>
<td>SMASIS2012-8176: Experimental Validation of Simultaneous Gust Alleviation and Energy Harvesting for Multifunctional Composite Wing Spars</td>
<td>Ya Wang, Daniel J. Inman, University of Michigan, Ann Arbor, MI, United States</td>
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<td>SMASIS2012-8131: Design of a Morphing Skin by Optimizing a Honeycomb Structure with a Two-Phase Material Infill</td>
<td>John Puttmann, Rich Beblo, University of Dayton Research Institute, Dayton, OH, United States, James Joo, Gregory Reich, Brian Smithers, Air Force Research Laboratory, WPAFB, Wright Patterson, OH, United States</td>
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<td>SMASIS2012-8100: Micromechanics Modeling of Multiphase Piezoelectric Composites</td>
<td>Mohammad H. Malakooti, Henry A. Sodano, University of Florida, Gainesville, FL, United States, James Joo, Gregory Reich, Brian Smithers, Air Force Research Laboratory, WPAFB, Wright Patterson, OH, United States</td>
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<td>SMASIS2012-8069: Hyper-redundant and Super-configurable Articulated Structures</td>
<td>John P. Swensen, Aaron M. Dollar, Yale University, New Haven, CT, United States</td>
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<td>SMASIS2012-8148: Tunable Band-Pass Filters Employing Stretchable Electronic Components</td>
<td>Geoffrey Slipher, Randy A Mrozek, Justin L. Shumaker, U.S. Army Research Laboratory, Aberdeen Proving Ground, Aberdeen, MD, United States</td>
</tr>
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</table>

#### SYMP 2-4  Ferroelectrics: Micro/Nanoscale Experiments

**Session Organizer:** Jay Shieh, National Taiwan University, Taipei, Taiwan  
**Session Co-Organizer:** Marc Kamila, Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany

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<th>Technical Publication</th>
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<tr>
<td>SMASIS2012-8283: Emergent SPM Modes and their Application to Energy and Memory Materials</td>
<td>Sergei Kalinin, Oak Ridge National Lab, Oak Ridge, TN, United States</td>
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<tr>
<td>SMASIS2012-8037: Observation of the Poling Process in Ferroelectric Ceramics using Piezoresponse Force Microscopy</td>
<td>Kwanlae Kim, John Huber, University of Oxford, Oxford, United Kingdom</td>
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<tr>
<td>SMASIS2012-7949: Time Dependent Polarization and Strain Evolution Around a Circular Hole in Ferroelectrics</td>
<td>Liu Qida, Xi'an Jiaotong University, Xi'an, China</td>
</tr>
<tr>
<td>SMASIS2012-8019: Biological Ferroelectricity in Aortic Walls by Piezoresponse Force Microscopy</td>
<td>Jiangyu Li, University of Washington, Seattle, WA, United States</td>
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All technical sessions take place on Lobby Level.
### SYMP 2-5  Adaptive Composites

**Session Organizer:** Tian Tang, Mississippi State University, Starkville, MS, United States  
**Session Co-Organizer:** Jiangyu Li, University of Washington, Seattle, WA, United States  

| SMASIS2012-8018: The Effective Thermoelectric Properties of Composite Materials  
**Technical Presentation Only.**  
Jiangyu Li, University of Washington, Seattle, WA, United States |
| SMASIS2012-7957: A Morphing Bi-Stable Composite Laminate Actuated by Electric Heating Method  
**Technical Publication.**  
Hao Li, Fuhong Dai, Shanyi Du, Harbin Institute of Technology, Harbin, China |
| SMASIS2012-8081: A Variational Asymptotic Approach for the Effective Magnetostriuctive Composites  
**Technical Publication.**  
Tian Tang, Mark Horstemeyer, Mississippi State University, Starkville, MS, United States, Oliver Myers, Mississippi State University, Mississippi State, MS, United States |
| SMASIS2012-8031: Mechanical Characterization of Electro-bonded Laminates  
**Technical Publication.**  
Luigi Di Lillo, Wolfram Raither, Claudio Di Fratta, Paolo Erman, Swiss Federal Institute of Technology ETH, Zurich, Switzerland, Andrea Bergamini, EMPA, Laboratory for Mechanics for Modelling and Simulation, Dübendorf, Switzerland |
| SMASIS2012-8048: Variable Stiffness Tube Based on Shape Memory Polymer Composite and Morphing Skin  
**Technical Presentation Only.**  
Jinsong Leng, Yijin Chen, Liwu Liu, Yanju Liu, Jian Sun, Harbin Institute of Technology, Harbin, China |

### SYMP 3-4  SMA Applications & Models II

**Session Organizer:** Mohammad Elahinia, University of Toledo, Toledo, OH, United States  
**Session Co-Organizer:** Andrea Spaggiari, University of Modena and Reggio Emilia, Reggio Emilia, Italy  

| SMASIS2012-8258: Recent Development of Shape Memory Alloys and Engineering Actuator Applications  
**Invited Speaker Presentation Only.**  
Francesco Butera, SAES-Getters, Lainate, Italy |
| SMASIS2012-8243: Shape Memory Effect Behavior of NiTi Torque Tubes in Torsion  
**Technical Publication.**  
Reza Mehrabi, Mahmoud Kakhkhotaei, Isfahan University of Technology, Isfahan, Isfahan, Iran, Masood Taheri Andani, Mohammad Elahinia, The University of Toledo, Toledo, OH, United States |
| SMASIS2012-7964: Analytical and Numerical Modelling of Shape Memory Alloy Negator Springs for Long-Stroke Constant-Force Actuators  
**Technical Publication.**  
Andrea Spaggiari, Eugenio Dragoni, University of Modena and Reggio Emilia, Reggio Emilia, Italy |
| SMASIS2012-7973: A Minimally Invasive Cage for Spinal Fusion Surgery Utilizing Superslastic Hinges  
**Technical Publication.**  
Walter Anderson, Zohreh Karbaschi, Mohammad Elahinia, The University of Toledo, Toledo, OH, United States, Cory Chapman, Kimberly Clark, Oshkosh, WI, United States |

### SMASIS2012-8031: Mechanical Characterization of Electro-bonded Laminates  
**Technical Publication.**  
Luigi Di Lillo, Wolfram Raither, Claudio Di Fratta, Paolo Erman, Swiss Federal Institute of Technology ETH, Zurich, Switzerland, Andrea Bergamini, EMPA, Laboratory for Mechanics for Modelling and Simulation, Dübendorf, Switzerland  

### SMASIS2012-8048: Variable Stiffness Tube Based on Shape Memory Polymer Composite and Morphing Skin  
**Technical Presentation Only.**  
Jinsong Leng, Yijin Chen, Liwu Liu, Yanju Liu, Jian Sun, Harbin Institute of Technology, Harbin, China  

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All technical sessions take place on Lobby Level.
### SYMP 5-4
**SHM of Aerospace/Space Structures**

**Session Organizer:** Oliver Myers, Mississippi State University, Mississippi State, MS, United States  
**Session Co-Organizer:** Whitney Reynolds, Air Force Research Lab, Kirtland AFB, Albuquerque, NM, United States

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<tbody>
<tr>
<td>Whitney Reynolds, Derek Doyle, Air Force Research Lab, Kirtland AFB, Albuquerque, NM, United States</td>
<td>Jessica Alvarenga, Francisco Pena, Helen Boussalis, NASA URC Space Center, Los Angeles, CA, United States</td>
<td>James T. Ayers, III, Tusit Weerasooriya, Anindya Ghoshal, Allan Gunnarsson, Collin Pecora, Peter Turney, U.S. Army Research Laboratory, Aberdeen Proving Ground, Aberdeen, MD, United States, Brett Sanborn, Oak Ridge Institute of Science and Education, Aberdeen, MD, United States</td>
<td>Yong Han, Pratt and Whitney Canada, Longueil, QC, Canada, Dan Mateescu, Arun K. Misra, McGill University, Montreal, QC, Canada</td>
<td></td>
</tr>
</tbody>
</table>

### SYMP 6-4
**Biomimetic Aerial Vehicles**

**Session Organizer:** Rashi Tiwari, Dow Chemical, Midland, TX, United States  
**Session Co-Organizer:** Vishnu Baba Sundaresan, Virginia Commonwealth University, Richmond, VA, United States

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<tbody>
<tr>
<td>Stephen Furst, Stefan Seelecke, Saarland University, Saarbruecken, Germany, Bryan Peele, North Carolina State University, Raleigh, NC, United States</td>
<td>Ainy A. Wissa, James E. Hubbard Jr., Nelson Guerreiro, University of Maryland, Hampton, VA, United States, Yashwanth Tummala, Mary Frecker, Pennsylvania State University, University Park, PA, United States, Jared Grauer, NASA, Hampton, VA, United States</td>
<td>Christopher J. Blower, Adam Wickenheiser, George Washington University, Washington, DC, United States</td>
<td>Kiron Mateti, Rory A. Byrne-Dugan, Srivivas A. Tadigadapa, Christopher D. Rahn, Pennsylvania State University, University Park, PA, United States</td>
<td>Kiron Mateti, Rory A. Byrne-Dugan, Srivivas A. Tadigadapa, Christopher D. Rahn, Pennsylvania State University, University Park, PA, United States</td>
<td>Algan Samur, Alper Erturk, Georgia Institute of Technology, Atlanta, GA, United States</td>
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</tbody>
</table>

#### “Into the Woods” Reception
6:00pm–8:00pm **Salon Foyer, Lake Level**

#### ASME ASMS Branch Meeting
7:30pm–10:00pm **Rotunda, Lake Level**

#### Student Outing
8:00pm–11:30pm **Deck, Lake Level**

All technical sessions take place on Lobby Level.
### THURSDAY, SEPTEMBER 20, 2012

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Breakfast 7:00am–8:00am Salón Foyer, Lobby Level</td>
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<tr>
<td>9:10</td>
<td>Keynote 8:00am–9:00am Salón D, Lobby Level</td>
</tr>
<tr>
<td>9:30</td>
<td>Coffee Break 9:00am–9:10am Salón Foyer, Lobby Level</td>
</tr>
<tr>
<td>9:50</td>
<td>Coffee Break 9:00am–9:10am Salón Foyer, Lobby Level</td>
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<tr>
<td>10:10</td>
<td>Coffee Break 9:00am–9:10am Salón Foyer, Lobby Level</td>
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<tr>
<td>10:20</td>
<td>Coffee Break 9:00am–9:10am Salón Foyer, Lobby Level</td>
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</tbody>
</table>

#### SYMP 1-5 Characterization of Carbon-based Nanostructures

**Session Organizer:** Hani Naguib, University of Toronto, Toronto, ON, Canada  
**Session Co-Organizer:** Zoubeida Ounaies, Pennsylvania State University, State College, PA, United States  

<table>
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<tr>
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<tbody>
<tr>
<td>Frank Gardea, Sneha Chawla, Mohammad Naraghi, Dimitris Lagoudas, Texas A&amp;M University, College Station, TX, United States</td>
<td>Yupeng Li, Jonghwan Suhr, University of Delaware, Newark, DE, United States, Junmo Kang, SKKU Advanced Institute of Nanotechnology (SAINT) and Center for Human Interface Nano Technology Gyenggi-do, Korea (Republic), J.B. Choi, Sungkyunkwan University, Kyungi-do, Korea (Republic)</td>
<td>Reza Rizvi, Hani Naguib, University of Toronto, Toronto, ON, Canada, Elaine Biddiss, University of Toronto, Bloorview Research Institute, Toronto, ON, Canada</td>
<td>Sebastian Geier, Thorsten Mahrholz, Peter Wierach, German Aerospace Center, Braunschweig, Germany, Stephan Müller, Coburg University of Applied Science, Coburg, Germany, Johannes Riemenschnieder, DLR, Braunschweig, Germany, Michael Sinapius, Institute of Adaptronics and Function Integration, Braunschweig, Germany</td>
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All technical sessions take place on Lobby Level.
<table>
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<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>SYMP 2-6</td>
<td>SMA Constitutive Models</td>
<td>Brian T. Lester, Dimitris Lagoudas, Texas A&amp;M University, College Station, TX, United States</td>
<td>Salon A</td>
</tr>
<tr>
<td>9:30</td>
<td></td>
<td>SMASIS2012-7969: Modeling of Hybrid Shape Memory Alloy Composites Incorporating MAX Phase Ceramics Technical Publication.</td>
<td>Brian T. Lester, Dimitris Lagoudas, Texas A&amp;M University, College Station, TX, United States</td>
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<td>SMASIS2012-8046: Extended Constitutive Integration Algorithms and Fully-Coupled Finite Element Analysis for Magnetic Shape Memory Response Technical Presentation Only.</td>
<td>Bjorn Kiefer, Thorsten Bartel, Andreas Menzel, Technische Universität Dortmund, Dortmund, Germany</td>
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<td>SMASIS2012-8188: Influence of the Latent Heat of Transformation and Thermomechanical Coupling on the Performance of Shape Memory Alloy Actuators Technical Publication.</td>
<td>Majid Tabesh, Brian Lester, Darren Hartl, Dimitris Lagoudas, Texas A&amp;M University, College Station, TX, United States</td>
<td></td>
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<tr>
<td>10:10</td>
<td>SYMP 3-5</td>
<td>Nonlinear Constitutive Models</td>
<td>Heidi Feigenbaum, Northern Arizona University, Flagstaff, AZ, United States</td>
<td>Salon E</td>
</tr>
<tr>
<td></td>
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<td>SMASIS2012-8164: Predicting the Magneto-Mechanical Behavior of MSMAs Subject to Complex Load Paths Technical Publication.</td>
<td>Heidi Feigenbaum, Constantin Ciocanel, Alex Waldauer, Northern Arizona University, Flagstaff, AZ, United States</td>
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<td>SMASIS2012-7938: Shape Characterization of a Simply Supported Beam in Morphing Technical Publication.</td>
<td>Amin M Motlagh, William Clark, University of Pittsburgh, Pittsburgh, PA, United States</td>
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All technical sessions take place on Lobby Level.
### THURSDAY, SEPTEMBER 20, 2012

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<th>9:00</th>
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**SYMP 4-2**  
**Actuation Systems**  
*Session Organizer: Jae-Hung Han, KAIST, Daejeon, Korea (Republic)*  
*Session Co-Organizer: Gregory J. Hiemenz, Techno-Sciences, Inc., Beltsville, MD, United States*

- **SMASIS2012-8253**: Performance Modeling of a Smart Material Hydraulic Actuator  
  Technical Publication.  
  John Larson, Marcelo J. Dapino, The Ohio State University, Columbus, OH, United States

- **SMASIS2012-8217**: Novel Dielectric Stack Actuators for Dynamic Applications  
  Technical Publication.  
  Sven Herold, William Kaal, Tobias Melz, Fraunhofer-Institute LBF, Darmstadt, Germany

- **SMASIS2012-8240**: Development of Multi-DOF Active Microvibration Emulator  
  Technical Publication.  
  Geeyong Park, Dae-Oen Lee, Jae-Hung Han, KAIST, Daejeon, Daejeon, Korea (Republic), Nam Seo Goo, Konkuk University, Seoul, Seoul, Korea (Republic)

- **SMASIS2012-8140**: Fabrication of a Dielectric Electro Active Polymer Actuator with Pre-strain Mechanism  
  Technical Publication.  
  Oscar Alvarado, University of Maryland, Silver Spring, MD, United States, Alison Flatau, University of Maryland, College Park, MD, United States

**SYMP 5-5**  
**SHM for Composite Materials**  
*Session Organizer: Oliver Myers, Mississippi State University, Mississippi State, MS, United States*  
*Session Co-Organizer: Jinkyu Yang, University of South Carolina, Columbia, SC, United States*

- **SMASIS2012-7958**: Conductivity-based Damage Detection in Carbon Fiber Composites  
  Technical Publication.  
  Bryan Loyola, Sandia National Laboratories, Livermore, CA, United States, Luciana Arronche, Kenneth Loh, Valeria La Saponara, University of California, Davis, Davis, CA, United States

- **SMASIS2012-7948**: A Structural Health Monitoring System for Composite Beams with Coupled Bending-Torsion  
  Technical Publication.  
  Zeaid Hasan, Arizona State University, Tempe, AZ, United States, Ghassan Atmeh, University of Texas at Arlington, Arlington, TX, United States

- **SMASIS2012-8083**: Intrinsic Spatio-Temporal Resolution Analysis of Nondestructive Impact Diagnostic Force Ensembles and Collocated Accelerations in a Composite Beam Structure  
  Technical Publication.  
  Ioannis Georgiou, National Technical University / Purdue University, Zografos, Athens, Greece

- **SMASIS2012-8231**: A New Imaging Approach to In-situ and Ex-situ Inspections of Fibre Reinforced Composites by Magnetic Induction Tomography (MIT)  
  Technical Publication.  
  Axel Renner, Wolf-Joachim Fischer, Uwe Marschner, Technische Universität Dresden, Dresden, Germany

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All technical sessions take place on Lobby Level.
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<table>
<thead>
<tr>
<th>Time</th>
<th>SYMP 7-1: Noise Energy Harvesting</th>
<th>SYMP 8-1: Structural &amp; Material Logic I</th>
<th>Coffee Break</th>
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<tbody>
<tr>
<td>9:00</td>
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All technical sessions take place on Lobby Level.
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<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>10:50</td>
<td>SYMP 1-6: Novel Nanostructures for Active Applications</td>
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<th>Time</th>
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<tbody>
<tr>
<td>11:10</td>
<td>SYMP 2-7: CASMART I: SMA Modeling &amp; Applications</td>
</tr>
<tr>
<td>11:30</td>
<td>SMASIS2012-8196: Comparison of Three-Dimensional Shape Memory Alloy Models: Finite Element Analysis of Common Engineering Components Technical Presentation Only. Darren Hartl, Abhay Mohan, Texas A&amp;M University, College Station, TX, United States, Aaron Stebner, Pingping Zhu, Northwestern University, Evanston, IL, United States, Travis Turner, NASA Langley Research Center, Hampton, VA, United States.</td>
</tr>
<tr>
<td>12:15</td>
<td>SMASIS2012-8219: Computational Design of a Reconfigurable Origami Space Structure Incorporating Shape Memory Alloy Thin Films Technical Publication. Darren Hartl, Kathryn L. Lane, Richard J. Malak, Texas A&amp;M University, College Station, TX, United States.</td>
</tr>
<tr>
<td>Time</td>
<td>Session 3-6: Actuator Modeling</td>
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<td>10:50</td>
<td><strong>SMASIS2012-7940:</strong> Modeling of Non-monotonic Hysteresis Behavior in VO2-coated Microactuators Technical Publication. Jun Zhang, Emmanuelle Merced, Xiaobo Tan, Michigan State University, East Lansing, MI, United States, Parsaoran Hutapea, Temple University, Philadelphia, PA, United States</td>
</tr>
<tr>
<td>11:10</td>
<td><strong>SMASIS2012-7942:</strong> Homogenized Energy Model and Markov Chain Monte Carlo Simulations for Macro Fiber Composites Operating In Broadband Regimes Technical Publication. Zhengzheng Hu, Ralph Smith, North Carolina State University, Raleigh, NC, United States, Michael Hays, William Oates, Florida State University, Tallahassee, FL, United States, Nathaniel Burch, Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, NC, United States</td>
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<tr>
<td>12:15</td>
<td><strong>SMASIS2012-8010:</strong> Experimental Nondestructive Testing using Magnetostrictive Particles Embedded in Carbon Fiber Reinforced Polymer Beams Technical Publication. Jonathan Rudd, Dustin Spayne, Oliver Myers, Mississippi State University, Mississippi State, MS, United States</td>
</tr>
<tr>
<td>12:30</td>
<td><strong>SMASIS2012-8118:</strong> Gyroscopic Effects of Horizontal Axis Wind Turbines using Stochastic Aeroelasticity via Spinning Finite Elements Technical Publication. Antonio Velazquez, Andrew Swartz, Michigan Tech, Houghton, MI, United States</td>
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All technical sessions take place on Lobby Level.
### SYMP 6-5  Bioinspired Materials

**Session Organizer:** Michael Philen, Virginia Polytechnic Institute and State University, Blacksburg, VA, United States  
**Session Co-Organizer:** Vishnu Baba Sundaresan, Virginia Commonwealth University, Richmond, VA, United States

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
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</table>
| 10:50  | SMASIS2012-8128: Bio-Inspired Self-Healing of FRPs using Microvascules and Novel Healing Chemistries  
Invited Speaker Presentation Only.  
Ian Bond, Tim Coope, Kasia Boba, Richard Trask, Chris Norris, University of Bristol, Bristol, United Kingdom |  
| 11:10  | SMASIS2012-8168: Synthetic Ion Channels as Gating Devices in a Conducting Polymer Ionic Transistor  
Technical Presentation Only.  
Vishnu Baba Sundaresan, James Carr, Virginia Commonwealth University, Richmond, VA, United States |  
Technical Publication.  
Joseph N. Goodman, Guillermo J. Amador, Jeannette Yen, Russell Gentry, Georgia Institute of Technology, Atlanta, GA, United States, Kathryn Nagel, Georgia Tech Research Institute, Alpharetta, GA, United States |  
Technical Publication.  
Matteo Carrara, Martin Cacan, Joel Toussaint, Michael Leamy, Massimo Ruzzene, Alper Erturk, Georgia Institute of Technology, Atlanta, GA, United States |  
| 12:15  | SMASIS2012-7926: Energy Harvesting from Hydraulic Pressure Fluctuations  
Technical Publication.  
Kenneth A. Cunefare, Alper Erturk, Jeremy Savor, Nalin Verma, Ellen A. Skow, Martin Cacan, Georgia Institute of Technology, Atlanta, GA, United States |  
| 12:30  | SMASIS2012-8212: Small Wind Energy Harvesting from Galloping using Piezoelectric Materials  
Technical Publication.  
Liya Zhao, Lihua Tang, Yaowen Yang, Nanyang Technological University, Singapore |  

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<tr>
<td>10:50</td>
<td>SYMP 8-2: Structural &amp; Material Logic II</td>
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<tr>
<td>11:10</td>
<td>SMASIS2012-8268: High Stiffness/Damping Materials via Fluidic Microelements Technical Presentation Only. Gene Cha, Terry Creasy, Texas A&amp;M University, College Station, TX, United States, John Schwille, Tony Tang, Gary F. Hawkins, The Aerospace Corporation, Chantilly, VA, United States</td>
</tr>
<tr>
<td>11:30</td>
<td>SMASIS2012-8269: Design And Modeling of Microarchitected Composites Materials with CNTs and Nanoengineered Polymers Technical Presentation Only. Julien Meaud, Sei Jin Park, Bongjun Yeom, Trisha Sain, Zheng-Dong Ma, John Hart, Greg Hubert, Nicholas Kotov, Ellen Arruda, Anthony Waas, University of Michigan, Ann Arbor, MI, United States</td>
</tr>
<tr>
<td>11:50</td>
<td>SMASIS2012-8270: Vibration Isolation using Resonating Structure Technical Presentation Only. J.M. Manimala, H.H. Huang, Chin- Teh Sun, Purdue University, West Lafayette, IN, United States, R. Snyder, S. Bland, NextGen Aeronautics, Torrance, CA, United States</td>
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<tr>
<td>12:15</td>
<td>Bingo Lunch 12:15pm–1:45pm</td>
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<td>Waterside Restaurant, Lobby Level</td>
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<tr>
<td>12:15</td>
<td>ASME ASMS Technical Committee Meetings</td>
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<td>12:15</td>
<td>Journal of Intelligent Material Systems and Structures Editorial Board Meeting</td>
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<td>12:15</td>
<td>12:15pm–1:45pm</td>
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<td>Rotunda, Lake Level</td>
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<td>Willow, Lake Level</td>
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<th>Session Co-Organizer(s)</th>
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<tbody>
<tr>
<td>1:45</td>
<td>SYMP 1-7</td>
<td>New Responsive Soft Materials</td>
<td>Christopher Lynch, University of California Los Angeles, Sherman Oaks, CA, United States</td>
<td>Michael Wegener, Fraunhofer IAP, Potsdam, Germany</td>
</tr>
<tr>
<td>2:05</td>
<td>SMASIS2012-8103: Fracture Modeling of an Embedded Crack in Self-healing Polymers</td>
<td>Mohammad H. Malakooti, Henry A. Sodano, University of Florida, Gainesville, FL, United States</td>
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<tr>
<td>2:25</td>
<td>SMASIS2012-8070: Experimental Optimization of Electrode Composition for Ionic Polymer Transducers in Sensing</td>
<td>Bilge Kocer, Lisa Weiland, University of Pittsburgh, Pittsburgh, PA, United States</td>
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<tr>
<td>2:45</td>
<td>SMASIS2012-8127: Back-relaxation of Carbon-based Ionic Electroactive Polymer Actuators</td>
<td>Veiko Vunder, Andres Punning, Alvo Aabloo, University of Tartu, Tartu, Estonia</td>
<td></td>
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<tr>
<td>3:05</td>
<td>SMASIS2012-7975: Evaluation of Encapsulated IPMC Sensor Based on Thick Parylene Coating</td>
<td>Mohammad H. Malakooti, Henry A. Sodano, University of Florida, Gainesville, FL, United States</td>
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<td></td>
<td>SMASIS2012-8070: Experimental Optimization of Electrode Composition for Ionic Polymer Transducers in Sensing</td>
<td>Bilge Kocer, Lisa Weiland, University of Pittsburgh, Pittsburgh, PA, United States</td>
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<tr>
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<td>SMASIS2012-8103: Fracture Modeling of an Embedded Crack in Self-healing Polymers</td>
<td>Mohammad H. Malakooti, Henry A. Sodano, University of Florida, Gainesville, FL, United States</td>
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### SYMP 2-8

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<th>Session Organizer(s)</th>
<th>Session Co-Organizer(s)</th>
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<tbody>
<tr>
<td>2:05</td>
<td>SMASIS2012-8078: Characterization and Modeling of Trained NiTiNol Torsional Actuators under Reverse Bias Loads</td>
<td>James Mabe, Brian Fischer, Boeing Research and Technology, Seattle, WA, United States</td>
<td></td>
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<tr>
<td>2:25</td>
<td>SMASIS2012-8211: Experimental Characterization of Self-Sensing SMA Actuators under Controlled Convective Cooling</td>
<td>Nicole Lewis, Stefan Seelecke, Saarland University, Saarbruecken, Germany</td>
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<tr>
<td>2:45</td>
<td>SMASIS2012-8225: Effect of Precipitates on Cyclic Actuation Response of Ni-Rich NiTi Shape Memory Alloys</td>
<td>Ceylan Hayrettin, Ebubekir Dogan, Ibrahim Karaman, Texas A&amp;M University, College Station, TX, United States</td>
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<tr>
<td>3:05</td>
<td>SMASIS2012-8227: Improvement in Shape Memory Response of a Ni-Rich NiTiHf Alloys via Nanosize Precipitation</td>
<td>Alper Evirgen, Ibrahim Karaman, Texas A&amp;M University, College Station, TX, United States, Ronald D. Noebe, NASA Glenn Research Center, Cleveland, OH, United States</td>
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<th>Organizer/Speaker</th>
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<tbody>
<tr>
<td>1:45</td>
<td>SYMP 3-7</td>
<td>Soft Electroactive Materials</td>
<td>William Oates, Florida State University, Tallahassee, FL, United States, N. Seetharamaiah, Hyderabad, India</td>
</tr>
<tr>
<td>2:05</td>
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<td>SMASIS2012-8082: Design and Characterization of a Soft Electroactive Adaptive Structure for Legged Robotic Motion</td>
<td>Jason Newton, Michael Hays, Jonathan Clark, William Oates, Florida State University, Tallahassee, FL, United States</td>
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<tr>
<td>2:25</td>
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<td>SMASIS2012-8228: Experimental Investigation on Chatter Stability with Magneto-Rheological Damping in End Milling Operation</td>
<td>G.M. Sayeed Ahmed, N. Seetharamaiah, Muffakham Jah College of Engineering and Technology, Hyderabad, India</td>
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<tr>
<td>3:05</td>
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<td>SMASIS2012-8295: A Bidirectional-Controllable Magneto-Rheological Energy Absorber for Shock and Vibration Isolation Systems</td>
<td>Xian-Xu Bai, Chongqing University &amp; University of Maryland, College Park, MD, United States, Norman M. Wereley, Wei Hu, University of Maryland, College Park, MD, United States, Dai-Hua Wang, Chongqing University, Chongqing, China</td>
</tr>
<tr>
<td>3:25</td>
<td>SYMP 4-3</td>
<td>Adaptive Structures Prize I</td>
<td>Faramarz Gordaninejad, University of Nevada, Reno, NV, United States, Curt Kothera, Techno-Sciences Inc., Beltsville, MD, United States</td>
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<td>SMASIS2012-8281: Bioinspired Pneumatic Artificial Muscle Actuator System Design For Aerospace And Robotics Applications</td>
<td>Norman M. Wereley, University of Maryland, College Park, MD, United States</td>
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<td>SMASIS2012-8250: A Bidirectional-Controllable Magneto-Rheological Energy Absorber for Shock and Vibration Isolation Systems</td>
<td>Xian-Xu Bai, Chongqing University &amp; University of Maryland, College Park, MD, United States, Norman M. Wereley, Wei Hu, University of Maryland, College Park, MD, United States, Dai-Hua Wang, Chongqing University, Chongqing, China</td>
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<td>SMASIS2012-8114: Mechanism and Bias Considerations for Design of a Bi-Directional Artificial Muscle Actuator</td>
<td>Robert D. Vocke, III, Norman M. Wereley, University of Maryland, College Park, MD, United States, Curt Kothera, Techno-Sciences Inc., Beltsville, MD, United States</td>
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All technical sessions take place on Lobby Level.
### Thursday, September 20, 2012

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1:45</td>
<td><strong>SYMP 5-7</strong> Modeling Applications for SHM</td>
<td><strong>Salon C</strong></td>
<td>Session Organizer: Haiying Huang, University of Texas Arlington, Arlington, TX, United States</td>
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<td></td>
<td>Session Co-Organizer: Ioannis Georgiou, National Technical University / Purdue University, Zografos, Athens, Greece</td>
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<td></td>
<td>SMASIS2012-8094: Electromechanical Impedance Modeling for Structural Health Monitoring Technical Publication.</td>
<td></td>
<td>Liuxian Zhao, Lingyu Yu, Matthew Gresil, Michael Sutton, Siming Guo, University of South Carolina, Columbia, SC, United States</td>
</tr>
<tr>
<td></td>
<td>SMASIS2012-7917: Simulation of Interaction between Lamb Waves and Cracks for Structural Health Monitoring with Piezoelectric Wafer Active Sensors Technical Publication.</td>
<td></td>
<td>Yanfeng Shen, Victor Giurgiutiu, University of South Carolina, Columbia, SC, United States</td>
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<td></td>
<td>SMASIS2012-8139: Nonlinear Guided Waves for Structural Health Monitoring - Numerical Algorithm and Application to a Railroad Track Technical Publication.</td>
<td></td>
<td>Claudio Nucera, Francesco Lanza di Scalea, University of California San Diego, La Jolla, CA, United States</td>
</tr>
<tr>
<td>2:05</td>
<td><strong>SYMP 7-3</strong> Nonlinear Energy Harvesting</td>
<td><strong>Salon G</strong></td>
<td>Session Organizer: Mohammed Daqaq, Clemson University, Clemson, SC, United States</td>
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<td>Session Co-Organizer: Alper Erturk, Georgia Institute of Technology, Atlanta, GA, United States</td>
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<td></td>
<td>SMASIS2012-8261: Mechanically Nonlinear MEMS Electrostatic Energy Harvesters Invited Speaker Presentation Only.</td>
<td></td>
<td>Einar Halvorsen, Vestfold University College, Borre, Norway</td>
</tr>
<tr>
<td></td>
<td>SMASIS2012-8041: Magnetic Coupled Cantilever Piezoelectric Energy Harvester Technical Publication.</td>
<td></td>
<td>Lihua Tang, Yaowen Yang, Liya Zhao, Nanyang Technological University, Singapore</td>
</tr>
<tr>
<td></td>
<td>SMASIS2012-8112: Non-Linear Modeling and Analysis of Composite Helicopter Blade for Piezoelectric Energy Harvesting Technical Publication.</td>
<td></td>
<td>Wander G.R. Vieira, Carlos De Marqui Jr, University of Sao Paulo, Sao Carlos, SP, Brazil, Fred Nitzsche, Carleton University, Ottawa, ON, Canada</td>
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All technical sessions take place on Lobby Level.
### THURSDAY, SEPTEMBER 20, 2012

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<tr>
<th>Time</th>
<th>Session Title</th>
<th>Venue</th>
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<tbody>
<tr>
<td>1:45</td>
<td><strong>SYMP 8-3</strong> Structural &amp; Material Logic III</td>
<td>RHODODENDRON</td>
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<td></td>
<td>SMASIS2012-8272: On the Use of Geometric Amplification for High Stiffness/High Damping Structural Systems Technical Presentation Only. Zheng-Dong Ma, Gregory Hubert, University of Michigan, Ann Arbor, MI, United States</td>
<td></td>
</tr>
<tr>
<td>2:05</td>
<td>SMASIS2012-8273: Structural Assemblies Based on Negative Stiffness Elements for Simultaneous High Stiffness and High Damping Technical Presentation Only. Farhan Gandhi, S. Barbarino, M. Pontecorvo, Pennsylvania State University, University Park, PA, United States, S. Bland, R. Snyder, NextGen Aeronautics, Torrance, CA, United States</td>
<td></td>
</tr>
<tr>
<td>2:25</td>
<td>SMASIS2012-8274: Assemblies of Negative Stiffness Elements for Adaptive Shock and Vibration Isolation Technical Presentation Only. Benjamin Fulcher, Jordan Matthews, David Shahan, Michael R. Haberman, Carolyn Seevers, University of Texas at Austin, Austin, TX, United States</td>
<td></td>
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<tr>
<td>2:45</td>
<td>SMASIS2012-8275: Constitutive Modeling of Polymer Nanocomposites; Towards Simultaneously High Stiffness and High Damping Nanocomposites Technical Presentation Only. Trisha Sain, Bongjun Yeom, Nicholas Kotov, Anthony Waas, Ellen Arruda, University of Michigan, Ann Arbor, MI, United States</td>
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<tr>
<td>3:05</td>
<td>Coffee Break 3:05pm–3:25pm</td>
<td>SALON FOYER, LOBBY LEVEL</td>
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<tr>
<td>3:25</td>
<td><strong>SMASIS2012-8126</strong>: Characterization of Ferroelectric Single Crystals with Field Induced Phase Transformations Technical Publication. John A. Gallagher, University of California Los Angeles, Los Angeles, CA, United States, Christopher Lynch, University of California Los Angeles, Sherman Oaks, CA, United States</td>
<td>SALON F</td>
</tr>
<tr>
<td>4:05</td>
<td>SMASIS2012-8134: Polycrystalline PMN-PT Thin Films for Piezoelectric MEMS Applications Technical Presentation Only. Yaser Bastani, Nazanin Bassiri-Gharb, Georgia Institute of Technology, Atlanta, GA, United States</td>
<td></td>
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<tr>
<td>4:25</td>
<td>SMASIS2012-8002: Piezoelectric-Property Adjustment of Cellular Ferroelectrets by Foam-Structure and Geometry Variations Technical Publication. Martynas Sborikas, Michael Wegener, Fraunhofer IAP, Potsdam, Germany</td>
<td></td>
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<tr>
<td>4:45</td>
<td><strong>SMASIS2012-7911</strong>: Wave Propagation in Periodic Piezoelectric Elastic Waveguides Technical Publication. Davit Piliposyan, Karen Ghazaryan, Institute of Mechanics, Yerevan, Armenia, Gayane Piliposian, University of Liverpool, Liverpool, United Kingdom, Ara Avetsian, State Engineering University of Armenia (SEUA), Yerevan, Armenia</td>
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<tr>
<td>5:00</td>
<td>All technical sessions take place on Lobby Level.</td>
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### THURSDAY, SEPTEMBER 20, 2012

#### SYMP 2-9  SMA Fatigue & Fracture

**Session Organizer:** Othmane Benafan, NASA Glenn Research Center, Cleveland, OH, United States  
**Session Co-Organizer:** Travis Turner, NASA Langley Research Center, Hampton, VA, United States

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Paper Title</th>
<th>Authors</th>
<th>Location</th>
</tr>
</thead>
</table>
Antonino Parrinello,  
Theocharis Baxevanis,  
Dimitris Lagoudas, Texas A&M University, College Station, TX, United States,  
Austin E. Cox, Texas A&M University, Bryan, TX, United States | Sala A |
| 3:45  | SYMP 2-9 | SMASIS2012-7934: Mode I Steady Crack-Growth in Superelastic Shape Memory Alloys | Technical Publication.  
Theocharis Baxevanis, Dimitris Lagoudas, Texas A&M University, College Station, TX, United States, Chad Landis, The University of Texas at Austin, Austin, TX, United States | Sala A |
| 4:05  | SYMP 2-9 | SMASIS2012-8222: A Study of Actuation Fatigue of Shape Memory Alloy | Technical Publication.  
Babatunde Agboola, Darren Harti, Dimitris Lagoudas, Texas A&M University, College Station, TX, United States | Sala A |
Xin Xiang Jiang, Guanghan Wang, Andrew S. Gibson, Stephane Gendron, Darius Nikanpour, Canadian Space Agency, St-Hubert, Quebec, Canada | Sala A |

#### SYMP 2-10  Piezoelectrics: Applications

**Session Organizer:** Nelson Sepulveda, Michigan State University, East Lansing, MI, United States  
**Session Co-Organizer:** Masoud Tahani, Ferdowsi University of Mashhad, Mashhad, Iran

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Paper Title</th>
<th>Authors</th>
<th>Location</th>
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</table>
Tommaso Delpero, Paolo Ermanni, Swiss Federal Institute of Technology ETH, Zurich, Switzerland, Filippo Casadei, Massimo Ruzzene, Georgia Institute of Technology, Atlanta, GA, United States, Andrea Bergamini, EMPA, Laboratory for Mechanics for Modelling and Simulation, Dübendorf, Switzerland | Sala E |
| 3:45  | SYMP 2-10 | SMASIS2012-8150: Viscelastic and Non-Linear Piezoelectric Behavior of Active Fiber Composites | Technical Presentation Only.  
Hasene Ben Attilallah, Pennsylvania State University, State College, PA, United States, Zoubeida Ounaies, Pennsylvania State University, University Park, PA, United States, Anastasia Muliana, Texas A&M University, College Station, TX, United States | Sala E |
Masoud Tahani, S. Abdolmajid Yousefsani, Ferdowsi University of Mashhad, Mashhad, Iran | Sala E |
Rashed H. Bhuiyan, MD Mazharul Islam, Haiying Huang, University of Texas at Arlington, Arlington, TX, United States | Sala E |

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All technical sessions take place on Lobby Level.
### THURSDAY, SEPTEMBER 20, 2012

#### SYMP 4-4  Adaptive Structures Prize II

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<tr>
<th>Time</th>
<th>Session Title</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>3:45</td>
<td>Invited Speaker Presentation Only</td>
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<tr>
<td>4:25</td>
<td>SMASIS2012-8189: Optimal Control of Gun Recoil Using Magnetorheological Dampers</td>
<td>Harinder Singh, Norman M.Wereley, University of Maryland, College Park, MD, United States</td>
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<tr>
<td>4:45</td>
<td>SMASIS2012-7914: Development of a Lumped-Parameter Occupant Injury Assessment Model for Vehicular Blast Effects Simulation</td>
<td>Jin-Hyeong Yoo, Muthuvel Murugan, D. Le, U.S. Army Research Laboratory, Aberdeen Proving Ground, Aberdeen, MD, United States</td>
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#### SYMP 5-8  Guided Waves/Acoustic Emission

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<tr>
<th>Time</th>
<th>Session Title</th>
<th>Speaker(s)</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>3:45</td>
<td>Technical Publication.</td>
<td>Anindya Ghoshal, James T. Ayers, III, U.S. Army Research Laboratory, Aberdeen Proving Ground, Aberdeen, MD, United States</td>
<td></td>
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<tr>
<td>4:45</td>
<td>SMASIS2012-8013: Lamb Wave Propagation Study using Frequency-Wavenumber Analysis Technical Publication.</td>
<td>Zhenhua Tian, Lingyu Yu, University of South Carolina, Columbia, SC, United States</td>
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<tr>
<td>5:00</td>
<td>SMASIS2012-8061: Multimodal Lamb Waves Power and Transfer Function Analysis of Structurally-Bonded PWAS Technical Publication.</td>
<td>Bin Lin, Ayman Kamal, Victor Giurgiutiu, Tuncay Kamas, University of South Carolina, Columbia, SC, United States</td>
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All technical sessions take place on Lobby Level.
### THURSDAY, SEPTEMBER 20, 2012

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>3:25</td>
<td>SYMP 7-4 Fluidic and Thermoelectric Energy Harvesting</td>
<td>Salon G</td>
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<tr>
<td>3:45</td>
<td>SYMP 8-4 Structural &amp; Material Logic IV</td>
<td>Rhododendron</td>
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**SYMP 7-4 Fluidic and Thermoelectric Energy Harvesting**

Session Organizer: Norbert Schwesinger, Technische Universitaet Muenchen, Munich, Germany  
Session Co-Organizer: Adam Wickenheiser, George Washington University, Washington, DC, United States

- SMASIS2012-7978: Investigation of Host Structure Compliance in Aeroelastic Energy Harvesting  
  Technical Publication.  
  Matthew Bryant, Ricky Tse, Ephrahim Garcia, Cornell University, Ithaca, NY, United States

- SMASIS2012-8000: Piezoelectric Energy Harvesting Through Fluid Excitation  
  Technical Publication.  
  Andrew Truitt, S. Nima Mahmoodi, The University of Alabama, Tuscaloosa, AL, United States

- SMASIS2012-8247: A Feasibility Investigation on Improving Structural Integrity of Thermoelectric Modules with Varying Geometry  
  Technical Publication.  
  Ugur Erturun, Karla Mossi, Virginia Commonwealth University, Richmond, VA, United States

**SYMP 8-4 Structural & Material Logic IV**

- SMASIS2012-8266: Structural Logic System Synthesis with Bi-stable Snap-Through Elements  
  Technical Presentation Only.  
  David Johnson, Manoj Thota, Zhen Wu, Kon-Well Wang, University of Michigan, Ann Arbor, MI, United States, Bing C. Chen, Kyle Gould, Teledyne Scientific Company, Camarillo, CA, United States, Soobum Lee, Fabio Semperlotti, University of Notre Dame, South Bend, IN, United States

- SMASIS2012-8276: Hierarchical Design of Advanced Nanocomposites With Extreme Stiffness And Damping Properties  
  Technical Presentation Only.  
  Sei Jin Park, Bonjun Yeom, Julien Meaud, Trisha Sain, Zheng-dong Ma, John Hart, Greg Hulbert, Nicholas Kotov, Ellen Arruda, Anthony Waas, University of Michigan, Ann Arbor, MI, United States

- SMASIS2012-8277: Columnar LBL Nanocomposites with Record Stiffness-Damping Combination  
  Technical Presentation Only.  
  Bongjun Yeom, Anthony Waas, Ellen Arruda, Nicholas Kotov, University of Michigan, Ann Arbor, MI, United States

**“Georgia on My Mind” Pioneer Banquet**  
6:00pm–10:00pm  
GEORGIA AQUARIUM

Buses will depart from the Conference Center entrance promptly at 5:00pm.

**Game Night**  
10:00pm–12:00am  
STONEWALL’S LOUNGE/POOL AREA

All technical sessions take place on Lobby Level.
FRIDAY, SEPTEMBER 21, 2012

Breakfast 7:00am–8:00am  
Keynote 8:00am–9:00am  
Coffee Break 9:00am–9:20am

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<th>9:00</th>
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<td></td>
<td>SYMP 1-9 Shape Memory Effect in Soft Materials I</td>
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<td>Session Organizer: Marcelo J. Dapino, The Ohio State University, Columbus, OH, United States</td>
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<td>Session Co-Organizer: Gregory Reich, Air Force Research Laboratory, WPAFB, Wright Patterson, OH, United States</td>
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<td>SMASIS2012-7936: Processing and Characterization of Novel Bismaleimide-Based Shape Memory Polymer Composites Technical Publication. Gyaneshwar Tandon, Thao Gibson, Joseph Shumaker, University of Dayton Research Institute, Dayton, OH, United States, Richard Coomer, SOCHE, Dayton, OH, United States, Ryan Justice, Air Force Research Laboratory, Lebanon, OH, United States, Jeffery W. Baur, Air Force Research Laboratory, Dayton, OH, United States</td>
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<td>SMASIS2012-8257: Analysis of Shape Memory Polymer-Alloy Composites: Modeling and Parametric Studies Technical Publication. Jungkyu Park, Leon M. Headings, Marcelo J. Dapino, The Ohio State University, Columbus, OH, United States, Jeffery W. Baur, Air Force Research Laboratory, Dayton, OH, United States, Gyaneshwar Tandon, University of Dayton Research Institute, Dayton, OH, United States</td>
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<td>SMASIS2012-8245: A Model Framework for Microvascular Shape Memory Polymers Invited Speaker Presentation Only. Nakhiah Goulbourne, University of Michigan, Ann Arbor, MI, United States</td>
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All technical sessions take place on Lobby Level.
### SYMP 2-11  CASMART III: SMA Microstructure Evolution  
**Session Organizer:** Santo A. Padula II, NASA Glenn Research Center, Cleveland, OH, United States  
**Session Co-Organizer:** Rajan Vaidyanathan, University of Central Florida, Orlando, FL, United States

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<th>Authors</th>
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<tbody>
<tr>
<td>9:40</td>
<td>SMASIS2012-8001: Development of Stable Two-Way Shape Memory Behavior in a Polycrystalline NiTi Shape Memory Alloy Technical Presentation Only.</td>
<td>Othmane Benafan, Ronald D. Noebe, Santo A. Padula II, NASA Glenn Research Center, Cleveland, OH, United States, Raj Vaidyanathan, University of Central Florida, Orlando, FL, United States, Thomas A. Sisneros, Los Alamos National Laboratory, Los Alamos, NM, United States</td>
</tr>
<tr>
<td>9:20</td>
<td>SMASIS2012-8248: Transients and Evolution in NiTi Technical Presentation Only.</td>
<td>Santo A. Padula II, NASA Glenn Research Center, Cleveland, OH, United States, Darrell J. Gaydosh, Ohio Aerospace Institute, Cleveland, OH, United States, Atif F. Saleeb, Binod Dhakal, The University of Akron, Akron, OH, United States</td>
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</tbody>
</table>

### SYMP 3-8  Control Theory & Implementation III  
**Session Organizer:** Ralph Smith, North Carolina State University, Raleigh, NC, United States  
**Session Co-Organizer:** Lucus Van Blaircum, North Carolina State University, Raleigh, NC, United States

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<th>Time</th>
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<tbody>
<tr>
<td>9:00</td>
<td>SMASIS2012-8259: Adaptive Sparse Grid Generalized Stochastic Collocation Methods for UQ of Invited Speaker Presentation Only.</td>
<td>Clayton Webster, Oak Ridge National Lab, Oak Ridge, TN, United States</td>
</tr>
<tr>
<td>9:40</td>
<td>SMASIS2012-7988: Sliding Mode Control of the Human Vestibular System Technical Publication.</td>
<td>Rachael McCarty, The University of Alabama, Bessemer, AL, United States, S. Nima Mahmoodi, Keith Williams, The University of Alabama, Tuscaloosa, AL, United States</td>
</tr>
<tr>
<td>10:00</td>
<td>SMASIS2012-7989: Development of Robust Control Algorithms for Shape Memory Alloy Bending Actuators Technical Publication.</td>
<td>John H. Crews, Ralph Smith, Jennifer Hannen, North Carolina State University, Raleigh, NC, United States</td>
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All technical sessions take place on Lobby Level.
### FRIDAY, SEPTEMBER 21, 2012

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<th>SYMP 4-5</th>
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<tr>
<td>9:00</td>
<td><strong>Energy Harvesting with Piezoelectric Materials</strong></td>
<td><strong>Integrated Design</strong></td>
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<tr>
<td>9:20</td>
<td>Session Organizer: <strong>Flaviano Tateo</strong>, FEMTO-ST, Besancon, France</td>
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<tr>
<td>9:40</td>
<td>Session Co-Organizer: <strong>Changki Mo</strong>, Washington State University-Tri-Cities, Richland, WA, United States</td>
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<tr>
<td>10:00</td>
<td><strong>SMASIS2012-7908: Energy Harvesting under Combined Aerodynamic and Base Excitations Technical Publication.</strong> Amin Bibo, Mohammed Daqaq, Clemson University, Clemson, SC, United States</td>
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<tr>
<td>10:40</td>
<td><strong>SMASIS2012-8107: Full Electromechanical Optimization of Shunted Piezoelectric Patch for Controlling Elastodynamic Waves’ Power Flow Technical Publication.</strong> Flaviano Tateo, FEMTO-ST, Besancon, France, Tianli Huang, Laboratoire de Tribologie et Dynamique des Systemes, Ecully, France</td>
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<td><strong>SMASIS2012-8141: A Miniature MR Actuator with an Impedance Sensing Mechanism for Haptic Applications Technical Publication.</strong> Tae-Heon Yang, Korea Research Institute of Standards and Science, Daejeon, Korea (Republic), Jeong-Hoi Koo, Miami University, Oxford, OH, United States, Sang-Youn Kim, Korea University of Technology &amp; Education, Cheonan, Korea (Republic), Dong-Soo Kwon, KAIST, Daejeon, Korea (Republic)</td>
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<td><strong>SMASIS2012-7931: A Design of an Active Tool Holding Device Technical Publication.</strong> Alexander Boldering, Annika Raatz, Technische Universität Braunschweig, Braunschweig, Germany</td>
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<td></td>
<td><strong>SMASIS2012-8262: A Lightweight Thermal Energy Recovery System Based on Shape Memory Alloys: A DOE ARPA-E Initiative Invited Speaker Presentation Only.</strong> Alan Browne, GM R&amp;D Center, Warren, MI, United States</td>
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All technical sessions take place on Lobby Level.
### SYMP 5-9  
**Damage Detection/Prognosis I**  
Session Organizer: **Andrew Swartz**, Michigan Technological University, Houghton, MI, United States  
Session Co-Organizer: **Chin-Hsiung Loh**, National Taiwan University, Taipei, Taiwan

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<th>Session ID</th>
<th>Title</th>
<th>Primary Authors</th>
<th>Institution(s)</th>
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<tbody>
<tr>
<td>SMASIS2012-8096</td>
<td>Dual Mode Sensing of Crack Growth in Steel Bridge Structures Technical Publication.</td>
<td>Lingyu Yu, Liuxian Zhao, Zhenhua Tian, Victor Giurgiutiu, Paul Ziehl, University of South Carolina, Columbia, SC, United States</td>
<td></td>
</tr>
<tr>
<td>SMASIS2012-8145</td>
<td>Investigation of Low Velocity Impact Damage in Aluminum Alloys Technical Publication.</td>
<td>Ben Cooper, Andrei Zagrai, New Mexico Institute of Mining and Technology, Socorro, NM, United States</td>
<td></td>
</tr>
<tr>
<td>SMASIS2012-7905</td>
<td>Application of Singular Spectrum Analysis to Bridge Structure Health Monitoring and Damage Detection Technical Publication.</td>
<td>Chin-Hsiung Loh, Shu-Hsien Chao, National Taiwan University, Taipei, Taiwan</td>
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</tbody>
</table>

### SYMP 6-6  
**Bioinspired Actuators I**  
Session Organizer: **Armaghan Salehian**, University of Waterloo, Waterloo, ON, Canada  
Session Co-Organizer: **Andy Sarles**, University of Tennessee, Knoxville, TN, United States

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<tr>
<th>Session ID</th>
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<th>Institution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMASIS2012-7996</td>
<td>Design of Bend-and-Sweep Compliant Mechanism for Passive Shape Change Technical Publication.</td>
<td>Yashwanth Tummala, Pennsylvania State University, University Park, PA, United States, Mary I. Frecker, Pennsylvania State University, State College, PA, United States, Aimy A. Wissa, University of Maryland / National Institute of Aeronautics, Hampton, VA, United States, James E. Hubbard Jr., University of Maryland, Hampton, VA, United States</td>
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<tr>
<td>SMASIS2012-8205</td>
<td>Fabrication and Characterization of an Integrated Bioderived Polypyrrole Actuator Technical Presentation Only.</td>
<td>Hao Zhang, Vishnu Baba Sundaresan, Virginia Commonwealth University, Richmond, VA, United States</td>
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<tr>
<td>SMASIS2012-8220</td>
<td>Synthesis of a Flexible Matrix Composite Cellular Adaptive Structure Based on Non-Dimensional Dynamic Model Technical Presentation Only.</td>
<td>Suyi Li, Kon-Well Wang, University of Michigan, Ann Arbor, MI, United States</td>
<td></td>
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<tr>
<td>SMASIS2012-8088</td>
<td>Characterization of Shape-Changing Panels with Embedded Rubber Muscle Actuators Technical Publication.</td>
<td>Larry Peel, Enrique Molina, Texas A&amp;M University-Kingsville, Kingsville, TX, United States, Jeffery W. Baur, Air Force Research Laboratory, Dayton, OH, United States, Ryan Justice, Air Force Research Laboratory, Lebanon, OH, United States</td>
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</tbody>
</table>

All technical sessions take place on Lobby Level.
## FRIDAY, SEPTEMBER 21, 2012

<table>
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<tr>
<th>11:00</th>
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<tbody>
<tr>
<td><strong>Coffee Break</strong></td>
<td>10:40am–11:00am</td>
<td><strong>SALON Foyer, Lobby Level</strong></td>
<td><strong>SALON Foyer, Lobby Level</strong></td>
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</tbody>
</table>

### SYMP 1-10  Shape Memory Effect in Soft Materials II

**Session Organizer:** Nakhiah Goulbourne, University of Michigan, Ann Arbor, MI, United States  
**Session Co-Organizer:** Mohammad Elahinia, University of Toledo, Toledo, OH, United States

- **SMASIS2012-8036:** Miniaturization of QR Code Carriers based on Shape Memory Polymer  
  Technical Publication.  
  Nikolaus Fritzsche, Thorsten Pretsch, BAM Federal Institute for Materials Research and Testing, Berlin, Germany

- **SMASIS2012-8038:** Durability of QR Code Carriers based on Shape Memory Polymer  
  Technical Publication.  
  Melanie Ecker, Thorsten Pretsch, BAM Federal Institute for Materials Research and Testing, Berlin, Germany

- **SMASIS2012-7968:** Solvent Induced Shape Memory Behaviour of Sulfonated Poly Ether Ether Ketone (SPEEK)  
  Technical Publication.  
  Anand V.S., Vimal K.V., Susy Varughese, Indian Institute of Technology, Madras, Chennai, India

- **SMASIS2012-8180:** In-plane Field Propagation in EAP Transducers based on the Equivalent Network Method  
  Technical Publication.  
  Christian Graf, Jürgen Maas, Hochschule Ostwestfalen-Lippe University of Applied Sciences, Lemgo, NRW, Germany

### SYMP 2-12  Multifunctionality of Electronic EAP I

**Session Organizer:** Xuanhe Zhao, Duke University, Durham, NC, United States  
**Session Co-Organizer:** Markus Henke, Dresden University of Technology, Dresden, Germany

- **SMASIS2012-7947:** Dielectric Elastomers for Giant Voltage-Induced Deformation of Actuation and Renewable Energy Harvesting  
  Invited Speaker Presentation Only.  
  Christoph Keplinger, Harvard University, Cambridge, MA, United States

- **SMASIS2012-8234:** Pressure Sensing using Dielectric Electro-Active Polymer Membranes  
  Technical Presentation Only.  
  Alexander York, Saarland University, Cary, NC, United States, Stefan Seelecke, Saarland University, Saarbruecken, Germany

- **SMASIS2012-8049:** Inverse-Motion-Based Modeling for Electromechanics with Application to Electrostrictive Polyurethane  
  Technical Publication.  
  Anna Ask, Matti Ristimaa, Lund University, Lund, Sweden, Ralf Denzer, Andreas Menzel, Technische Universität Dortmund, Dortmund, Germany

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All technical sessions take place on Lobby Level.
### FRIDAY, SEPTEMBER 21, 2012

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<tbody>
<tr>
<td><strong>SYMP 3-10</strong> Structural Analysis &amp; Applications</td>
<td><strong>SYMP 4-6</strong> SMA I</td>
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</table>
| **Session Organizer:** Charles Seeley, GE Global Research, Niskayuna, NY, United States  
**Session Co-Organizer:** Michael Hays, Florida State University, Tallahassee, FL, United States | **Session Organizer:** Silvestro Barbarino, Rensselaer Polytechnic Institute, Troy, NY, United States  
**Session Co-Organizer:** Alexander Czechowicz, Ruhr-University Bochum, Bochum, Germany |

Cornelia Altenbuchner, National Institute of Aerospace, Hampton, VA, United States, James E. Hubbard Jr., University of Maryland, Hampton, VA, United States | SMASIS2012-8125: The Study of Fluid Structure Interactions of an Electroactive Membrane Wing Technical Publication.  
Michael Hays, William Oates, Florida State University, Tallahassee, FL, United States, Lawrence Ukeiley, Adam Hart, University of Florida, Shalimar, FL, United States |
Charles Seeley, Brian Rush, Stan Weaver, General Electric Global Research Center, Niskayuna, NY, United States |

John Redmond, Isabel Czarnocki, Jonathan Luntz, Diann Brei, University of Michigan, Ann Arbor, MI, United States, Andrew Enke, NextGen Aeronautics, Torrance, CA, United States |
| SMASIS2012-8155: Application of Shape Memory Alloys in Locking Devices Technical Publication.  
Alexander Czechowicz, Ruhr-University Bochum, Bochum, Germany, Sven Langbein, FG-INNOVATION GmbH, Bochum, NRW, Germany |

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All technical sessions take place on Lobby Level.
### SYMP 5-10 Damage Detection/Prognosis II

**Session Organizer:** Byungseok Yoo, Techno-Sciences, Inc., Beltsville, MD, United States  
**Session Co-Organizer:** Yang Wang, Georgia Institute of Technology, Atlanta, GA, United States

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00</td>
<td>SMASIS2012-7998: Evaluation of Damage in a Continuum through a Multi-Objective Optimization Inverse Approach Technical Publication.</td>
<td>Mengyu Wang, John Brigham, University of Pittsburgh, Pittsburgh, PA, United States</td>
</tr>
</tbody>
</table>

### SYMP 6-7 Bioinspired Actuators II

**Session Organizer:** Michael Philen, Virginia Polytechnic Institute and State University, Blacksburg, VA, United States  
**Session Co-Organizer:** Rashi Tiwari, Dow Chemical, Midland, United States

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Authors</th>
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<tbody>
<tr>
<td>11:00</td>
<td>SMASIS2012-8235: A Geometrically Bio-Inspired MFC Actuator for Wrinkle Control of Kapton Membranes Technical Publication.</td>
<td>Eric Fleurent-Wilson, University of Waterloo, Kingston, ON, Canada, Mohammed Ibrahim, Armaghan Salehian, University of Waterloo, Waterloo, ON, Canada</td>
</tr>
<tr>
<td>11:20</td>
<td>SMASIS2012-8161: 4/5 Spool Valve with the Ability to Dangle Technical Presentation Only.</td>
<td>Michael Meller, Ephraim Garcia, Cornell University, Ithaca, NY, United States</td>
</tr>
<tr>
<td>11:40</td>
<td>SMASIS2012-7970: Compliant Articulation Structure using Superalastic NiTiNOL Technical Publication.</td>
<td>Jiening Liu, Mary I. Frecker, Ben Hall, Ted Reutzel, Pennsylvania State University, State College, PA, United States</td>
</tr>
<tr>
<td>12:00</td>
<td>SMASIS2012-8111: Development of Localized, Light-Weight Pressurization Mechanisms: Approach, Feasibility, and Impact Technical Publication.</td>
<td>Thomas Sutter, University of Dayton Research Institute, Wright-Patterson AFB, OH, United States, Matthew B. Dickerson, Jeffery W. Baur, Air Force Research Laboratories, Wright-Patterson AFB, OH, United States, Terry Creasy, Texas A&amp;M University, College Station, TX, United States, Ryan Justice, Air Force Research Laboratory, Lebanon, OH, United States</td>
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### FRIDAY, SEPTEMBER 21, 2012

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<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>11:00</td>
<td>SYMP 7-5 Broadband and Nonlinear Energy Harvesting</td>
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<tr>
<td>11:20</td>
<td>atorio: <strong>Nizar Lajnef</strong>, Michigan State University, East Lansing, MI, United States</td>
</tr>
<tr>
<td>11:40</td>
<td>Session Co-Organizer: <strong>Einar Halvorsen</strong>, Vestfold University College, Borre, Norway</td>
</tr>
<tr>
<td>12:00</td>
<td>SMASIS2012-7956: <strong>Modelling of Broadband Piezoelectric Energy Harvesters</strong> Technical Publication. Shengxi Zhou, Junyi Cao, Jing Lin, Xi’an Jiaotong University, Xi’an, Shaanxi Province, China, Chengbin Ma, Shanghai Jiaotong University, Shanghai, Shanghai City, China</td>
</tr>
<tr>
<td>12:20</td>
<td>SMASIS2012-8027: <strong>Modeling of a Vibration-Based Piezomagnetoelastic Energy Harvesting System by using the Duffing Equation</strong> Technical Publication. Henrik Westermann, University of Hannover, Hannover, Germany, Marcus Neubauer, Joerg Wallaschek, Leibniz Universität Hannover, Hannover, Germany</td>
</tr>
<tr>
<td>12:40</td>
<td>SMASIS2012-8007: <strong>Modeling, Analysis and Experimental Validation of an Electromagnetic Energy Harvesting Unit</strong> Technical Publication. Yan Chen, Armaghan Salehian, University of Waterloo, Waterloo, ON, Canada</td>
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<tr>
<td></td>
<td><strong>SMART Trivia Lunch</strong> 12:30pm–2:00pm Waterside Restaurant, Lobby Level</td>
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<tr>
<td></td>
<td>Aerospace Division 12:30pm–2:00pm Willow, Lake Level</td>
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<tr>
<td></td>
<td>Executive Meeting 12:30pm–2:00pm Willow, Lake Level</td>
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All technical sessions take place on Lobby Level.
### SYMP 1-11 Novel Processing of Shape Memory Materials

**Session Organizer:** Gyaneshwar Tandon, University of Dayton Research Institute, Dayton, OH, United States

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Technical Publication</th>
<th>Authors/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMASIS2012-8040</td>
<td>On the Properties of Ni-rich NiTi Shape Memory Parts Produced by Selective Laser Melting</td>
<td>Technical Publication</td>
<td>Christoph Haberland, Horst Meier, Jan Frenzel, Ruhr University Bochum, Bochum, Germany</td>
</tr>
<tr>
<td>SMASIS2012-8042</td>
<td>New Ferromagnetic Shape Memory Alloy Production and Actuator Concepts</td>
<td>Technical Publication</td>
<td>Emmanouel Pagounis, Markus Laufenberg, ETO MAGNETIC GmbH, Stockach, Germany</td>
</tr>
<tr>
<td>SMASIS2012-8132</td>
<td>Fabrication of Nitinol Components by Laser Sintering</td>
<td>Technical Presentation Only</td>
<td>Jason Walker, Mohammad Elahinia, The University of Toledo, Toledo, OH, United States</td>
</tr>
<tr>
<td>SMASIS2012-8244</td>
<td>Microstructure and Mechanical Properties of ATiCrN, ATiN Coatings Deposited by Advanced Magnetron Sputtering Technique</td>
<td>Technical Publication</td>
<td>Girish Joshi, Atul Kulkarni, Vikas Sargade, Dr. Babasaheb Ambedkar Technological University, Raigad, Maharashtra, India</td>
</tr>
<tr>
<td>SMASIS2012-7979</td>
<td>Shape Memory Effect and Superelasticity in a Ti-rich NiTiPt High Temperature Shape Memory Alloy</td>
<td>Technical Presentation Only</td>
<td>Jordan E. Massad, Thomas E. Buchheit, James R. McElhanon, Donald F. Susan, Sandia National Laboratories, Albuquerque, NM, United States, Ronald D. Noebe, NASA Glenn Research Center, Cleveland, OH, United States</td>
</tr>
</tbody>
</table>

### SYMP 2-13 Ionic EAP: Modeling & Applications

**Session Organizer:** Maurizio Porfiri, Polytechnic Institute of New York University, Brooklyn, NY, United States

**Session Co-Organizer:** Ursula Zangrilli, University of Pittsburgh, Pittsburgh, PA, United States

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Technical Publication</th>
<th>Authors/Institution</th>
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</thead>
<tbody>
<tr>
<td>SMASIS2012-7976</td>
<td>Modeling the Diluent Effect on Streaming Current for Ionic Polymer Transducers in Shear</td>
<td>Technical Publication</td>
<td>Ursula Zangrilli, Lisa Weiland, University of Pittsburgh, Pittsburgh, PA, United States</td>
</tr>
<tr>
<td>SMASIS2012-7982</td>
<td>On a Physics-Based Model of the Electrical Impedance of Ionic Polymer Metal Composites</td>
<td>Technical Publication</td>
<td>Youngsu Cha, Matteo Aureli, Maurizio Porfiri, Polytechnic Institute of New York University, Brooklyn, NY, United States</td>
</tr>
<tr>
<td>SMASIS2012-7983</td>
<td>On a Physics-Based Model for Nonlinear Sensing in Ionic Polymer Metal Composites</td>
<td>Technical Publication</td>
<td>Matteo Aureli, Maurizio Porfiri, Polytechnic Institute of New York University, Brooklyn, NY, United States</td>
</tr>
<tr>
<td>SMASIS2012-8149</td>
<td>Thermodynamic Modeling of Ionic Polymer-Metal Composite Beams</td>
<td>Technical Publication</td>
<td>Jayavel Arumugam, Arun Srinivasa, Texas A&amp;M University, College Station, TX, United States</td>
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All technical sessions take place on Lobby Level.
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<tbody>
<tr>
<td><strong>SYMP 2-15</strong></td>
<td><strong>SMA Actuators &amp; Structures</strong></td>
<td><strong>SYMP 3-11</strong></td>
<td><strong>Modeling &amp; Analysis of Electroactive Actuators</strong></td>
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<tr>
<td><strong>Session Organizer:</strong> Edward White, The Boeing Company, St. Louis, MO, United States</td>
<td><strong>Session Co-Organizer:</strong> Travis Turner, NASA Langley Research Center, Hampton, VA, United States</td>
<td><strong>Session Organizer:</strong> Giovanni Berselli, University of Modena and Reggio Emilia, Modena, Italy</td>
<td><strong>Session Co-Organizer:</strong> Oliver Myers, Mississippi State University, Mississippi State, MS, United States</td>
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<td>SMASIS2012-8185: Tension-Torsion Experiments on Superelastic Shape Memory Alloy Tubes Technical Publication. Benjamin Reedlunn, John Shaw, Samantha Daly, University of Michigan, Ann Arbor, MI, United States</td>
<td>SMASIS2012-8187: Analytical Solution for Pseudoelastic Response of a Shape Memory Alloy Thick-Walled Cylinder under Internal Pressure Technical Publication. Majid Tabesh, Bingfei Liu, James Boyd, Dimitris Lagoudas, Texas A&amp;M University, College Station, TX, United States</td>
<td>SMASIS2012-8144: Implementation of a Variable Stiffness Actuator based on Dielectric Elastomers: A Feasibility Study. Technical Publication. Rocco Vertechy, Scuola Superiore Sant'Anna - TéCIP, Pisa, Italy, Giovanni Berselli, University of Modena and Reggio Emilia, Modena, Italy, Mitja Babic, Jožef Stefan Institute, Ljubljana, Slovenia, Vincenzo Parenti Castelli, University of Bologna, Bologna, Italy</td>
<td>SMASIS2012-8175: Comparative Investigation of the Electroelastic Dynamics of Piezoceramics with Interdigitated and Uniform Electrodes Technical Publication. Martin Cacan, Alper Erturk, Georgia Institute of Technology, Atlanta, GA, United States</td>
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<th>Time</th>
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<tr>
<td>2:00</td>
<td>SYMP 4-7</td>
<td>Aerospace Applications</td>
<td>Farhan Gandhi, Pennsylvania State University, University Park, PA, United States</td>
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<td>2:40</td>
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<td>SMASIS2012-7900: Active Twist Blades - Electromechanical Damping Technical Publication.</td>
<td>Johannes Riemenschneider, Martin Schulz, DLR, Braunschweig, Germany, Martin Pohl, German Aerospace Center, Braunschweig, Germany</td>
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<tr>
<td>3:00</td>
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<td>SMASIS2012-7955: Effect of Filler Materials on the Performance of Conformal Load-Bearing Spiral Antennas Technical Publication.</td>
<td>Ali Daliri, Chun H. Wang, Sabu John, RMIT University, Bundoora, Victoria, Australia, Amir Galehdar, Wayne S.T. Rowe, Kamran Ghorbani, RMIT University, Melbourne, Victoria, Australia, Paul J. Callus, Defence Science and Technology Organisation, Fishermans Bend, Victoria, Australia</td>
</tr>
<tr>
<td>3:20</td>
<td></td>
<td>SMASIS2012-8279: The Potential Role of Smart Structures in Gas Turbines Invited Speaker Presentation Only.</td>
<td>Eric Ruggiero, GE Global Research, Niskayuna, NY, United States</td>
</tr>
<tr>
<td>3:40</td>
<td></td>
<td>SMASIS2012-8016: Lamb Wave Instantaneous Phase Based Method for Quantitative Level of Delamination Damage in Composite Structures Technical Publication.</td>
<td>Dulip Samaratunga, Ruisheng Wang, Ratneshwar Jha, Clarkson University, Potsdam, NY, United States</td>
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<td>SMASIS2012-8206: Wireless Vibration Sensing Without a Battery Technical Publication.</td>
<td>Ya-ju Hiew, Haiying Huang, University of Texas Arlington, Arlington, TX, United States</td>
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<td>SMASIS2012-8242: Kernel Feature Space Based Low Velocity Impact Monitoring Technical Publication.</td>
<td>Yingtao Liu, Aditi Chattopadhyay, Masoud Yekani Fard, Arizona State University, Tempe, AZ, United States</td>
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All technical sessions take place on Lobby Level.
### SYMP 7-6 Design, Optimization, and Frequency Conversion

**Session Organizer:** Daniel J. Inman, University of Michigan, Ann Arbor, MI, United States  
**Session Co-Organizer:** S. Nima Mahmoodi, The University of Alabama, Tuscaloosa, AL, United States

James Gilbert, Saad Alzemi, Frederick Paige, Mohammed Daqaq, Clemson University, Clemson, SC, United States | SMASIS2012-8157: Theoretical and Experimental Evaluation of System Energy Balance and Power Generation Efficiency for Piezocomposite Vibration Energy Harvester under Low Intensity Excitation Condition  
Kazuhiko Adachi, Tatsuya Sakamoto, Kobe University Kobe, Hyogo, Japan |
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**Coffee Break** 3:40pm–4:00pm

All technical sessions take place on Lobby Level.
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<th>Session</th>
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<tbody>
<tr>
<td>4:00</td>
<td>SYMP 2-14</td>
<td>Multifunctionality of Electronic EAP II</td>
<td>Christoph Keplinger, Harvard University, Cambridge, MA, United States</td>
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<td>Alexander York, Saarland University, Cary, NC, United States</td>
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<td>4:20</td>
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<td>SMASIS2012-7909: Bioinspired Electroactive Skin</td>
<td>Xuanhe Zhao, Duke University, Durham, NC, United States</td>
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<tr>
<td>4:40</td>
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<td>SMASIS2012-7968: Smart Composite Structure with Tuneable Resonant Frequency for Vibration Control</td>
<td>Markus Henke, Gerald Gerlach, Dresden University of Technology, Dresden, Germany</td>
</tr>
<tr>
<td>5:00</td>
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<td>SMASIS2012-8202: Experimental Investigation of a Loaded Circular Dielectric Electro-Active Polymer Actuator Coupled to Negative-Rate Bias Spring Mechanism</td>
<td>Micah Hodgins, Stefan Seelecke, Saarland University, Saarbruecken, Germany, Alexander York, Saarland University, Cary, NC, United States</td>
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<tr>
<td>5:20</td>
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<td>SMASIS2012-7990: Mechanosensitive Soft Machines</td>
<td>Iain A. Anderson, Benjamin M. O’Brien, Todd A. Gisby, Thomas G. McKay, Auckland Bioengineering Institute, Auckland, New Zealand</td>
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<tr>
<td>5:40</td>
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<td>SMASIS2012-8025: Failure Analysis of Dielectric Elastomer Plane Actuator under Electromechanical Coupling Field</td>
<td>Liwu Liu, Yanju Liu, Jinsong Leng, Harbin Institute of Technology, Harbin, China</td>
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<td>SYMP 2-16</td>
<td>Meso / Microscale Materials &amp; Devices</td>
<td>William Oates, Florida State University, Tallahassee, FL, United States</td>
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<td>Nelson Sepulveda, Michigan State University, East Lansing, MI, United States</td>
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<td>4:20</td>
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<td>SMASIS2012-7919: Characterization of Work per Volume Density of VO2-Based MEMS Actuators Technical Publication</td>
<td>Emmanuelle Merced, Jun Zhang, XiaoBo Tan, Nelson Sepulveda, Michigan State University, East Lansing, MI, United States</td>
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<tr>
<td>4:40</td>
<td></td>
<td>SMASIS2012-8020: Probing Li-Ion Intercalation and Extraction at Nanoscale: Electrochemical Strain Microscopy and Phase Field Simulations Technical Publication</td>
<td>Jiangyu Li, University of Washington, Seattle, WA, United States</td>
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<tr>
<td>5:00</td>
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<td>SMASIS2012-8076: NMR Characteristics of Photomechanics and Thermomechanics of Azobenzene Polymer Networks Technical Publication</td>
<td>Matt Worden, Hongbo Wang, Anant Paravastu, William Oates, Florida State University, Tallahassee, FL, United States</td>
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<tr>
<td>5:20</td>
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<td>SMASIS2012-8152: Diffusive and Burst-Like Release from Microgel Carriers Technical Publication</td>
<td>Hassan Masoud, Alexander Alexeev, Georgia Institute of Technology, Atlanta, GA, United States</td>
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</tbody>
</table>

All technical sessions take place on Lobby Level.
### SYMP 3-12: Structural & Fluid Applications

**Session Organizer:** Gang Wang, University of Alabama in Huntsville, Huntsville, AL, United States  
**Session Co-Organizer:** Matteo Aureli, Polytechnic Institute of New York University, Brooklyn, NY, United States

| SMASIS2012-8077: Tunable Filtering of Mechanical Waves using a Monodispersed Chain of Cylindrical Particles at Various Angles  
Duc Ngo, Eastern International University, Binh Duong, Viet Nam, Feng Li, Jinkyu Yang, University of South Carolina, Columbia, SC, United States | SMASIS2012-8016: Nonlinear Vibration Response of a Beam with a Breathing Crack  
Gang Wang, University of Alabama in Huntsville, Huntsville, AL, United States | SMASIS2012-8051: Optimal Arrangement of Lead Zirconate Titanate (Pzt) Actuators For Buckling Control Of Cylindrical Shells  
Matteo Aureli, Maurizio Porfiri, Polytechnic Institute of New York University, Brooklyn, NY, United States | SMASIS2012-8191: Stable Bipedal Locomotion using Biomimetic IPMC Actuators  
Milad Hosseinipour, Mohammad Eshahnia, University of Toledo, Toledo, OH, United States |

### SYMP 4-8: SMA II

**Session Organizer:** Jonathan Luntz, University of Michigan, Ann Arbor, MI, United States  
**Session Co-Organizer:** Kathrin Schlüter, Technische Universität Braunschweig, Braunschweig, Germany

| SMASIS2012-7977: Cooling Strategies for a SMA Wire Actuator in a Feed Axis  
Horst Meier, Jan Pollmann, Alexander Czechowicz, Ruhr-University Bochum, Bochum, Germany | SMASIS2012-8062: Sensorless Control of SMA Using Seebeck Voltage  
Sriram V.V.N. Malladi, Pablo A. Tarazaga, Virginia Polytechnic Institute and State University, Blacksburg, VA, United States | SMASIS2012-8213: High Speed Shape Memory Alloy Activation  
Alexander Czechowicz, Ruhr-University Bochum, Bochum, Germany, Jonas Boettcher, Sebastian Mojrzisch, Leibniz University of Hannover, Hannover, Germany, Sven Langbein, FG-INNOVATION GmbH, Bochum, NRW, Germany | SMASIS2012-8184: Problems and Solutions for Shape Memory Actuators in Automotive Applications  
Sven Langbein, Alexander Czechowicz, FG-INNOVATION GmbH, Bochum, NRW, Germany | SMASIS2012-8043: Development of a Miniaturized Clamping Device Driven by Magnetic Force of Shape Memory Alloys  
Kathrin Schlüter, Philipp Blumenthal, Anniqa Raatz, Technische Universität Braunschweig, Braunschweig, Germany |
| SMASIS2012-8068: Application of SMA Actuators to Spacesuit Glove Mobility  
Grant Atkinson, Darren Hartl, John Valasek, Texas A&M University, College Station, TX, United States, Kenton Kirkpatrick, Texas A&M University, Montgomery, TX, United States |

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*All technical sessions take place on Lobby Level.*
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<tr>
<th>Time</th>
<th>Session Title</th>
<th>Authors</th>
<th>Institution</th>
</tr>
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<tbody>
<tr>
<td>4:00</td>
<td>Multi-Source and Alternative Configurations</td>
<td>Kazuhiko Adachi, Kobe University, Kobe, Japan</td>
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<td>Nizar Lajnef, Michigan State University, East Lansing, MI, United States</td>
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<td>SMASIS2012-8224: Piezoelectret Foam-based Vibration Energy Harvester For Low-Power Energy Generation Technical Publication.</td>
<td>Steven Anton, Kevin Farinholt, Los Alamos National Laboratory, Los Alamos, NM, United States</td>
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<td>SMASIS2012-7960: Series Connection of Multiple Piezoelectric Oscillators Technical Publication.</td>
<td>H.C. Lin, P.H. Wu, I.C. Lien, Yi-Chung Shu, National Taiwan University, Taipei, Taiwan</td>
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<td>SMASIS2012-7941: Hybrid Rotary-Translational Energy Harvester for Multi-Axis Ambient Vibrations Technical Publication.</td>
<td>M. Amin Karami, Daniel J. Inman, University of Michigan, Ann Arbor, MI, United States</td>
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<td>SMASIS2012-8120: A Micro Kinetic Energy Harvester Demonstrating Energy Harvesting from 3-D Mechanical Motion and Power Increasing through Magnetic-Based Frequency Rectification Technical Publication.</td>
<td>Tien-Kan Chung, Chieh-Min Wang, Chia-Yuan Tseng, Tzu-Wei Liu, Po-Chen Yeh, National Chiao Tung University, Hsinchu, Taiwan</td>
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Integrated System Design and Implementation
Chair: Norman Wereley, Univ. of Maryland
Co-Chair: Eric Ruggiero, GE
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Mechanics & Behavior of Active Materials
Chair: John Huber, Univ. of Oxford
Co-Chairs: Travis Turner, NASA Langley
Iain Anderson, Univ. of Auckland
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Andrew Swartz, Michigan Tech
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