

# 2014 Smart Structures/NDE

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**Technical Program**

[www.spie.org/ssnde](http://www.spie.org/ssnde)

**Conferences & Course**

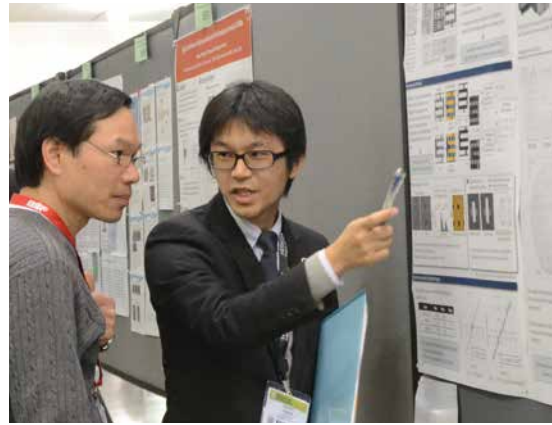
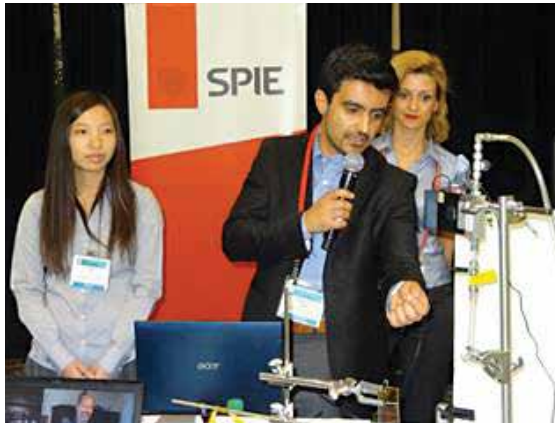
9–13 March 2014

**Exhibition**

11–12 March 2014

**Location**

Town & Country Resort  
and Convention Center  
San Diego, California, USA



# Welcome

The Organizing Committee of the SPIE 21st Annual International Symposium on Smart Structures and Materials + Nondestructive Evaluation and Health Monitoring welcomes you to what promises to be an exciting meeting. This unique symposium offers many opportunities to network with colleagues from a variety of disciplines in academia, industry, and government from all over the world.

Over the last two decades, this meeting has grown from small beginnings in the then-emerging field of smart systems into a premier technical event. The symposium is organized in ten parallel conferences and brings together technologies and advanced research in instrumentation, sensing, and measurement science with advanced materials, diagnostics, and smart systems where case studies, emerging research agendas, and innovative new technologies will be presented.

This meeting provides an excellent opportunity to explore new research areas by teaming with new partners from many fields while enjoying a full suite of special events and plenary presentations. We hope that you enjoy this opportunity for exploration and collaboration.

### Symposium Chairs



**Victor Giurgiutiu,**  
Univ. of South Carolina  
(USA)



**Christopher S. Lynch,**  
Univ. of California, Los Angeles  
(USA)

### Symposium Co-Chairs



**Jayanth N. Kudva,**  
NextGen Aeronautics, Inc.  
(USA)



**Theodoros E. Matikas,**  
Univ. of Ioannina  
(USA)

**SPIE**   
Smart Structures/NDE  
**Technical Program**

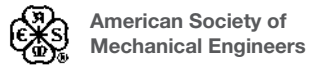
**Conferences & Course: 9–13 March 2014**  
**Exhibition: 11–12 March 2014**  
Town & Country Resort and  
Convention Center  
San Diego, California, USA



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**Intelligent Materials Forum** (Japan)  
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**National Science Foundation**

SPIE would like to express its deepest appreciation to the symposium chairs, conference chairs, program committees, and session chairs who have so generously given of their time and advice to make this symposium possible. The symposium, like our other conferences and activities, would not be possible without the dedicated contribution of our participants and members.

This program is based on commitments received up to the time of publication and is subject to change without notice.

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**Yoseph Bar-Cohen**, Jet Propulsion Lab. (USA)

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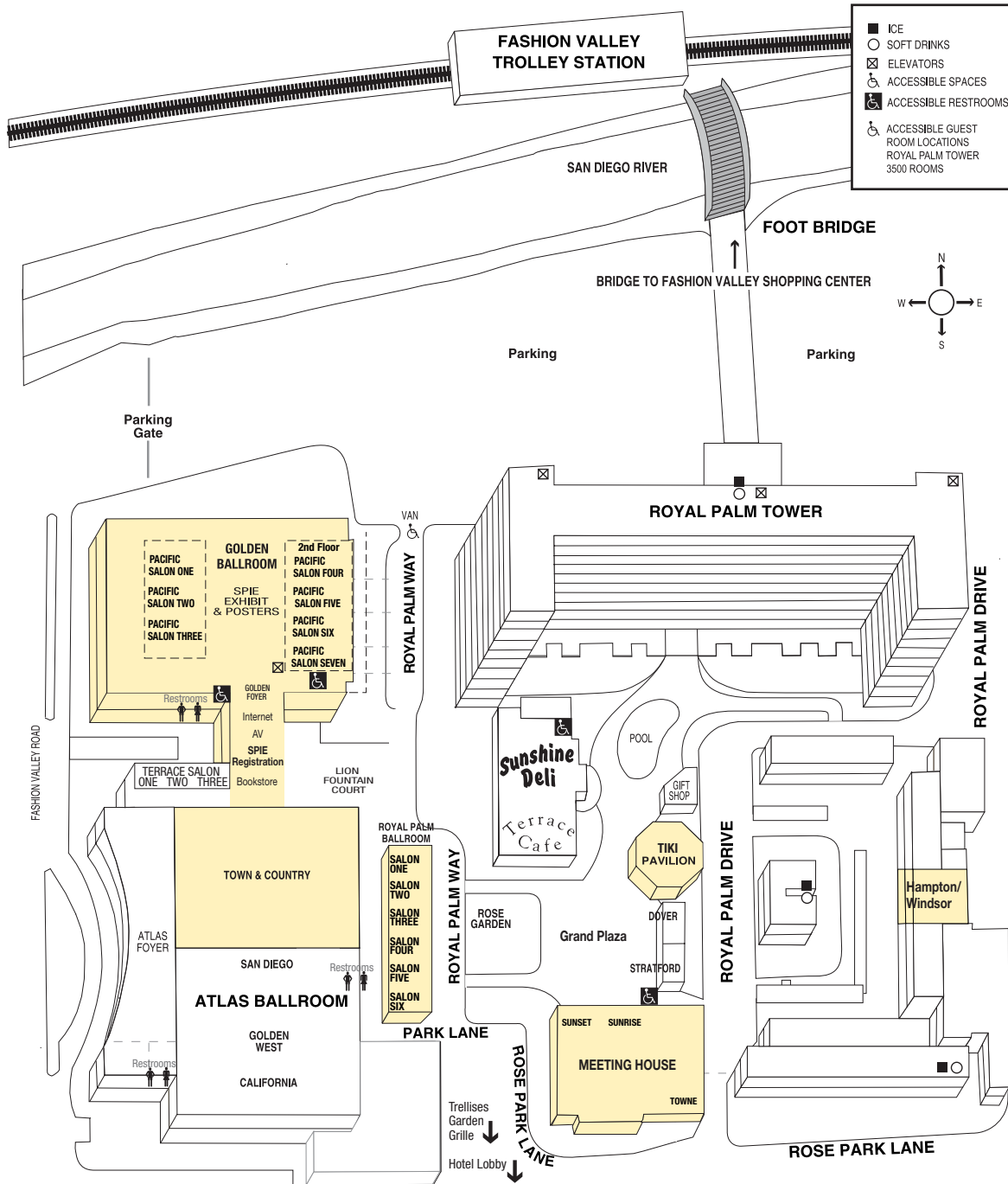
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### Technical Conferences

9055 <b>Bioinspiration, Biomimetics, and Bioreplication 2014 (Lakhtakia)</b> . . . . .	16-40
9056 <b>Electroactive Polymer Actuators and Devices (EAPAD) 2014 (Bar-Cohen)</b> . . . . .	16-48
9057 <b>Active and Passive Smart Structures and Integrated Systems 2014 (Liao)</b> . . . . .	16-50
9058 <b>Behavior and Mechanics of Multifunctional Materials and Composites 2014 (Goulbourne)</b> . . . . .	16-38
9059 <b>Industrial and Commercial Applications of Smart Structures Technologies 2014 (Farinholt)</b> . . . . .	16-42
9060 <b>Nanosensors, Biosensors, and Info-Tech Sensors and Systems 2014 (Varadan)</b> . . . . .	17-43
9061 <b>Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2014 (Lynch)</b> . . . . .	17-50
9062 <b>Smart Sensor Phenomena, Technology, Networks, and Systems Integration 2014 (Ecke)</b> . . . . .	17-31
9063 <b>Nondestructive Characterization for Composite Materials, Aerospace Engineering, Civil Infrastructure, and Homeland Security 2014 (Wu)</b> . . . . .	17-51
9064 <b>Health Monitoring of Structural and Biological Systems 2014 (Kundu)</b> . . . . .	17-47

# Town & Country



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## SPIE Conference App

See complete programs of all presentations, exhibitors, and special events. Sort by relevance and create a schedule. Add notes, see the attendee list, be notified of upcoming events, and see Yelp reviews of nearby businesses.

Available at [spie.org/mobile](http://spie.org/mobile), Android Market, and AppStore.



Sunday	Monday	Tuesday	Wednesday	Thursday
<b>Special Events</b>				
	<p><b>SPIE Fellows Recognition, and SSM Lifetime Achievement Award</b>, 8:15 to 8:30 am, p. 7</p> <p><i>Plenary Presentation: Noncontact Laser Sensing Technology for Structural Health Monitoring and Nondestructuve Testing</i>, (Sohn), 8:30 to 9:15 am, p. 4</p> <p><i>Plenary Presentation: Light-Induced Electrical Switching of Porphyrin-Covered Silicon Nanowire FETs</i>, (Cuniberti), 9:15 to 10:00 am, p. 4</p> <p><i>EAPAD Keynote Presentation: Soft robotics: a review and progress towards faster and higher torque actuators</i> (Shepherd), 10:30 to 11:00 am, p. 6</p> <p><b>16th Annual EAP-in-Action Session and Demonstrations</b>, 4:30 to 5:45 pm, p. 12–13</p> <p><b>All Symposium Welcome Reception</b>, 6:00 to 7:30 pm, p. 6</p>	<p><b>Smart Structures Product Implementation Award, NDE Lifetime Achievement Award</b>, 8:15 to 8:30 am, p. 7</p> <p><i>Plenary Presentation: Transition from Nondestructive Testing (NDT) to Structural Health Monitoring (SHM): Potential and Challenges</i>, (Cawley), 8:25 to 9:10 am, p. 5</p> <p><b>Poster Viewing</b>, 10:00 to 4:00 pm, p. 6</p> <p><b>Lunch with the Experts - A Student Networking Event</b>, 12:30 to 1:30 pm, p. 6</p> <p><b>Poster Exhibition/Reception</b>, 6:00 to 7:30 pm, p. 6</p>	<p><b>ASME Best Paper Awards and ASME Gary Anderson Early Achievement Award</b>: 8:10 to 8:25 am, p. 8</p> <p><i>Plenary Presentation: Heterointegration of Smart Systems in Foil</i>, (Bock), 8:25 to 9:10 am, p. 5</p> <p><b>Poster Viewing</b>, 10:00 to 4:00 pm, p. 6</p> <p><b>SPIE/ASME Best Student Paper Session</b>, 1:30 pm to 4:00 pm, p. 8</p> <p><i>Panel Discussion: Biomimicry, Bioinspiration, and the San Diego Zoo</i>, 2:15 to 3:30 pm, p. 10</p>	<p><b>SPIE/ASME Best Student Paper Award, and Bioinspiration, Biomimetics, and Bioreplication Best Student Paper Award</b>, 8:10 to 8:25 am, p. 8</p> <p><i>Plenary Presentation: Intelligent Adaptive Fluid-Structure Interaction Systems</i>, (Ohayon), 8:25 to 9:10 am, p. 5</p>
		<p><b>EXHIBITION</b>, p. 11 10:00 am to 4:00 pm; 6:00 to 7:30 pm</p>	<p><b>EXHIBITION</b>, p. 11 10:00 am to 4:00 pm</p>	
<b>Conferences</b>				
				Conf. 9055 <b>Bioinspiration, Biomimetics, and Bioreplication IV</b> (Lakhtakia), p. 16–40
				Conf. 9056 <b>Electroactive Polymer Actuators and Devices (EAPAD) XVI</b> (Bar-Cohen), p. 16–48
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				Conf. 9062 <b>Smart Sensor Phenomena, Technology, Networks, and Systems Integration VII</b> (Ecke), p. 17–31
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				Conf. 9064 <b>Health Monitoring of Structural and Biological Systems VIII</b> (Kundu), p. 17–47
<b>Course</b>				
	<b>SC634 Electroactive Polymer Actuators and Devices</b> , 1:30 am to 5:30 pm, p. 9			

Monday–Thursday daily sessions will consist of opening remarks, award presentations, and plenary presentations.

Monday · 8:15 to 10:00 am

Awards: 8:15 to 8:30 am

## - SPIE Fellow Recognition

presented to

**Christopher S. Lynch**, Univ. of California, Los Angeles (United States)

**Norman M. Wereley**, Univ. of Maryland, College Park (United States)

**Bert Müller**, Basel University Hospital (Switzerland)

## - SSM Lifetime Achievement Award Presentations

presented to **Christopher S. Lynch**, Univ. of California, Los Angeles (USA) and **Shiv Joshi**, NextGen Aeronautics, Inc. (USA)

Plenary Presentation: 8:30 to 9:15 am

## Noncontact Laser Sensing Technology for Structural Health Monitoring and Nondestructive Testing



**Hoon Sohn**, KAIST (Korea, Republic of)

*Abstract:* Noncontact sensing techniques is gaining prominence for structural health monitoring (SHM) and nondestructive testing (NDT) due to (1) their noncontact and nonintrusive natures, (2) their spatial resolution much higher than conventional discrete sensors can achieve, (3) their less dependency on baseline

data obtained from the pristine condition of a target structure (reference-free diagnosis), (4) cost and labor reduction in sensor installation and maintenance. In this talk, a suite of noncontact sensing techniques particularly based on laser technology will be presented for SHM and NDT of aircraft, wind turbine blades, high-speed trains, nuclear power plants, bridges, automobile manufacturing facilities and semiconductors.

*Biography:* Hoon Sohn earned his B.S. and M.S. degrees from Seoul National University, Ph.D. from Stanford University, and now Chaired Professor at KAIST. He received 2011 SHM Person-of-Year Award at International workshop on SHM and 2008 Presidential Young Scientists Award in Korea. He was also among 100 most promising individuals in Korea selected by Donga Daily Newspaper in 2012.

Plenary Presentation: 9:15 to 10:00 am

## Light-Induced Electrical Switching of Porphyrin-Covered Silicon Nanowire FETs



**Gianarelio Cuniberti**, Technische Univ. Dresden (Germany)

*Abstract:* Nanowires represent excellent building blocks for future nanoelectronics, due to their efficient charge transport characteristics. Here we present light-induced switching behaviour of porphyrin-coated silicon nanowire field effect transistors (Si NW FETs) and demonstrate their capabilities for design of hybrid nanodevices – consisting of organic complexes and inorganic nanowires. Switching of Si NW FETs highly reflects the electrical change of porphyrin molecules by light. To demonstrate significant factors of concentration-dependent switching of porphyrin-covered devices, electrical charging mechanism through molecules and nanowires has been understood, that allows the systematic integration of the hybrid devices.

*Biography:* **Prof. Gianarelio Cuniberti** holds since 2007 the Chair of Materials Science and Nanotechnology at the Dresden University of Technology and the Max Bergmann Center of Biomaterials Dresden. He studied Physics at the University of Genoa and at the University of Hamburg and was visiting scientist at MIT and the Max Planck Institute for the Physics of Complex Systems Dresden.

Tuesday · 8:10 to 9:10 am

Awards: 8:10 to 8:25 am

## - Smart Structures Product Implementation Award

## - NDE Lifetime Achievement Award Presentations

presented to **Nobuo Takeda**, Univ. of Tokyo (Japan) and **Peter Cawley**, Imperial Collage London (UK)

Monday–Thursday daily sessions will consist of opening remarks, award presentations, and plenary presentations.

Tuesday Plenary Presentation: 8:25 to 9:10 am

## Transition from Nondestructive Testing (NDT) to Structural Health Monitoring (SHM): Potential and Challenges



**Peter Cawley**, Imperial College London (United Kingdom)

*Abstract:* There is a gradual shift in emphasis from periodic inspection with detachable monitoring systems giving information about the structural integrity at pre-programmed intervals or on demand (SHM). The drivers of this change

are discussed, together with the requirements of successful SHM systems. Particular issues are that NDT often involves scanning and this is not possible with typical SHM configurations; it therefore becomes important to cover a significant area of structure from each transducer position. Guided waves provide a possible solution to this problem and permanently installed guided wave pipe inspection systems are now available. The sensitivity obtained with a permanently installed system is significantly better than that in a one-off test as baseline subtraction can be employed. However, this is far from trivial as it is necessary to compensate for benign changes such as temperature. The guided wave technique does not provide accurate remaining thickness information and is best complemented by point measurements at selected locations. Another issue is that the SHM transducers must survive in operational conditions, which is particularly difficult at high temperatures. Recent work at Imperial College and associated spin-out companies on solutions to these problems is discussed.

*Biography:* **Peter Cawley** received BSc and PhD degrees in Mechanical Engineering from University of Bristol in 1975 and 1979 respectively. He worked in industry from 1979-1981 and then joined the Mechanical Engineering Department at Imperial College, London initially as a lecturer and then successively senior lecturer, reader and professor. He is now head of the Imperial College Mechanical Engineering department and leads the NDE research group; he is also the principal investigator of the UK Research Centre for NDE (RCNDE) that has its head office at Imperial College. He has published over 160 refereed journal papers and a similar number of conference papers in this field and holds 4 current patents. Peter Cawley is a fellow of the Royal Academy of Engineering and of the Royal Society. He is a director of two spin-out companies set up to exploit technology developed in his research group (Guided Ultrasonics Ltd and Permasense Ltd), and he is a consultant to a variety of industries.

Wednesday · 8:10 to 9:10 am

Awards: 8:10 to 8:25 am

- ASME Best Paper Awards
- ASME Gary Anderson Early Achievement Award

Plenary Presentation: 8:25 to 9:10 am

## Heterointegration of Smart Systems in Foil



**Karlheinz Bock**, Fraunhofer EMFT (Germany)

*Abstract:* The development of flexible electronic systems as a smart structure has become an important field of research in industry and at research institutions worldwide. Main objectives are the integration of different electronic components and functionalities like batteries, displays, microcontroller ICs, sensors and passive components on a flexible substrate. A flex-to-flex integration concept allows for a potentially free form factor, which allows placing of film based systems on curved surfaces or in very thin housings. It also enables the integration of various sensing, controlling and acting functionalities on thin and bendable surfaces. These aspects are of relevance for the technical vision of smart electronic surface i.e. “electronic skin” and future applications in adaptronics i.e. robotics.

*Biography:* **Karlheinz Bock** studied electronics and communication engineering at the University of Saarbrücken, Germany. In 1994 he achieved the Dr.-Ing. degree in RF microelectronics from the University of Darmstadt, Germany. Since January 2001 he is with the Fraunhofer Institute for Reliability and Microintegration IZM in Munich (since 2010 renamed Fraunhofer Research Institution for Modular Solid State Technologies EMFT), Germany, as head of the Polytronic and Multi-Functional Systems department working on the development of thin and flexible systems and technologies as well as chemical and biological sensors and bio-analytical systems. Since March 2008 he also serves as Professor of Polytronic Microsystems at the University of Berlin (TU Berlin).

Thursday · 8:20 to 9:10 am

Awards: 8:10 to 8:25 am

- SPIE/ASME Best Student Paper Award
- Bioinspiration, Biomimetics, and Bioreplication Best Student Paper Award: In Memory of H. Don Wolpert

Plenary Presentation: 8:25 to 9:10 am

## Intelligent Adaptive Fluid-Structure Interaction Systems



**Roger Ohayon**, Conservatoire National des Arts et Métiers (France)

*Abstract:* It is proposed to analyze, from predictive computational point of view – finite element discretization, reduced order models - the dynamic behaviour of complex coupled systems and their adaptive intelligent treatment

of interfaces for vibration and noise reduction of interior fluid-structure interactions problems, such as liquid-structure and/or structural-acoustics. The applications may be found for example, in aerospace engineering such as liquid propelled launchers for the attenuation of the vibrations of liquids in tanks, the attenuation of noise in fairings for the satellites as well as attenuation of noise in fuselage cabin of aircrafts or helicopters.

*Biography:* **Roger Ohayon**, Professor (Emeritus), Conservatoire National des Arts et Metiers (CNAM), Structural Mechanics and Coupled Systems Laboratory, Paris, France. He is an AIAA, ASME and IACM Fellow, member of the National Academy of Engineering of Brazil and of the Air and Space Academy of France. He received several awards, French Academy of Science, ASMS/ASME/AIAA Adaptive Structures and Materials Systems Prize, IACM Awards, EASD Award, Eccomas Prandtl Award, Humboldt Research Award (2013), SPIE Lifetime Achievement Award (2013). His researches concern computational models for fluid-structure interaction and structural-acoustic vibrations using smart systems with emphasis to interface modeling. He is the co-author of three books on fluid-structure and structural acoustics problems.

# Special and Technical Events

## EAPAD Keynote Presentation

Location: Town and Country Room

Monday 10 March . . . . . 10:30 to 11:00 am

### Soft robotics: a review and progress towards faster and higher torque actuators



**Robert F. Shepherd**, Cornell Univ. (USA)

**Abstract:** Last year, nearly 160,000 industrial robots were shipped worldwide—into a total market valued at ~\$26 Bn (including hardware, software, and peripherals).[1] Service robots for professional (e.g., defense, medical, agriculture) and personal (e.g., household, handicap assistance, toys, and education) use accounted for ~16,000 units, \$3.4 Bn and ~3,000,000 units, \$1.2 Bn respectively.[1] The vast majority of these robotic systems use fully actuated, rigid components that take little advantage of passive dynamics. Soft robotics is a field that is taking advantage of compliant actuators and passive dynamics to achieve several goals: reduced design, manufacturing and control complexity, improved energy efficiency, more sophisticated motions, and safe human-machine interactions to name a few. The potential for societal impact is immense. In some instances, soft actuators have achieved commercial success; however, large scale adoption will require improved methods of controlling non-linear systems, greater reliability in their function, and increased utility from faster and more forceful actuation. In my talk, I will describe efforts from my work in the Whitesides group at Harvard to prove sophisticated motions in these machines using simple controls, as well capabilities unique to soft machines. I will also describe the potential for combinations of different classes of soft actuators (e.g., electrically and pneumatically actuated systems) to improve the utility of soft robots.

1. World Robotics - Industrial Robots 2013, 2013, International Federation of Robotics.

**Biography:** **Dr. Robert Shepherd** is an assistant professor at Cornell University in the Department of Mechanical & Aerospace Engineering with a Field Appointment in Material Science & Engineering. Robert received both his B.S. and Ph.D. in Material Science from The University of Illinois, Urbana-Champaign (studying under Dr. Jennifer Lewis) where he developed polymeric and colloidal inks for 3D printers, as well as microfluidic devices that generate granular material via photolithography. Following his PhD, Dr. Shepherd was a Postdoctoral Fellow in the Department of Chemistry & Chemical Biology at Harvard University (studying under Dr. George M. Whitesides) where he developed pneumatically powered soft machines composed of silicone elastomers. These machines took the form of grippers that require no sensors, and mobile robots that can change their shape to navigate underneath obstacle or jump over them. At Cornell, he is pursuing the 3D printing of soft actuators and sensors, increasing the toughness of actuators, and using granular material as reconfigurable architecture.

## All Symposium Welcome Reception

Location: Tiki Pavilion

Monday 10 March . . . . . 6:00 to 7:30 pm

All attendees are invited to relax, socialize, and enjoy refreshments. Please remember to wear your conference registration badges. Dress is casual.

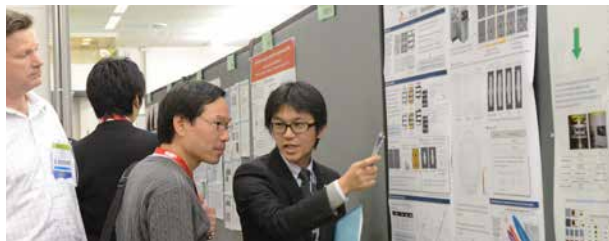
## Lunch with the Experts - A Student Networking Event

Location: Windsor

Tuesday 11 March . . . . . 12:30 to 1:30 pm

Open to Student Attendees

Seating is limited. Enjoy a casual meal with colleagues at this engaging networking opportunity. Hosted by SPIE Student Services, this event features experts willing to share their experience and wisdom on career paths in optics and photonics. Seating is limited and will be granted on a first-come, first-served basis.



## Poster Exhibition/Reception

Location: Golden Ballroom

Tuesday 11 March . . . . . 6:00 to 7:30 pm

Conference attendees are invited to attend the poster session on Tuesday evening. Come view the posters, ask questions, and enjoy the refreshments. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster sessions. Posters will also be available for viewing on Wednesday during exhibition hours.

### Poster Viewing

Tuesday 11 March . . . . . 10:00 to 4:00 pm

Wednesday 12 March . . . . . 10:00 to 4:00 pm

## Best Student Paper Session

Location: Sunset

Wednesday 12 March . . . . . 1:30 pm to 4:00 pm

Finalists for the SPIE/ASME Best Student Paper Award will present their papers in this special session.

## Panel Discussion: Biomimicry, Bioinspiration, and the San Diego Zoo

Location: Sunrise

Wednesday 12 March . . . . . 2:15 to 3:30 pm

SPIE and the SS/NDE symposium have partnered with the San Diego Zoo to promote the value of biomimicry as a paradigm for engineering research and practice. A representative from the San Diego Zoo will introduce the audience to an 'animal ambassador' and explain some of the remarkable features that can provide inspiration for the work of engineers and scientists. Panelists will discuss the current state of bioinspiration in the research lab, design challenges, and future solutions.

This panel is open for all attendees and will focus on all aspects of engineered biomimicry, including education, awareness, applications, research, and funding sources.

**Panel Moderators:** **Dr. Gabriel Miller**, Director of Research and Development, Centre for Bioinspiration, San Diego Zoo Global (United States); **Raúl J. Martín-Palma**, Univ. Autónoma de Madrid (Spain)

**Panelists include:** **Joseph E. Jakes**, U.S. Forest Service (USA); **Mato Knez**, CIC nanoGUNE Consolider (Spain); **Tony J. Prescott**, The Univ. of Sheffield (United Kingdom); **Akira Saito**, Osaka Univ. (Japan); **Georg Studor**, NASA Johnson Space Ctr. (USA).

For more information about the San Diego Zoo's Biomimicry project, please visit our website: [www.spie.org/SDZOO](http://www.spie.org/SDZOO)



## Smart Structures Product Implementation Award

Location: Town and Country Room

Tuesday 11 March . . . . . 8:10 to 8:25 am

This award is intended to recognize those individuals or companies who have taken the critical step of transitioning smart structure technologies into viable industrial and commercial products. These visionaries are required for this important field of science and engineering to be recognized and accepted in the world at large. A panel of independent experts selects the best product based on its importance, uniqueness, and usefulness to commercial industries. We are looking for the most innovative-but realistic-products using smart structures and materials technologies. System integration aspects are very important criteria as well.

SPIE will publish information about the winner and the product in OE Reports, and news items will be sent to appropriate trade journals. In addition, the winning company will be able to use the recognition associated with this award in any of its subsequent marketing endeavors.

Location: Town and Country Room

Monday 10 March . . . . . 8:15 to 8:30 am

## SPIE Fellow Recognition

### SSM Lifetime Achievement Award

presented to



**Christopher S. Lynch**, Univ. of California, Los Angeles (USA)

Christopher S. Lynch served on the faculty of the Woodruff School of Mechanical Engineering from September 1995 through September 2007. He accepted the responsibilities as associate chair of administration of the Woodruff School in 2002, the largest Mechanical Engineering Program in the US. In 2007 he joined the faculty of the Mechanical and Aerospace Engineering Department at UCLA and from 2008 to June 2013 served as Director of the MS Engineering Online Program. Prof. Lynch's research program focuses on multi-field and multi-scale constitutive law development with finite element implementation in support of numerous sensing and actuation applications. Recent work on multiferroic coupling at the nanoscale has demonstrated the ability to switch magnetization using strain coupling between magnetic features deposited on ferroelectric single crystals. This breakthrough contributed to establishing the UCLA TANMS NSF-NERC where Prof. Lynch serves as the thrust lead for the modeling team. In addition to his research, his accomplishments include the development of a new international conference (ASME-SMASIS), serving as chair of the American Society of Mechanical Engineering Technical Committee on Adaptive Structures and Materials Systems (ASMS-TC), serving as chair of the AMSE Aerospace Division, and serving as co-chair (2012-2013) and chair (2014-2015) of the SPIE SS-NDE conference. He has been honored with an NSF CAREER award, an ONR Young Investigator award, an ASEE educator award, the "Faculty Award for Excellence in Teaching" at Georgia Tech, the ASME "Adaptive Structures Prize" and is a Fellow of ASME.

### SSM Lifetime Achievement Award

presented to

**Shiv Joshi**, NextGen Aeronautics, Inc. (USA)



Dr. Shiv P. Joshi served as an assistant professor on the faculty at the University of Arizona Tucson (1985-1989) and the University of Texas Arlington (1989-1996). He then served as professor at University of Texas Arlington from 1996-2002. In 2003, he left academia to become a founding partner of NextGen Aeronautics, a major research and development company in the adaptive structures, materials, and systems areas. While at NextGen, Dr. Joshi served as a chief engineer on the Morphing Aircraft Structure program. He also conceived and started the Cognitive UAV program where he served as PI for the initial design and risk reduction phase. In addition to major UAV development programs, Dr. Joshi developed DOD, NASA, and defense industry-funded programs in the structural health monitoring and smart materials and structures areas. He was also a team member on the Northrop Grumman Smart Wing program. Dr. Joshi serves on several technical committees: AIAA Adaptive Structures Technical Committee (2008 as Technical Chair), ASME Smart Materials and Structures Technical Committee, and Technical Chair of the ASME Nondestructive Evaluation Engineering (NDE) Executive Committee (2013-2015). He is also an Associate Fellow of AIAA.

*Awards continue next page*

# Awards

Location: Town and Country Room

Tuesday 11 March. . . . . 8:10 to 8:25 am

## NDE Lifetime Achievement Award

presented to



**Peter Cawley**, Imperial College London (united Kingdom)

Peter Cawley received BSc and PhD degrees in Mechanical Engineering from University of Bristol in 1975 and 1979 respectively. He worked in industry from 1979-1981 and then joined the Mechanical Engineering Department at Imperial College, London initially as a lecturer and then successively senior lecturer, reader and professor. He is now head of the Imperial College Mechanical Engineering department and leads the NDE research group; he is also the principal investigator of the UK Research Centre for NDE (RCNDE) that has its head office at Imperial College. He has published over 160 refereed journal papers and a similar number of conference papers in this field and holds 4 current patents. Peter Cawley is a fellow of the Royal Academy of Engineering and of the Royal Society. He is a director of two spin-out companies set up to exploit technology developed in his research group (Guided Ultrasonics Ltd and Permasense Ltd), and he is a consultant to a variety of industries.

## NDE Lifetime Achievement Award

presented to



**Nobuo Takeda**, The Univ. of Tokyo (Japan)

Nobuo Takeda is, currently, Professor, Director of TJCC (Todai-JAXA Center for Composites) and Dean, of Graduate School of Frontier Sciences, the University of Tokyo. He is also Professor, Dept. Aeronautics and Astronautics, School of Engineering. He has been very active in both research fields of advanced composites and of structural health monitoring (SHM), which provides a unique standpoint in the SHM research and development. In the field of advanced composites, he is one of the worldwide leaders as Asian

Editor of Composites: Part A Journal and as Senior Vice President of ICCM (Int. Committee of Composite Materials). He proposed the research field of 'Experimental Micromechanics of Composites'. In-situ microscopic failure observation techniques were developed using several types of microscopes (SEM, TEM, SAM and so on.) with loading apparatus to quantify the microscopic failure process in composites, and then theoretical and numerical modeling was developed based on such observations. This is an extended NDE technique with in-situ microscopic failure observation and diagnostics. He is keeping one of the worldwide leaders in this field since the application of advanced composites to commercial aircraft, spacecraft, high-speed trains and automobiles has drastically increased and practical failure issues are increasing with more material development. In the field of SHM, he is a leading researcher on fiber optic sensor based SHM. Although fiber optic sensors are normally used as strain/temperature sensors, he proposed to use the reflection spectra from fiber Bragg grating (FBG) sensors to identify the damage initiation and growth in composite laminates. He and his colleagues developed so-called small-diameter optical fiber sensors (52 microns in diameter with coating) to be embedded within composite laminas (125 microns in thickness) without deteriorating the strength properties of the composite laminates. Such sensors can be embedded near critical regions to detect the initial damage inside the laminates. His most recent research includes the sensitivity analysis of Brillouin-scattering-based distributed sensors and their applications to identify the damage initiation and growth in composite sandwich structures and to reconstruct the shape of large-scale structures including boundary condition effects. Distributed strain sensing is also extended for measuring the residual strain distribution introduced during the fabrication of large-scale composite structures. He has been leading Japanese national projects on SHM organized by RIMCOF (Res. Inst. Metals & Composites for Future Industries, Japan) since 1999. Several fiber optic sensor-based SHM systems have been developed in collaboration with aerospace industries, such as (1) Impact damage detection of composite structures, (2) Debond detection of bonded composite structures using PZT-FBG active sensing systems, and (3) Damage-tolerant composite grid structures with FBG sensor network. He has published 295 peer-reviewed journal papers, and has been invited to write the review articles and to make many plenary talks in related international conferences.

Location: Town and Country Room

Wednesday 12 March. . . . . 8:10 to 8:25 am

## ASME Gary Anderson Early Achievement Award

This award is given for notable contributions to the field of Adaptive Structures and Material Systems.

## ASME Best Paper Awards

The ASME Technical Committee presents two awards annually: Best Paper in Structures and Best Paper in Materials.

Location: Town and Country Room

Thursday 13 March. . . . . 8:20 to 8:25 am

## SPIE/ASME Best Student Paper Award

SPIE and the ASME Adaptive Structures and Material Technical Committee are sponsoring the best student paper contest. Papers will be presented in a special session on Wednesday evening. Entrants will be judged by a committee of the ASME Adaptive Structures and Materials Technical Committee. The committee will then vote to determine the top three finalists. The top three finalist student authors and/or student co-authors will receive certificates and cash awards.

## Bioinspiration, Biomimetics, and Bioreplication Best Student Paper Award: In Memory of H. Don Wolpert

The Bioinspiration, Biomimetics, and Bioreplication IV conference chairs will present the Best Student Paper Award from their conference.



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### Continuing Education Units

SPIE has been approved as an authorized provider of CEUs by IACET, The International Association for Continuing Education and Training (Provider #1002091). In obtaining this approval, SPIE has demonstrated that it complies with the ANSI/IACET Standards which are widely recognized as standards of good practice.

*SPIE reserves the right to cancel courses due to insufficient pre-registration.*

## SPIE Course

### Electroactive Polymer Actuators and Devices

SC634

**Course Level: Introductory**  
**CEU: 0.35 \$360 Members | \$410 Non-Members USD**  
**Sunday 1:30 pm to 5:30 pm**

This course will provide an overview of the field of EAP covering the state of the art, challenges and potential. Two general classes of polymer materials are described, namely those that involve ionic mechanisms (Ionic EAP), and field activated materials (Electronic EAP). The basic mechanisms responsible for the electroactive behavior of EAP materials will be covered and compared with natural muscles. Analytical models, fabrication processes and methods of characterizing these materials will be described. Moreover, the currently considered applications will be reviewed including actuators, robotics, animatronics, energy harvesting, medical, and biologically inspired mechanisms, so called biomimetics.

The course begins with an overview of the field, current capabilities, potential and challenges. The course follows with a description of the currently available EAP materials and principles of operating them as actuators and artificial muscles. The course ends with a review of the future prospect of EAP as actuators in systems, mechanisms and smart structures for space, industrial and medical applications.

#### LEARNING OUTCOMES

This course will enable you to:

- identify EAP based available and emerging actuators
- learn the fundamentals of electroactive behavior in leading EAP materials
- describe the capabilities, limitations and benefits of electroactive polymers
- become familiar with fabrication processes
- review mechanical analysis and design principles associated with EAP
- assess the applicability of current EAP actuators while accounting for their limitations
- describe the future prospects of EAP materials as actuators and their applications

#### INTENDED AUDIENCE

Engineers, scientists and managers who need to understand the basic concepts of EAP, or are interested in learning, applying or engineering mechanisms or devices using EAP materials. Also those who wish to discover the excitement of research and development in EAP materials and their applications - present and future.

#### INSTRUCTORS

**Yoseph Bar-Cohen** is Senior Research Scientist and Supervisor, Advanced Technologies Group, at JPL. He is a leading expert in advanced actuators using electroactive polymers and ceramic materials. Dr. Bar-Cohen is a Fellow of SPIE and ASNT. He is the author/coauthor of numerous publications, has many registered patents and is the recipient of many awards and honors. Further information on: <http://ndea.jpl.nasa.gov/nasade/yosi/yosi.htm>

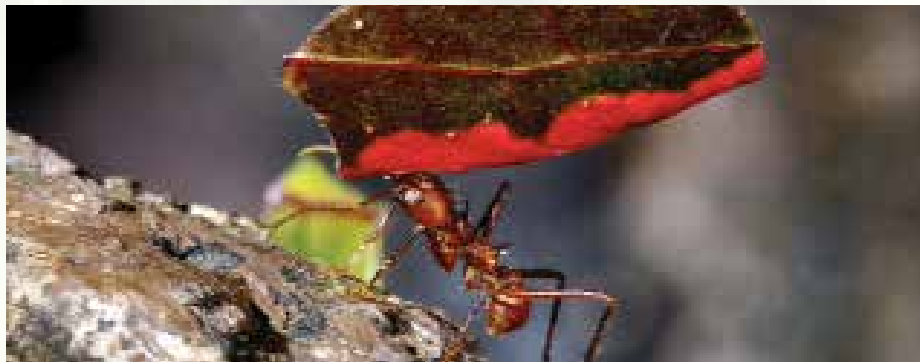
**John Madden** is a Professor of Electrical & Computer Engineering at the University of British Columbia, Vancouver, Canada. His research areas include the application of EAP materials in active catheters, as well as the development and characterization of molecular and carbon nanotube actuators. <http://www.mina.ubc.ca/jmadden>

**Qibing Pei** is professor of materials science and engineering at the University of California, Los Angeles. His research interests cover a wide range of soft materials and span from polymer synthesis, processing, to fabrication of functional devices which include flexible polymer electronics, dielectric elastomer artificial muscles, and Braille electronic readers. <http://www.ms.ucla.edu/people/bios/pei>

# Biomimicry, Bioinspiration, and the San Diego Zoo Panel Discussion



Location: Sunrise · Wednesday 12 March · 2:15 to 3:30 pm



SPIE and the SS/NDE symposium have partnered with the San Diego Zoo to promote the value of biomimicry as a paradigm for engineering research and practice. A representative from the San Diego Zoo will introduce the audience to an 'animal ambassador' and explain some of the remarkable features that can provide inspiration for the work of engineers and scientists. Panelists will discuss the current state of bioinspiration in the research lab, design challenges, and future solutions.

This panel is open for all attendees and will focus on all aspects of engineered biomimicry, including education, awareness, applications, research, and funding sources.



2011 featured a presentation about an alligator named 'Laveau'. 2012 featured 'Shaman' a Great Horned Owl whose serrated feathers allow silent flight for nighttime predation. 2013 featured a bald python named 'Monte'.

**Panel Moderators:** **Dr. Gabriel Miller**, Director of Research and Development, Centre for Bioinspiration, San Diego Zoo Global (United States); **Raúl J. Martín-Palma**, Univ. Autónoma de Madrid (Spain)

**Panelists include:** **Joseph E. Jakes**, U.S. Forest Service (USA); **Mato Knez**, CIC nanoGUNE Consolider (Spain); **Tony J. Prescott**, The Univ. of Sheffield (United Kingdom); **Akira Saito**, Osaka Univ. (Japan); **Georg Studor**, NASA Johnson Space Ctr. (USA).

**Alison Flatau**, Prof. of Aerospace Engineering, at the Univ. of Maryland, is a long-standing supporter of SS/NDE: She has served as a conference chair, as well as a symposium chair. Alison has been a plenary speaker and she was also the recipient of the 2010 SPIE Smart Structures and Materials Lifetime Achievement Award. She speaks here about the 'new' movement that surrounds bioinspired design.

For more information about the partnership between SPIE and the San Diego Zoo's Center for Bioinspiration, please visit: [www.spie.org/SDZOO](http://www.spie.org/SDZOO)

# Visit the free **EXHIBITION** at SPIE Smart Structures/NDE

**11–12 March 2014**

*Golden Ballroom*

Tuesday 10:00 am to 4:00 pm;  
6:00 to 7:30 pm (Posters/  
Exhibition Reception)

Wednesday 10:00 am to 4:00 pm

See products in

- **sensor systems**
- **health monitoring**
- **smart materials**
- **actuation**
- **damping**
- **safety and reliability of structures**
- **smart sensor networks**
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- Smart Structures and Materials
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- Nanotechnology
- Civil Infrastructure Systems
- Modeling, Control, and Optimization
- Energy Harvesting/Energy Systems
- Bio-inspired and Robotic Systems
- Electroactive Polymers
- Shape Memory Alloys
- MR Fluids and Elastomers
- Piezoelectric Materials
- Embedded and Self-diagnostic Sensors
- Optical Fiber Sensors
- Sensor Networks
- Real-Time NDE

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*“Smart Structures/NDE is where a diverse community representing all facets of the field come together to talk about relevant work and interface with colleagues and vendors.”*

— **Attendee**

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[spie.org/ss14exhibition](http://spie.org/ss14exhibition)

# 16th Annual EAP-in-Action Session and Demonstration

Location: Town and Country Ballroom · Monday 10 March · 4:30 to 5:45 pm

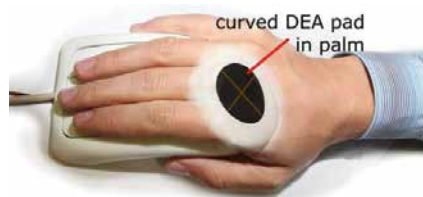


Session Chair:  
**Yoseph Bar-Cohen**,  
Jet Propulsion Lab.

EAPs is presented. This microprocessor-controlled robot is powered by an on-board lithium battery and is able to move in ambient air on a smooth surface. The construction takes advantage of the unique properties of soft iEAP technology.

## DEA enhanced PC-mouse for improving human machine interaction

**Henry Haus, Holger Hossinger, and Helmut F. Schlaak**, Technische Univ. Darmstadt (Germany)



The flexibility of rubber-like dielectric elastomer actuators allows adjusting the shape of tactile interfaces to fit onto arbitrary surfaces. This flexibility offers the opportunity to provide tactile stimulus not only the fingertips but also to other parts of the human body, using greater parts of the human skin to transmit information. A fully functional PC-mouse, enhanced with DEA technology, providing tactile feedback into the palm of the users hand, will be demonstrated. The audience may try out the tactile feedback while interacting with specially designed demo software on a PC, giving everyone the opportunity to experience the advantages of flexible DE-actuators for human machine interaction.

## Wearable and portable energy harvesters and soft sensor technologies

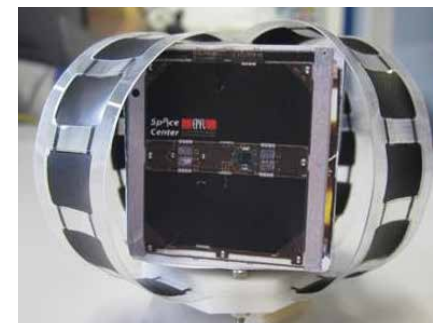
**Iain Anderson**, Biomimetics Lab. (New Zealand) and StretchSense Ltd. (New Zealand); **Thomas McKay, Daniel Xu, Andrew Lo, Tony Tse**, Biomimetics Lab. (New Zealand); **Todd Gisby**, StretchSense Ltd. (New Zealand)



The Biomimetics Lab and the new spinout StretchSense Ltd. will demonstrate advances leading to an exciting future of wearable and portable energy harvesters and soft sensor technologies that include a wireless glove. (1) Getting low voltage power from a dielectric elastomer generator (DEG) is now possible. The developed electronics is specifically designed for small portable DEGs that are capable of efficiently transforming high voltage to low voltage. (2) To get the most out of a DEG, its mechanical strain should be sensed. The best way to do this is to monitor the elastomer directly: to self-sense. The DEGs can now self-sense, simultaneously harvesting energy and sensing mechanical state without the need for bulky sensors. (3) Measuring human body motion can provide valuable feedback for sports, medical, video and game applications. The next generation of soft sensor technologies, including a wireless glove, will be presented.

## High speed silicone DEAs

**S. Rosset, S. Araromi, A. Poulin, L. Maffli, J. Shintake, H. Shea**, École Polytechnique Fédérale de Lausanne (Switzerland)



$\mu\text{m}$ - to  $\text{cm}$ -scale dielectric elastomer actuators will be presented. Processes to manufacture DEAs were developed with a high quality and reliability. Large area silicone membrane casting and precise patterning of electrodes allows producing small-scale and robust DEAs with a high yield. Different functioning devices will be demonstrated, such as a 4 fingers multi-segment gripper, seen in the photo grabbing a mockup of EPFL's SwissCube. This DEA-based gripper is a soft-actuator candidate to be mounted on CleanSpace One, the EPFL's next satellite whose task is to demonstrate the possibility of orbital debris removal by capturing and deorbiting the now-decommissioned SwissCube [<http://space.epfl.ch/page-61745-en.html>].

## Carbon-based tensile and torsional artificial muscles

**Carter S. Haines, Marcio D. Lima, Ray H. Baughman, Alan G. MacDiarmid**, Univ. of Texas at Dallas (USA)

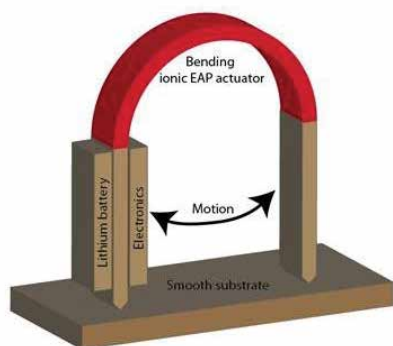
Carbon-based artificial muscles have been designed to provide fast torsional and tensile actuation. In tension, these muscles can provide in excess of 20% stroke without

This Session highlights some of the latest capabilities and applications of Electroactive Polymers (EAP) materials where the attendees are shown demonstrations of these materials in action. Also, the attendees interact directly with technology developers and given "hands-on" experience with this emerging technology. The first Human/EAP-Robot Armwrestling Contest was held during this session of the 2005 EAPAD conference.

### Tentative EAP Demonstrations:

## Bio-inspired autonomous robot actuated by ionic EAPs

**Indrek Must, Friedrich Kaasik, Inga Poldsalu, Lauri Mihkels, Urmas Johanson, Andrews Punning, Alvo Aabloo**, Univ. of Tartu (Estonia)



An autonomous crawling microrobot with locomotion inspired by an inchworm and propelled by ionic liquid-based bending

# 16th Annual EAP-in-Action Session and Demonstration

Location: Town and Country Ballroom · Monday 10 March · 4:30 to 5:45 pm



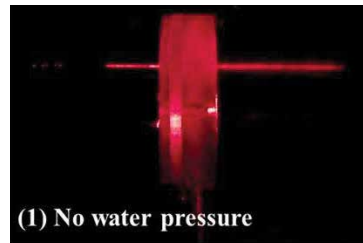
hysteresis when powered electrically or by using hot liquids such as water. More than a million cycles of reversible tensile actuation have been performed without a significant loss of performance. Torsional muscles that can move heavy loads and operate from ambient temperature gradients have also been shown. Such muscles

can be woven into braids and fabrics to produce smart textiles and actuating fabric. Demonstrations include torsional and tensile muscles exhibiting large stroke and giant force performance.

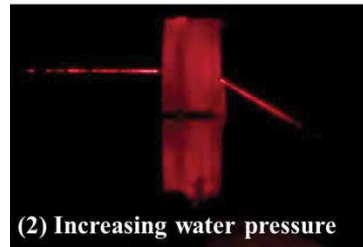
in a game controller for direct contact with skin as well as individually controlled haptic feedback zones. The device provides high definition feel with a broad spectrum of haptic effects having silent operation and without any audible buzzer.

## Smart gel Robotics with flexible and transparent shape memory gel (FT-SMG)

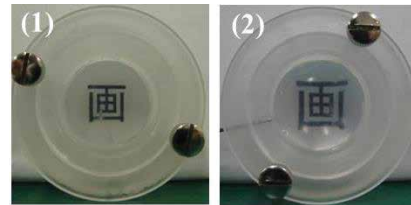
Jin Gong, Hidemitsu Furukawa, Yamagata Univ. (Japan)



(1) No water pressure



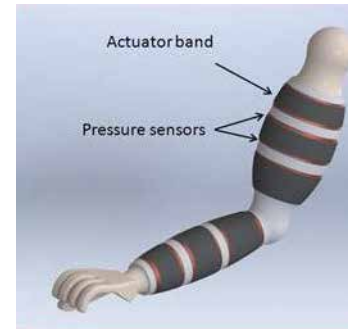
(2) Increasing water pressure



A smart varifocal lens is designed with flexible & transparent shape memory gel (FT-SMG), which freely adjusts the focal length based on simple mechanism of changing water pressure inside. Except for a soft eye of a robot, we have also developed other FT-SMG gel for robots including soft touch paper and soft skin finger.

## A Massaging Sleeve for Prevention of Lymphoedema using Artificial Muscles

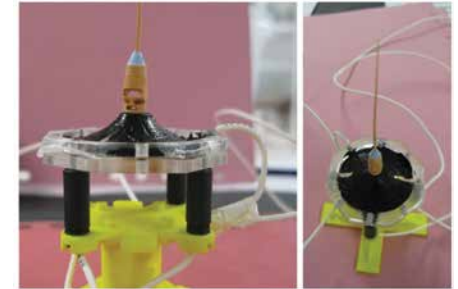
Geoffrey M. Spinks, Sina Naficy, Javad Foroughi, Gordon Wallace, Gursel Alici, Julie R. Steele, Julia Fellows, Philip Clingan, Univ. of Wollongong (Australia).



A woven sleeve powered by artificial muscles is being developed to massage patients' arms as a means for the prevention and / or treatment of breast cancer-related lymphoedema (BCRL). About one third of women newly diagnosed with invasive breast cancer will develop BCRL or swelling of the arm caused by the build-up of lymphatic fluids which leads to heaviness, swelling and discomfort for patients. The collaborative project draws on several research strengths – from materials engineering, robotics, biomechanics and medicine. The demonstration will utilize artificial muscles developed with our collaborators at the University of Texas at Dallas; University of British Columbia; Hanyang University; and Namik Kemal University.

## DEA-Based Whisker for Robotics

Tareq Assaf, Jonathan Rossiter, Andrew Conn, Martin Pearson, Peter Walters, Bristol Robotics Lab. (United Kingdom)



DEA-based whisker module will be presented showing the results of the efforts to scale and overcome critical issues for the exploitation of this artificial muscle technology in robotics, in particular as actuator to drive active tactile sensing. The modularity, dimensions, low weight and soft features make of this technology ideal for such application with relatively easy access to 2 Degrees of freedom and achieving both actuator and sensor capabilities. During the demonstration the prototypes will be shown and actuated together with the new upcoming release that contains improvements both on the design and performance point of view.

Acknowledgement: The DEA-based whisker module has been developed under the BELLA Project funded by EPSRC under grant EP/I032533/1

## ViviTouch HD Feel enables advanced and multi-dimensional communication through touch

Dirk Schapeler, ViviTouch, A Bayer Brand (USA)



An EAP stacked actuator will be demonstrated that is smaller than a thumb tack that is easily integrated as wearable devices and unique spaces. It can be used as a bracelet or line clothing, in trigger buttons or thumb sticks,

# Conference Session Schedule

Session times shown here are approximate – see individual conferences for exact times.

	Conf. 9055	Conf. 9056	Conf. 9057	Conf. 9058	Conf. 9060	Conf. 9061	Conf. 9062	Conf. 9063	Conf. 9064
<b>Monday</b>									

8:15 am · **Plenary Session**

10:30 am	Keynote Session	EAP As Emerging Actuators I		Energy Harvesting and Scavenging: General I	Modeling of SMA	Keynote Session I	Keynote Session I		Distributed Fiber Optic Sensors	Acoustic Emission and Ultrasonic-Based NDE/SHM I	Nonlinear Guided Waves and Other Nonlinear Techniques	SHM of Civil Infrastructure: Bridge Monitoring
	Flight I					Nanosensors and Systems I						
1:30 pm	Fabrication	Special Session: Electroding Materials and Systems	EAP As Emerging Actuators II	Passive and Active Vibration Isolation Systems I	Multifunctional Composites	Keynote Session II	Acoustic and Ultrasonic Methods for SHM	Condition Monitoring of Transportation Infrastructure	Fiber Optic Sensors	Acoustic Emission and Ultrasonic-Based NDE/SHM II	SHM of Composites: Experiment and Modeling	Biomedical Applications
						Nanosensors and Systems II						
3:30 pm	Sensors	EAP-In-Action Demonstration Session		Energy Harvesting and Scavenging: Flow	Smart Gels and Polymers	Nano- and Micro-Systems in Medicine and Healthcare I	SHM of Civil Engineering Systems	Active Sensing for Structures	Micro-structured Optical Sensors		Emerging and Futuristic Techniques/ Instruments	Vibration-Based SHM

<b>Tuesday</b>									
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8:10 am · **Plenary Session**

9:30 am	Robotics/ Locomotion I	EAP Materials and Actuators	Energy Harvesting Using EAP I	Biological-Inspired Systems and Bio-MEMS	Magneto Active Materials	Keynote Session III	SHM of Wind Turbines	Truss and Tensegrity Structures	Thermography Sensors	Roadway and Pavement Inspection and Monitoring Using NDE/SHM Technologies I	Guided Waves for SHM: Noncontact Techniques	EMI-Based SHM for Aerospace Applications
						Nano- and Micro-Systems in Medicine and Healthcare II						
10:30 am	Robotics/ Locomotion II	Dielectric Elastomers EAP I		Energy Harvesting and Scavenging: Circuitry	Piezoelectric Materials	Keynote Session IV	Nano-engineered Sensing Technology I	Non-Contact Measurements I	Electric Field Sensors		Guided Waves for SHM-Modeling Aspects	EMI-Based SHM and Practical Considerations
2:00 pm	Biomaterials I	Energy Harvesting Using EAP II	Electro-Responsive Materials	Magneto Rheological Systems I	Nano-composites Applications	Nano-composites I	Nano-engineered Sensing Technology II	Non-Contact Measurements II	Sensors for SHM of Turbine Engines	Roadway and Pavement Inspection and Monitoring Using NDE/SHM Technologies II	Guided Waves for SHM of Composites	Modeling Aspects: Deterministic and Stochastic
3:30 pm	Biomaterials II	Energy Harvesting Using EAP III	Robotic Applications I	Energy Harvesting and Scavenging: Electro-magnetic	Smart Composites	Nano-composites II	Sensor Fusion for SHM of Civil Structures	Statistical Learning for Smart Structures	Acoustic Emission and Ultrasound Sensors	Vibration-Based SHM/ NDE	Nonlinear SHM Techniques and Modeling	Civil Infrastructure: Pipe, Rail, Concrete, and Building
	Robotics/ Locomotion III											
	Poster Pops: In Memory of Don Wolpert											



# Conference Session Schedule

Session times shown here are approximate – see individual conferences for exact times.

Conf. 9055	Conf. 9056	Conf. 9057	Conf. 9058	Conf. 9059	Conf. 9060	Conf. 9061	Conf. 9063	Conf. 9064
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## Wednesday

8:10 am · Plenary Session

9:30 am	Optics/ Photonics I	Dielectric Elastomers EAP II	EAP Sensors	Energy Harvesting and Scavenging: Broadband Techniques	Magneto Rheological Systems II	Photo-responsive Materials	Synthetic Jets	Keynote Session V	Thin-Film Crack Sensors	Robotic Platforms for Sensing	Bridge Inspection and Monitoring Using NDE/SHM Technologies	Metamaterial I
10:30 am	Optics/ Photonics II		Aircraft, MAV/ UAV, and Morphing Systems	Piezo-Based Materials and Systems	SMA Materials and Design	Fabrication and Characterization		Wireless Sensor Networks for SHM	Carbon Nanotube-Based Sensing	Metamaterial II		
	Flight II											

2:00 pm	Panel Discussion: Biomimicry, Bioinspiration, and the San Diego Zoo	Energy Harvesting Using EAP IV	Applications of EAP to Optics	Energy Harvesting and Scavenging: Modeling	SMA-Based Materials and Systems	Smart Systems: Enabling Technologies	Ultrasonic Additive Manufacturing	Keynote Session VI	Fiber Optic-Based Sensing Methods I	Multifunctional Material Sensors	Piezoelectric Sensing Technologies for SHM/NDE	Guided Waves for SHM in Aerospace Applications I	
3:30 pm		Dielectric Elastomers EAP III	Conducting Polymers and IMPC	Modeling, Simulation, Optimization, Signal Processing, Control, and Design of Integrated Systems I	Passive and Active Vibration Isolation Systems II		Smart Systems: Examples	Nano-composites and Actuators					Microwave, RF, Metamaterials, and Optical Applications

## Thursday

8:20 am · Plenary Session

9:30 am	General Applications of EAP Materials	EAP Mechanisms and Processes	Energy Harvesting and Scavenging: General II	Passive and Active Vibration Isolation Systems III	Smart Building Technology I	Wind Loads on Complex Structural Systems	Railway Health Monitoring	NDE/SHM for Civil Infrastructure	NDE/SHM for Composites I	Metamaterial III
10:30 am			Micro- and Nano-Integrated Systems	Smart Structures and Applications		Smart Building Technology I	Data Processing Methods for SHM			

2:00 pm	Characterization of EAP Materials	Robotic Applications II	Energy Harvesting and Scavenging: General III	Passive and Active Vibration Isolation Systems IV	Fiber Optic-Based Sensing Methods II	Applications of Piezoelectric-Based Health Monitoring	Modeling and Simulation Techniques in NDE/SHM I	NDE/SHM for Composites II	Guided Wave-Based SHM and Other Advanced Techniques II
3:30 pm	Dielectric Elastomers EAP IV		Modeling, Simulation, Optimization, Signal Processing, Control, and Design of Integrated Systems II	Magneto Rheological Systems III	Smart Building Technology II	Adaptive Structures and Controlled Systems	Modeling and Simulation Techniques in NDE/SHM II		

# Technical Conferences

## Conference 9055

Sunday–Wednesday  
9–12 March 2014  
Proceedings of SPIE Vol. 9055

### Bioinspiration, Biomimetics, and Bioreplication IV

*Conference Chair:* **Akhlesh Lakhtakia**, The Pennsylvania State Univ. (USA)

*Conference Co-Chair:* **Raúl J. Martín-Palma**, Univ. Autónoma de Madrid (Spain)

*Program Committee:* **Yoseph Bar-Cohen**, Jet Propulsion Lab. (USA); **Steven F. Barrett**, Univ. of Wyoming (USA); **Michael H. Bartl**, The Univ. of Utah (USA); **Javaan S. Chahl**, Defence Science and Technology Organisation (Australia); **Shantanu Chakrabarty**, Michigan State Univ. (USA); **Francesco Chiadini**, Univ. degli Studi di Salerno (Italy); **Peng Jiang**, Univ. of Florida (USA); **Mato Knez**, IKERBASQUE. Basque Foundation for Science (Spain); **Sunghoon Kwon**, Seoul National Univ. (Korea, Republic of); **Gabriel A. Miller**, Ctr. for Bioinspiration at San Diego Zoo Global (USA); **Bert Müller**, Basel Univ. Hospital (Switzerland); **Maurizio Porfiri**, Polytechnic Institute of New York Univ. (USA); **Akira Saito**, Osaka Univ. (Japan)



## Conference 9056

Monday–Thursday  
10–13 March 2014  
Proceedings of SPIE Vol. 9056

### Electroactive Polymer Actuators and Devices (EAPAD) XVI

*Conference Chair:* **Yoseph Bar-Cohen**, Jet Propulsion Lab. (USA)

*Conference Co-Chair:* **Barbar J. Akle**, Lebanese American Univ. (Lebanon)

*Program Committee:* **Iain A. Anderson**, The Univ. of Auckland (New Zealand); **Siegfried G. Bauer**, Johannes Kepler Univ. Linz (Austria); **Kinji Asaka**, National Institute of Advanced Industrial Science and Technology (Japan); **Ray Baughman**, The Univ. of Texas at Dallas (USA); **Václav Bouda**, Czech Technical Univ. in Prague (Czech Republic); **Federico Carpi**, Queen Mary, Univ. of London (United Kingdom); **Suresh Chandra**, Institute of Technology, Banaras Hindu Univ. (India); **Hyouk Ryeol Choi**, Sungkyunkwan Univ. (Korea, Republic of); **Gal deBotton**, Ben-Gurion Univ. of the Negev (Israel); **Toribio Fernández Otero**, Univ. Politécnica de Cartagena (Spain); **Yahya A. Ismail**, Univ. of Nizwa (Oman); **Edwin W. H. Jager**, Linköping Univ. (Sweden); **Jaehwan Kim**, Inha Univ. (Korea, Republic of); **Kwang Jin Kim**, Univ. of Nevada, Las Vegas (USA); **Roy D. Kornbluh**, SRI International (USA); **Gabor M. Kovacs**, EMPA (Switzerland); **Maarja Kruusmaa**, Univ. of Tartu (Estonia); **Jinsong Leng**, Harbin Institute of Technology (China); **Wen-Liang Liu**, Industrial Technology Research Institute (Taiwan); **John D. Madden**, The Univ. of British Columbia (Canada); **Siavouche Nemat-Nasser**, Univ. of California, San Diego (USA); **Qibing Pei**, Univ. of California, Los Angeles (USA); **Valentin Radu**, Omicron Plus S.R.L. (Romania); **Mehdi Razzaghi-Kashani**, Tarbiat Modares Univ. (Iran, Islamic Republic of); **Jonathan M. Rossiter**, Univ. of Bristol (United Kingdom); **Anuvat Sirivat**, Chulalongkorn Univ. (Thailand); **Anne L. Skov**, Technical Univ. of Denmark (Denmark); **Elisabeth Smela**, Univ. of Maryland, College Park (USA); **Ji Su**, NASA Langley Research Ctr. (USA); **Minoru Taya**, Univ. of Washington (USA); **Gordon G. Wallace**, Univ. of Wollongong (Australia); **Frédéric Vidal**, Univ. de Cergy-Pontoise (France); **Thomas Wallmersperger**, Technische Univ. Dresden (Germany); **Qiming M. Zhang**, The Pennsylvania State Univ. (USA); **Pawel Zylka**, Wroclaw Univ. of Technology (Poland)

## Conference 9057

Monday–Thursday  
10–13 March 2014  
Proceedings of SPIE Vol. 9057

### Active and Passive Smart Structures and Integrated Systems VIII

*Conference Chair:* **Wei-Hsin Liao**, The Chinese Univ. of Hong Kong (Hong Kong, China)

*Conference Co-Chair:* **Gyuhae Park**, Chonnam National Univ. (Korea, Republic of)

*Program Committee:* **Gregory S. Agnes**, Jet Propulsion Lab. (USA); **Mehdi Ahmadian**, Virginia Polytechnic Institute and State Univ. (USA); **Eric H. Anderson**, CSA Engineering, Inc. (USA); **Hiroshi Asanuma**, Chiba Univ. (Japan); **Amr M. Baz**, Univ. of Maryland, College Park (USA); **Diann E. Brei**, Univ. of Michigan (USA); **Gregory P. Carman**, Univ. of California, Los Angeles (USA); **Seung-Bok Choi**, Inha Univ. (Korea, Republic of); **William W. Clark**, Univ. of Pittsburgh (USA); **Alper Erturk**, Georgia Institute of Technology (USA); **Alison B. Flatau**, Univ. of Maryland, College Park (USA); **Farhan Gandhi**, Rensselaer Polytechnic Institute (USA); **Ephraim Garcia**, Cornell Univ. (USA); **Mehrdad N. Ghasemi-Nejhad**, Univ. of Hawai'i (USA); **Victor Giurgiutiu**, Univ. of South Carolina (USA); **Faramarz Gordaninejad**, Univ. of Nevada, Reno (USA); **Nakhiah C. Goulbourne**, Univ. of Michigan (USA); **Daniel Guyomar**, Institut National des Sciences Appliquées de Lyon (France); **Tristram Tupper Hyde**, NASA Goddard Space Flight Ctr. (USA); **Daniel J. Inman**, Univ. of Michigan (USA); **Conor D. Johnson**, CSA Engineering, Inc. (USA); **Hyung-Jo Jung**, KAIST (Korea, Republic of); **Jeong-Hoi Koo**, Miami Univ. (USA); **Roger Ohayon**, Conservatoire National des Arts et Métiers (France); **Mohammad Rastgaar Aagaah**, Massachusetts Institute of Technology (USA); **Norbert Schwesinger**, Technische Univ. München (Germany); **Yi-Chung Shu**, National Taiwan Univ. (Taiwan); **Henry A. Sodano**, Univ. of Florida (USA); **Steve Southward**, Virginia Polytechnic Institute and State Univ. (USA); **Roger Stanway**, The Univ. of Sheffield (United Kingdom); **Jiong Tang**, Univ. of Connecticut (USA); **Dai-Hua Wang**, Chongqing Univ. (China); **Kon-Well Wang**, Univ. of Michigan (USA); **Norman M. Wereley**, Univ. of Maryland, College Park (USA)

## Conference 9058

Monday–Wednesday  
10–12 March 2014  
Proceedings of SPIE Vol. 9058

### Behavior and Mechanics of Multifunctional Materials and Composites VIII

*Conference Chair:* **Nakhiah C. Goulbourne**, Univ. of Michigan (USA)

*Conference Co-Chair:* **Hani E. Naguib**, Univ. of Toronto (Canada)

*Program Committee:* **Abhijit Bhattacharyya**, Univ. of Arkansas at Little Rock (USA); **Gregory P. Carman**, Univ. of California, Los Angeles (USA); **Pavel M. Chaplya**, Sandia National Labs. (USA); **Constantin Ciocanel**, Northern Arizona Univ. (USA); **Marcelo J. Dapino**, The Ohio State Univ. (USA); **Sergio Luis dos Santos e Lucato**, Teledyne Scientific Co. (USA); **LeAnn E. Faidley**, Wartburg College (USA); **Daniel J. Inman**, Univ. of Michigan (USA); **Marc Kamlah**, Karlsruher Institut für Technologie (Germany); **Haluk E. Karaca**, Univ. of Kentucky (USA); **Kwang Jin Kim**, Univ. of Nevada, Las Vegas (USA); **Dimitris C. Lagoudas**, Texas A&M Univ. (USA); **Chad M. Landis**, The Univ. of Texas at Austin (USA); **Kam K. Leang**, Univ. of Nevada, Reno (USA); **Donald J. Leo**, Virginia Polytechnic Institute and State Univ. (USA); **Jiangyu Li**, Univ. of Washington (USA); **Christopher S. Lynch**, Univ. of California, Los Angeles (USA); **Karla M. Mossi**, Virginia Commonwealth Univ. (USA); **Robert C. O'Handley**, Massachusetts Institute of Technology (USA); **Etienne Patoor**, Univ. Metz (France); **Ralph C. Smith**, North Carolina State Univ. (USA); **Jonghwan Suhr**, Univ. of Delaware (USA); **Vishnu Baba Sundaresan**, Virginia Commonwealth Univ. (USA)

## Conference 9059

Tuesday–Wednesday  
11–12 March 2014  
Proceedings of SPIE Vol. 9059

### Industrial and Commercial Applications of Smart Structures Technologies VIII

*Conference Chair:* **Kevin M. Farinholt**, Luna Innovations Inc. (USA)

*Conference Co-Chair:* **Steven F. Griffin**, Boeing LTS Inc. (USA)

*Program Committee:* **Eric H. Anderson**, CSA Engineering, Inc. (USA); **Steven R. Anton**, Los Alamos National Lab. (USA); **Emil V. Ardelean**, Schafer Corp. (USA); **Brandon J. Arritt**, Air Force Research Lab. (USA); **Christian Boller**, Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren (Germany); **Diann E. Brei**, Univ. of Michigan (USA); **Alan L. Browne**, General Motors Corp. (USA); **Peter C. Chen**, NASA Goddard Space Flight Ctr. (USA); **Marcelo J. Dapino**, The Ohio State Univ. (USA); **L. Porter Davis**, Honeywell Defense and Space Electronic Systems (USA); **Xiao-Yan Gong**, Medical Implant Mechanics LLC (USA); **Holger Hanselka**, Fraunhofer-Institut für Betriebsfestigkeit und Systemzuverlässigkeit (Germany); **Ernie Havens**, Cornerstone Research Group, Inc. (USA); **Nancy L. Johnson**, General Motors Corp. (USA); **Chad H. Joshi**, Energen, Inc. (USA); **Jayanth N. Kudva**, NextGen Aeronautics, Inc. (USA); **Amrita Kumar**, Acellent Technologies, Inc. (USA); **Ou Ma**, New Mexico State Univ. (USA); **Geoffrey P. McKnight**, HRL Labs., LLC (USA); **Christopher Niezrecki**, Univ. of Massachusetts Lowell (USA); **Wieslaw M. Ostachowicz**, The Szwedalski Institute of Fluid-Flow Machinery (Poland); **Gyuhae Park**, Chonnam National Univ. (Korea, Republic of); **Marc E. Regelbrugge**, Rhombus Consultants Group (USA); **W. Lance Richards**, NASA Dryden Flight Research Ctr. (USA); **Janet M. Sater**, Institute for Defense Analyses (USA); **Henry A. Sodano**, Univ. of Florida (USA); **Wieslaw Jerzy Staszewski**, AGH Univ. of Science and Technology (Poland); **Edward V. White**, The Boeing Co. (USA)

## Conference 9060

Monday–Thursday  
10–13 March 2014  
Proceedings of SPIE Vol. 9060

### Nano-, Bio-, Info-Tech Sensors and Systems

*Conference Chair:* **Vijay K. Varadan**, Univ. of Arkansas (USA)

*Conference Co-Chairs:* **Jaehwan Kim**, Inha Univ. (Korea, Republic of); **Kyo D. Song**, Norfolk State Univ. (USA); **Sang H. Choi**, NASA Langley Research Ctr. (USA); **Yeonhoon Park**, National Institute of Aerospace (USA)

*Program Committee:* **Anja Boisen**, Technical Univ. of Denmark (Denmark); **Christina L. Brantley**, U.S. Army Research, Development and Engineering Command (USA); **Natalie Clark**, NASA Langley Research Ctr. (USA); **Dileepan Joseph**, Univ. of Alberta (Canada); **Sam Kassegne**, San Diego State Univ. (USA); **Kimiya Komurasaki**, The Univ. of Tokyo (Japan); **Ajit Khosla**, Simon Fraser Univ. (Canada); **Kunik Lee**, Federal Highway Administration Turner Fairbank Highway Research Ctr. (USA); **Uhn Lee M.D.**, Gachon Univ. Gil Medical Ctr. (Korea, Republic of); **Xinxin Li**, Shanghai Institute of Microsystem and Information Technology (China); **Yanjan Liao**, Chongqing Univ. (China); **Samuel C. Lee**, The Univ. of Oklahoma (USA); **D. Roy Mahapatra**, Indian Institute of Science (India); **Parag Ganapathi Patil**, Univ. of Michigan Health System (USA); **Ilkwon Oh**, KAIST (Korea, Republic of); **Aswini K. Pradhan**, Norfolk State Univ. (USA); **Paul B. Ruffin**, U.S. Army Research, Development and Engineering Command (USA); **Ashok Srivastava**, Louisiana State Univ. (USA); **Tauno Vaha-Heikkila**, VTT Technical Research Ctr. of Finland (Finland); **W-C. Wang**, Univ. of Washington (USA); **Richard K. Watt**, Brigham Young Univ. (USA); **Hargsoon Yoon**, Norfolk State Univ. (USA); **T. C. Yi**, California State Univ., Long Beach (USA); **Ming Zhou**, Suzhou Institute of Nano-tech and Nano-bionics (China)

## Conference 9061

Monday–Thursday  
10–13 March 2014  
Proceedings of SPIE Vol. 9061

### Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems

*Conference Chair:* **Jerome P. Lynch**, Univ. of Michigan (USA)

*Conference Co-Chairs:* **Kon-Well Wang**, Univ. of Michigan (USA); **Hoon Sohn**, KAIST (Korea, Republic of)

*Program Committee:* **Dumitru Caruntu**, The Univ. of Texas-Pan American (USA); **Fabio Casciati**, Univ. degli Studi di Pavia (Italy); **Chih-Chen Chang**, Hong Kong Univ. of Science and Technology (Hong Kong, China); **Genda Chen**, Missouri Univ. of Science and Technology (USA); **Alison B. Flatau**, Univ. of Maryland, College Park (USA); **Yojo Fujino**, The Univ. of Tokyo (Japan); **Branko Glisic**, Princeton Univ. (USA); **Faramarz Gordaninejad**, Univ. of Nevada, Reno (USA); **Xiaoyan Han**, Wayne State Univ. (USA); **Benjamin Kyle Henderson**, Air Force Research Lab. (USA); **Jung-Wuk Hong**, KAIST (Korea, Republic of); **Neil Hoult**, Queen's Univ. (Canada); **Haiying Huang**, The Univ. of Texas at Arlington (USA); **Ying Huang**, North Dakota State Univ. (USA); **Shinae Jang**, Univ. of Connecticut (USA); **Jeong-Tae Kim**, Pukyong National Univ. (Korea, Republic of); **Junhee Kim**, Dankook Univ. (Korea, Republic of); **Masahiro Kurata**, Kyoto Univ. (Japan); **Simon Laflamme**, Iowa State Univ. (USA); **Francesco Lanza di Scalea**, Univ. of California, San Diego (USA); **Wei-Hsin Liao**, The Chinese Univ. of Hong Kong (Hong Kong, China); **Yingzi Lin**, Northeastern Univ. (USA); **Chin-Hsiung Loh**, National Taiwan Univ. (Taiwan); **Kenneth J. Loh**, Univ. of California, Davis (USA); **Sami F. Masri**, The Univ. of Southern California (USA); **Akira Mita**, Keio Univ. (Japan); **Tomonori Nagayama**, The Univ. of Tokyo (Japan); **Yiqing Ni**, The Hong Kong Polytechnic Univ. (Hong Kong, China); **Hae Young Noh**, Carnegie Mellon Univ. (USA); **Irving J. Oppenheim**, Carnegie Mellon Univ. (USA); **Wieslaw M. Ostachowicz**, The Szwedzki Institute of Fluid-Flow Machinery (Poland); **Jinping Ou**, Dalian Univ. of Technology (China); **Shamim N. Pakzad**, Lehigh Univ. (USA); **Jin-Song Pei**, The Univ. of Oklahoma (USA); **Michael K. Philen**, Virginia Polytechnic Institute and State Univ. (USA); **Paul Reynolds**, Univ. of Exeter (United Kingdom); **Massimo Ruzzene**, Georgia Institute of Technology (USA); **Liming W. Salvino**, Office of Naval Research Global (USA); **Jeffrey T. Scruggs**, Univ. of Michigan (USA); **Fabio Semperlotti**, Univ. of Notre Dame (USA); **Sung-Han Sim**, Ulsan National Institute of Science and Technology (Korea, Republic of); **Billie F. Spencer Jr.**, Univ. of Illinois at Urbana-Champaign (USA); **Wieslaw Jerzy Staszewski**, AGH Univ. of Science and Technology (Poland); **Lizhi Sun**, Univ. of California, Irvine (USA); **R. Andrew Swartz**, Michigan Technological Univ. (USA); **Masayoshi Tomizuka**, Univ. of California, Berkeley (USA); **Ming L. Wang**, Northeastern Univ. (USA); **Xingwei Wang**, Univ. of Massachusetts Lowell (USA); **Yang Wang**, Georgia Institute of Technology (USA); **Chung-Bang Yun**, Ulsan National Institute of Science and Technology (Korea, Republic of); **Yunfeng Zhang**, Univ. of Maryland, College Park (USA); **Li Zhou**, Nanjing Univ. of Aeronautics and Astronautics (China); **Daniele Zonta**, Univ. degli Studi di Trento (Italy)

## Conference 9062

Monday–Tuesday  
10–11 March 2014  
Proceedings of SPIE Vol. 9062

### Smart Sensor Phenomena, Technology, Networks, and Systems Integration VII

*Conference Chair:* **Wolfgang Ecke**, Institut für Photonische Technologien e.V. (Germany)

*Conference Co-Chairs:* **Kara J. Peters**, North Carolina State Univ. (USA); **Norbert G. Meyendorf**, Fraunhofer IKTS-CMD (Germany); **Theodoros E. Matikas**, Univ. of Ioannina (Greece)

*Program Committee:* **Farhad Ansari**, Univ. of Illinois at Chicago (USA); **George Y. Baaklini**, NASA Glenn Research Ctr. (USA); **Horst J. Baier**, Technische Univ. München (Germany); **Curtis E. Banks**, NASA Marshall Space Flight Ctr. (USA); **Xiaoyi Bao**, Univ. of Ottawa (Canada); **Hartmut Bartelt**, Institut für Photonische Technologien e.V. (Germany); **Rolf Brönnimann**, EMPA (Switzerland); **Brian Culshaw**, Univ. of Strathclyde (United Kingdom); **Chiara Daraio**, ETH Zurich (Switzerland); **Wolfgang R. Habel**, Bundesanstalt für Materialforschung und -prüfung (Germany); **Daniele Inaudi**, Smartec S.A. (Switzerland); **Kerop D. Janoyan**, Clarkson Univ. (USA); **YeonWan Koh**, FIBERPRO, Inc. (Korea, Republic of); **Silvio E. Kruger**, National Research Council Canada (Canada); **Jinsong Leng**, Harbin Institute of Technology (China); **Alexis Mendez**, MCH Engineering LLC (USA); **Bernd Michel**, Fraunhofer-Institut für Elektronische Nanosysteme (Germany); **Jeff W. Miller**, Micron Optics, Inc. (USA); **Marc Nikles**, Omnisens S.A. (Switzerland); **Ioannis E. Psarobas**, Univ. of Athens (Greece); **Richard Selfridge**, Brigham Young Univ. (USA); **Leszek Roman Jaroszewicz**, Military Univ. of Technology (Poland); **Nobuo Takeda**, The Univ. of Tokyo (Japan); **Michael D. Todd**, Univ. of California, San Diego (USA); **Eric Udd**, Columbia Gorge Research (USA); **Zhishen Wu**, Ibaraki Univ. (Japan); **Rosalind M. Wynne**, Villanova Univ. (USA); **Chung-Bang Yun**, Ulsan National Institute of Science and Technology (Korea, Republic of)

## Conference 9063

Monday–Thursday  
10–13 March 2014  
Proceedings of SPIE Vol. 9063

### Nondestructive Characterization for Composite Materials, Aerospace Engineering, Civil Infrastructure, and Homeland Security VIII

*Conference Chair:* **H. Felix Wu**, Univ. of North Texas (USA)

*Conference Co-Chairs:* **Tzu-Yang Yu**, Univ. of Massachusetts Lowell (USA); **Andrew L. Gyekenyesi**, Ohio Aerospace Institute (USA); **Aaron A. Diaz**, Pacific Northwest National Lab. (USA); **Peter J. Shull**, The Pennsylvania State Univ. (USA)

*Program Committee:* **Sreenivas Alampalli**, New York State Dept. of Transportation (USA); **Aditi Chattopadhyay**, Arizona State Univ. (USA); **Genda Chen**, Missouri Univ. of Science and Technology (USA); **Shen-En Chen**, The Univ. of North Carolina at Charlotte (USA); **Mohammed M. Ettouney**, Weidinger Associates, Inc. (USA); **Andrea E. Del Grosso**, Univ. degli Studi di Genova (Italy); **Valery F. Godinez-Azcuaga**, MISTRAS Group, Inc. (USA); **Nenad Gucunski**, Rutgers, The State Univ. of New Jersey (USA); **Dryver R. Huston**, The Univ. of Vermont (USA); **Xiaoning Jiang**, North Carolina State Univ. (USA); **Simon Laflamme**, Iowa State Univ. (USA); **Dendvid Lau**, City Univ. of Hong Kong (Hong Kong, China); **Kenneth J. Loh**, Univ. of California, Davis (USA); **Jerome Peter Lynch**, Univ. of Michigan (USA); **Theodoros E. Matikas**, Univ. of Ioannina (Greece); **Piotr Omenzetter**, The Univ. of Auckland (New Zealand); **Didem Ozevin**, Univ. of Illinois at Chicago (USA); **Pradeep Ramuhalli**, Pacific Northwest National Lab. (USA); **Bijan Samali**, Univ. of Technology, Sydney (Australia); **Akira Sasamoto**, National Institute of Advanced Industrial Science and Technology (Japan); **Kurt Silvers**, Pacific Northwest National Lab. (USA); **Caesar Singh**, U.S. Dept. of Transportation (USA); **Yu-Min Su**, National Central Univ. (Taiwan); **Bernhard R. Tittmann**, The Pennsylvania State Univ. (USA); **Yan Wan**, Univ. of North Texas (USA); **Ming L. Wang**, Northeastern Univ. (USA); **Xingwei Wang**, Univ. of Massachusetts Lowell (USA); **Yang Wang**, Georgia Institute of Technology (USA); **Sharon L. Wood**, The Univ. of Texas at Austin (USA); **Lingyu Yu**, Univ. of South Carolina Libraries (USA); **Fuh-Gwo Yuan**, North Carolina State Univ. (USA); **Ying Zhang**, Georgia Institute of Technology (USA); **Jinying Zhu**, The Univ. of Texas at Austin (USA); **Paul H. Ziehl**, Univ. of South Carolina (USA)

## Conference 9064

Monday–Thursday  
10–13 March 2014  
Proceedings of SPIE Vol. 9064

### Health Monitoring of Structural and Biological Systems VIII

*Conference Chair:* **Tribikram Kundu**, The Univ. of Arizona (USA)

*Conference Co-Chair:* **Wolfgang Grill**, Univ. Leipzig (Germany)

*Program Committee:* **Douglas E. Adams**, Purdue Univ. (USA); **Sourav Banerjee**, Univ. of South Carolina (USA); **Yoseph Bar-Cohen**, Jet Propulsion Lab. (USA); **Fu-Kuo Chang**, Stanford Univ. (USA); **Anthony J. Croxford**, Univ. of Bristol (United Kingdom); **Paul Fromme**, Univ. College London (United Kingdom); **Victor Giurgiutiu**, Univ. of South Carolina (USA); **Daniel J. Guyomar**, Institut National des Sciences Appliquées de Lyon (France); **Shivan Haran**, Arkansas State Univ. (USA); **Guoliang Huang**, Univ. of Arkansas at Little Rock (USA); **Xiaoning Jiang**, North Carolina State Univ. (USA); **Sridhar Krishnaswamy**, Northwestern Univ. (USA); **Francesco Lanza di Scalea**, Univ. of California (USA); **Jerome Peter Lynch**, Univ. of Michigan (USA); **Jennifer E. Michaels**, Georgia Institute of Technology (USA); **Won-Bae Na**, Pukyong National Univ. (Korea, Republic of); **Christopher Niezrecki**, Univ. of Massachusetts Lowell (USA); **Wieslaw M. Ostachowicz**, The Szwedzki Institute of Fluid-Flow Machinery (Poland); **Paul D. Panetta**, Applied Research Associates, Inc. (USA); **Perngjin F. Pai**, Univ. of Missouri-Columbia (USA); **Xinlin P. Qing**, Commercial Aircraft Corp. of China, Ltd. (China); **Henrique L. Reis**, Univ. of Illinois at Urbana-Champaign (USA); **Piervincenzo Rizzo**, Univ. of Pittsburgh (USA); **Hoon Sohn**, KAIST (Korea, Republic of); **Wieslaw Jerzy Staszewski**, AGH Univ. of Science and Technology (Poland); **Nobuo Takeda**, The Univ. of Tokyo (Japan); **Michael D. Todd**, Univ. of California, San Diego (USA); **Wei-Chih Wang**, Univ. of Washington (USA); **Andrei N. Zagrai**, New Mexico Institute of Mining and Technology (USA); **George Zentai**, Varian Medical Systems, Inc. (USA)

## Conference 9055

## Conference 9056

## Conference 9057

## Conference 9058

## Conference 9060

### Announcements, Awards, Plenary Presentations

Location: Town and Country Ballroom

8:15 to 8:30 am

- SPIE Fellow Recognition

- SSM Lifetime Achievement Award Presentations presented to **Christopher S. Lynch**, Univ. of California, Los Angeles (USA) and **Shiv Joshi**, NextGen Aeronautics, Inc. (USA)

### Plenary Presentation · 8:30 to 9:15 am



#### Noncontact Laser Sensing Technology for Structural Health Monitoring and Nondestructive Testing

Hoon Sohn, KAIST (Korea, Republic of)

### Plenary Presentation · 9:15 to 10:00 am



#### Light-Induced Electrical Switching of Porphyrin-Covered Silicon Nanowire FETs

Gianaurelio Cuniberti, Technische Univ. Dresden (Germany)

Location: Sunrise  
10:30 am to 11:10 am

### Keynote Session

Session Chair: **Akhlesh Lakhtakia**, The Pennsylvania State Univ. (USA)

10:30 am: **A future of living machines?: International trends and prospects in biomimetic and biohybrid systems** (*Keynote Presentation*), Tony J. Prescott, Nathan Lepora, The Univ. of Sheffield (United Kingdom); Paul F. M. J. Vershure, Univ. Pompeu Fabra (Spain). . . . . [9055-1]

### Session 1

Location: Sunrise  
Mon 11:10 am to 12:00 pm

### Flight I

Session Chair: **Tony J. Prescott**, The Univ. of Sheffield (United Kingdom)

11:10 am: **Including natural systems into the system engineering process: benefits to spaceflight and beyond** (*Invited Paper*), George Studor, NASA Johnson Space Ctr., Retired (USA). . . . . [9055-2]

11:40 am: **Resonance versus aerodynamics for energy savings in agile natural flyers**, Javan S. Chahl, Univ. of South Australia (Australia) and Defence Science and Technology Organisation (Australia); Jia M. Kok, Univ. of South Australia (Australia). . . . . [9055-3]

Lunch Break . . . . . Mon 12:00 pm to 1:30 pm

### Session 1

Location: Town and Country  
Mon 10:30 am to 11:50 am

### EAP As Emerging Actuators I

Session Chairs: **Yoseph Bar-Cohen**, Jet Propulsion Lab. (USA); **Barbar J. Akle**, Lebanese American Univ. (Lebanon)

10:30 am: **Soft robotics: a review and progress towards faster and higher torque actuators** (*Keynote Presentation*), Robert Shepherd, Cornell Univ. (USA) . . . . . [9056-1]

11:10 am: **Artificial muscles harvesting sensational power** (*Invited Paper*), Thomas G. McKay, The Univ. of Auckland (New Zealand); Todd A. Gisby, StretchSense (New Zealand); Iain A. Anderson, The Univ. of Auckland (New Zealand). . . . . [9056-2]

Lunch Break . . . . . Mon 11:50 am to 1:20 pm

### Session 1

Location: Royal Palm Five  
Mon 10:30 am to 12:10 pm

### Energy Harvesting and Scavenging: General I

Session Chairs: **Wei-Hsin Liao**, The Chinese Univ. of Hong Kong (Hong Kong, China); **Gyuhae Park**, Chonnam National Univ. (Korea, Republic of)

10:30 am: **Global nonlinear electroelastic dynamics of a bimorph piezoelectric cantilever for energy harvesting, sensing, and actuation**, Stephen M. Leadenham, Alper Erturk, Georgia Institute of Technology (USA). . . . . [9057-1]

10:50 am: **Feasibility study of a two-dimensional vibration energy harvester with frame configuration**, Hao Wu, Lihua Tang, Yaowen Yang, Chee Kiong Soh, Nanyang Technological Univ. (Singapore). . . . . [9057-2]

11:10 am: **Investigation of practical on-road energy harvester**, Jinwoo Park, Lei Zuo, Stony Brook Univ. (USA) . . . . . [9057-3]

11:30 am: **Optimal piezoelectric energy harvesting using elastoacoustic mirrors by frequency-wavenumber domain investigation**, Matteo Carrara, Jason A. Kulpe, Stephen M. Leadenham, Michael J. Leamy, Alper Erturk, Georgia Institute of Technology (USA) . . . . . [9057-4]

11:50 am: **Durability of a piezo-composite electricity generating element in a d33 mode energy harvesting to impact loading**, Vinh Tung Le, Van-Lai Pham, Seong-Up Hwang, Nam Seo Goo, Konkuk Univ. (Korea, Republic of) . . . . . [9057-5]

Lunch Break . . . . . Mon 12:10 pm to 1:40 pm

### Session 1

Location: Sunset  
Mon 10:30 am to 12:20 pm

### Modeling of SMA

Session Chairs: **Nakhiah C. Goulbourne**, Univ. of Michigan (USA); **Hani E. Naguib**, Univ. of Toronto (Canada)

10:30 am: **Fracture toughness enhancement due to global thermo-mechanically-induced phase transformation in shape memory alloy actuators** (*Invited Paper*), Dimitris C. Lagoudas, Sameer Jape, Theocharis Bexevanis, Texas A&M Univ. (USA) . . . . . [9058-1]

11:00 am: **Modeling size effect in the SMA response: a gradient theory**, Majid Tabesh, James G. Boyd IV, Dimitris C. Lagoudas, Texas A&M Univ. (USA) . . . . . [9058-2]

11:20 am: **Iterative calibration of a shape memory alloy constitutive model from 1D and 2D experimental data using optimization methods**, Darren J. Hartl, William D. Whitten, Texas A&M Univ. (USA) . . . . . [9058-3]

11:40 am: **Three-dimensional constitutive model considering transformation-induced damage and resulting fatigue failure in shape memory alloys**, Darren J. Hartl, Texas A&M Univ. (USA); Yves Chemisky, Fodil Meraghni, Lab. d'Etude des Microstructures et de Mécanique des Matériaux (France). . . . . [9058-4]

12:00 pm: **Interfacial stress in shape memory alloy reinforced polymer composites**, Shashishakarayya R. Hiremath, Rajendra Prasath, D. Roy Mahapatra, Indian Institute of Science (India) . . . . . [9058-6]

Lunch Break . . . . . Mon 12:20 pm to 2:10 pm

### Session 1

Location: Royal Palm Three  
Mon 10:30 am to 11:10 am

### Keynote Session I

Session Chair: **Vijay K. Varadan**, Univ. of Arkansas (USA)

10:30 am: **Nonlinear plasmonics with Kerr-like media for sensing** (*Keynote Presentation*), Paul B. Ruffin, Sihon H. Crutcher, Eugene Edwards, Christina L. Brantley, U.S. Army Research, Development and Engineering Command (USA). . . . . [9060-1]

### Session 2

Location: Royal Palm Three  
Mon 11:10 am to 12:20 pm

### Nanosensors and Systems I

Session Chair: **Vijay K. Varadan**, Univ. of Arkansas (USA)

11:10 am: **Metallic single-walled, carbon-nanotube-based temperature sensor** (*Invited Paper*), Kaji Muhammad M. Mohsin, Yaser Mohammadi Banadaki, Ashok Srivastava, Louisiana State Univ. (USA) [9060-2]

11:40 am: **Small-area low-power decimators for delta-sigma video sensors**, Erika Azabache Villar, Alireza Mahmoodi, Orit Skorka, Dileepan Joseph, Univ. of Alberta (Canada). . . . . [9060-3]

12:00 pm: **Oxygen sensing glucose biosensors based on alginate nano-micro systems**, Rashmi D. Chaudhari, Abhijeet Joshi, Rohit Srivastava, Indian Institute of Technology Bombay (India) . . . . . [9060-4]

Lunch Break . . . . . Mon 12:20 pm to 1:30 pm

## Conference 9061

## Conference 9062

## Conference 9063

## Conference 9064

### Announcements, Awards, Plenary Presentations

Location: Town and Country Ballroom

8:15 to 8:30 am

- SPIE Fellow Recognition

- SSM Lifetime Achievement Award Presentations presented to **Christopher S. Lynch**, Univ. of California, Los Angeles (USA) and **Shiv Joshi**, NextGen Aeronautics, Inc. (USA)

### Plenary Presentation · 8:30 to 9:15 am



#### Noncontact Laser Sensing Technology for Structural Health Monitoring and Nondestructive Testing

Hoon Sohn, KAIST (Korea, Republic of)

### Plenary Presentation · 9:15 to 10:00 am



#### Light-Induced Electrical Switching of Porphyrin-Covered Silicon Nanowire FETs

Gianaurelio Cuniberti, Technische Univ. Dresden (Germany)

### Session 1

Location: Pacific Salon Seven  
Mon 10:30 am to 11:50 am

#### Keynote Session

Session Chairs: **Jerome Peter Lynch**, Univ. of Michigan (USA); **Hoon Sohn**, KAIST (Korea, Republic of); **Kon-Well Wang**, Univ. of Michigan (USA)

10:30 am: **Surface acoustic wave action on microfluidic channels and microparticles** (Keynote Presentation), Erin R. Dauson, Kelvin B. Gregory, David W. Greve, Irving J. Oppenheim, Carnegie Mellon Univ. (USA) . . . . . [9061-1]

11:10 am: **Smart design** (Keynote Presentation), Diann E. Brei, Univ. of Michigan (USA) . . . . . [9061-2]

Lunch Break . . . . . Mon 11:50 am to 1:20 pm

### Session 1

Location: Towne  
Mon 10:30 am to 11:40 am

#### Distributed Fiber Optic Sensors

Session Chair: **Wolfgang Ecke**, Institut für Photonische Technologien e.V. (Germany)

10:30 am: **OTDR and OFDR for distributed multi-parameter sensing** (Invited Paper), Xiaoyi Bao, Univ. of Ottawa (Canada) . . . . . [9062-1]

11:00 am: **Improved distributed fiber optic sensing system based on single-ended double-pulse input Brillouin scattering**, Tianying Chang, Ruijun Yang, Jilin Univ. (China); Yongliang Wang, David Y. Li, L.C. Pegasus Corp. (China); Lei Jia, Shandong Univ. (China); Hong-Liang Cui, Jilin Univ. (China) . . [9062-2]

11:20 am: **Vibration pattern recognition and classification in OTDR based distributed optical-fiber vibration sensing system**, Hui Zhu, Chao Pan, Xiaohan Sun, Southeast Univ. (China) . . . . . [9062-4]

Lunch Break . . . . . Mon 11:40 am to 1:30 pm

### Session 1

Location: Royal Palm Four  
Mon 10:30 am to 12:30 pm

#### Acoustic Emission and Ultrasonic-Based NDE/SHM I

Session Chairs: **Xiaoning Jiang**, North Carolina State Univ. (USA); **Didem Ozevin**, Univ. of Illinois at Chicago (USA)

10:30 am: **New strategies for SHM based on a multichannel wireless AE node** (Keynote Presentation), Valery F. Godinez-Azcuaga, Abdulia Lay, MISTRAS Group, Inc. (USA) . . . . . [9063-1]

11:10 am: **Studying the effect of cracks on the ultrasonic wave propagation in a two-dimensional gearbox finite element model**, Didem Ozevin, Hossein Fazel, Univ. of Illinois at Chicago (USA); Justin Cox, William Hardman, Naval Air Warfare Ctr. Aircraft Div. (USA); Seth S. Kessler, Metis Design Corp. (USA); Alan Timmons, Naval Air Warfare Ctr. Aircraft Div. (USA) . . . . . [9063-2]

11:30 am: **Assessment of weld quality of aerospace grade metals by using ultrasonic matrix phased array technology**, Jeong K. Na, Edison Welding Institute (USA) . . . . . [9063-3]

11:50 am: **3D-assisted defect recognition for the ultrasonic waveform inspection of titanium components**, Andrew Ferro, Patrick Howard, GE Aviation (USA) . . . . . [9063-4]

12:10 pm: **Ultrasonic sensor for thickness measurement of hybrid materials**, Marc C. Wurz, Anja Wienecke, Lutz Rissing, Jens Twiefel, Jörg Wallaschek, Leibniz Univ. Hannover (Germany) . . . . . [9063-5]

Lunch Break . . . . . Mon 12:30 pm to 2:00 pm

### Concurrent Sessions

#### Session 1a

Location: Royal Palm Six  
Mon 10:30 am to 12:30 pm

#### Nonlinear Guided Waves and Other Nonlinear Techniques

Session Chairs: **Tribikram Kundu**, The Univ. of Arizona (USA); **Wolfgang Grill**, ASI Analog Speed Instruments GmbH (Germany)

10:30 am: **Nonlinear damage detection in composite structures using bispectral analysis**, Francesco Ciampa, Michele Meo, Univ. of Bath (United Kingdom) . . . . . [9064-1]

10:50 am: **The need for a refined definition of the established elasto-acoustic coupling coefficient and the influence of pseudo-anharmonic effects**, Wolfgang Grill, ASI Analog Speed Instruments GmbH (Germany); Hermann Klinghammer, Univ. Leipzig (Germany) . . . . . [9064-2]

11:10 am: **Characterization of limestone rock using a non-collinear ultrasonic wave mixing approach**, Megan E. McGovern, Henrique L. Reis, Univ. of Illinois at Urbana-Champaign (USA) . . . . . [9064-3]

11:30 am: **Fatigue damage characterization using time-domain features extracted from nonlinear Lamb wave signals**, Ming Hong, Zhongqing Su, Li Cheng, The Hong Kong Polytechnic Univ. (Hong Kong, China); Ye Lu, Monash Univ. (Australia); Peter Xinlin Qing, Beijing Aeronautical Science and Technology Research Institute of COMAC (China) . . [9064-4]

11:50 am: **Development of a wireless nonlinear wave modulation spectroscopy (NWMS) sensor node for fatigue crack detection**, Peipei Liu, Suyoung Yang, Hyung Jin Lim, KAIST (Korea, Republic of); Hyung Chul Park, In Chang Ko, Seoul National Univ. of Science and Technology (Korea, Republic of); Hoon Sohn, KAIST (Korea, Republic of) [9064-5]

12:10 pm: **Nonlinear effect of debonding of Wafer-type piezoelectric actuator on the behaviour of Lamb wave**, Nitesh P. Yelve, Mira Mitra, P. M. Mujumdar, Indian Institute of Technology Bombay (India) . . . . . [9064-6]

Lunch Break . . . . . Mon 12:30 pm to 2:00 pm

#### Session 1b

Location: Royal Palm Two  
Mon 10:30 am to 12:10 pm

#### SHM of Civil Infrastructure: Bridge Monitoring

Session Chairs: **Piervincenzo Rizzo**, Univ. of Pittsburgh (USA); **George Zentai**, Varian Medical Systems, Inc. (USA)

10:30 am: **Evaluation of post-tensioning of a curved continuous girder using long-gauge fiber optic sensors**, Hiba Abdel-Jaber, Branko Glisic, Princeton Univ. (USA) . . . . . [9064-7]

10:50 am: **Virtual test bed for a novel erosion monitoring system**, Mohamed Rhimi, Alison B. Flatau, Kaye Brubaker, Univ. of Maryland, College Park (USA) . . . . . [9064-9]

11:10 am: **A new approach for structural health monitoring by applying anomaly detection on strain sensor data**, Konstantinos Trichias, Erik H. B. Meeuwissen, Richard R. J. M. Pijpers, TNO (Netherlands) . . . . . [9064-10]

11:30 am: **Bridge condition assessment from dynamic response collected using wireless sensor networks**, AKM Anwarul Islam, Hiwa F. Hamid, Frank Li, Youngstown State Univ. (USA) . . . . . [9064-11]

11:50 am: **Bridge load rating from dynamic response collected using wireless sensor networks**, AKM Anwarul Islam, Amer S. Jaroo, Frank Li, Youngstown State Univ. (United States) . . . . . [9064-12]

Lunch Break . . . . . Mon 12:10 pm to 2:00 pm

Conference 9055	Conference 9056	Conference 9057	Conference 9058	Conferences 9060
<p style="text-align: center;"><b>Session 2</b></p> <p style="text-align: center;"><b>Location: Sunrise</b> Mon 1:30 pm to 3:00 pm</p> <p style="text-align: center;"><b>Fabrication</b></p> <p>Session Chair: <b>Raúl J. Martín-Palma</b>, Univ. Autónoma de Madrid (Spain)</p> <p>1:30 pm: <b>Designing nanomanufacturing system from laboratory based nano-fab operation</b> (<i>Invited Paper</i>), Tarun Gupta, Western Michigan Univ. (USA) . . . . [9055-4]</p> <p>2:00 pm: <b>Simple mass-fabrication method of micro-color-powders based on the Morpho butterfly's blue for wide applications</b>, Akira Saito, Osaka Univ. (Japan) and Japan Synchrotron Radiation Research Institute (Japan); Kosei Ishibashi, Takuto Shibuya, Megumi Akai-Kasuya, Yuji Kuwahara, Osaka Univ. (Japan) . . . . [9055-5]</p> <p>2:20 pm: <b>Fine-scale features on bioreplicated decoys of the emerald ash borer provide necessary visual verisimilitude</b>, Michael J. Domingue, Drew P. Pulsifer, The Pennsylvania State Univ. (USA); Mahesh S. Narkhede, Univ. of Massachusetts Lowell (USA); Leland G. Engel, The Pennsylvania State Univ. (USA); Raul J. Martin-Palma, Univ. Autónoma de Madrid (Spain); Jayant Kumar, Univ. of Massachusetts Lowell (USA); Thomas C. Baker, Akhlesh Lakhtakia, The Pennsylvania State Univ. (USA) . . . . . [9055-6]</p> <p>2:40 pm: <b>Fabrication of biomimetic hierarchical microstructures by using self-organization processes</b>, Aki Sato, Yuji Hirai, Chitose Institute of Science and Technology (Japan); Yoshimitsu Matsunaga, Tohoku Univ. (Japan); Takuya Ohzono, Masatsugu Shimomura, National Institute of Advanced Industrial Science and Technology (Japan) . . . . . [9055-7]</p> <p>Coffee Break . . . . Mon 3:00 pm to 3:30 pm</p>	<p style="text-align: center;">Concurrent Sessions</p> <hr/> <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p style="text-align: center;"><b>Session 2a</b></p> <p style="text-align: center;"><b>Location: Town and Country</b> Mon 1:20 pm to 3:00 pm</p> <p style="text-align: center;"><b>Special Session: Electroding Materials and Systems</b></p> <p>Session Chairs: <b>Qibing Pei</b>, Univ. of California, Los Angeles (USA); <b>Iain A. Anderson</b>, The Univ. of Auckland (New Zealand)</p> <p>1:20 pm: <b>Durability of dielectric elastomer actuators made with ionic conductors</b>, Philipp Rothemund, Christoph Keplinger, Jeong-Yun Sun, Harvard Univ. (USA); Qin Li, Mejdi Kammoun, Univ. of Houston (USA); David Bwambok, Harvard Univ. (USA); Haleh Ardebili, Univ. of Houston (USA); George M. Whitesides, Zhigang Suo, Harvard Univ. (USA) . . . . [9056-3]</p> <p>1:40 pm: <b>Effects of electrode surface structure on the mechano-electrical transduction of IPMC sensors</b>, Viljar Palmre, Univ. of Nevada, Las Vegas (USA) and Univ. of Nevada, Reno (USA); David Pugal, Univ. of Nevada, Reno (USA); Kwang Jin Kim, Univ. of Nevada, Las Vegas (USA) . . . . . [9056-4]</p> <p>2:00 pm: <b>Geometry optimization of tubular dielectric elastomer actuators with anisotropic metallic electrodes</b>, Björn Rechenbach, Univ. of Southern Denmark (Denmark); Morten Willatzen, Technical Univ. of Denmark (Denmark) and Univ. of Southern Denmark (Denmark); Rahimullah Sarban, Cai Liang, Danfoss PolyPower A/S (Denmark); Benny Lassen, Univ. of Southern Denmark (Denmark) . . . . . [9056-5]</p> <p>2:20 pm: <b>Impact of electrode preparation on the bending of asymmetric planar electro-active polymer microstructures</b>, Florian M. Weiss, Tino Töpfer, Carla Winterhalter, Univ. Basel (Switzerland); Konrad Vogelsang, Paul Scherrer Institut (Switzerland); Gabor M. Kovacs, EMPA (Switzerland); Bert Müller, Univ. Basel (Switzerland) . . . . . [9056-6]</p> <p>2:40 pm: <b>Design and characterization of a stacked dielectric elastomer actuator based on SWNT electrode and IPN composite films</b>, Jianwen Zhao, Jiangcheng Yu, Junyang Niu, Harbin Institute of Technology in Weihai (China); Liwu Liu, Harbin Institute of Technology (China) . . . . . [9056-7]</p> <p>Coffee Break . . . . . Mon 3:00 pm to 3:30 pm</p> </div> <div style="width: 48%;"> <p style="text-align: center;"><b>Session 2b</b></p> <p style="text-align: center;"><b>Location: Royal Palm One</b> Mon 1:20 pm to 3:00 pm</p> <p style="text-align: center;"><b>EAP As Emerging Actuators II</b></p> <p>Session Chairs: <b>Kwang Jin Kim</b>, Univ. of Nevada, Las Vegas (USA); <b>Barbar J. Akle</b>, Lebanese American Univ. (Lebanon)</p> <p>1:20 pm: <b>ViviTouch HD Feel enables advanced and multi-dimensional communication through touch</b>, Dirk Schapeler, ViviTouch   A Bayer Brand (USA) . . . . . [9056-8]</p> <p>1:40 pm: <b>Dielectric elastomer driven adaptive lens arrays for fly-eye optical detectors</b>, Roger M. Diebold, Samuel Shian, David R. Clarke, Harvard Univ. (USA) . . . . . [9056-9]</p> <p>2:00 pm: <b>Biodegradable and edible gelatine actuators for use as artificial muscles</b>, Lily Chambers, Univ. of Bristol (United Kingdom) and Bristol Robotics Lab. (United Kingdom); Jonathan Winfield, Bristol Robotics Lab. (United Kingdom); Ioannis Ieropoulos, Univ. of the West of England (United Kingdom); Jonathan M. Rossiter, Univ. of Bristol (United Kingdom) . . . . . [9056-10]</p> <p>2:20 pm: <b>Soft silicone based interpenetrating networks as materials for actuators</b>, Lidia González, Soren Hvilsted, Anne L. Skov, Technical Univ. of Denmark (Denmark) . . . . . [9056-11]</p> <p>2:40 pm: <b>A novel method of fabricating laminated silicone stack actuators with pre-strained dielectric layers</b>, Andrew D. Hinit, Andrew T. Conn, Univ. of Bristol (United Kingdom) . . . . . [9056-12]</p> <p>Coffee Break . . . . Mon 3:00 pm to 3:30 pm</p> </div> </div>	<p style="text-align: center;"><b>Session 2</b></p> <p style="text-align: center;"><b>Location: Royal Palm Five</b> Mon 1:40 pm to 3:00 pm</p> <p style="text-align: center;"><b>Passive and Active Vibration Isolation Systems I</b></p> <p>Session Chairs: <b>Daniel J. Inman</b>, Univ. of Michigan (USA); <b>Mehrdad N. Ghasemi-Nejhad</b>, Univ. of Hawai'i (USA)</p> <p>1:40 pm: <b>Negative capacitance shunt damping system with optimized characteristics for use with piezoelectric transducers</b>, Martin Pohl, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . . [9057-6]</p> <p>2:00 pm: <b>Development of vibration isolation platform for low amplitude vibration</b>, Dae Oen Lee, Geeyong Park, Jae-Hung Han, KAIST (Korea, Republic of) . . . . . [9057-7]</p> <p>2:20 pm: <b>Optimal design of buildings subjected to near-fault earthquakes with S-FBI system using genetic algorithm</b>, Osman E. Ozbulut, Baikuntha Silwal, Univ. of Virginia (USA) . . . . . [9057-8]</p> <p>2:40 pm: <b>New strategy for the control of low frequency large band mechanical suspensions and inertial platforms</b>, Fabrizio Barone, Fausto Acernese, Univ. degli Studi di Salerno (Italy); Rosario De Rosa, Univ. degli Studi di Napoli Federico II (Italy); Gerardo Giordano, Rocco Romano, Univ. degli Studi di Salerno (Italy) . . . . . [9057-9]</p> <p>Coffee Break . . . . Mon 3:00 pm to 3:30 pm</p>	<p style="text-align: center;"><b>Session 2</b></p> <p style="text-align: center;"><b>Location: Sunset</b> Mon 2:10 pm to 3:10 pm</p> <p style="text-align: center;"><b>Multifunctional Composites</b></p> <p>Session Chair: <b>Ali Abdul-Aziz</b>, NASA Glenn Research Ctr. (USA)</p> <p>2:10 pm: <b>Hierarchical multifunctional nanocomposites</b>, Mehrdad N. Ghasemi-Nejhad, Univ. of Hawai'i (USA) . . . . [9058-7]</p> <p>2:30 pm: <b>Multifunctional composites for energy storage</b>, Mohammad Arif I. Shuvo, Hasanul Karim, Diego Delfin, Yirong Lin, The Univ. of Texas at El Paso (USA) . . . . [9058-8]</p> <p>2:50 pm: <b>Design of a multifunctional composite material with enhanced structural and power storage capability</b>, Constantin Ciocanel, Cindy Browder, Katie Caroli, Ben Luginbuhl, Roger Guiel, Sara Doyle, Northern Arizona Univ. (USA) [9058-9]</p> <p>Coffee Break . . . . Mon 3:10 pm to 3:40 pm</p>	<p style="text-align: center;"><b>Session 3</b></p> <p style="text-align: center;"><b>Location: Royal Palm Three</b> Mon 1:30 pm to 2:10 pm</p> <p style="text-align: center;"><b>Keynote Session II</b></p> <p>Session Chair: <b>Sang H. Choi</b>, NASA Langley Research Ctr. (USA)</p> <p>1:30 pm: <b>Boron nitride nanotube: synthesis and applications</b> (<i>Keynote Presentation</i>), Catharine Fay, NASA Langley Research Ctr. (USA) . . . . [9060-5]</p> <p style="text-align: center;"><b>Session 4</b></p> <p style="text-align: center;"><b>Location: Royal Palm Three</b> Mon 2:10 pm to 3:20 pm</p> <p style="text-align: center;"><b>Nanosensors and Systems II</b></p> <p>Session Chair: <b>Hargsoon Yoon</b>, Norfolk State Univ. (USA)</p> <p>2:10 pm: <b>A new low-cost, thick-film metallization transfer process onto PDMS using a sacrificial copper seed</b> (<i>Invited Paper</i>), Daniel D. Hilbich, Simon Fraser Univ. (Canada); Ajit Khosla, Concordia Univ. (Canada); Bonnie L. Gray, Lesley Shannon, Simon Fraser Univ. (Canada) . . . . . [9060-6]</p> <p>2:40 pm: <b>Synthesis and characterization of graphene/cellulose nanocomposite</b>, Abdullahil Kafy, Inha Univ. (Korea, Republic of); Mithilesh Yadav, Kishore Kumar, Inha Univ. (Korea, Republic of); Seongcheol Mun, Xiaoyuan Gao, Jaehwan Kim, Inha Univ. (Korea, Republic of) . . . . . [9060-7]</p> <p>3:00 pm: <b>Electrically conductive and thermal properties of electrospun PAN based carbon nanofiber membranes</b>, Fenghua Zhang, Zhichun Zhang, Yanju Liu, Jinsong Leng, Yongtao Yao, Harbin Institute of Technology (China) . . . . [9060-8]</p> <p>Coffee Break . . . . Mon 3:20 pm to 3:40 pm</p>

Conference 9061	Conference 9062	Conference 9063	Conference 9064		
Concurrent Sessions		Session 2	Concurrent Sessions		
Session 2a	Session 2b	Location: Towne Mon 1:30 pm to 3:00 pm	Session 2a		
<b>Location: Pacific Salon Seven Mon 1:20 pm to 3:00 pm</b> <b>Acoustic and Ultrasonic Methods for SHM</b> Session Chairs: <b>Fabio Semperlotti</b> , Univ. of Notre Dame (USA); <b>Haeng-Ki Lee</b> , KAIST (Korea, Republic of)	<b>Location: Pacific Salon Five Mon 1:20 pm to 3:00 pm</b> <b>Condition Monitoring of Transportation Infrastructure</b> Session Chairs: <b>Ying Huang</b> , North Dakota State Univ. (USA); <b>Genda Chen</b> , Missouri Univ. of Science and Technology (USA)	<b>Location: Royal Palm Four Mon 2:00 pm to 5:50 pm</b> <b>Acoustic Emission and Ultrasonic-Based NDE/ SHM II</b> Session Chairs: <b>Xiaoning Jiang</b> , North Carolina State Univ. (USA); <b>Didem Ozevin</b> , Univ. of Illinois at Chicago (USA)	<b>Location: Royal Palm Six Mon 2:00 pm to 3:00 pm</b> <b>SHM of Composites: Experiment and Modeling</b> Session Chairs: <b>Paul Fromme</b> , Univ. College London (United Kingdom); <b>Wieslaw Mieczyslaw Ostachowicz</b> , The Szwalski Institute of Fluid-Flow Machinery (Poland)		
<p>1:20 pm: <b>One the use of EMI for the health monitoring of bonded elements</b>, Piervincenzo Rizzo, Univ. of Pittsburgh (USA); Alberto Milazzo, Vincenzo Gulizzi, Univ. degli Studi di Palermo (Italy) [9061-3]</p> <p>1:40 pm: <b>Damage identification with PVDF in two-dimensional structures using Lamb waves</b>, Marco Menzer, Technische Univ. Freiberg (Germany) . . . . . [9061-4]</p> <p>2:00 pm: <b>Metamaterials enhanced acoustic sensing</b>, Yongyao Chen, Miao Yu, Haijun Liu, Michael Reilly, Hyungdae Bae, Univ. of Maryland, College Park (USA) . . . . . [9061-5]</p> <p>2:20 pm: <b>A passively tunable acoustic metamaterial lens for damage detection applications</b>, Hongfei Zhu, Fabio Semperlotti, Univ. of Notre Dame (USA) . . . . . [9061-6]</p> <p>2:40 pm: <b>Predicting damaged areas on a metal plate using electromechanical impedance technique with different frequency ranges</b>, Sam Na, Kangjin Cho, Haeng-Ki Lee, KAIST (Korea, Republic of) . . . . . [9061-7]</p> <p>Coffee Break . . . . . Mon 3:00 pm to 3:30 pm</p>	<p>1:20 pm: <b>Real-time weigh-in-motion measurement using fiber Bragg grating sensors</b>, Ying Huang, North Dakota State Univ. (USA) . . . . . [9061-8]</p> <p>1:40 pm: <b>A participatory sensing approach to characterize ride quality</b>, Raj Bridgelall, North Dakota State Univ. (USA) . . . . . [9061-9]</p> <p>2:00 pm: <b>Impact event identification through real-time strain measurements</b>, Mijia Yang, Saeed Ahmari, North Dakota State Univ. (USA) . . . . . [9061-10]</p> <p>2:20 pm: <b>Performance of a movable flexible pipe-encapsulated FBG sensor developed for shape monitoring of multi-layered pavement structure</b>, Huaping Wang, Wanqiu Liu, Zhi Zhou, Dalian Univ. of Technology (China) . . . . . [9061-11]</p> <p>2:40 pm: <b>Strain and temperature distributions in concrete pavement panels under truck loads with Brillouin scattering measurement</b>, Yi Bao, Brandon P. Schafer, Missouri Univ. of Science and Technology (USA); Ying Huang, North Dakota State Univ. (USA); John A. Cain, Missouri Univ. of Science and Technology (USA); Len Palek, Minnesota Dept. of Transportation (USA); Genda Chen, Missouri Univ. of Science and Technology (USA) . . . . . [9061-12]</p> <p>Coffee Break . . . . . Mon 3:00 pm to 3:30 pm</p>	<p>1:30 pm: <b>Localized measurements of composite dynamic response for health monitoring</b> (<i>Invited Paper</i>), Kara J. Peters, Sean C. Webb, Kyle G. Oman, North Carolina State Univ. (USA) . . . . . [9062-5]</p> <p>2:00 pm: <b>Piezo-optical measurements for guided wave and acoustic emission structural health monitoring</b>, Erik L. Frankforter, Bin Lin, Victor Giurgiutiu, Univ. of South Carolina (USA) . . . . . [9062-6]</p> <p>2:20 pm: <b>Development of a plastic optical fiber and chemiluminescent crack detection sensor system for structural health monitoring</b>, Kevin S. C. Kuang, National Univ. of Singapore (Singapore) . . . . . [9062-7]</p> <p>2:40 pm: <b>Novel optical fiber ultrasonic sensor based on fiber laser</b>, Qi Wu, Yoji Okabe, The Univ. of Tokyo (Japan); Junqiang Sun, Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology (China) . . . [9062-8]</p> <p>Coffee Break . . . . . Mon 3:00 pm to 3:30 pm</p>	<p>2:00 pm: <b>Crack propagation testing using a YCOB acoustic emission sensor</b>, Joseph A. Johnson, Kyungrim Kim, North Carolina State Univ. (USA); Shujun Zhang, The Pennsylvania State Univ. (USA); Xiaoning Jiang, North Carolina State Univ. (USA) . . . . . [9063-6]</p> <p>2:20 pm: <b>Two-year corrosion monitoring of prestressed concrete piles using acoustic emission</b>, William Vélez, Fabio Matta, Paul H. Ziehl, Univ. of South Carolina (USA) . . . . . [9063-7]</p> <p>2:40 pm: <b>Accurate pupil function applied quantitative evaluation of materials with scanning acoustic microscopy</b>, Seon Hee Kim, Seoul National Univ. of Science and Technology (Korea, Republic of); Jeong Nyeon Kim, The Pennsylvania State Univ. (USA); Dong Ryul Kwak, Seoul National Univ. of Science and Technology (Korea, Republic of); Richard L. Tutwiler, The Pennsylvania State Univ. (USA); Ikkeun Park, Seoul National Univ. of Science and Technology (Korea, Republic of) . . . . . [9063-8]</p> <p>Coffee Break . . . . . Mon 3:00 pm to 3:30 pm</p>	<p>2:00 pm: <b>Instantaneous wavenumber estimation for damage quantification in layered plate structures</b>, Massimo Ruzzene, Olivier Mesnil, Georgia Institute of Technology (USA); Cara A. Leckey, NASA Langley Research Ctr. (USA) . . . . . [9064-13]</p> <p>2:20 pm: <b>Characterisation of CFRP surface contamination by laser induced fluorescence</b>, Pawel H. Malinowski, Miroslaw Sawczak, Tomasz Wandowski, The Szwalski Institute of Fluid-Flow Machinery (Poland); Wieslaw M. Ostachowicz, The Szwalski Institute of Fluid-Flow Machinery (Poland) and Warsaw Univ. of Technology (Poland); Adam Cenian, The Szwalski Institute of Fluid-Flow Machinery (Poland) . . . . . [9064-14]</p> <p>2:40 pm: <b>A non-local finite difference scheme for simulation of wave propagation in composites</b>, Massimo Ruzzene, Georgia Institute of Technology (USA); Adam Martowicz, AGH Univ. of Science and Technology (Poland); Julian Rimoli, Georgia Institute of Technology (USA); Wieslaw J. Staszewski, Tadeusz Uhl, AGH Univ. of Science and Technology (Poland) . . . . . [9064-15]</p> <p>Coffee Break . . . . . Mon 3:00 pm to 3:30 pm</p>	<p>2:00 pm: <b>A dual frequency transducer for intravascular ultrasound imaging</b>, Zhuochen Wang, Xiaoning Jiang, North Carolina State Univ. (USA) . . . . . [9064-17]</p> <p>2:20 pm: <b>Speed of sound in red blood cells determined from the acoustic phase images</b>, Esam T. Ahmed Mohamed, Moritz von Bittlar, Wolfgang Grill, Univ. Leipzig (Germany) . . . [9064-18]</p> <p>2:40 pm: <b>On the use of EMI for the assessment of dental implant stability</b>, Piervincenzo Rizzo, Emma La Malfa Ribolla, Vincenzo Gulizzi, Univ. of Pittsburgh (USA) . . . . . [9064-16]</p> <p>Coffee Break . . . . . Mon 3:00 pm to 3:30 pm</p>

Conference 9055	Conference 9056	Conference 9057	Conference 9058	Conference 9060
<p style="text-align: center;"><b>Session 3</b></p> <p style="text-align: center;"><b>Location: Sunrise Mon 3:30 pm to 5:30 pm</b></p> <p style="text-align: center;"><b>Sensors</b></p> <p>Session Chair: <b>Tarun Gupta</b>, Western Michigan Univ. (USA)</p> <p>3:30 pm: <b>Noise-driven signal transmission device using molecular dynamics of organic polymers</b>, Naoki Asakawa, Gunma Univ. (Japan); Teruo Kanki, Hidekazu Tanaka, Osaka Univ. (Japan) . . . . . [9055-8]</p> <p>3:50 pm: <b>Bio-mimetic optical sensor for structural deflection measurement</b>, Susan A. Frost, NASA Ames Research Ctr. (USA); Robert Streeter, Cameron H. G. Wright, Steven F. Barrett, Univ. of Wyoming (USA) . . . . . [9055-9]</p> <p>4:10 pm: <b>Optical flow on a linear compound array</b>, Javan S. Chahl, Univ. of South Australia (Australia) and Defence Science and Technology Organisation (Australia) . . . . . [9055-10]</p> <p>4:30 pm: <b>Whisker-like sensors with tunable follicle sinus complex for underwater applications</b>, Pablo Valdivia y Alvarado, Singapore-MIT Alliance (Singapore) and Massachusetts Institute of Technology (USA); Karthik Srivatsa, SMART-Singapore MIT Alliance for Research &amp; Technology (Singapore) . . . . . [9055-11]</p> <p>4:50 pm: <b>Role of the array geometry in multi-bilayer hair cell sensors</b>, Nima Tamaddon, Stephen A. Sarles, The Univ. of Tennessee (USA) . . . . . [9055-12]</p> <p>5:10 pm: <b>Towards a fish-inspired underwater hearing device</b>, Tony C. H. Tse, John Montgomery, Iain A. Anderson, The Univ. of Auckland (New Zealand) . . . . . [9055-13]</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;"><b>Session 3</b></p> <p style="text-align: center;"><b>Location: Town and Country Mon 4:30 pm to 5:45 pm</b></p> <p style="text-align: center;"><b>EAP-In-Action Demonstration Session</b></p> <p style="text-align: center;"><i>Moderator</i> : <b>Yoseph Bar-Cohen</b>, Jet Propulsion Lab. (USA)</p> <p>This session highlights some of the latest capabilities and applications of Electroactive Polymers (EAP) materials where the attendees are shown demonstrations of these materials in action. Also, the attendees interact directly with technology developers and given "hands-on" experience with this emerging technology. The first Human/EAP Robot Armwrestling Contest was held during this session of the 2005 EPAD conference.</p> <p>See the full program and descriptions of EAP presentations on pages 12-13.</p> </div>	<p style="text-align: center;"><b>Session 3</b></p> <p style="text-align: center;"><b>Location: Royal Palm Five Mon 3:30 pm to 5:30 pm</b></p> <p style="text-align: center;"><b>Energy Harvesting and Scavenging: Flow</b></p> <p>Session Chairs: <b>Henry A. Sodano</b>, Univ. of Florida (USA); <b>Alper Erturk</b>, Georgia Institute of Technology (USA)</p> <p>3:30 pm: <b>Multistable chain for ocean wave vibration energy harvesting</b>, Ryan L. Harne, Univ. of Michigan (USA); Michel E. Schoemaker, Univ. of Florida (USA); Kon-Well Wang, Univ. of Michigan (USA) . . [9057-10]</p> <p>3:50 pm: <b>Electrohydroelastic dynamics of macro-fiber composites for underwater energy harvesting from base excitation</b>, Shima Shahab, Alper Erturk, Georgia Institute of Technology (USA) . . . . [9057-11]</p> <p>4:10 pm: <b>Flow energy piezoelectric bimorph nozzle harvester</b>, Stewart Sherrit, Hyeong Jae Lee, Phil Walkemeyer, Jet Propulsion Lab. (USA); Jennifer Hasenoehrl, Univ. of Idaho (USA); Jeffrey L. Hall, Jet Propulsion Lab. (USA); Tim Colonius, California Institute of Technology (USA); Alvaro J. Arrazola, Philippe Tosi, Chevron Corp. (USA) . . . . . [9057-12]</p> <p>4:30 pm: <b>Energy harvesting for self-powered aerodynamic control surfaces</b>, Matthew J. Bryant, North Carolina State Univ. (USA); Matthew Pizzonia, Michael Mehallow, Ephraim Garcia, Cornell Univ. (USA) . . . . . [9057-13]</p> <p>4:50 pm: <b>Ultrasound acoustic wave energy transfer and harvesting</b>, Shima Shahab, Stephen M. Leadenham, François Guillot, Karim G. Sabra, Alper Erturk, Georgia Institute of Technology (USA) [9057-14]</p> <p>5:10 pm: <b>Energy harvesting measurements from stall flutter limit cycle oscillations</b>, Jasper Chen, Adit Dhanushkodi, Christopher L. Lee, Franklin W. Olin College of Engineering (USA) . . . . . [9057-15]</p>	<p style="text-align: center;"><b>Session 3</b></p> <p style="text-align: center;"><b>Location: Sunset Mon 3:40 pm to 6:00 pm</b></p> <p style="text-align: center;"><b>Smart Gels and Polymers</b></p> <p>Session Chair: <b>Darren J. Hartl</b>, Texas A&amp;M Univ. (USA)</p> <p>3:40 pm: <b>3D jet printer of edible gels for food creation</b>, Ryo Serizawa, Mariko Shitara, Kouki Yamamoto, Jin Gong, Masato Makino, Md. Hasnat Kabir, Hidemitsu Furukawa, Yamagata Univ. (Japan) . . . . . [9058-10]</p> <p>4:00 pm: <b>Fabrication and characterization of a foamed polylactic acid (PLA)/ thermoplastic polyurethane (TPU) shape memory polymer (SMP) blend for biomedical and clinical applications</b>, Janice Song, Hani E. Naguib, Univ. of Toronto (Canada) . . . . . [9058-11]</p> <p>4:20 pm: <b>Frictional properties of gel engineering materials with laser surface texturing</b>, Naoya Yamada, Jin Gong, Masato Makino, Md. Hasnat Kabir, Keisuke Maekawa, Masato Wada, Hidemitsu Furukawa, Yamagata Univ. (Japan) . . . . . [9058-12]</p> <p>4:40 pm: <b>Frictional properties of high functional gel materials</b>, Masato Wada, Kohei Yamada, Naoya Yamada, Masato Makino, Jin Gong, Hidemitsu Furukawa, Yamagata Univ. (Japan) . . . . . [9058-13]</p> <p>5:00 pm: <b>Facile fabrication of uniaxial nanopatterns on shape memory polymer substrates using a complete bottom-up approach</b>, Zhongbi Chen, Sridhar Krishnaswamy, Northwestern Univ. (USA) . . . . . [9058-14]</p> <p>5:20 pm: <b>Designing light responsive bistable arches for rapid, remotely triggered actuation</b>, Matthew L. Smith, Hope College (USA); M. Ravi Shankar, Univ. of Pittsburgh (USA); Ryan Backman, Hope College (USA); Vincent P. Tondiglia, Kyung Min Lee, Michael E. McConney, David H. Wang, Loon-Seng Tan, Timothy J. White, Air Force Research Lab. (USA) . . . [9058-15]</p> <p>5:40 pm: <b>Development of a standard method to observe the surface friction of high-strength gels</b>, Kouhei Yamada, Naoya Yamada, Yosuke Watanabe, Masato Wada, Jin Gong, Masato Makino, Md. Hasnat Kabir, Hidemitsu Furukawa, Yamagata Univ. (Japan) . . . . . [9058-16]</p>	<p style="text-align: center;"><b>Session 5</b></p> <p style="text-align: center;"><b>Location: Royal Palm Three Mon 3:40 pm to 5:50 pm</b></p> <p style="text-align: center;"><b>Nano- and Micro-Systems in Medicine and Healthcare I</b></p> <p>Session Chair: <b>Prashanth S. Kumar</b>, Univ. of Arkansas (USA)</p> <p>3:40 pm: <b>Low-cost near-infrared measurement of subcutaneous fat for newborn malnutrition</b>, Alistair L. McEwan, The Univ. of Sydney (Australia); Shuning Bian, The Univ. of Sydney (Australia) and The University of Oxford (United Kingdom); Gaetano Gargiulo, Univ. of Western Sydney (Australia); Robert Morhard, The Univ. of Sydney (Australia) and Swiss Federal Institute of Technology, Zürich (Switzerland); Peter Jones, Fatin Hamimi Mustafa, Emily Bek, Heather Jeffery, The Univ. of Sydney (Australia) . . . . . [9060-9]</p> <p>4:00 pm: <b>Development of an electrical and optical neural probe for neurotransmitter sensing in the brain</b>, Hargsoon Yoon, Min H. Kim, Norfolk State Univ. (USA); Hyunjung Kim, National Institute of Aerospace (USA); Kyo D. Song, Norfolk State Univ. (USA); Laurie L. Wellman, Larry D. Sanford, Eastern Virginia Medical School (USA); Hae S. Kim, The College of William &amp; Mary (USA); Sang H. Choi, NASA Langley Research Ctr. (USA) . . . . . [9060-10]</p> <p>4:20 pm: <b>Nano-electrode array for in-vivo action potential recording in the brain</b>, Darryl W. Scott, Min H. Kim, Camille Cooper, Hargsoon Yoon, Norfolk State Univ. (USA) . . . . . [9060-11]</p> <p>4:40 pm: <b>Neural activity-based biofeedback therapy for autism spectrum disorder through wearable wireless textile EEG monitoring system</b>, Ahna Sahi, Sam Higginbottom Institute of Agriculture, Technology and Sciences (India); Pratyush Rai, Sechang Oh, Mouli Ramasamy, Vijay K. Varadan, Univ. of Arkansas (USA); Robert E. Harbaugh, The Pennsylvania State Univ. (USA) and Penn State Milton S. Hershey Medical Ctr. (USA) . . . . . [9060-12]</p> <p>5:00 pm: <b>Wireless sleep monitoring headband to identify sleep and track fatigue</b>, Mouli Ramasamy, Sechang Oh, Vijay K. Varadan, Univ. of Arkansas (USA) . . . . . [9060-13]</p> <p>5:20 pm: <b>A graphene field effect transistor for high temperature sensing applications</b> (<i>Invited Paper</i>), Yaser Mohammadi Banadaki, Kaji Muhammad M. Mohsin, Ashok Srivastava, Louisiana State Univ. (USA) . . . . . [9060-32]</p>



Conference 9061

Concurrent Sessions

Session 3a

Location: Pacific Salon Seven  
Mon 3:30 pm to 5:50 pm

SHM of Civil Engineering Systems

- Session Chairs: **Jeong-Tae Kim**, Pukyong National Univ. (Korea, Republic of); **R. Andrew Swartz**, Michigan Technological Univ. (USA)
- 3:30 pm: **ASR damage detection in concrete from ultrasonic methods**, Peng Gong, Carnegie Mellon Univ. (USA) and Mark E Patton Ltd. (USA); David W. Greve, Joel B. Harley, Chang Liu, Irving J. Oppenheim, Carnegie Mellon Univ. (USA) . . . . . [9061-13]
- 3:50 pm: **Design and deployment of a prototype scour monitoring system**, Steven R. Day, Alison B. Flatau, Suok-Min Na, Univ. of Maryland, College Park (USA); R. Andrew Swartz, Michigan Technological Univ. (USA) . . . . . [9061-14]
- 4:10 pm: **Data-driven finite element model estimation for built-up structures**, Junhee Kim, Dankook Univ. (Korea, Republic of); Kiyoun Kim, KAIST (Korea, Republic of); Won-Deuk Seo, Dankook Univ. (Korea, Republic of); Hoon Sohn, KAIST (Korea, Republic of) . . . . . [9061-15]
- 4:30 pm: **Structural health monitoring of unbonded posttensioning tendons by measuring relative strain variation in multi-strand anchorage**, A. B. M. Abdullah, Jennifer A. Rice, H. R. Hamilton, Univ. of Florida (USA) . . . . . [9061-16]
- 4:50 pm: **Scavenging vibration energy from seismically-isolated bridges using an electromagnetic harvester**, Lu Qiuchen, Chengning Loong, Chih-Chen Chang, Ilias G. Dimitrakopoulos, Hong Kong Univ. of Science and Technology (Hong Kong, China) . . . . . [9061-17]
- 5:10 pm: **Field testing of prototype systems for the non-destructive measurement of the neutral temperature of railroad tracks**, Robert R. Phillips, Rail Inspections LLC (USA); Francesco Lanza di Scalea, Claudio Nucera, Univ. of California, San Diego (USA); Mahmood Fateh, Federal Railroad Administration (USA); John Choros, John A. Volpe National Transportation Systems Ctr. (USA) . . . . . [9061-18]
- 5:30 pm: **Visualized magnetic flux-based remote steel cable NDE system for steel cables in long span bridges**, Ju-Won Kim, Jun Seok Oh, Sungkyunkwan Univ. (Korea, Republic of); Jong-Jae Lee, Sejong Univ. (Korea, Republic of); Seunghee Park, Sungkyunkwan Univ. (Korea, Republic of) . . . . . [9061-19]

Session 3b

Location: Pacific Salon Five  
Mon 3:30 pm to 6:10 pm

Active Sensing for Structures

- Session Chairs: **Fuh-Gwo Yuan**, North Carolina State Univ. (USA); **Kon-Well Wang**, Univ. of Michigan (USA)
- 3:30 pm: **Enhanced vibration-based energy harvesting using embedded acoustic black holes**, Liuxian Zhao, Univ. of Notre Dame (USA); Stephen C. Conlon, The Pennsylvania State Univ. (USA); Fabio Semperlotti, Univ. of Notre Dame (USA) . . . . . [9061-20]
- 3:50 pm: **The effects of bonding layer on ultrasound generation and sensing using PWAS**, Mazharul Islam, Haiying Huang, The Univ. of Texas at Arlington (USA) . . . . . [9061-21]
- 4:10 pm: **Impedance-based damage identification enhanced via tunable piezoelectric circuitry**, Jinki Kim, Kon-Well Wang, Univ. of Michigan (USA) . . . . . [9061-22]
- 4:30 pm: **Generation and sensing of guided waves using in-plane shear piezoelectric wafers in metallic pipe**, Wensong Zhou, Hui Li, Harbin Institute of Technology (China); Fuh-Gwo Yuan, North Carolina State University (USA) . . . . . [9061-23]
- 4:50 pm: **Structural design and analysis of an air vehicle smart fin embedded with single crystal piezoelectric actuator**, Inn Sun Roh, Chan Hoon Chung, Seoul National Univ. (Korea, Republic of); Jeong Lim Lim, Univ. of Michigan (USA); SangJoon Shin, Seoul National Univ. (Korea, Republic of); Bum-Soo Yoon, Kwang-Joon Yoon, Konkuk Univ. (Korea, Republic of) . . . . . [9061-24]
- 5:10 pm: **Characterization of vibration transfer paths in nose gearboxes of an AH-64 Apache**, AKM Anwarul Islam, Youngstown State Univ. (USA) and NASA Glenn Research Ctr. (USA); Paula J. Dempsey, NASA Glenn Research Ctr. (USA); Jason Feldman, Chris Larsen, Etegent Technologies, Ltd. (USA) . . . . . [9061-25]
- 5:30 pm: **Structural damage detection using PZT sensors based on wavelet packet analysis and cross correlation function**, Li Xu, Lin-Sheng Huo, Hongnan Li, Dalian Univ. of Technology (China) . . . . . [9061-26]
- 5:50 pm: **Non-contact damage detection of structure with oscillation using electromagnetic impedance sensing**, Qi Shuai, Jiong Tang, Univ. of Connecticut (USA) . . . . . [9061-27]

Conference 9062

Session 3

Location: Towne  
Mon 3:30 pm to 5:40 pm

Microstructured Optical Sensors

- Session Chair: **Kara J. Peters**, North Carolina State Univ. (USA)
- 3:30 pm: **Fluorescence monitoring with steering wheel photonic crystal fiber (Invited Paper)**, Rosalind M. Wynne, Alpha Mansaray, Villanova Univ. (USA) . [9062-9]
- 4:00 pm: **Image-based spectroscopy for environmental monitoring**, Rosalind M. Wynne, Eduard Bachmakov, Carolyn Molina, Villanova Univ. (USA) . . [9062-10]
- 4:20 pm: **A novel microbending hetero-core fiber optic sensor for force and location sensing with applications to home security systems**, Sumeyra Likoglu, Kubra Alemdar, Kemal Fidanboyul, Onur Tokur, Fatih Univ. (Turkey) . . . . [9062-11]
- 4:40 pm: **A novel periodic macrobending hetero-core fiber optic sensor embedded in textile for respiratory movements analysis**, Kubra Alemdar, Sumeyra Likoglu, Onur Tokur, Kemal Fidanboyul, Fatih Univ. (Turkey) [9062-12]
- 5:00 pm: **Fiber optic temperature profiling for thermal protection system heat shields**, Richard J. Black, Joannes Costa, Behzad Moslehi, Livia Zamescu, Intelligent Fiber Optic Systems Corp. (USA); Drew A. Hackney, Kara J. Peters, North Carolina State Univ. (USA) [9062-40]
- 5:20 pm: **Millimeter-wave interferometry: an attractive technique for fast and accurate sensing of civil and mechanical structures**, Seok-Tae Kim, Information and Communications Univ. (Korea, Republic of); Cam Nguyen, Texas A&M Univ. (USA) . . . . . [9062-14]

Conference 9063

Session 2 continued

- 3:30 pm: **High frequency elastic wave propagation in large structures using spectral elements and perfectly matched layer**, Zahra Heidary, Didem Ozevin, Univ. of Illinois at Chicago (USA) . . . . . [9063-9]
- 3:50 pm: **Evaluation of induction healing performance of asphalt mixtures with ultrasonic scattering and mechanical measurements**, Qingli Dai, Zigeng Wang, Michigan Technological Univ. (USA) . . . . . [9063-10]
- 4:10 pm: **Acoustic and temperature-based non-destructive testing for damage assessment of concrete masonry system subjected to seismic loading**, Md Fuad H. Khan, Ivan Bartoli, Satish Rajaram, Prashanth Abraham Vanniamparambil, Antonios Kontsos, Mohamad Bollhassani, Ahmad Hamid, Drexel Univ. (USA) . . . . . [9063-11]
- 4:30 pm: **Characterization of complex materials with elastic discontinuities using scanning acoustic microscope**, Xin Li, Richard L. Tutwiler, The Pennsylvania State Univ. (USA) [9063-12]
- 4:50 pm: **Monitoring the fracture behavior in ceramic matrix composites by infrared thermography and acoustic emission**, Dimitrios A. Exarchos, Konstantinos G. Dassios, Theodoros E. Matikas, Univ. of Ioannina (Greece) . . . . . [9063-13]
- 5:10 pm: **Influence of geometry on the fracturing behavior of textile reinforced cement monitored by acoustic emission**, Dimitrios G. Aggelis, Johan Blom, Vrije Univ. Brussel (Belgium); Michael Elkadi, Jan Wastiels, Vrije Univ Brussel (Belgium) . . . . . [9063-14]
- 5:30 pm: **Towards early ice detection on wind turbine blades using acoustic waves**, Viktor Berbyuk, Bo Peterson, Jan Möller, Chalmers Univ. of Technology (Sweden) . . . . . [9063-15]

Conference 9064

Concurrent Sessions

Session 3a

Location: Royal Palm Six  
Mon 3:30 pm to 5:30 pm

Emerging and Futuristic Techniques/Instruments

- Session Chairs: **George Zentai**, Varian Medical Systems, Inc. (USA); **Wei-Chih Wang**, Univ. of Washington (USA)
- 3:30 pm: **Optical controller for 3D manipulation**, Wei-Chih Wang, Univ. of Washington (USA) . . . . . [9064-19]
- 3:50 pm: **Robust evaluation of time series classification algorithms for structural health monitoring**, Dustin Y. Harvey, Univ. of California, San Diego (USA); Keith Worden, The Univ. of Sheffield (United Kingdom); Michael D. Todd, Univ. of California, San Diego (USA) . . . . . [9064-20]
- 4:10 pm: **Ultrasonic structural health monitoring based on wide band excitation schemes**, Wolfgang Grill, Gerhard Birkelbach, ASI Analog Speed Instruments GmbH (Germany) . . . . . [9064-21]
- 4:30 pm: **Laser Doppler velocimeter using dual-core photonic crystal fiber**, Wei-Chih Wang, Univ. of Washington (USA) . [9064-22]
- 4:50 pm: **Evaluation of different scintillators for 1MV NDE x-ray imaging**, George Zentai, Arundhuti Ganguly, Gary Virshup, Varian Medical Systems, Inc. (USA) . . . . . [9064-23]
- 5:10 pm: **Anomaly detection in heterogeneous media via saliency analysis of propagating wavefields**, Jeffrey Druce, Jarvis D. Haupt, Stefano Gonella, Univ. of Minnesota (USA) . . . . . [9064-25]

Session 3b

Location: Royal Palm Two  
Mon 3:30 pm to 5:30 pm

Vibration-Based SHM

- Session Chairs: **Henrique L. Reis**, Univ. of Illinois at Urbana-Champaign (USA); **Perngjin F. Pai**, Univ. of Missouri-Columbia (USA)
- 3:30 pm: **Robust modal curvature features for identifying multiple damage in beams**, Wieslaw M. Ostachowicz, The Szewalski Institute of Fluid-Flow Machinery (Poland); Wei Xu, Hohai Univ. (China); Maciej Radzienski, The Szewalski Institute of Fluid-Flow Machinery (Poland); Maosen Cao, Hohai Univ. (China) . . . . . [9064-27]
- 3:50 pm: **Sideband frequency response function based damage identification of rotor system with open cracks**, Jie Zhao, Schlumberger Ltd. (USA); Hans A. DeSmidt, The Univ. of Tennessee Knoxville (USA) . . . . . [9064-28]
- 4:10 pm: **Bayesian prognosis of bearing condition using vibration-based monitoring data**, Zhu Mao, Michael D. Todd, Univ. of California, San Diego (USA) . . . . . [9064-29]
- 4:30 pm: **Continuous fatigue assessment of offshore wind turbines using stress prediction technique**, Alexandros N. Iliopoulos, Sokratis N. Iliopoulos, Christof Devriendt, Danny Van Hemelrijck, Vrije Univ. Brussel (Belgium) . . . . . [9064-30]
- 4:50 pm: **Vibration-based structural health monitoring using adaptive statistical method under varying environmental condition**, Seungseop Jin, Hyung-Jo Jung, KAIST (Korea, Republic of) . . . . . [9064-32]
- 5:10 pm: **Vibration test and health monitoring of membrane structure using non-contact laser excitation**, Feblil Huda, Hokkaido Univ. (Japan) and Univ. of Riau (Indonesia); Itsuro Kajiwara, Hokkaido Univ. (Japan); Naoki Hosoya, Shibaura Institute of Technology (Japan) . . . . . [9064-33]

**Announcements, Awards, and Plenary Presentation**

*Location: Town and Country*

**8:10 to 8:25**

- **Smart Structures Product Implementation Award**
- **NDE Lifetime Achievement Award Presentations** presented to **Nobuo Takeda**, Univ. of Tokyo (Japan), and **Peter Cawley**, Imperial College London (United Kingdom)

**Plenary Presentation · 8:25 to 9:10 am**



**Transition from Nondestructive Testing (NDT) to Structural Health Monitoring (SHM): Potential and Challenges**

**Peter Cawley**, Imperial College London (United Kingdom)

**Session 4**

**Location: Sunrise  
Tue 9:30 am to 10:00 am**

**Robotics/Locomotion I**

Session Chair: **Joseph E. Jakes**, U.S. Forest Service (USA)

9:30 am: **Self-organization and motion in plants** (*Invited Paper*), Torben A. Lenau, Technical Univ. of Denmark (Denmark); Thomas Hesselberg, Univ. of Oxford (United Kingdom) . . . . . [9055-14]

Coffee Break Tue 10:00 am to 10:30 am

**Concurrent Sessions**

**Session 4a**

**Location: Town and Country  
Tue 9:20 am to 11:50 am**

**EAP Materials and Actuators**

Session Chairs: **Karl Kruusamäe**, National Institute of Advanced Industrial Science and Technology (Japan); **Robert Shepherd**, Cornell Univ. (USA)

9:20 am: **Carbon-based torsional and tensile artificial muscles driven by thermal expansion** (*Invited Paper*), Carter S. Haines, Márcio D. Lima, Na Li, The Univ. of Texas at Dallas (USA); Geoffrey M. Spinks, Javad Foroughi, Univ. of Wollongong (Australia); John D. W. Madden, The Univ. of British Columbia (Canada); Shi-Hyeong Kim, Hanyang Univ. (Korea, Republic of); Shaoli Fang, Monica Jung de Andrade, The Univ. of Texas at Dallas (USA); Fatma Göktepe, Ozer Göktepe, Namik Kemal Univ. (Turkey); Seyed M. Mirvakili, The Univ. of British Columbia (Canada); Sina Naficy, Univ. of Wollongong (Australia); Xavier Lepró, Jiyong Oh, Mikhail E. Kozlov, The Univ. of Texas at Dallas (USA); Seon-Jeong Kim, Hanyang Univ. (Korea, Republic of); Xiuru Xu, Benjamin J. Swedlove, The Univ. of Texas at Dallas (USA); Gordon G. Wallace, Univ. of Wollongong (Australia); Ray H. Baughman, The Univ. of Texas at Dallas (USA) . . . . . [9056-13]

Coffee Break Tue 10:00 am to 10:30 am

**Session 4b**

**Location: Royal Palm One  
Tue 9:20 am to 10:00 am**

**Energy Harvesting Using EAP I**

Session Chairs: **Anne Ladegaard Skov**, Technical Univ. of Denmark (Denmark); **Ingrid M. Graz**, Johannes Kepler Univ. Linz (Austria)

9:20 am: **A tapped-inductor buck-boost converter for a multi-DEAP generator system**, Emmanouil Dimopoulos, Ionut Trintis, Stig Munk-Nielsen, Aalborg Univ. (Denmark) . . . . . [9056-17]

9:40 am: **Buckling effects on actuation and energy harvesting in IPMCs**, Paola Nardinocchi, Matteo Pezzulla, Univ. degli Studi di Roma La Sapienza (Italy); Barbar J. Akle, Lebanese American Univ. (Lebanon); Margarita Guenther, Thomas Walmlersperger, Technische Univ. Dresden (Germany). . . . . [9056-18]

Coffee Break Tue 10:00 am to 10:30 am

**Session 4**

**Location: Royal Palm Five  
Tue 9:20 am to 10:20 am**

**Biological-Inspired Systems and Bio-MEMS**

Session Chairs: **Kon-Well Wang**, Univ. of Michigan (USA); **Matthew J. Bryant**, North Carolina State Univ. (USA)

9:20 am: **Climbing robot actuated by meso-hydraulic artificial muscles**, Matthew J. Bryant, North Carolina State Univ. (USA); Jason Fitzgerald, Samuel Miller, Jonah Saltzman, Sang K. Kim, Yong Lin, Ephraim Garcia, Cornell Univ. (USA) . . . . . [9057-16]

9:40 am: **Study of a bio-mimic spider web**, Lingue Zheng, Univ. of Nevada, Reno (USA); Rui Li, Chongqing Univ. (China); Faramarz Gordaninejad, Majid Behrooz, Xiaojie Wang, Univ. of Nevada, Reno (USA) . . . . . [9057-17]

10:00 am: **Resonant ultrasonic wireless power transmission for bio-implants**, Sung Q. Lee, Woosub Youm, Gunn Hwang, Electronics and Telecommunications Research Institute (Korea, Republic of); Kee S. Moon, San Diego State Univ. (USA) . . . . . [9057-18]

Coffee Break Tue 10:20 am to 10:50 am

**Session 4**

**Location: Sunset  
Tue 9:20 am to 10:30 am**

**Magneto Active Materials**

Session Chairs: **William S. Oates**, The Florida State Univ. (USA); **Mehrdad N. Ghasemi-Nejhad**, Univ. of Hawai'i (United States)

9:20 am: **Modeling of ferroelectric-ferromagnetic composites to improve magnetoelectric coupling and durability** (*Invited Paper*), Andreas Ricoeur, Artjom Avakian, Roman Gellmann, Univ. Kassel (Germany). . . . . [9058-17]

9:50 am: **Mechanosensitive droplet interface bilayer networks**, Eric C. Freeman, Michael K. Philen, Virginia Polytechnic Institute and State Univ. (USA) . . . . . [9058-18]

10:10 am: **Characterization of optically actuated MRI-compatible active needles for medical interventions**, Richard J. Black, Seokchang Ryu, Behzad Moslehi, Joannes Costa, Intelligent Fiber Optic Systems Corp. (USA) . . . . . [9058-58]

Coffee Break Tue 10:30 am to 11:00 am

**Session 6**

**Location: Royal Palm Three  
Tue 9:20 am to 10:20 am**

**Keynote Session III**

Session Chair: **Ajit Khosla**, Concordia Univ. (Canada)

9:20 am: **CMOS digital pixel sensors: technology and applications** (*Keynote Presentation*), Orit Skorka, Dileepan Joseph, Univ. of Alberta (Canada). . . . . [9060-15]

10:00 am: **Molecular dynamics study of phonon screening in graphene** (*Invited Paper*), Brahmanandam Javvaji, D. Roy Mahapatra, S. Raha, Indian Institute of Science (India) . . . . . [9060-16]

Coffee Break Tue 10:20 am to 10:40 am

## Conference 9061

## Conference 9062

## Conference 9063

## Conference 9064

### Announcements, Awards, and Plenary Presentation

Location: Town and Country

8:10 to 8:25

- **Smart Structures Product Implementation Award**
- **NDE Lifetime Achievement Award Presentations**  
presented to **Nobuo Takeda**, Univ. of Tokyo (Japan), and **Peter Cawley**, Imperial College London (United Kingdom)

### Plenary Presentation · 8:25 to 9:10 am



### Transition from Nondestructive Testing (NDT) to Structural Health Monitoring (SHM): Potential and Challenges

Peter Cawley, Imperial College London (United Kingdom)

#### Concurrent Sessions

#### Session 4

#### Session 3

#### Concurrent Sessions

##### Session 4a

Location: Pacific Salon Seven  
Tue 9:20 am to 10:00 am

##### SHM of Wind Turbines

Session Chairs: **Shinae Jang**, Univ. of Connecticut (USA); **R. Andrew Swartz**, Michigan Technological Univ. (USA)

9:20 am: **Health monitoring of offshore wind farm structures**, Shinae Jang, Chenhao Jin, Jingcheng Li, Zheng Peng, Univ. of Connecticut (USA). . . . [9061-28]

9:40 am: **Operational model updating of spinning finite element models for HAWT blades**, Antonio Velazquez, R. Andrew Swartz, Michigan Technological Univ. (USA); Kenneth J. Loh, Yingjun Zhao, Valeria La Saponara, Robert J. Kamisky, Cornelis P. van Dam, Univ. of California, Davis (USA). . . . [9061-29]

Coffee Break. . . Tue 10:00 am to 10:30 am

##### Session 4b

Location: Pacific Salon Five  
Tue 9:20 am to 10:00 am

##### Truss and Tensegrity Structures

Session Chairs: **Yunfeng Zhang**, Univ. of Maryland, College Park (USA); **Jeong-Tae Kim**, Pukyong National Univ. (Korea, Republic of)

9:20 am: **Nonlinear damage identification of breathing cracks in Truss system**, Jie Zhao, Schlumberger Ltd. (USA); Hans A. DeSmidt, The Univ. of Tennessee (USA) . . . . . [9061-30]

9:40 am: **Minimal mass design of tensegrity structures**, Kenji Nagase, Wakayama Univ. (Japan); Robert E. Skelton, Univ. of California, San Diego (USA) . . . . . [9061-31]

Coffee Break. . . Tue 10:00 am to 10:30 am

Location: Towne  
Tue 9:20 am to 10:00 am

##### Thermography Sensors

Session Chair: **Theodoros E. Matikas**, Univ. of Ioannina (Greece)

9:20 am: **Pulsed thermographic assessment of CFRP structures: experimental results and image analysis tools**, Panagiotis Theodorakeas, National Technical Univ. of Athens (Greece); Nicolas Avdelidis, National Technical Univ. of Athens (Greece) and Univ. Laval (Canada); Clemente Ibarra-Castaneda, Univ. Laval (Canada); Maria Koui, National Technical Univ. of Athens (Greece); Xavier P. V. Maldague, Univ. Laval (Canada). . [9062-15]

9:40 am: **Thermo-electrical Lockin thermography for characterization of subsurface defects**, Evangelos Z. Kordatos, Sheffield Hallam Univ. (United Kingdom); Dimitrios A. Exarchos, Konstantinos G. Dassiou, Theodoros E. Matikas, Univ. of Ioannina (Greece) [9062-16]

Coffee Break. . . Tue 10:00 am to 10:30 am

Location: Royal Palm Four  
Tue 9:20 am to 12:30 pm

##### Roadway and Pavement Inspection and Monitoring Using NDE/SHM Technologies I

Session Chairs: **Ming L. Wang**, Northeastern Univ. (USA); **Yu-Min Su**, National Central Univ. (Taiwan)

9:20 am: **Framework and implementation of a continuous network-wide health monitoring system for roadways** (*Keynote Presentation*), Ming L. Wang, Ralf Birken, Salar Shahini Shamsabadi, Northeastern Univ. (USA) . . . . . [9063-16]

Coffee Break. . . Tue 10:00 am to 10:30 am

Location: Town and Country  
Session 4a

Location: Royal Palm Six  
Tue 9:20 am to 10:00 am

##### Guided Waves for SHM: Noncontact Techniques

Session Chairs: **Wieslaw Jerzy Staszewski**, AGH Univ. of Science and Technology (Poland); **George Zentai**, Varian Medical Systems, Inc. (USA)

9:20 am: **Non-contact high speed ultrasonic guided wave inspections of rails**, Thompson V. Nguyen, Stefano Mariani, Robert R. Phillips, Univ. of California, San Diego (USA); Piotr Kijanka, AGH Univ. of Science and Technology (Poland); Francesco Lanza di Scalea, Univ. of California, San Diego (USA); Wieslaw J. Staszewski, AGH Univ. of Science and Technology (Poland); Mahmood Fateh, Federal Railroad Administration (USA) . . . . . [9064-34]

9:40 am: **On the processing of Leaky guided waves propagating in immersed plates**, Abdollah Bagheri, Elisabetta Pistone, Piervincenzo Rizzo, Univ. of Pittsburgh (USA) . . . . . [9064-35]

Coffee Break. . . Tue 10:00 am to 10:30 am

##### Session 4b

Location: Royal Palm Two  
Tue 9:20 am to 10:00 am

##### EMI-Based SHM for Aerospace Applications

Session Chairs: **Christopher Niezrecki**, Univ. of Massachusetts Lowell (USA); **Andrei N. Zagrai**, New Mexico Institute of Mining and Technology (USA)

9:20 am: **Combined electromechanical impedance and fiber optic diagnosis of aerospace structures**, Jon M. Schlavin, Andrei N. Zagrai, Rebecca C. Clemens, New Mexico Institute of Mining and Technology (USA); Richard J. Black, Joannes Costa, Behzad Moslehi, Intelligent Fiber Optic Systems Corp. (USA) . . . . . [9064-36]

9:40 am: **New applications of a model of electromechanical impedance for SHM**, Vitalijs Pavelko, Riga Technical Univ. (Latvia) . . . . . [9064-37]

Coffee Break. . . Tue 10:00 am to 10:30 am

Conference 9055	Conference 9056	Conference 9057	Conference 9058	Conference 9060
<p style="text-align: center;"><b>Session 5</b></p> <p style="text-align: center;"><b>Location: Sunrise</b> Tue 10:30 am to 12:00 pm</p> <p style="text-align: center;"><b>Robotics/Locomotion II</b></p> <p>Session Chair: <b>Torben A. Lenau</b>, Technical Univ. of Denmark (Denmark)</p> <p>10:30 am: <b>Kirigami design and fabrication for biomimetic robotics</b> (<i>Invited Paper</i>), Jonathan M. Rossiter, Sina Sareh, King's College London (United Kingdom) [9055-15]</p> <p>11:00 am: <b>Design and gait analysis of a multi-segment in-pipe robot inspired by earthworm's peristaltic locomotion</b>, Hongbin Fang, Univ. of Michigan (USA) and Tongji Univ. (China); Chenghao Wang, Suyi Li, Kon-Well Wang, Univ. of Michigan (USA); Jian Xu, Tongji Univ. (China) . . . . . [9055-16]</p> <p>11:20 am: <b>Fish-robot interactions in a free-swimming environment: effects of speed and configuration of robots on live fish</b>, Sachit Butail, Giovanni Polverino, Paul T. Phamduy, Fausto Del Sette, Maurizio Porfiri, Polytechnic Institute of New York Univ. (USA) . . . . . [9055-17]</p> <p>11:40 am: <b>Influence of shunt-damping circuit on the dynamic response of a bio-inspired piezoelectric micro-pillar sensor</b>, Junliang Tao, The Univ. of Akron (USA); Xiong Yu, Case Western Reserve Univ. (USA) . . . . . [9055-43]</p> <p>Lunch Break . . . . . Tue 12:00 pm to 1:30 pm</p>	<p style="text-align: center;">Concurrent Sessions</p> <hr/> <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p style="text-align: center;"><b>Session 4a continued</b></p> <p style="text-align: center;"><b>Location: Town and Country</b></p> <p>10:30 am: <b>Recent progress on graphene-based artificial muscles</b> (<i>Invited Paper</i>), Ilkwon Oh, KAIST (Korea, Republic of) . . . . . [9056-14]</p> <p>11:10 am: <b>The viscoelastic effect in bending bucky-gel actuators</b>, Karl Kruusamäe, Ken Mukai, Takushi Sugino, Kinji Asaka, National Institute of Advanced Industrial Science and Technology (Japan) . . . . . [9056-15]</p> <p>11:30 am: <b>Electroactive nanostructured polymers actuators</b>, Chong Min Koo, Jang-Woo Lee, Hyunchul Park, Soon Man Hong, Korea Institute of Science and Technology (Korea, Republic of) . . . . . [9056-16]</p> <p>Lunch/Exhibition Break . . . . . Tue 11:50 am to 1:20 pm</p> </div> <div style="width: 48%;"> <p style="text-align: center;"><b>Session 4c</b></p> <p style="text-align: center;"><b>Location: Royal Palm One</b> Tue 10:30 am to 11:50 am</p> <p style="text-align: center;"><b>Dielectric Elastomers EAP I</b></p> <p>Session Chairs: <b>Xuanhe Zhao</b>, Duke Univ. (USA); <b>Adrian Koh</b>, National Univ. of Singapore (Singapore)</p> <p>10:30 am: <b>Characterization of dielectric electroactive polymer transducers</b>, Dennis Nielsen, Arnold Knott, Michael A. E. Andersen, Technical Univ. of Denmark (Denmark) . . . . . [9056-19]</p> <p>10:50 am: <b>An instrument to obtain the correct biaxial hyperelastic parameters of silicones for accurate DEA modelling</b>, Samuel Rosset, Simon Houis, Luc Maffli, Herbert R. Shea, Ecole Polytechnique Fédérale de Lausanne (Switzerland)[9056-20]</p> <p>11:10 am: <b>Novel dielectric elastomer structures with electromechanical instability</b>, Tiefeng Li, Chi Li, Guoyong Mao, Zhanan Zou, Zhejiang Univ. (China); Yilun Xie, Beijing Univ. of Posts and Telecommunications (China); Shaoxing Qu, Zhejiang Univ. (China) . . . . . [9056-21]</p> <p>11:30 am: <b>An energy approach to characterize the dynamic instability of dielectric elastomer actuators</b>, Manish M. Joglekar, Indian Institute of Technology Roorkee (India) . . . . . [9056-22]</p> <p>Lunch/Exhibition Break . . . . . Tue 11:50 am to 1:20 pm</p> </div> </div>	<p style="text-align: center;"><b>Session 5</b></p> <p style="text-align: center;"><b>Location: Royal Palm Five</b> Tue 10:50 am to 12:10 pm</p> <p style="text-align: center;"><b>Energy Harvesting and Scavenging: Circuitry</b></p> <p>Session Chairs: <b>Daniel J. Guyomar</b>, Institut National des Sciences Appliquées de Lyon (France); <b>Junrui Liang</b>, ShanghaiTech Univ. (China)</p> <p>10:50 am: <b>A power electronics circuit for simultaneous semi-active vibration control and energy harvesting for electromagnetic regenerative suspensions</b>, Peng Li, Lei Zuo, Chongxiao Zhang, Junyoung Kim, Stony Brook Univ. (USA) . . . . . [9057-19]</p> <p>11:10 am: <b>Piezoelectric polarization in the design of a vibration energy harvester</b>, James M. Gibert, Clemson Univ. (USA) . . . . . [9057-20]</p> <p>11:30 am: <b>Recent progress on micro-piezoelectric energy harvesters fabricated with aero-deposition and the interfacing circuits</b>, Ya Shan Shih, Shun Chiu Lin, Wen Jong Wu, National Taiwan Univ. (Taiwan) . . . . . [9057-21]</p> <p>11:50 am: <b>Synchronized charge extraction for aeroelastic energy harvesting</b>, Liya Zhao, Lihua Tang, Hao Wu, Yaowen Yang, Nanyang Technological Univ. (Singapore) . . . . . [9057-22]</p> <p>Lunch/Exhibition Break . . . . . Tue 12:10 pm to 1:40 pm</p>	<p style="text-align: center;"><b>Session 5</b></p> <p style="text-align: center;"><b>Location: Sunset</b> Tue 11:00 am to 12:20 pm</p> <p style="text-align: center;"><b>Piezoelectric Materials</b></p> <p>Session Chairs: <b>Henry A. Sodano</b>, Univ. of Florida (USA); <b>Andreas Ricoeur</b>, Univ. Kassel (Germany)</p> <p>11:00 am: <b>Dynamic electromechanical behavior of barium titanate cantilevers under ac electric fields</b>, Fumio Narita, Yasuhide Shindo, Tohoku Univ. (Japan) . . . . . [9058-20]</p> <p>11:20 am: <b>Geometrically nonlinear and coupled thermopiezomechanical modeling and analysis of smart composite shells</b>, Narasimha R. Mekala, Rüdiger Schmidt, RWTH Aachen (Germany)[9058-21]</p> <p>11:40 am: <b>Suppression method of overshoot on non/less-energy shape-retainment control utilizing hysteretic behavior of piezoelectric actuators</b>, Tadashige Ikeda, Tomonori Uchida, Nagoya Univ. (Japan) . . . . . [9058-22]</p> <p>12:00 pm: <b>Finite element implementation of a novel strain energy function for dielectric elastomers</b>, Austin Allen, Nakhiah C. Goulbourne, Univ. of Michigan (USA) . . . . . [9058-23]</p> <p>Lunch/Exhibition Break . . . . . Tue 12:20 pm to 2:10 pm</p>	<p style="text-align: center;"><b>Session 7</b></p> <p style="text-align: center;"><b>Location: Royal Palm Three</b> Tue 10:40 am to 12:20 pm</p> <p style="text-align: center;"><b>Nano- and Micro-Systems in Medicine and Healthcare II</b></p> <p>Session Chair: <b>Christina L. Brantley</b>, U.S. Army Research, Development and Engineering Command (USA)</p> <p>10:40 am: <b>A dual-function electronic module for chronic neural sensing and optogenetic stimulation</b>, Min H. Kim, Norfolk State Univ. (USA); Young Kee Ryu, Sun Moon Univ. (Korea, Republic of); Hargsoon Yoon, Norfolk State Univ. (USA); Ilho Nam, Old Dominion Univ. (USA); Darryl W. Scott, Norfolk State Univ. (USA); Larry D. Sanford, Eastern Virginia Medical School (USA) . . . . . [9060-17]</p> <p>11:00 am: <b>Antibacterial polyelectrolyte-coated Mg alloys for cardiovascular applications</b>, S. Seraz, Ramazan Asmatulu, Zheng Chen, M. Ceylan, Anil Mahapatro, Shang-You Yang, Wichita State Univ. (USA) . . . . . [9060-18]</p> <p>11:20 am: <b>Efficient heart beat detection using embedded system electronics</b>, Mouli Ramasamy, Sechang Oh, Vijay K. Varadan, Univ. of Arkansas (USA)[9060-19]</p> <p>11:40 am: <b>Smart insole sensors for sports and rehabilitation</b>, Tarmo Tamm, Univ. of Tartu (Estonia) . . . . . [9060-20]</p> <p>12:00 pm: <b>Non-destructive examination system of vitreous body</b>, Takuma Shibata, Jin Gong, Yosuke Watanabe, Md. Hasnat Kabir, Masato Makino, Hidemitsu Furukawa, Yamagata Univ. (Japan) . . . . . [9060-21]</p> <p>Lunch/Exhibition Break . . . . . Tue 12:20 pm to 1:20 pm</p>

## Conference 9061

Concurrent Sessions

### Session 5a

**Location: Pacific Salon Seven**  
Tue 10:30 am to 11:50 am

#### Nanoengineered Sensing Technology I

Session Chairs: **Bryan R. Loyola**, Sandia National Labs., California (USA); **Jerome Peter Lynch**, Univ. of Michigan (USA)

10:30 am: **Compressive strain sensing performance of RFID patch antenna sensors**, ChunHee Cho, Xiaohua Yi, Yang Wang, Manos M. Tentzeris, Georgia Institute of Technology (USA); Roberto T. Leon, Virginia Polytechnic Institute and State Univ. (USA) ..... [9061-32]

10:50 am: **Crack identification based on thin-film full-bridge strain sensors**, Shue-Ting E. Tung, Yao Yao, Branko Glisic, Princeton Univ. (USA) ... [9061-33]

11:10 am: **In situ phase change characterization of spray deposited PVDF thin films**, Miranda T. Riosbaas, Univ. of California, Davis (USA); Gregory O'Bryan, Sandia National Labs., California (USA); Kenneth J. Loh, Univ. of California, Davis (USA); Bryan R. Loyola, Sandia National Labs., California (USA) [9061-34]

11:30 am: **Design and creation of embeddable multifunctional 3D sensory systems for integrated structural damage monitoring of advanced composite**, Jasim Uddin, Deborah Daramola, Jin Yan, Tarik J. Dickens, David O. Olawale, Okenwa O. Okoli, The Florida State Univ. (USA) ..... [9061-75]

Lunch/Exhibition  
Break ..... Tue 11:50 am to 1:20 pm

### Session 5b

**Location: Pacific Salon Five**  
Tue 10:30 am to 11:50 am

#### Non-Contact Measurements I

Session Chairs: **Mohammad Reza Jahanshahi**, Jet Propulsion Lab. (USA); **Hoon Sohn**, KAIST (Korea, Republic of)

10:30 am: **Application of image analysis and time-frequency analysis for tracking the rotating blades vibration**, Wan-Ying Hsiung, Yu-Ting Huang, National Taiwan Univ. (Taiwan); Yuan-Shen Yang, National Taipei Univ. of Technology (Taiwan); Chin-Hsiung Loh, National Taiwan Univ. (Taiwan) ..... [9061-36]

10:50 am: **Air-coupled ultrasound and laser vibrometry for damage detection in composites**, Mohammad S. Harb, National Institute of Aerospace (USA) and North Carolina State Univ. (USA); Donato Girolamo, Che-Yuan Chang, National Institute of Aerospace (USA); Fuh-Gwo Yuan, National Institute of Aerospace (USA) and North Carolina State Univ. (USA) ..... [9061-37]

11:10 am: **The dual cantilever flutter phenomenon: a novel energy harvesting method**, Jared D. Hobeck, Damien Geslain, Daniel J. Inman, Univ. of Michigan (United States) ..... [9061-169]

11:30 am: **Air-coupled guided wave detection and wavenumber filtering to full-field representation of delamination in composite plates**, Nicola Testoni, Luca De Marchi, Alessandro Marzani, Univ. degli Studi di Bologna (Italy) ..... [9061-39]

Lunch/Exhibition  
Break ..... Tue 11:50 am to 1:40 pm

## Conference 9062

Session 5

**Location: Towne**  
Tue 10:30 am to 12:00 pm

#### Electric Field Sensors

Session Chair: **Richard Selfridge**, Brigham Young Univ. (USA)

10:30 am: **Non-intrusive electric field sensing (Invited Paper)**, Stephen Schultz, Richard Selfridge, Spencer Chadderdon, Daniel T. Perry, Brigham Young Univ. (USA) ..... [9062-17]

11:00 am: **Ion trap electrical field measurements using slab coupled optical sensors**, LeGrand J. Shumway, Spencer Chadderdon, Andrew Powell, Aaron R. Hawkins, Richard Selfridge, Stephen Schultz, Ailin Li, Daniel E. Austin, Brigham Young Univ. (USA) ..... [9062-18]

11:20 am: **High-speed non-intrusive high voltage measurement using slab coupled optical sensors**, Nikola Stan, Spencer Chadderdon, Eric Whiting, Reid Worthen, LeGrand J. Shumway, Brigham Young Univ. (USA) ..... [9062-19]

11:40 am: **An ultrahigh sensitive self-powered current sensor utilizing a piezoelectric connected-in-series approach**, Po-Chen Yeh, Tien-Kan Chung, National Chiao Tung Univ. (Taiwan); Cheng-Huang Lai, National Tsing Hua Univ. (Taiwan) ..... [9062-20]

Lunch/Exhibition  
Break ..... Tue 12:00 pm to 1:30 pm

## Conference 9063

Session 3 continued

**Location: Royal Palm Four**

10:30 am: **A new vision after the NIST civil infrastructure program: the challenges of next-generation sustainable construction materials and processes**, H. Felix Wu, Yan Wan, Univ. of North Texas (USA) . . . [9063-17]

10:50 am: **Evaluating pavement surface conditions using dynamic tire pressure sensor**, Yubo Zhao, Northeastern Univ. (USA); H. Felix Wu, Univ. of North Texas (USA); J. Gregory McDaniel Jr., Boston Univ. (USA); Ming L. Wang, Northeastern Univ. (USA) and Boston Univ. (USA) . . . [9063-18]

11:10 am: **Pavement macrotecture estimation using principal component analysis of tire/road noise**, Yiyang Zhang, Northeastern Univ. (USA); J. Gregory McDaniel Jr., Boston Univ. (USA); Ming L. Wang, Northeastern Univ. (USA) . . . [9063-19]

11:30 am: **DCPD resins for concrete pavement pothole patching materials**, Wei Yuan, Jenn-Ming Yang, Kuo-Yao Yuan, Univ. of California, Los Angeles (USA) . . . [9063-20]

11:50 am: **Air-coupled ultrasonic system for fusion of impact-echo tests and surface wave measurements**, Seong-Hoon Kee, Nenad Gucunski, Rutgers, The State Univ. of New Jersey (USA) . . . . . [9063-21]

12:10 pm: **Automatic road markings recognition development**, Chiapeli Chou, Taipei Economic and Cultural Representative Office (USA) ..... [9063-22]

Lunch/Exhibition  
Break ..... Tue 12:30 pm to 2:00 pm

## Conference 9064

Concurrent Sessions

### Session 5a

**Location: Royal Palm Six**  
Tue 10:30 am to 12:30 pm

#### Guided Waves for SHM- Modeling Aspects

Session Chairs: **Wolfgang Grill**, ASI Analog Speed Instruments GmbH (Germany); **Wieslaw Jerzy Staszewski**, AGH Univ. of Science and Technology (Poland)

10:30 am: **Modeling GW generation, propagation, and sensing in LISA**, Kalyan S. Nadella, Carlos E. S. Cesnik, Univ. of Michigan (USA) . . . . . [9064-38]

10:50 am: **Predictive modeling of power and energy of guided waves in anisotropic composites excited by PWAS**, Ayman M. Kamal, Victor Giurgiutiu, Univ. of South Carolina (USA) . . . . . [9064-39]

11:10 am: **WFR-2D: an analytical model for PWAS-generated 2D ultrasonic guided wave propagation**, Yanfeng Shen, Victor Giurgiutiu, Univ. of South Carolina (USA) . . . . . [9064-40]

11:30 am: **Use of augmented reality in aircraft maintenance operations**, Luca De Marchi, Alessandro Ceruti, Nicola Testoni, Alessandro Marzani, Alfredo Liverani, Univ. degli Studi di Bologna (Italy) . . . . . [9064-41]

11:50 am: **Vibro-acoustic 3D FE simulations to validate a SAFE-BEM formulation for leaky waves computation**, Giovanni Castellazzi, Univ. degli Studi di Bologna (Italy); Matteo Mazzotti, Drexel Univ. (USA); Alessandro Marzani, Univ. degli Studi di Bologna (Italy); Petr Krysl, Univ. of California, San Diego (USA); Ivan Bartoli, Qiang Mao, Drexel Univ. (USA) . . . [9064-42]

12:10 pm: **Improved damage imaging in aerospace structures using a piezoceramic hybrid pin-force wave generation model**, Pierre-Claude Ostiguy, Nicolas Quaegebeur, Patrice Masson, Univ. de Sherbrooke (Canada) . . . . . [9064-43]

Lunch/Exhibition  
Break ..... Tue 12:30 pm to 2:00 pm

### Session 5b

**Location: Royal Palm Two**  
Tue 10:30 am to 11:50 am

#### EMI-Based SHM and Practical Considerations

Session Chairs: **Andrei N. Zagrai**, New Mexico Institute of Mining and Technology (USA); **Lingyu Yu**, Univ. of South Carolina (USA)

10:30 am: **Characterisation of CFRP adhesive bonds by electromechanical impedance**, Pawel H. Malinowski, Tomasz Wandowski, Wieslaw M. Ostachowicz, The Szewalski Institute of Fluid-Flow Machinery (Poland) . [9064-44]

10:50 am: **Small-factor electromechanical impedance measurement board for space applications**, William R. Masker, Andrei N. Zagrai, Joel Runnels, New Mexico Institute of Mining and Technology (USA) . . . . . [9064-45]

11:10 am: **Effects of temperature variations on piezoelectric sensor diagnostics process based on impedance measurements**, HyeJin Jo, Tong-il Park, Gyehae Park, Chonnam National Univ. (Korea, Republic of) . . . . . [9064-46]

11:30 am: **Towards monitoring of acoustic emission activity using thin wafer piezoelectric sensor**, Andrei N. Zagrai, Blaine Trujillo, Daniel Meisner, New Mexico Institute of Mining and Technology (USA) . . . . . [9064-48]

Lunch/Exhibition  
Break ..... Tue 11:50 am to 2:00 pm

Conference 9055	Conference 9056	Conference 9057	Conference 9058	Conference 9060
<p style="text-align: center;"><b>Session 6</b></p> <p style="text-align: center;"><b>Location: Sunrise</b> Tue 1:30 pm to 3:00 pm</p> <p style="text-align: center;"><b>Biomaterials I</b></p> <p>Session Chair: <b>Jonathan M. Rossiter</b>, Univ. of Bristol (United Kingdom)</p> <p>1:30 pm: <b>Wood as inspiration for new stimuli-responsive structures and materials</b> (<i>Invited Paper</i>), Joseph E. Jakes, Sam L. Zelinka, U.S. Forest Service (USA); Nayomi Plaza, U.S. Forest Service (USA) and Univ. of Wisconsin-Madison (USA); Don Stone, Univ. of Wisconsin-Madison (USA); Sophie C. Gleber, Stefan Vogt, Argonne National Lab. (USA) . . . . . [9055-19]</p> <p>2:00 pm: <b>Enzyme mimetic bioinorganic nanoparticles: tuning, inhibiting, and restoring of catalytic activities</b>, Mato Knez, CIC nanoGUNE Consolider (Spain) and Ikerbasque (Spain); Lianbing Zhang, Le Li, Unai Carmona, CIC nanoGUNE Consolider (Spain). . . . . [9055-20]</p> <p>2:20 pm: <b>Comparing remineralization of carious lesions in natural and artificial crowns of human teeth</b>, Bert Müller, Lea M. Botta, Hans Deyhle, Iwona Dziadowiec, Peter Thalmann, Basel Univ. Hospital (Switzerland); Shane N. White, Univ. of California, Los Angeles (USA); Lucy Kind, Uwe Pielies, Fachhochschule NordWestschweiz (Switzerland) . [9055-21]</p> <p>2:40 pm: <b>Biomimetic-inspired joining of composite with metal structures: a survey of natural joints and application to single lap joints</b>, Evangelos Ioannis Avgoulas, Michael P. F. Sutcliffe, Univ. of Cambridge (United Kingdom) . . . . . [9055-22]</p> <p>Coffee Break. . . . . Tue 3:00 pm to 3:30 pm</p>	<p style="text-align: center;">Concurrent Sessions</p> <hr/> <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p style="text-align: center;"><b>Session 5a</b></p> <p style="text-align: center;"><b>Location: Town and Country</b> Tue 1:20 pm to 3:00 pm</p> <p style="text-align: center;"><b>Energy Harvesting Using EAP II</b></p> <p>Session Chairs: <b>Iain A. Anderson</b>, The Univ. of Auckland (New Zealand); <b>Ilkwon Oh</b>, KAIST (Korea, Republic of)</p> <p>1:20 pm: <b>Soft generators for sustainable motion-based energy harvesting</b> (<i>Invited Paper</i>), Adrian Koh, National Univ. of Singapore (Singapore) and Institute of High Performance Computing (Singapore) . . . . . [9056-23]</p> <p>2:00 pm: <b>Stack design for portable artificial muscle generators: is it dangerous to be short and fat?</b>, Iain A. Anderson, The Univ. of Auckland (New Zealand); Samuel Rosset, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Thomas G. McKay, The Univ. of Auckland (New Zealand); Herbert R. Shea, Ecole Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [9056-24]</p> <p>2:20 pm: <b>An experimental and numerical approach to understand the effect of the IPMC composition on its sensing and energy harvesting behavior</b>, Barbar J. Akle, Lebanese American Univ. (Lebanon) . . . . . [9056-25]</p> <p>2:40 pm: <b>Multi-source energy harvester for wildlife tracking</b>, You Wu, Wanlu Zhou, Lei Zuo, Stony Brook Univ. (USA) [9056-26]</p> <p>Coffee Break. . . . . Tue 3:00 pm to 3:30 pm</p> </div> <div style="width: 48%;"> <p style="text-align: center;"><b>Session 5b</b></p> <p style="text-align: center;"><b>Location: Royal Palm One</b> Tue 1:20 pm to 3:00 pm</p> <p style="text-align: center;"><b>Electro-Responsive Materials</b></p> <p>Session Chairs: <b>Dirk Schapeler</b>, Vivitouch, A Bayer Brand (USA); <b>Anne Ladegaard Skov</b>, Technical Univ. of Denmark (Denmark)</p> <p>1:20 pm: <b>Filled liquid silicone rubbers: possibilities and challenges</b> (<i>Invited Paper</i>), Anne L. Skov, Liyun Yu, Sindhu Vudayagiri, Shamsul Zakaria, Technical Univ. of Denmark (Denmark); Mohamed Y. Benslimane, Danfoss PolyPower A/S (Denmark) [9056-27]</p> <p>2:00 pm: <b>Electroactive polymers with giant electromechanical response</b>, Qiming M. Zhang, Mehdi Ghaffari, The Pennsylvania State Univ. (USA); Yue Zhou, Chad Welsh, Rodney S. Ruoff, The Univ. of Texas at Austin (USA) . . . . . [9056-134]</p> <p>2:20 pm: <b>Electromechanical response of NCC-PEO composites</b>, Patrick S. Bass, Matthew Baltzell, Daihui Zhang, Lin Zhang, Maobing Tu, ZhongYang Cheng, Auburn Univ. (USA) . . . . . [9056-29]</p> <p>2:40 pm: <b>Stimuli-responsive hydrogel actuators</b>, Sina Naficy, Geoffrey M. Spinks, Gordon G. Wallace, Univ. of Wollongong (Australia) . . . . . [9056-30]</p> <p>Coffee Break. . . . . Tue 3:00 pm to 3:30 pm</p> </div> </div>	<p style="text-align: center;"><b>Session 6</b></p> <p style="text-align: center;"><b>Location: Royal Palm Five</b> Tue 1:40 pm to 3:00 pm</p> <p style="text-align: center;"><b>Magneto Rheological Systems I</b></p> <p>Session Chairs: <b>Norman M. Wereley</b>, Univ. of Maryland, College Park (USA); <b>Weihua Li</b>, Univ. of Wollongong (Australia)</p> <p>1:40 pm: <b>Design of a new MR brake mount system considering vertical and horizontal vibrations</b>, Phu Xuan Do, Inha Univ. (Korea, Republic of); Quoc Hung Nguyen, Ho Chi Minh Univ. of Industry (Viet Nam); Joon-Hee Park, Seung-Bok Choi, Inha Univ. (Korea, Republic of) . . . . . [9057-23]</p> <p>2:00 pm: <b>A variable stiffness and damping suspension system for high speed train</b>, Shuaishuai Sun, Weihua Li, Univ. of Wollongong (Australia); Huaxia Deng, Hefei Univ. of Technology (China) . . . . . [9057-24]</p> <p>2:20 pm: <b>A bi-directional, controllable liquid-spring magnetorheological fluid damper</b>, Nicholas Maus, Faramarz Gordaninejad, Univ. of Nevada, Reno (USA) . . . . . [9057-25]</p> <p>2:40 pm: <b>Magnetorheological impact seat suspensions for ground vehicle crash mitigation</b>, Xian-Xu Bai, Hefei Univ. of Technology (China); Norman M. Wereley, Univ. of Maryland, College Park (USA) . . . . . [9057-26]</p> <p>Coffee Break. . . . . Tue 3:00 pm to 3:30 pm</p>	<p style="text-align: center;"><b>Session 6</b></p> <p style="text-align: center;"><b>Location: Sunset</b> Tue 2:10 pm to 3:10 pm</p> <p style="text-align: center;"><b>Nanocomposites Applications</b></p> <p>Session Chairs: <b>Zoubeida Ounaies</b>, The Pennsylvania State Univ. (USA); <b>Jonathan M. Rossiter</b>, Univ. of Bristol (United Kingdom)</p> <p>2:10 pm: <b>High energy density nanocomposite capacitors based on non-ferroelectric nanowires</b>, Haixiong Tang, Henry A. Sodan, Univ. of Florida (USA) . . . . . [9058-25]</p> <p>2:30 pm: <b>Development of time-domain master curves using the data of dynamic mechanical analysis for polyurea and polyurea-based composites</b>, Zhanzhan Jia, Alireza V. Amirkhizi, Siavouche Nemat-Nasser, Univ. of California, San Diego (USA) . . . . . [9058-27]</p> <p>2:50 pm: <b>Test validation of environmental barrier coating (EBC) durability and damage tolerance modeling approach</b>, Ali Abdul-Aziz, NASA Glenn Research Ctr. (USA); Mohit Garg, Frank Abdi, AlphaSTAR Corp. (USA); Ramakrishna T. Bhatt, Joseph E. Grady, NASA Glenn Research Ctr. (USA) . . . . . [9058-26]</p> <p>Coffee Break. . . . . Tue 3:10 pm to 3:40 pm</p>	<p style="text-align: center;"><b>Session 8</b></p> <p style="text-align: center;"><b>Location: Royal Palm Three</b> Tue 1:20 pm to 2:00 pm</p> <p style="text-align: center;"><b>Keynote Session IV</b></p> <p>Session Chair: <b>Ajit Khosla</b>, Concordia Univ. (Canada)</p> <p>1:20 pm: <b>Smart materials for smart microfluidic devices and instruments</b> (<i>Keynote Presentation</i>), Bonnie L. Gray, Simon Fraser Univ. (Canada) . . [9060-22]</p> <p style="text-align: center;"><b>Session 9</b></p> <p style="text-align: center;"><b>Location: Royal Palm Three</b> Tue 2:00 pm to 3:00 pm</p> <p style="text-align: center;"><b>Nanocomposites I</b></p> <p>Session Chair: <b>Dileepan Joseph</b>, Univ. of Alberta (Canada)</p> <p>2:00 pm: <b>Robust low-cost flexible touchpads using embedded conductive nanocomposite polymer</b>, Alireza Rahbar, Mona Rahbar, Bonnie L. Gray, Simon Fraser Univ. (Canada) . . . . . [9060-23]</p> <p>2:20 pm: <b>FITC-tagged macromolecule-based alginate microspheres for urea sensing</b>, Abhijeet Joshi, Rashmi D. Chaudhari, Rohit Srivastava, Indian Institute of Technology Bombay (India) . . . . . [9060-24]</p> <p>2:40 pm: <b>Strain sensor based on cellulose ZnO hybrid nanocomposite</b>, Hyun-U Ko, Gyu-Young Yun, Joo-Hyung Kim, Jaehwan Kim, Inha Univ. (Korea, Republic of) . . . . . [9060-25]</p> <p>Coffee Break. . . . . Tue 3:00 pm to 3:30 pm</p>

## Conference 9061

Concurrent Sessions

### Session 6a

**Location: Pacific Salon Seven**  
Tue 1:20 pm to 3:00 pm

#### Nanoengineered Sensing Technology II

Session Chairs: **Kenneth J. Loh**, Univ. of California, Davis (USA); **Simon Laflamme**, Iowa State Univ. (USA)

1:20 pm: **Dynamic characterization of a soft elastomeric capacitor for structural health monitoring applications**, Hussam S. Saleem, Simon Laflamme, Iowa State Univ. (USA); Filippo Ubertini, Univ. degli Studi di Perugia (Italy); Randall Geiger, Nicola Bowler, Michael R. Kessler, Krishna Rajan, Iowa State Univ. (USA) . . . [9061-40]

1:40 pm: **Thin film sensor network for condition assessment of wind turbine blades**, Simon Laflamme, Hussam S. Saleem, Umesh Vaidya, Venkatesh Chinde, Partha Sarkar, Heather Sauder, Iowa State Univ. (USA) . . . [9061-41]

2:00 pm: **Electromechanical models of carbon nanotube-polyelectrolyte thin films guided by microscopy**, Bo Mi Lee, Univ. of California, Davis (USA); Bryan R. Loyola, Sandia National Labs., California (USA); Kenneth J. Loh, Univ. of California, Davis (USA) . . . [9061-42]

2:20 pm: **Design and characterization of a Piezoelectric sensor for monitoring scour hole evolution**, Faezeh Azhari, Kenneth J. Loh, Fabian A. Bombardelli, Univ. of California, Davis (USA) . [9061-43]

2:40 pm: **Cracks monitoring and characterization by Ba<sub>0.64</sub>Sr<sub>0.36</sub>TiO<sub>3</sub> flexoelectric strain gradient sensors**, Wenbin Huang, Xiaoning Jiang, Fuh-Gwo Yuan, Michael Yang, North Carolina State Univ. (USA) . . . [9061-44]

Coffee Break. . . . Tue 3:00 pm to 3:30 pm

### Session 6b

**Location: Pacific Salon Five**  
Tue 1:40 pm to 3:00 pm

#### Non-Contact Measurements II

Session Chairs: **Hoon Sohn**, KAIST (Korea, Republic of); **Yang Wang**, Georgia Institute of Technology (USA)

1:40 pm: **Residual stress measurement of butt-weld zone for shipbuilding materials using laser speckle interferometry**, Hyunchul Jung, Taeho Choi, Kyeongsuk Kim, Chosun Univ. (Korea, Republic of) . . . [9061-45]

2:00 pm: **Noncontact visualization of nonlinear ultrasonic modulation for reference-free fatigue crack detection**, Hyung Jin Lim, Hoon Sohn, Peipei Liu, KAIST (Korea, Republic of) . . . [9061-46]

2:20 pm: **Non-contact sensing through image-based 3D scene reconstruction in the presence of mismatched features**, Mohammad Reza Jahanshahi, Adnan Ansar, Curtis W. Padgett, Jet Propulsion Lab. (United States) and California Institute of Technology (United States) . . . [9061-47]

2:40 pm: **Noncontact monitoring of fatigue crack growth using high frequency guided waves**, Bernard Masserey, HES-SO Fribourg (Switzerland); Paul Fromme, Univ. College London (United Kingdom) . . . [9061-49]

Coffee Break. . . . Tue 3:00 pm to 3:30 pm

## Conference 9062

Session 6

**Location: Towne**  
Tue 1:30 pm to 3:00 pm

#### Sensors for SHM of Turbine Engines

Session Chair: **Mark R. Woike**, NASA Glenn Research Ctr. (USA)

1:30 pm: **Structural health monitoring on turbine engines using microwave blade tip clearance sensors** (*Invited Paper*), Mark R. Woike, Michelle M. Clem, Ali Abdul-Aziz, NASA Glenn Research Ctr. (USA) [9062-21]

2:00 pm: **Turbine engine rotor health monitoring evaluation by means of finite element analyses and spin tests data**, Ali Abdul-Aziz, Mark R. Woike, Michelle M. Clem, George Y. Baakini, NASA Glenn Research Ctr. (USA) . . . [9062-22]

2:20 pm: **Progress of a cross-correlation based optical strain measurement technique for detecting radial growth of a rotating disk**, Michelle M. Clem, Mark R. Woike, Ali Abdul-Aziz, NASA Glenn Research Ctr. (USA) . . . [9062-23]

2:40 pm: **In-process, non-destructive multimodal dynamic testing of high-speed composite rotors**, Robert Kuschmierz, Angelos Filippatos, Andreas Fischer, Albert Langkamp, Werner Hufenbach, Jürgen W. Czarske, Technische Univ. Dresden (Germany) . . . [9062-24]

Coffee Break. . . . Tue 3:00 pm to 3:30 pm

## Conference 9063

Session 4

**Location: Royal Palm Four**  
Tue 2:00 pm to 3:00 pm

#### Roadway and Pavement Inspection and Monitoring Using NDE/SHM Technologies II

Session Chairs: **Ming L. Wang**, Northeastern Univ. (USA); **Yu-Min Su**, National Central Univ. (Taiwan)

2:00 pm: **Logging evaluation of porous asphalt concrete in conjunction with medical x-ray computed tomography**, Yu-Min Su, Cheng-Yu Hsu, Jyh-Dong Lin, National Central Univ. (Taiwan) . . . [9063-23]

2:20 pm: **Repair monitoring of cracked concrete floor using the impulse response method**, Nikolaos Zoidis, Geotest S.A. (Greece); Efthymios Tatsis, Univ. of Ioannina (Greece); Christos Vlachopoulos, Geotest S.A. (Greece); Anastasios Gotzamanis, Earthquake Engineering (Greece); Jesper Stærke Clausen, Ramboll Danmark A/S (Denmark); Dimitrios G. Aggelis, Vrije Univ. Brussel (Belgium); Theodoros E. Matikas, Univ. of Ioannina (Greece) . . . [9063-24]

2:40 pm: **Modelling ultrasound guided wave propagation for plate thickness measurement**, Rakesh Malladi, Rice Univ. (USA) and Texas Instruments Inc. (USA); Anand G. Dabak, Nitish K. Murthy, Texas Instruments Inc. (USA) . . . [9063-25]

Coffee Break. . . . Tue 3:00 pm to 3:30 pm

## Conference 9064

Concurrent Sessions

### Session 6a

**Location: Royal Palm Six**  
Tue 2:00 pm to 3:00 pm

#### Guided Waves for SHM of Composites

Session Chairs: **Victor Giurgiutiu**, Univ. of South Carolina (USA); **Jennifer E. Michaels**, Georgia Institute of Technology (USA)

2:00 pm: **Guided ultrasonic waves for impact damage detection in composite panels**, Bibi I. S. Murat, Pouyan Khalili, Paul Fromme, Univ. College London (United Kingdom) . . . [9064-49]

2:20 pm: **Theoretical solution for response of surface bonded rectangular piezoelectric actuators/sensors to Lamb waves**, Yuling Liu, Fuh-Gwo Yuan, North Carolina State Univ. (USA) . . . [9064-50]

2:40 pm: **Electro-thermo-mechanical coupled elastodynamic model for anisotropic guided wave propagation analysis**, Luke Borkowski, Aditi Chattopadhyay, Arizona State Univ. (USA) . . . [9064-51]

Coffee Break. . . . Tue 3:00 pm to 3:30 pm

### Session 6b

**Location: Royal Palm Two**  
Tue 2:00 pm to 3:00 pm

#### Modeling Aspects: Deterministic and Stochastic

Session Chairs: **Michael D. Todd**, Univ. of California, San Diego (USA); **Shivan Haran**, Arkansas State Univ. (USA)

2:00 pm: **Structural system identification of buildings by a wave method based on a layered Timoshenko beam model**, Mahdi Ebrahimi, Maria I. Todorovska, The Univ. of Southern California (USA) . . . [9064-52]

2:20 pm: **Wave transmission across bolted interfaces on satellites**, James Gibert, Clarkson Univ. (USA); Douglas M. Coombs, Eric M. Austin, Moog CSA Engineering (USA) . . . [9064-53]

2:40 pm: **Reliable predictions of micro-anomalies from macro-observables**, Sonjoy Das, Sourish Chakravarty, Univ. at Buffalo (USA) . . . [9064-54]

Coffee Break. . . . Tue 3:00 pm to 3:30 pm

**Conference 9055**      **Conference 9056**      **Conference 9057**      **Conference 9058**      **Conference 9060**

**Session 7**

**Location: Sunrise**  
Tue 3:30 pm to 3:50 pm

**Biomaterials II**  
Session Chair: **Raúl J. Martín-Palma**, Univ. Autónoma de Madrid (Spain)

3:30 pm: **Bio inspired smart multifunctional magnet-polymer (MagPol) composites**, Anansa S. Ahmed, Raju V. Ramanujan, Nanyang Technological Univ. (Singapore) . . . . . [9055-23]

**Session 8**

**Location: Sunrise**  
Tue 3:50 pm to 4:30 pm

**Robotics/Locomotion III**  
Session Chair: **Akhlesh Lakhtakia**, The Pennsylvania State Univ. (USA)

3:50 pm: **Intelligent agents: adaptation of autonomous bimodal microsystems**, Theodore B. Terry, Patrice Smith, Walden Univ. (USA) . . . . . [9055-24]

4:10 pm: **Influence of bending mode shape and trailing edge deflection on propulsive performance of flexible heaving fins using digital image correlation**, Ashok K. Kancharala, Kevin Dewillie, Michael K. Philen, Virginia Polytechnic Institute and State Univ. (USA) . . . . . [9055-26]

**Location: Sunrise**  
4:30 pm to 5:25 pm

**Poster Pops: In Memory of H. Don Wolpert**  
Session Chair: **Raúl J. Martín-Palma**, Univ. Autónoma de Madrid (Spain)

*In addition to their poster presentations, the poster authors will provide 5-minute oral presentations during the conference.*

Concurrent Sessions

**Session 6a**

**Location: Town and Country**  
Tue 3:30 pm to 4:30 pm

**Energy Harvesting Using EAP III**  
Session Chairs: **John D. W. Madden**, The Univ. of British Columbia (Canada); **Ilkwon Oh**, KAIST (Korea, Republic of)

3:30 pm: **An improved electromechanical conversion cycle for optimizing the energy density of dielectric elastomer generators**, Samuel Shian, Jiangshui Huang, Shijie Zhu, David R. Clarke, Harvard Univ. (USA) . . . . . [9056-31]

3:50 pm: **High-dielectric elastomeric actuation stress generated in oil immersion**, Thanh-Giang La, Lau-Gih Keong, Li-Lynn Shiau, Adrian W. Y. Tan, Nanyang Technological Univ. (Singapore) . . . . . [9056-33]

4:10 pm: **Harvesting energy from a water flow through ionic polymer metal composites' buckling**, Filippo Cellini, Youngsu Cha, Maurizio Porfiri, Polytechnic Institute of New York Univ. (USA) . [9056-34]

**Session 6b**

**Location: Royal Palm One**  
Tue 3:30 pm to 4:50 pm

**Robotic Applications I**  
Session Chairs: **Qibing Pei**, Univ. of California, Los Angeles (USA); **Samuel Shian**, Harvard Univ. (USA)

3:30 pm: **Design of an innovative dielectric elastomer actuator for space applications**, Francesco Branz, Francesco Sansone, Alessandro Francesconi, Univ. degli Studi di Padova (Italy) . . . . . [9056-35]

3:50 pm: **Towards shear tactile displays with DEAs**, Lars E. Knoop, Jonathan M. Rossiter, Univ. of Bristol (United Kingdom) . . . . . [9056-36]

4:10 pm: **Bucky gel actuators optimization towards haptic applications**, Grzegorz Bubak, Alberto Ansaldo, Luca Ceseracciu, Davide Ricci, Istituto Italiano di Tecnologia (Italy) . . . . . [9056-37]

4:30 pm: **Improvement sensitivity of resistance type single-axis tactile sensor using liquid**, Seonggi Kim, Hyungpil Moon, Baek-chul Kim, Jiyeon Jung, Ja Choon Koo, Hyouk Ryeol Choi, Sungkyunkwan Univ. (Korea, Republic of) . . . . . [9056-38]

**Session 7**

**Location: Royal Palm Five**  
Tue 3:30 pm to 5:30 pm

**Energy Harvesting and Scavenging: Electromagnetic**  
Session Chairs: **Norbert Schwesinger**, Technische Univ. München (Germany); **Lei Zuo**, Stony Brook Univ. (USA)

3:30 pm: **Vibration energy harvesting using a spherical permanent magnet**, Scott D. Moss, Genevieve A. Hart, Steve K. Burke, Steve C. Galea, Defence Science and Technology Organisation (Australia); Gregory P. Carman, Univ. of California, Los Angeles (USA) . . . . . [9057-27]

3:50 pm: **Scaling of electromagnetic vibration energy harvesting devices**, Genevieve A. Hart, Scott D. Moss, Defence Science and Technology Organisation (Australia) . . . . . [9057-28]

4:10 pm: **Characterization of hybrid energy harvesting device consisting of piezoelectric and electromagnetic systems**, Miles Larkin, Yonas T. Tadesse, The Univ. of Texas at Dallas (USA) [9057-29]

4:30 pm: **Integration of regenerative shock absorber into vehicle electric system**, Chongxiao Zhang, Peng Li, Junyoung Kim, Sha Lou, Sharanjit Singh, Lei Zuo, Stony Brook Univ. (USA) . . . . . [9057-30]

4:50 pm: **Energy harvesting with coupled magnetostrictive resonators**, Suketu Naik, Alex Phipps, Visarath In, Space and Naval Warfare Systems Command (USA); Peyton Cavaroc, Space and Naval Warfare Systems Ctr. Atlantic (USA); Antonio Matus, Antonio Palacios, San Diego State Univ. (USA) . . . . . [9057-31]

5:10 pm: **A novel miniature thermomagnetic energy harvester**, Chin-Chung Chen, Tien-Kan Chung, Cheng-Chi Cheng, Chia-Yuan Tseng, National Chiao Tung Univ. (Taiwan) . . . . . [9057-32]

**Session 7**

**Location: Sunset**  
Tue 3:40 pm to 6:00 pm

**Smart Composites**  
Session Chairs: **Dimitrios Chronopoulos**, The Univ. of Nottingham (United Kingdom); **Kwang Jin Kim**, Univ. of Nevada, Las Vegas (USA)

3:40 pm: **Bayesian techniques to quantify parameter and model uncertainty in smart material systems**, Ralph C. Smith, North Carolina State Univ. (USA) . . . . . [9058-28]

4:00 pm: **Investigation of temperature influence on mechanical properties of graphene oxide thin films**, Mohammad Arif I. Shuvo, Hasanul Karim, Diego Delfin, Yirong Lin, The Univ. of Texas at El Paso (USA) . . . . . [9058-29]

4:20 pm: **Omniphobic behavior of transparent graphene oxide by trichlorosilane self-assembled monolayers**, Dae Hwan Kim, Northfield Mount Hermon (USA) . . . . . [9058-30]

4:40 pm: **Physical and mechanical properties of short glass fiber/polyurea composites**, Jing Qiao, Chong Wu, Gaohui Wu, Harbin Institute of Technology (China) . . . . . [9058-31]

5:00 pm: **Quantitative analysis on the compressive behavior of vertically aligned carbon nanotubes**, Yupeng Li, Univ. of Delaware (USA); Junmo Kang, Sungkyunkwan Univ. (Korea, Republic of); Hyung-ick Kim, Univ. of Delaware (USA); Jaeboong Choi, Jonghwan Suhr, Sungkyunkwan Univ. (Korea, Republic of) . . . . . [9058-32]

5:20 pm: **Theoretical and experimental studies of small diameter cylindrical IPMC actuators**, Shelby E. Nelson, Univ. of Nevada, Las Vegas (USA); Viljar Palmre, Univ. of Nevada, Las Vegas (USA) and Univ. of Nevada, Reno (USA); Taeseon Whang, Kwang Jin Kim, Univ. of Nevada, Las Vegas (USA) . . . . . [9058-33]

5:40 pm: **Real-time programmable variable stiffness 2D surface design**, Sarah S. Trabia, Woosoon Yim, Univ. of Nevada, Las Vegas (USA) . . . . . [9058-34]

**Session 10**

**Location: Royal Palm Three**  
Tue 3:30 pm to 6:00 pm

**Nanocomposites II**  
Session Chair: **Eugene Edwards**, U.S. Army Research, Development and Engineering Command (USA)

3:30 pm: **Development of a flexible supercapacitor using iridium oxide nanowire and active carbon electrodes (Invited Paper)**, Min H. Kim, Hargsoon Yoon, Norfolk State Univ. (USA) [9060-26]

4:00 pm: **Paper like cellulose-ZnO hybrid nanocomposite and its photoelectrical behavior**, Seongcheol Mun, Hyun-U Ko, Inha Univ. (Korea, Republic of); Bryan Kang, Samsung Electro-Mechanics (Korea, Republic of); Jaehwan Kim, Inha Univ. (Korea, Republic of) . . . . . [9060-27]

4:20 pm: **Present a new type of self-heating composite based on carbon nanotubes paper and investigate the feasibility in deicing**, Hetao Chu, Zhichun Zhang, Yanju Liu, Jinsong Leng, Harbin Institute of Technology (China) . [9060-28]

4:40 pm: **Screen printed conductive nanoparticle composite polymer with applications to wearable ECG electrodes**, Daehwan Chung, Simon Fraser Univ. (Canada); Ajit Khosla, Concordia Univ. (Canada); Bonnie L. Gray, Simon Fraser Univ. (Canada) . . . . . [9060-29]

5:00 pm: **Patterned nano-islands using solid-state dewetting with predefined temperature profiles**, Ilwoo Seok, Shivan Haran, Arkansas State Univ. (USA) . . . . . [9060-30]

5:20 pm: **Digital watermarking algorithm on tank's 3D mesh model based on DHartley transform**, Qi Hu, Jilin Business and Technology College (China) and Changchun Univ. of Science and Technology (China); Lang Zhai, Jilin Business and Technology College (China) . . . . . [9060-56]

5:40 pm: **Multiple watermark algorithm on fighter's 3D model based on DCT transform**, Qi Hu, Jilin Business and Technology College (China) and Changchun Univ. of Science and Technology (China); Lang Zhai, Jilin Business and Technology College (China) . . . . . [9060-57]



## Conference 9061

Concurrent Sessions

### Session 7a

**Location: Pacific Salon Seven  
Tue 3:30 pm to 5:30 pm**

#### Sensor Fusion for SHM of Civil Structures

Session Chairs: **Masahiro Kurata**, Kyoto Univ. (Japan); **Sung-Han Sim**, Ulsan National Institute of Science and Technology (Korea, Republic of)

3:30 pm: **Damage sensitive features in seismically damaged steel beam-column connection extracted in ambient vibration testing**, Zhenyun Tang, Masahiro Kurata, Kaede Minegishi, Kyoto Univ. (Japan) ..... [9061-50]

3:50 pm: **Multi-metric model-based structural health monitoring**, Hongki Jo, The Univ. of Arizona (USA); Bill F. Spencer Jr., Univ. of Illinois at Urbana-Champaign (USA) ..... [9061-51]

4:10 pm: **Response estimation of a building subject to a large earthquake using acceleration data of a single floor recorded by a sensor agent robot**, Akira Mita, Yushi Shinagawa, Keio Univ. (Japan) ..... [9061-52]

4:30 pm: **Multisensor fusion for system identification**, Sung-Han Sim, Soojin Cho, Ulsan National Institute of Science and Technology (Korea, Republic of); Jong-Woong Park, Korea Institute of Ocean Science & Technology (Korea, Republic of); Hyunjun Kim, Ulsan National Institute of Science and Technology (Korea, Republic of) ..... [9061-53]

4:50 pm: **Parametric time-domain identification of civil engineering structures with multiple inputs using decoupled output signals**, Jian Li, The Univ. of Kansas (USA); Manuel Ruiz-Sandoval, Univ. Autónoma Metropolitana (Mexico); Bill F. Spencer Jr., Amr S. Elhashai, Univ. of Illinois at Urbana-Champaign (USA) ..... [9061-54]

5:10 pm: **Targeted deployment of scour monitoring sensors for at-risk bridges**, Ian Anderson, Mandar Dewoolkar, Jeff Frolik, Caleb Fields, Donna Rizzo, Dryver R. Huston, The Univ. of Vermont (United States) ..... [9061-85]

### Session 7b

**Location: Pacific Salon Five  
Tue 3:30 pm to 5:30 pm**

#### Statistical Learning for Smart Structures

Session Chairs: **Hae Young Noh**, Carnegie Mellon Univ. (USA); **Yang Wang**, Georgia Institute of Technology (USA)

3:30 pm: **A robust baseline removal method for guided wave damage localization**, Chang Liu, Joel B. Harley, Mario Bergés, Warren Junker, David W. Greve, Irving J. Oppenheim, Carnegie Mellon Univ. (USA) ..... [9061-56]

3:50 pm: **Extraction of a series of novel damage sensitive features derived from the continuous wavelet transform of input and output acceleration measurements**, Konstantinos Balafas, Anne S. Kiremidjian, Stanford Univ. (USA) ..... [9061-57]

4:10 pm: **Toward characterization of the effects of environmental and operational conditions (EOC) on diffuse-field ultrasonic guided-waves in pipes**, Matineh Eyyboosh, Mario Bergés, Hae Young Noh, Carnegie Mellon Univ. (USA) ..... [9061-58]

4:30 pm: **Damage diagnosis using improved Hilbert Huang transform on a non-stationary signal**, Varun Kasireddy, Hae Young Noh, Carnegie Mellon Univ. (USA) ..... [9061-59]

4:50 pm: **BOES: building occupancy estimation system using sparse ambient vibration monitoring**, Shijia Pan, Carnegie Mellon Univ. (USA); Lin Zhang, Tsinghua Univ. (China); Hae Young Noh, Pei Zhang, Carnegie Mellon Univ. (USA) ..... [9061-60]

5:10 pm: **Oriented wireless sensing: algorithms for estimating damage sensitive features**, Mark Mollineaux, Ram Rajagopal, Stanford Univ. (USA) ..... [9061-61]

## Conference 9062

### Session 7

**Location: Towne  
Tue 3:30 pm to 5:30 pm**

#### Acoustic Emission and Ultrasound Sensors

Session Chair: **Norbert G. Meyendorf**, Fraunhofer IKTS-CMD (Germany), Univ. of Dayton (United States)

3:30 pm: **The influence of fracture modes in acoustic emission signals in concrete beams**, Dimitrios G. Aggelis, Vrije Univ. Brussel (Belgium); Anastasios C. Balaskas, Theodore E. Matikas, Univ. of Ioannina (Greece); Danny Van Hemelrijck, Vrije Univ. Brussel (Belgium) ..... [9062-25]

3:50 pm: **A qualitative and quantitative investigation of the uncracked and cracked condition of concrete beams using impulse excitation, acoustic emission, and ultrasonic pulse velocity techniques**, Sokratis N. Iliopoulos, Alexandros N. Iliopoulos, Lincy Pyl, Hugo Sol, Dimitrios G. Aggelis, Vrije Univ. Brussel (Belgium) ..... [9062-26]

4:10 pm: **Development of optical equipment for ultrasonic guided wave measurement**, Bin Lin, Victor Giurgiutiu, Erik L. Frankforter, Univ. of South Carolina (USA) ..... [9062-27]

4:30 pm: **Sensing light and sound velocities of liquids in two-dimensional phoxonic crystals**, Samira Amoudache, Rayisa P. Moiseyenko, Yan Pennec, Bahram Djafari-Rouhani, Univ. des Sciences et Technologies de Lille (France) ... [9062-28]

4:50 pm: **Elastic wave propagation on human femur tissue**, Maria Strantz, Dimitrios G. Aggelis, Vrije Univ. Brussel (Belgium); Olivia Louis, Univ. Ziekenhuis Brussel (Belgium) and Vrije Univ. Brussel (Belgium); D. Polyzos, Univ. of Patras (Greece); Danny Van Hemelrijck, Vrije Univ. Brussel (Belgium) ..... [9062-29]

5:10 pm: **Ultrasonic guided wave sensing properties of PVDF thin film with inter digital electrodes**, Vivek T. Rathod, D. Roy Mahapatra, Indian Institute of Science (India) ..... [9062-30]

Conference End.

## Conference 9063

### Session 5

**Location: Royal Palm Four  
Tue 3:30 pm to 5:30 pm**

#### Vibration-Based SHM/NDE

Session Chairs: **Akira Sasamoto**, National Institute of Advanced Industrial Science and Technology (Japan); **Valery F. Godinez-Azcuaga**, MISTRAS Group, Inc. (USA)

3:30 pm: **Vibrational characteristics of FRP-bonded concrete interfacial defects in a low frequency regime**, Tin Kei Cheng, Denvid Lau, City Univ. of Hong Kong (Hong Kong, China) ..... [9063-26]

3:50 pm: **Feasibility study on 3 axis magnetic sensor for flux leakage method**, Akira Sasamoto, National Institute of Advanced Industrial Science and Technology (Japan) ..... [9063-27]

4:10 pm: **Estimation performance of civil structures from impulse response data: graph interpretation**, Gopichand Movva, Shuo Sun, Yan Wan, H. Felix Wu, Univ. of North Texas (USA) ..... [9063-28]

4:30 pm: **The extended Ibrahim time-domain modal identification method for over-damped structural systems**, Chang-Sheng Lin, National Synchrotron Radiation Research Ctr. (Taiwan) ..... [9063-29]

4:50 pm: **Dynamic monitoring of stay cables by enhanced cable equations**, Chih-Peng Yu, Keng-Tsang Hsu, Chih-Hung Chiang, Chia-Chi Cheng, Chaoyang Univ. of Technology (Taiwan) ..... [9063-30]

5:10 pm: **Matrix crack detection in spatially random composite structures using fractal dimension**, Ranjan Ganguli, Umesh K., Indian Institute of Science (India) ..... [9063-31]

## Conference 9064

Concurrent Sessions

### Session 7a

**Location: Royal Palm Six  
Tue 3:30 pm to 5:30 pm**

#### Nonlinear SHM Techniques and Modeling

Session Chairs: **Sourav Banerjee**, Univ. of South Carolina (USA); **Daniel J. Guymar**, Institut National des Sciences Appliquées de Lyon (France)

3:30 pm: **Fatigue crack detection using nonlinear vibro-acoustic cross-modulations based on the Luxemburg-Gorky effect**, Tomasz Trojnar, Andrzej P. Klepka, Wieslaw J. Staszewski, AGH Univ. of Science and Technology (Poland) [9064-55]

3:50 pm: **Evaluation of frost damage in cement-based materials by a nonlinear elastic wave technique**, Jesús N. Eiras, Univ. Politècnica de València (Spain); Tribikram Kundu, The Univ. of Arizona (USA); J. Monzó, Univ. Politècnica de València (Spain); John S. Popovics, Univ. of Illinois at Urbana-Champaign (USA); L. Soriano, Jordi Payá, Univ. Politècnica de València (Spain) [9064-56]

4:10 pm: **Acoustic microscopy, electron microscopy, and hybrid microcontinuum physics for quantifying damage incubation in 5XXX aluminum**, Sourav Banerjee, Chijioge Agbasi, Univ. of South Carolina (USA) ..... [9064-57]

4:30 pm: **Experiments on a wind turbine blade testing an indication for damage using the causal and anti-causal Green's function reconstructed from a diffuse field**, Jeffery D. Tippmann, Francesco Lanza di Scalea, Univ. of California, San Diego (USA) ..... [9064-58]

4:50 pm: **Local computational strategies for predicting wave propagation in nonlinear media**, Michael J. Leamy, Georgia Institute of Technology (USA); Wieslaw J. Staszewski, Tadeusz Uhl, Pawel Packo, AGH Univ. of Science and Technology (Poland) [9064-59]

5:10 pm: **Nonlinear analysis of longitudinal wave-propagation in an axial rod with breathing crack**, Dhanashri M. Joglekar, Mira Mitra, Indian Institute of Technology Bombay (India) ..... [9064-60]

5:30 pm: **Substructure isolation and damage identification for frame structure**, Jilin Hou, Dalian Univ. of Technology (China) ..... [9064-61]

### Session 7b

**Location: Royal Palm Two  
Tue 3:30 pm to 5:50 pm**

#### Civil Infrastructure: Pipe, Rail, Concrete, and Building

Session Chairs: **Sridhar Krishnaswamy**, Northwestern Univ. (USA); **Henrique L. Reis**, Univ. of Illinois at Urbana-Champaign (USA)

3:30 pm: **Structural health monitoring of pipelines rehabilitated with lining technology using acoustic emission**, Alireza Farhizadeh, Ehsan Dehghan-Niri, Salvatore Salamone, Univ. at Buffalo (USA) ..... [9064-62]

3:50 pm: **Crack detection and sensitivity analysis in pipes by using a reflection-based method**, Qiang Fan, Shanghai Jiao Tong Univ. (China); Yinian Zhu, Northwestern Univ. (USA); Zhenyu Huang, Shanghai Jiao Tong Univ. (China); Sridhar Krishnaswamy, Northwestern Univ. (USA) ..... [9064-63]

4:10 pm: **Temperature and axial stress effects in electro-mechanical impedance method-based structural health monitoring systems**, Xuan Zhu, Francesco Lanza Di Scalea, Univ. of California, San Diego (USA); Mahmood Fateh, Federal Railroad Administration (USA) ... [9064-64]

4:30 pm: **Determination of optimal sampling rate and Hankel matrix size for subspace SI in Shear building under earthquake**, Seungkeun Park, Carnegie Mellon Univ. (USA); Hyun Woo Park, Dong-A Univ. (Korea, Republic of) ..... [9064-65]

4:50 pm: **Characterization of oxidative aging in asphalt concrete pavements using its complex moduli**, Megan E. McGovern, Behzad Behnia, Brian C. Hill, William G. Buttler, Henrique L. Reis, Univ. of Illinois at Urbana-Champaign (USA) [9064-66]

5:10 pm: **Effect of applied load on the non-destructive measurement of concrete strength**, Ehsan Mahmoudabadi, Umar Amjad, Tribikram Kundu, Hamid Saadatmanesh, The Univ. of Arizona (USA) ..... [9064-67]

5:30 pm: **Crack detection of railway turnouts using PZT sensors**, Yiqing Ni, The Hong Kong Polytechnic Univ. (Hong Kong, China); Z. G. Li, Hong Kong Univ. of Science and Technology (Hong Kong, China); F. Wu, Shanghai Jiao Tong Univ. (China) [9064-68]

# Posters · Tuesday · Location: Golden Ballroom · 6:00 to 7:30 pm

Conference attendees are invited to attend the joint poster session/exhibition reception to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10 am and 4 pm on Tuesday 11 March. View poster presentation guidelines.

## Conference 9055

**Soft materials-derived and reversible nano-lithography**, Jae Hong Park, National Nanofab Ctr. (Korea, Republic of) . . . . . [9055-32]

**Analysis of water droplets on the wettability-patterned biomimetic surface**, Yuji Hirai, Chitose Institute of Science and Technology (Japan); Hiroyuki Mayama, Asahikawa Medical Univ. (Japan); Yasutaka Matsuo, Hokkaido Univ. (Japan); Masatsugu Shimomura, Tohoku Univ. (Japan) . . . . . [9055-33]

**Measurement of dynamic characteristics of an artificial wing mimicking an *Allomyrina Dichotoma* beetle's hind wing using digital image correlation technique**, Hoang My Vang, Ngoc-San Ha, Nam Seo Goo, Konkuk Univ. (Korea, Republic of) . . . . . [9055-34]

**Electromagnetic response of the protective pellicle of different unicellular microalgae**, Marina Inchaussandague, Diana C. Skigin, Univ. de Buenos Aires (Argentina) and IFIBA (CONICET) (Argentina); Analia Tolivia, Isabel Fuertes Vila, Univ. de Buenos Aires (Argentina); Visitación Conforti, Univ. de Buenos Aires (Argentina) and IBBEA (CONICET) (Argentina) . . . . . [9055-35]

**Biomimetic surfaces of semiconducting metal oxides**, Kosuke Orita, Olaf Karthaus, Chitose Institute of Science and Technology (Japan) . . . . . [9055-37]

**Dragonfly hover is primarily mediated by vision**, Javan S. Chahl, Univ. of South Australia (Australia) and Defence Science and Technology Organisation (Australia); Akiko Mizutani, Odonatrix Pty. Ltd. (Australia) . . . . . [9055-38]

**Optimization of the leading edge segment of a corrugated wing**, Javan S. Chahl, Univ. of South Australia (Australia) and Defence Science and Technology Organisation (Australia); Manas S. Khurana, RMIT Univ. (Australia) . . . . . [9055-39]

**A new nonlinear model for studying morphing forces and moments acting on an articulated micro air vehicle**, Adetunji Oduyela, The Univ. of Alabama in Huntsville (USA) . . . . . [9055-40]

**Development of multimodal bubble contrast agent using SiO<sub>2</sub> as templates for biomedical application**, Hsiu-Ying Huang, Walter H. Chang, Tzu-Ying Hou, Chung Yuan Christian Univ. (Taiwan) . . . . . [9055-42]

## Conference 9056

**The effect of processing conditions on the crystal structure and electroactive properties of poly(vinylidene fluoride)/ multi-walled carbon nanotubes nanocomposites**, Lu Yang, Jinhao Qiu, Kongjun Zhu, Hongli Ji, Nanjing Univ. of Aeronautics and Astronautics (China) . . . . . [9056-99]

**Electrical actuation properties of epoxy shape memory polymers/reduced graphene oxide paper composite**, Wenxin Wang, Yanju Liu, Jinsong Leng, Harbin Institute of Technology (China); Dongyan Liu, Institute of Metal Research (China); Debes Bhattacharyya, The Univ. of Auckland (New Zealand) . . . . . [9056-100]

**Mechanism of strain-induced effect in VHB 4910 by in situ x-ray diffraction and Raman spectroscopy**, Raj K. Sahu, Karali Patra, Indian Institute of Technology Patna (India); Ramaswami Sammyaiken, Jerzy A. Szipuniar, Univ. of Saskatchewan (Canada) . . . . . [9056-101]

**Beta-phase poly(vinylidene fluoride) fabrication under droplet drying process**, Go Murasawa, Noriyasu Yamada, Ken Miyata, Akihiro Nishioka, Hidemitsu Furukawa, Yamagata Univ. (Japan) . . . . . [9056-103]

**Novel encapsulation technique for incorporation of high permittivity fillers into silicone elastomers**, Piotr Mazurek, Soren Hvilsted, Anne L. Skov, Technical Univ. of Denmark (Denmark) . . . . . [9056-104]

**DEAP actuator and its high voltage driver for heating valve application**, Lina Huang, Technical Univ. of Denmark (Denmark); Lars F. Normølle, Lanoe Electronics (Denmark); Rahimullah Sarban, Ebbe N. Christiansen, Danfoss PolyPower A/S (Denmark); Zhe Zhang, Michael A. E. Andersen, Technical Univ. of Denmark (Denmark) . . . . . [9056-105]

**The electrical breakdown of thin dielectric elastomers: thermal effects**, Shamsul Zakaria, Anne L. Skov, Technical Univ. of Denmark (Denmark); Peter H. Morshuis, Technische Univ. Delft (Netherlands); Mohamed Y. Benslimane, Danfoss PolyPower A/S (Denmark); Krist V. Gernaey, Technische Univ. Delft (Denmark) . . . . . [9056-108]

**Vacuum packages for MEMS-based sensors**, Jae Hong Park, National Nanofab Ctr. (Korea, Republic of) . . . . . [9056-109]

**Controlled active motion of metallic nanostructures on a stretchable electroactive polymer**, Hynchul Park, Chong Min Koo, Soon Man Hong, Jang Woo Lee, Korea Institute of Science and Technology (Korea, Republic of); Minh Kim, Korea Institute of Science and Technology (KIST) (Korea, Republic of); Seunggun Yu, Jin Hong Lee, Korea Institute of Science and Technology (Korea, Republic of) . . . . . [9056-110]

**PDMS/MWCNT nanocomposite actuators using silicone functionalized multiwalled carbon nanotubes via nitrene chemistry**, Chong Min Koo, Soon Man Hong, Santosh Yadav, Korea Institute of Science and Technology (Korea, Republic of) . . . . . [9056-111]

**Inhomogeneous deformation of circular dielectric actuator: simulation and experiment**, Yin Wang, Jinxiong Zhou, Xiaohong Wu, Ling Zhang, Na Ni, Fan Liu, Xi'an Jiaotong Univ. (China) . . . . . [9056-112]

**Autofocus fluid lens device construction and implementation of modified IPMC membrane actuators**, Harti Kivete, Rauno Temmer, Andres Punning, Alvo Aabloo, Rudolf Kiefer, Univ. of Tartu (Estonia) . . . . . [9056-113]

**Electrochemomechanical deformation (ECMD) of PPyDBS in free standing film formation and trilayer design**, Rauno Temmer, Tarmo Tamm, Univ. of Tartu (Estonia); Nihan Aydemir, Jadranka Travas-Sejdic, The Univ. of Auckland (New Zealand); Alvo Aabloo, Rudolf Kiefer, Univ. of Tartu (Estonia) . . . . . [9056-114]

**Leakage current of a charge-controlled dielectric elastomer**, Junshi Zhang, Hualing Chen, Junjie Sheng, Lei Liu, Xi'an Jiaotong Univ. (China) . . . . . [9056-115]

**Experimental investigations on energy harvesting performance of dielectric elastomers**, Yong-Quan Wang, Xuejing Liu, Huanhuan Xue, Hualing Chen, Shuhai Jia, Xi'an Jiaotong Univ. (China) . . . . . [9056-116]

**Effect of temperature on the electric breakdown strength of dielectric elastomer**, Lei Liu, Hualing Chen, Junjie Sheng, Junshi Zhang, Xi'an Jiaotong Univ. (China) . . . . . [9056-117]

**Comparison of plasma treatment and sandblast pre-processing for IPMC actuator**, Chi Zhang, Hualing Chen, Yanjie Wang, Yong-Quan Wang, Shuhai Jia, Xi'an Jiaotong Univ. (China) . . . . . [9056-118]

**Control of ionic polymer-metal composites actuators with cellular actuator method**, Yushiro Inoue, Norihiro Kamamichi, Tokyo Denki Univ. (Japan) . . . . . [9056-119]

**Optimized deformation behavior of a dielectric elastomer generator**, Florentine Foerster, Helmut F. Schlaak, Technische Univ. Darmstadt (Germany) . . . . . [9056-120]

**Dynamic performances of silicone dielectric elastomer actuators with bi-stable buckled beams**, Davide Gatti, Helmut F. Schlaak, Cameron Tropea, Technische Univ. Darmstadt (Germany) . . . . . [9056-121]

**Dielectric elastomer Bending actuator: experiment and theoretical analysis**, Liwu Liu, Jinrong Li, Yanju Liu, Jinsong Leng, Harbin Institute of Technology (China) . . . . . [9056-122]

**The influence of polyurethane type on the electrostrictive behavior**, Karat Petcharoen, Anuvat Sirivat, The Petroleum and Petrochemical College (Thailand) . . . . . [9056-123]

**Effect of electric field and degree of crosslinking on stress relaxation behavior of gelatin hydrogels: time-electric field superposition**, Thawatchai Tungkavet, Anuvat Sirivat, The Petroleum and Petrochemical College (Thailand); Nispa Seetapan, National Metal and Materials Technology Ctr. (Thailand); Datchanee Pattavarakorn, Chiang Mai Univ. (Thailand) . . . . . [9056-124]

**Tactile feedback to the palm using arbitrarily shaped DEA**, Holger Moessinger, Henry Haus, Helmut F. Schlaak, Technische Univ. Darmstadt (Germany) . . . . . [9056-125]

**IPMC electrodes with platinum nanothorn assemblies: effects on the electromechanical transduction**, Viljar Palmre, Univ. of Nevada, Las Vegas (USA) and Univ. of Nevada, Reno (USA); Kwang Jin Kim, Univ. of Nevada, Las Vegas (USA) [9056-126]

**Evaluation of encapsulating coatings on the performance of polypyrrole actuators**, Sina Naficy, Nicholas Stoboi, ARC Ctr. of Excellence for Electromaterials Science and Intelligent Polymer Research Institute (Australia); Philip G. Whitten, Univ. of Wollongong (Australia); Geoffrey M. Spinks, Gordon G. Wallace, ARC Ctr. of Excellence for Electromaterials Science and Intelligent Polymer Research Institute (Australia) . . . . . [9056-127]

**Extrusion printing of ionic-covalent entanglement hydrogels with high toughness**, Shannon E. Bakarich, Marc in het Panhuis, ARC Ctr. of Excellence for Electromaterials Science and Intelligent Polymer Research Institute (Australia) and Univ. of Wollongong (Australia); Stephen Beirne, Gordon G. Wallace, Geoffrey M. Spinks, ARC Ctr. of Excellence for Electromaterials Science and Intelligent Polymer Research Institute (Australia) . . . . . [9056-128]

**Dielectric elastomer based active layer for macro-scaled industrial application in roto-flexographic printing**, Fulvio Pinto, Michele Meo, Univ. of Bath (United Kingdom) . . . . . [9056-129]

**Dielectric elastomer bimorph actuator**, Fan Liu, Jinxiong Zhou, Ling Zhang, Yin Wang, Na Ni, Xi'an Jiaotong Univ. (China) . . . . . [9056-130]

**Compliant liquid metal electrodes for dielectric elastomer actuators**, Lauren Finkenauer, Carmel Majidi, Carnegie Mellon Univ. (USA) . . . . . [9056-131]

**An investigation of electrochemomechanical actuation of conductive polyacrylonitrile (PAN) nanofiber composites**, Mark A. Gonzalez, Wayne W. Walter, Rochester Institute of Technology (USA) . . . . . [9056-132]

**Design and fabrication of an IPMC-embedded tube for minimally invasive surgery applications**, Jiayu Liu, Yanjie Wang, Chi Zhang, Dongxu Zhao, Hualing Chen, Dichen Li, Xi'an Jiaotong Univ. (China) . . . . . [9056-133]

**Sequential growth and monitoring of a polypyrrole actuator system**, John C. Sarrazin, Stephen Mascaro, The Univ. of Utah (USA) . . . . . [9056-135]

**Modeling and experimental investigation of the IPMC electrodes**, Qi Sheng, BeiHang Univ. (China) and Univ. of Nevada, Las Vegas (USA); Kwang Jin Kim, Univ. of Nevada, Las Vegas (USA); Tianmiao Wang, BeiHang Univ. (China) . . . . . [9056-136]

**Characterization of close-loop performance of double drive modes unimorph deformable mirror**, Ying Liu, Univ. of Science and Technology of China (China); Jianqing Ma, Ningbo Univ. (China); Junjie Chen, Baoqing Li, Jiaru Chu, Univ. of Science and Technology of China (China) . . . . . [9056-137]

**A dielectric elastomer balloon actuator**, Michael Y. Wang, Feifei Chen, Hongying Zhang, The Chinese Univ. of Hong Kong (Hong Kong, China) . . . . . [9056-138]

**Intelligent forceps using highly twisted actuator**, Soheil Kianzad, John D. W. Madden, The Univ. of British Columbia (Canada) . . . . . [9056-139]

## Conference 9057

**A new method for speed control of a DC motor using magnetorheological clutch**, Quoc Hung Nguyen, Ho Chi Minh City Univ. of Technology (Viet Nam); Hwan-Choong Kim, Seung-Bok Choi, Inha Univ. (Korea, Republic of) . . . . . [9057-101]

**Optimal design of a jetting dispenser actuated by a dual piezoactuator**, Quoc Hung Nguyen, Ho Chi Minh Univ. of Industry (Viet Nam); Juncheol Jeon, Jong-Seok Oh, Seung-Bok Choi, Inha Univ. (Korea, Republic of) . . . . . [9057-102]

**Effects of eccentricity and order of vibration modes on the inelastic seismic responses of 3D steel structures**, Naser Pourakbar Sharifi, Aaron Sakulich, Worcester Polytechnic Institute (USA) . . . . . [9057-103]

**An active vibration isolation system using adaptive proportional control method**, Yun-Hui Liu, Hung-En Hsieh, Wei-Hao Wu, Southern Taiwan Univ. of Science & Technology (Taiwan) . . . . . [9057-104]

# Posters · Tuesday · Location: Golden Ballroom · 6:00 to 7:30 pm

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**Piezoelectric energy harvesting using a series synchronized switch technique**, Yang Li, Mickaël Lallart, Claude Richard, Institut National des Sciences Appliquées de Lyon (France) . . . . . [9057-105]

**An enhanced knee-mounted biomechanical energy harvester**, Li Yin Chau, Chao Chen, Wei-Hsin Liao, The Chinese Univ. of Hong Kong (Hong Kong, China) . . . . . [9057-106]

**Vibration control of shell-like structures with optical strain gauges**, Simone Cingolani, Francesco Braghin, Gabriele Cazzulani, Politecnico di Milano (Italy) . . . . . [9057-107]

**Microthermoelectric generator with semiconductor oxides thermoelectric materials**, Gabriela G. Telipan, Dragos Ovezea, Teodora Malaeru, INCDIE ICPE-CA (Romania) . . . . . [9057-108]

**Numerical analysis of cyclical performance of RC beam-column connection reinforced by superelastic shape memory alloy bars**, Hui Qian, Chenkai Hong, Zhengzhou Univ. (China); Hongnan Li, Dalian Univ. of Technology (China); Gangbing Song, Univ. of Houston (USA) . . . . . [9057-110]

**Superelastic viscous dampers for seismically resilient steel frame structures**, Osman E. Ozbulut, Benjamin Meguire, Univ. of Virginia (USA) [9057-111]

**Semi-active controller design for vibration suppression and energy harvesting via LMI approach**, Yilun Liu, Stony Brook Univ. (USA); Chi-Chang Lin, Stony Brook Univ. (USA) and National Chung Hsing Univ. (Taiwan); Lei Zuo, Stony Brook Univ. (USA) . . . . . [9057-112]

**Shock and vibration control systems using a self-sensing magnetorheological damper**, Xian-Xu Bai, Hefei Univ. of Technology (China); Dai-Hua Wang, Chongqing Univ. (China) . . . . . [9057-113]

**An adaptive optimal control for smart structures based on the subspace tracking identification technique**, Francesco Ripamonti, Ferruccio Resta, Massimo Borroni, Politecnico di Milano (Italy) . . . . . [9057-114]

**Eliminating whirl occurrence in fluid-film bearings of rotary machinery through optimally controlled anti-swirl injection**, Ching-Kuan Tsuei, Duc-Do Le, Min-Chun Pan, National Central Univ. (Taiwan) . . . . . [9057-115]

**Appropriate IMFs associated with cepstrum and envelope analysis for ball-bearing fault diagnosis**, Min-Chun Pan, Wen-Chang Tsao, National Central Univ. (Taiwan) . . . . . [9057-116]

**Analysis of the robust stability of piezoelectric shunt damping system with synthetic negative capacitor**, Kento Okumura, Kentaro Takagi, Tsuyoshi Inoue, Nagoya Univ. (Japan) . . . . . [9057-117]

**Theoretical and experimental analysis of frequency up-conversion energy harvesters under human-generated vibrations**, Raul B. Olympio, The George Washington Univ. (USA) and Univ. of São Paulo (Brazil); Ambrish Patel, Adam M. Wickenheiser, The George Washington Univ. (USA) . . . . . [9057-119]

**One-step Fabrication of Multifunctional Silica Microbelt with the Novel Stacked Structure by Electrospinning Technique**, Yongtao Yao, Weilong Yin, Harbin Institute of Technology (China) [9057-120]

**Solar self-tracking system powered by shape memory alloy wire**, The Minh Nguyen, Giridharan Rajagopalan, Tejaswini Lakkaraju, Alhasan Almakarami, California State Univ., Fresno (USA) . . . . . [9057-121]

**Shape memory alloy-based active chiral composite cells**, Maulik Prajapati, D. Roy Mahapatra, Indian Institute of Science (India) . . . . . [9057-122]

**Theoretical and experimental investigation of architected core materials incorporating negative stiffness elements**, Chia-Ming Chang, Andrew C. Keefe, William Barvosa-Carter, Christopher P. Henry, Geoffrey P. McKnight, HRL Labs., LLC (USA) . . . . . [9057-123]

**Development of a biologically inspired hydrobot tail**, Danielle Moore, Virginia Polytechnic Institute and State Univ. (USA); Alhaji Janneh, Hampton Univ. (USA); Michael K. Philen, Virginia Polytechnic Institute and State Univ. (USA) . . . . . [9057-124]

**The influence of osmotic pressure on the lifespan of cellularly inspired energy-relevant materials**, Esha Kapania, Univ. of Virginia (USA); Katherine Guillen, Virginia Polytechnic Institute and State Univ. (USA); Eden Cunningham, Hampton Univ. (USA); Eric C. Freeman, Michael K. Philen, Virginia Polytechnic Institute and State Univ. (USA) . . . . . [9057-125]

**Tapered two-layer stacked vibration energy harvesters using a modal approach**, Xingyu Xiong, S. Olutunde Oyadiji, The Univ. of Manchester (United Kingdom) . . . . . [9057-126]

**Doormat-like energy harvester from footsteps: design, modeling and experimental analysis**, Ya Wang, Wusi Chen, Wanlu Zhou, Lei Zuo, The State Univ. of New York (USA) . . . . . [9057-127]

**Angular placement of turbines over moving train to generate drag free electricity**, Amarjot Singh, Ramya Kupplii, Accendere KMS Labs. (India) . . . . . [9057-128]

**Rate-dependent, flexible extensible smart device using shear thickening fluid**, Paul Nenzo, U.S. Army Research Lab. (USA) . . . . . [9057-129]

## Conference 9058

**Anisotropic elastic properties of glancing-angle deposition (GLAD) thin films at micro-scale evaluated by resonant frequency spectra**, Hui Fang, China Academy of Engineering Physics (China) . . . . . [9058-43]

**A stress-induced phase transition model for semi-crystalline shape memory polymer**, Xiaogang Guo, Harbin Engineering Univ. (China); Liwu Liu, Bo Zhou, Yanju Liu, Jinsong Leng, Harbin Institute of Technology (China) . . . . . [9058-44]

**Vibration analysis of an active twist helicopter blade**, Ozge Ozdemir, Istanbul Technical Univ. (Turkey) . . . . . [9058-45]

**One-step fabrication of multifunctional silica microbelt with the novel stacked structure by electrospinning technique**, Yongtao Yao, Haibao Lu, Jianjun Li, Jinsong Leng, Harbin Institute of Technology (China) . . . . . [9058-46]

**Preparation and properties of polyurethane/silicone materials for biomimetic gecko setae**, Min Yu, Nanjing Univ. of Aeronautics and Astronautics (China) . . . . . [9058-47]

**High cycles fatigue damage of CFRP plates clamped by bolts for axial coupling joint with off-set angle during rotation**, Kazuaki Ooka, Kazuya Okubo, Toru Fujii, Doshisha Univ. (Japan); Shinichi Umeda, Masayuki Fujii, Tsubaki Emerson Co. (Japan); Tetsuya Sugiyama, Nippon Steel & Sumikin Materials Co., Ltd. (Japan) . . . . . [9058-48]

**Microstructure, mechanical, and thermophysical properties of Csf/SiC multilayer composites by tape casting and pressureless sintering**, Wenshu Yang, Harbin Institute of Technology (China); Sara Biamino, Elisa Padovano, Matteo Pavese, Paolo Fino, Claudio Badini, Politecnico di Torino (Italy) . . . . . [9058-49]

**Study on microstructure and thermo-physical properties of high volume fraction SiCp/Al composites**, Ziyang Xiu, Harbin Institute of Technology (China); Murid Hussain, COMSATS Institute of Information Technology (Pakistan); Longtao Jiang, Wenshu Yang, Harbin Institute of Technology (China) . . . . . [9058-50]

**Preparation and damping properties of cenosphere fly ash-aluminum composite**, Qiang Zhang, Linchi Zou, Qinlin Guo, Yingfei Lin, Gaohui Wu, Harbin Institute of Technology (China) . . . . . [9058-51]

**Effect of deformation on the friction and wear properties of TiB2/2024Al composite in unlubricated sliding condition**, Haitao Chi, Longtao Jiang, Pengchao Kang, Guoqin Chen, Wenshu Yang, Gaohui Wu, Harbin Institute Of Technology (China) . . . . . [9058-52]

**Influence of quenching on expansion coefficient and micro-yield strength of Invar36**, Guoqin Chen, Zelong Jiao, Longtao Jiang, Gaohui Wu, Harbin Institute of Technology (China) . . . . . [9058-53]

**Modeling and simulation of shape memory behavior and temperature memory effect in polymer undergoing relaxation transition**, Haibao Lu, Harbin Institute of Technology (China) . . . . . [9058-54]

**Multi functional devices combines shape-memory alloy to piezo electric material**, Hiroshi Sato, National Institute of Advanced Industrial Science and Technology (Japan) . . . . . [9058-55]

**Preliminary design and analysis of a cubic deployable support structure based on shape-memory polymer composites**, Fengfeng Li, Liwu Liu, Yanju Liu, Jinsong Leng, Harbin Institute of Technology (China) . . . . . [9058-56]

**A multiscale-based model for composite materials with embedded PZT filaments for energy harvesting**, Ahmed E. El-Etriby, Mohamed E. Abdel-Meguid, Tarek M. Hatem, Yehia A. Bahei-El-Din, The British Univ. in Egypt (Egypt) . . . . . [9058-57]

## Conference 9059

**Optimal design of a novel configuration of MR brake with coils placed on side housings**, Quoc Hung Nguyen, Ho Chi Minh City Univ. of Technology (Viet Nam); Phu Xuan Do, Seung-Bok Choi, Inha Univ. (Korea, Republic of) . . . . . [9059-18]

**Multilevel optimization for the placement of Piezo actuators on plate structures for active vibration control using modified heuristic genetic algorithm**, Deepak Chhabra, Maharshi Dayanand Univ., Rohtak (India); Gian Bhushan, Pankaj Chandna, National Institute of Technology, Kurukshetra (India) [9059-20]

**Study on sliding joint of curtain wall support structure of Shanghai Tower**, Li Jiupeng, Tongji Univ. (China) . . . . . [9059-21]

**Special optical fiber design to reduce reflection peak distortion of a FBG embedded in inhomogeneous material**, Lun-Kai Cheng, TNO (Netherlands); Peter Toet, TNO Science and Industry (Netherlands); Jan de Vreugd, TNO (Netherlands); Remco Nieuwland, TNO Science and Industry (Netherlands); Ming-Leung Vincent Tse, Hwa-Yaw Tam, The Hong Kong Polytechnic Univ. (Hong Kong, China) . . . . . [9059-23]

**A progression of damage repair capability in selfrepairing composites**, Carolyn M. Dry, Natural Process Design, Inc. (USA) . . . . . [9059-24]

**Comparison of self repair in various composite matrix materials**, Carolyn M. Dry, Natural Process Design, Inc. (USA) . . . . . [9059-25]

**Sensing of repair in chemically self-repairing composites**, Carolyn M. Dry, Natural Process Design, Inc. (USA) . . . . . [9059-26]

**Thixotropic action of self-repairing chemicals to increase strength at first impact**, Carolyn M. Dry, Natural Process Design, Inc. (USA) . . . . . [9059-27]

## Conference 9060

**Lateral migration of particles in the Newtonian fluid**, Masato Makino, Md. Hasnat Kabir, Jin Gong, Hidemitsu Furukawa, Yamagata Univ. (Japan)[9060-48]

**Experimental and numerical study of cellulose-based electro-active paper energy harvester** (Invited Paper), Zafar Abas, Heung Soo Kim, Dongguk Univ. (Korea, Republic of); Lindong Zhai, Joo-Hyung Kim, Jaehwan Kim, Inha Univ. (Korea, Republic of)[9060-50]

**Composite of polydiphenylamine/zeolite Y as sensing materials for halogenated solvents**, Tharaporn Permpool, Anuvat Sirivat, The Petroleum and Petrochemical College (Thailand); Darunee Atsawasathien, National Metal and Materials Technology Ctr. (Thailand) and National Science and Technology Development Agency (Thailand)[9060-51]

**Organic nanowire crystals from solution coating**, Olaf Karthaus, Masahiro Kawahara, Chitose Institute of Science and Technology (Japan) . . . . . [9060-53]

**Surface acoustic wave device for chemical and biological applications**, Joo-Hyung Kim, Gwang-Hoon Kim, Inha Univ. (Korea, Republic of) . . [9060-54]

**Ultra-small ZnO: Cu nanoparticles by ultrasonic chemical route for sensing applications**, Yogesh C. Goswami, U. P. S. Gahlaut, Vijay Kumar, ITM Univ. (India) . . . . . [9060-55]

**Powering nanorobotic devices: challenges and future strategies**, Krishna Moorthi Sankar, Accendere KMS Labs. (India) . . . . . [9060-58]

**ZnO-CdS nanowire arrays with composite nano films for optical absorption**, Q. Liu, J. Hu, J. B. Cui, Guoliang Huang, Univ. of Arkansas at Little Rock (USA) . . . . . [9060-60]

# Posters · Tuesday · 6:00 to 7:30 pm

Conference attendees are invited to attend the joint poster session/exhibition reception to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10 am and 4 pm on Tuesday 11 March. View poster presentation guidelines .

## Conference 9061

**Application of genetic mechanism for faster evolution of building reflecting environmental factors**, Saya Nishikawa, Akira Mita, Keio Univ. (Japan) ..... [9061-136]

**High-temperature measurement using Cu-plating fiber Bragg grating for metal smart structure applications**, Tianying Chang, Jilin Univ. (China); Lei Jia, Qingmei Sui, Shandong Univ. (China); Hong-Liang Cui, Jilin Univ. (China) ..... [9061-137]

**Watt-linkage based sensors for low frequency motion measurement and control of spacecrafts and satellites**, Fabrizio Barone, Fausto Acemese, Gerardo Giordano, Rocco Romano, Univ. degli Studi di Salerno (Italy) ..... [9061-138]

**Advances in Barkhausen noise analysis**, Norbert G. Meyendorf, Susanne Hillmann, Ulana Cikalova, Jürgen Schreiber, Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren (Germany) ..... [9061-139]

**The state of the art on innovative monitoring system in Korea**, Kitae Park, Hyunsoo Shin, Byungchul Kim, Bong-Chul Joo, Taeheon Kim, Ji Hyun Hwang, Korea Institute of Construction Technology (Korea, Republic of) ..... [9061-140]

**Natural frequency identification of smart washer by using adaptive observer**, Hitoshi Ito, Masayuki Okugawa, Aichi Institute of Technology (Japan) ..... [9061-141]

**A novel ionizing radiation sensor utilizing radiophotoluminescence in silver-doped phosphate glass**, Hidehito Nanto, Kanazawa Institute of Technology (Japan); Yuka Miyamoto, Chiyoda Technol Corp. (Japan); Tekeru Ohno, Takuma Ikeguchi, Kazuki Hirasawa, Yoshinori Takei, Kanazawa Institute of Technology (Japan); Toshio Kurobori, Kanazawa Univ. (Japan); Takayoshi Yamamoto, Chiyoda Technol Corp. (Japan); Takayuki Iida, Osaka Univ. (Japan) [9061-142]

**Design of overload vehicle monitoring and response system based on DSP**, Yiheng Liu, Yan Yu, Xuefeng Zhao, Dalian Univ. of Technology (China) ..... [9061-143]

**A novel high pressure, high temperature vessel used to conduct long-term stability measurements of silicon MEMS pressure transducers**, David Wisniewski, Meggitt Sensing Systems (USA) ..... [9061-144]

**Design of active whole-spacecraft vibration isolation based on voice-coil motor**, Weichao Chi, Dengqing Cao, Harbin Institute of Technology (China) ..... [9061-145]

**An FFT-based approach for dynamic response prediction of non-periodic systems**, Maria Chierichetti, Vahid Rahnesin, Worcester Polytechnic Institute (USA) ..... [9061-146]

**Scanning capability analysis of laser impulse radar**, Dapeng Chen, Hongwei Sun, Yu Han, Jiangsu Automation Research Institute (China) . . . [9061-147]

**Nanomaterial based sensor for monitoring real time aging process in structural composites**, Oludare Oluwabusi, Matt Boehle, Univ. of Dayton (USA); Lingchuan Li, Univ. of Dayton Research Institute (USA); Khalid Lafdi, Univ. of Dayton (USA); Ian Lenfant, Francisco Chinesta, Ecole Centrale de Nantes (France) ..... [9061-148]

**Parametric study of laser scanner for breathing cracked rotor damage identification**, Jie Zhao, Schlumberger Ltd. (USA); Hans A. DeSmidt, The Univ. of Tennessee (USA) ..... [9061-149]

**Application of genetic algorithm in position determination of perturbations along a Sagnac Interferometer**, Bingjie Wang, Shaohua Pi, Fudan Univ. (China) ..... [9061-150]

**Detecting and locating intrusion along a high sensitivity linear Sagnac interferometer**, Shaohua Pi, Bingjie Wang, Fudan Univ. (China) . . . . . [9061-151]

**Feature analysis of temperature gradient effect on indirect and direct bridge SHM**, Tianhao Tang, Siheng Chen, George Lederman, Zihao Wang, Hae Young Noh, Jacobo Bielak, James H. Garrett Jr., Carnegie Mellon Univ. (USA); Piervincenzo Rizzo, Univ. of Pittsburgh (USA); Fernando Cerda, Univ. de Concepción (Chile); Jelena Kovacevic, Carnegie Mellon Univ. (USA) ..... [9061-153]

**Application of wavelet domain in identifying vehicular axles in prescreening heavy vehicles**, Yueming Huang, Yuan Xiao, Guilin Lingui Urban Construction Investment Co., Ltd. (China) [9061-154]

**Galfenol-based directional magnetostrictive transducer for guided wave techniques**, Byungseok Yoo, Darryll J. Pines, Univ. of Maryland, College Park (USA) ..... [9061-155]

**Remote thermomagnetic sensing for internal temperature mapping of cylindrical lithium-ion batteries**, Chia-Ming Chang, HRL Labs., LLC (USA); John S. Wang, Souren Soukiazian, HRL Labs., LLC (USA); Guillermo Herrera, Shuoqin Wang, HRL Labs., LLC (USA); Geoffrey P. McKnight, HRL Labs., LLC (USA); Ping Liu, U.S. Dept. of Energy (USA) [9061-157]

**Combining computer vision and static sensor information through data fusion**, David Lattanzi, George Mason Univ. (USA) ..... [9061-158]

**Implementation of a self-sensing piezoelectric actuator for vibro-acoustic active control**, Anik Pelletier, Philippe Micheau, Alain Berry, Univ. de Sherbrooke (Canada) ..... [9061-159]

**Bio-inspired flow sensors using carbon nanomaterials**, Abenazer Darge, Erin Berg, Michael K. Philen, Virginia Polytechnic Institute and State Univ. (USA) ..... [9061-162]

**A robotic reproduction of the dynamic sonar sensing in horseshoe bats**, Brandon Goodman, Rebecca Castro, Yanqing Fu, Rolf Mueller, Michael K. Philen, Virginia Polytechnic Institute and State Univ. (USA) ..... [9061-163]

**Study the selecting of structural characteristic responses for finite element model updating of structures**, Linren Zhou, South China Univ. of Technology (China); Jinping Ou, South China Univ. of Technology (China) and Dalian Univ. of Technology (China) ..... [9061-164]

**Detection and calculation of reflected spectral shifts in Fiber-Bragg gratings (FBG) in polarization maintaining optical fiber**, Joel Quintana, Virgilio Gonzalez, The Univ. of Texas at El Paso (USA) ..... [9061-165]

**A statistical learning method for damage identification with guided-wave sensors in composites**, Arda Vanli, Sungmoon Jung, Florida State Univ. (USA) ..... [9061-166]

## Conference 9062

**Infrared absorption enhancement phenomenon on nano materials**, Jae Hong Park, National Nanofab Ctr. (Korea, Republic of) ..... [9062-32]

**3D mapping of reinforcement and tendon ducts on pre-stressed concrete bridges by means of ground penetrating radar (GPR)**, Eleni Cheilakou, Panagiotis Theodorakeas, Maria Kouli, Serafeim Moustakidis, Christos Zeris, National Technical Univ. of Athens (Greece) ..... [9062-33]

**Strength and fatigue life evaluation of composite laminate with embedded sensors**, Vivek T. Rathod, Shashishekarayya R. Hiremath, S. Sappannanavar, D. Roy Mahapatra, Indian Institute of Science (India) ..... [9062-34]

**Flexoelectric micro acoustic transducer using barium strontium titanate**, Seol Ryung Kwon, Wenbin Huang, Fuh-Gwo Yuan, Xiaoning Jiang, North Carolina State Univ. (USA) ..... [9062-35]

**A new molecular dynamic model of nanowire**, Lin Wang, Longqiu Li, Guangyu Zhang, Hongguang Xu, Qian Sun, Harbin Institute of Technology (China) ..... [9062-36]

**The damage assessment methodology in cooperation with smart sensors and inspection robots**, Yoshihiro Nitta, Ashikaga Institute of Technology (Japan); Akira Nishitani, Chisa Matsui, Waseda Univ. (Japan); Toshio Onai, Masami Ishida, Ashikaga Institute of Technology (Japan); Morimasa Watakabe, Technical Research Institute of Toda Corp. (Japan) ..... [9062-37]

**Cheap optical transducers (CHOTs) as chemical sensors**, Theodosia Stratoudaki, Leonel Marques, Matthew Clark, Mike G. Somekh, The Univ. of Nottingham (United Kingdom) ..... [9062-38]

**Thermal and electrical behavior of nano-modified cement mortar**, Dimitrios A. Exarchos, P. Dalla, Konstantinos G. Dassios, Theodoros E. Matikas, Univ. of Ioannina (Greece) ..... [9062-39]

**Fiber-optically sensorized composite wing**, Joannes Costa, Richard J. Black, Behzad Moslehi, Levy Oblea, Vahid Sotoudeh, Intelligent Fiber Optic Systems Corp. (USA); Essam Abouzeida, Vladimir Quinones, Yasser Gowayed, Paul Soobramaney, George Flowers, Auburn Univ. (USA) ..... [9062-41]

**Lamb wave-based damage detection of composite shells using high-speed fiber-optic sensing**, Vahid Sotoudeh, Richard Black, Behzad Moslehi, Intelligent Fiber Optic Systems Corp. (USA); Pizhong Qiao, Washington State Univ. (USA) ..... [9062-42]

**Fast fiber Bragg grating interrogation system with scalability to support monitoring of large structures in harsh environments**, Behzad Moslehi, Joannes Costa, Richard J. Black, Vahid Sotoudeh, Intelligent Fiber Optic Systems Corp. (USA) ..... [9062-43]

**Thermal diffusivity of templated nanocomposite using frequency modulated infrared imaging**, Lalat Indu Giri, Suneet Tuli, Indian Institute of Technology Delhi (India) ..... [9062-44]

# Posters · Tuesday · 6:00 to 7:30 pm

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## Conference 9063

**Acoustic metamaterial with negative parameter,** Hongwei Sun, Fei Yan, Hao Gu, Jiangsu Automation Research Institute (China) ..... [9063-75]

**Disbond detection using guided wave pzt excitation in honeycomb composite sandwich structure,** Chandrakant B. Pol, Sauvik Banerjee, Indian Institute of Technology Bombay (India) ..... [9063-76]

**SHM-based condition assessment of expansion joints in suspension bridges,** Yufeng Zhang, Zhen Sun, Jiangsu Transportation Research Institute Co., Ltd. (China) ..... [9063-77]

**Assessment of bond defects in adhesive joints before and after the treatment with laser generated shock waves,** Michael Kalms, Sandra Hellmers, Philipp Huke, Ralf B. Bergmann, Bremer Institut für angewandte Strahltechnik GmbH (Germany)[9063-78]

**Research progress of highway disease detection based on acoustic emission,** Panxu Sun, Shengli Li, Zhengzhou Univ. (China) ..... [9063-79]

**Evaluating cover depth of steel fiber reinforced concrete using impact-echo testing,** Yu Feng Lin, Chienkuo Technology Univ. (Taiwan) ..... [9063-80]

**Structural health monitoring in composite stiffened panels using ERA/NExT,** Md. Shakar U. Chowdhury, Md. Younus Ali, Krishnakumar Shankar, The Univ. of New South Wales (Australia) ..... [9064-106]

**Investigations of moisture ingressions in composite panels via NDI techniques,** Raghavendra Salagame, Vamsidhar R. Patolla, Ramazan Asmatulu, Wichita State Univ. (USA) ..... [9063-86]

**Guided wave phased array sensor tuning for improved defect detection and characterization,** Jason H. Bostron, Joseph L. Rose, The Pennsylvania State Univ. (USA) ..... [9063-87]

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**Research on prognostics and health management technology of numerical control equipment,** Rui Zheng, Hongwei Sun, Jiangsu Automation Research Institute (China); Yingzhi Zhang, Jilin Univ. (China) ..... [9064-95]

**The phase transition method for SAR measurement in MRI,** Fabrizio Barone, Rocco Romano, Fausto Acernese, Rosangela Canonico, Univ. degli Studi di Salerno (Italy) ..... [9064-96]

**The PRICONA algorithm for biological spectra normalization,** Fabrizio Barone, Rocco Romano, Fausto Acernese, Rosangela Canonico, Univ. degli Studi di Salerno (Italy) ..... [9064-97]

**Damage detection and locating using tone burst and continuous excitation modulation method,** Zheng Li, Zhi Wang, Li Xiao, Wenzhong Qu, Wuhan Univ. (China) ..... [9064-98]

**Nonlinear ball chain waveguides for acoustic emission and ultrasound sensing of ablation,** Stephen Pearson, Dryver R. Huston, Jason Meyers, Walten Owens, The Univ. of Vermont (USA) [9064-99]

**Dual-durometer suction foot robot for concrete inspection,** Dryver R. Huston, Dylan Burns, Paul Montane, John Gardner-Morse, Enrique Angola, The Univ. of Vermont (USA) ..... [9064-100]

**The study on the reliability of the actuator of FAST using FTA method,** Ming Zhu, Qi Ming Wang, National Astronomical Observatories (China) ..... [9064-101]

**Optical feather and foil for shape and dynamic load sensing of critical flight surfaces,** Richard J. Black, Joannes Costa, Behzad Moslehi, Mehrdad Pakmehr, Vahid Sotoudeh, Intelligent Fiber Optic Systems Corp. (United States); Andrei N. Zagrai, New Mexico Institute of Mining and Technology (United States) [9164-106]

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## Conference 9055

## Conference 9056

## Conference 9057

## Conference 9058

### Announcements, Awards, and Plenary Presentation

Location: Town and Country

8:10 to 8:25 am

- ASME Best Paper Awards
- ASME Gary Anderson Early Achievement Award

### Plenary Presentation · 8:25 to 9:10 am



#### Heterointegration of Smart Systems in Foil

Karlheinz Bock, Fraunhofer-Einrichtung für Modulare Festkörper-Technologien EMFT (Germany)

### Session 9

Location: Sunrise  
Wed 9:30 am to 10:00 am

#### Optics/Photonics I

Session Chair: **Alexandre Bontemps**, Univ. des Sciences et Technologies de Lille (France)

9:30 am: **Micro-pixelation and color mixing in biological photonic structures** (*Invited Paper*), Michael H. Bartl, Ramneet K. Nagi, The Univ. of Utah (USA) . . . . . [9055-27]

Coffee Break . . . Wed 10:00 am to 10:30 am

### Concurrent Sessions

#### Session 7a

Location: Town and Country  
Wed 9:40 am to 12:10 pm

#### Dielectric Elastomers EAP II

Session Chairs: **Benjamin M. O'Brien**, StretchSense (New Zealand); **Rick C.L. van Kessel**, SBM Offshore (Netherlands)

9:40 am: **Optimized control algorithms for feeding DEAP: transducer with bidirectional power electronics**, Jürgen Maas, Thorben Hoffstadt, Ostwestfalen-Lippe Univ. of Applied Sciences (Germany) . . . . . [9056-41]

Coffee Break . . . Wed 10:00 am to 10:30 am

#### Session 7b

Location: Royal Palm One  
Wed 9:20 am to 11:50 am

#### EAP Sensors

Session Chairs: **Hyouk Ryeol Choi**, Sungkyunkwan Univ. (Korea, Republic of); **Thomas G. McKay**, The Univ. of Auckland (New Zealand)

9:20 am: **EAP sensors for human body motion** (*Invited Paper*), Benjamin M. O'Brien, Todd A. Gisby, StretchSense (New Zealand) and The Univ. of Auckland (New Zealand); **Iain A. Anderson**, The Univ. of Auckland (New Zealand) and StretchSense (New Zealand) . . . . . [9056-44]

Coffee Break . . . Wed 10:00 am to 10:30 am

### Concurrent Sessions

#### Session 8a

Location: Royal Palm Five  
Wed 9:20 am to 10:20 am

#### Energy Harvesting and Scavenging: Broadband Techniques

Session Chairs: **William W. Clark**, Univ. of Pittsburgh (USA); **Ryan L. Harne**, Univ. of Michigan (USA)

9:20 am: **Broadband energy harvesting via adaptive control of bistable potential energy separatrix**, Scott A. Ouellette, Michael D. Todd, Univ. of California, San Diego (USA) . . . . . [9057-33]

9:40 am: **On the snap-through dynamic characteristics for broadband energy harvesting with bi-stable composites**, Andres F. Arrieta, Paolo Ermanni, ETH Zürich (Switzerland) . . . . . [9057-34]

10:00 am: **Broadband and band-limited random vibration energy harvesting using a piezoelectric patch on a thin plate**, Ugur Aridogan, Ipek Basdogan, Koç Univ. (Turkey); **Alper Erturk**, Georgia Institute of Technology (USA) . . . . . [9057-35]

Coffee Break . . . Wed 10:20 am to 10:50 am

#### Session 8b

Location: Towne  
Wed 9:20 am to 10:20 am

#### Magneto Rheological Systems II

Session Chairs: **Mehdi Ahmadian**, Virginia Polytechnic Institute and State Univ. (USA); **Seung-Bok Choi**, Inha Univ. (Korea, Republic of)

9:20 am: **Performance analysis of a semi-active railway vehicle suspension featuring MR dampers**, Hwan-Choong Kim, Inha Univ. (Korea, Republic of); **Gyu-Seop Lee**, Chae-Hun An, RMS Technology Co., Ltd. (Korea, Republic of); **Won-Hee You**, Korea Railroad Research Institute (Korea, Republic of); **Seung-Bok Choi**, Inha Univ. (Korea, Republic of) . . . . . [9057-36]

9:40 am: **Characterization and experimental validation of a squeeze film damper with MR fluid in a rotor-bearing system**, Luis A. Dominguez-Núñez, Gerardo Silva-Navarro, Ctr. de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (Mexico) . . . . . [9057-37]

10:00 am: **Study of a magnetically field-controllable phononic crystal**, Alireza Bayat, Faramarz Gordaninejad, Univ. of Nevada, Reno (USA) . . . . . [9057-38]

Coffee Break . . . Wed 10:20 am to 10:50 am

### Session 8

Location: Sunset  
Wed 9:20 am to 10:10 am


#### Photoresponsive Materials

Session Chairs: **Ralph C. Smith**, North Carolina State Univ. (USA); **Arun R. Srinivasa**, Texas A&M Univ. (USA)

9:20 am: **Thermodynamics and nonlinear mechanics of materials with photoresponsive microstructure** (*Invited Paper*), William S. Oates, Jonghoon Bin, The Florida State Univ. (USA) . . . [9058-35]

9:50 am: **Photoactive and self-sensing P3HT-based thin films for strain and corrosion monitoring**, Kenneth J. Loh, Donghyeon Ryu, Univ. of California, Davis (USA) . . . . . [9058-36]

Coffee Break . . . Wed 10:10 am to 10:40 am

<p><b>Award Presentations</b>  <i>Location: Town and Country</i></p> <p><b>8:10 to 8:25 am</b></p> <ul style="list-style-type: none"> <li>- ASME Best Paper Awards</li> <li>- ASME Gary Anderson Early Achievement Award</li> </ul>	<p><b>Plenary Presentation · 8:25 to 9:10 am</b></p>  <p><b>Heterointegration of Smart Systems in Foil</b>  <b>Karlheinz Bock</b>, Fraunhofer-Einrichtung für Modulare Festkörper-Technologien EMFT (Germany)</p>
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Session 1	Session 11	Concurrent Sessions		Session 6	Session 8		
<p><b>Location: Royal Palm Two</b>  <b>Wed 9:20 am to 11:30 am</b></p> <p><b>Synthetic Jets</b>                      Session Chair: <b>Kevin M. Farinholt</b>, Luna Innovations Inc. (USA)</p> <p>9:20 am: <b>Synthetic jet actuators for aerodynamic flow control</b> (<i>Invited Paper</i>), Ari Glezer, Georgia Institute of Technology (USA). . . . . [9059-1]</p> <p>10:00 am: <b>Development and test of synthetic jet actuators based on dual transducer concept</b>, Martin Schueller, Mathias Lipowski, Fraunhofer-Institut für Elektronische Nanosysteme (Germany); Robert Schulze, Technische Univ. Chemnitz (Germany); Perez Wiegel, Thomas Otto, Thomas Gessner, Fraunhofer-Institut für Elektronische Nanosysteme (Germany) . . . . . [9059-2]                      Coffee Break Wed 10:20 am to 10:50 am</p>	<p><b>Location: Royal Palm Three</b>  <b>Wed 9:20 am to 10:20 am</b></p> <p><b>Keynote Session V</b>                      Session Chair: <b>Mouli Ramasamy</b>, Univ. of Arkansas (USA)</p> <p>9:20 am: <b>Printing nanotube/nanowire for flexible microsystems</b> (<i>Keynote Presentation</i>), Jin-Woo Choi, Ryan P. Tortorich, Louisiana State Univ. (USA) . . . . . [9060-31]</p> <p>10:00 am: <b>Pericardial effusion ("dancing heart") monitoring by vector cardiograph</b>, Prashanth S. Kumar, Univ. of Arkansas (USA); Vijay K. Varadan, Univ. of Arkansas (USA) and The Pennsylvania State Univ. (USA) . . . . . [9060-14]                      Coffee Break . . . Wed 10:20 am to 10:50 am</p>	<table border="1"> <tr> <td style="background-color: #d9ead3; vertical-align: top;"> <p><b>Session 8a</b></p> <p><b>Location: Pacific Salon Seven</b>  <b>Wed 9:20 am to 10:00 am</b></p> <p><b>Thin-Film Crack Sensors</b>                      Session Chairs: <b>Dennis Backer</b>, Technische Univ. Bergakademie Freiberg (Germany); <b>David L. Mascarenas</b>, Los Alamos National Lab. (USA)</p> <p>9:20 am: <b>Measurement of Kirchoff's stress intensity factors in bending plates</b>, Dennis Bäcker, Meinhard Kuna, Christoph Häusler, Technische Univ. Bergakademie Freiberg (Germany). . . . . [9061-62]</p> <p>9:40 am: <b>Crack detection sensor layout and bus configuration analysis</b>, Nathan D. Sharp, Purdue Univ. (USA) and Los Alamos National Lab. (USA); Alan Kuntz, The Univ. of New Mexico (USA); Cole Brubaker, Colorado State Univ. (USA); Stephanie Amos, Georgia Institute of Technology (USA); Gautam Gupta, Wei Gao, Aditya Mohite, Charles R. Farrar, David L. Mascarenas, Los Alamos National Lab. (USA) . . . . . [9061-63]                      Coffee Break . . . Wed 10:00 am to 10:30 am</p> </td> <td style="background-color: #d9ead3; vertical-align: top;"> <p><b>Session 8b</b></p> <p><b>Location: Pacific Salon Five</b>  <b>Wed 9:20 am to 10:00 am</b></p> <p><b>Robotic Platforms for Sensing</b>                      Session Chair: <b>Yang Wang</b>, Georgia Institute of Technology (USA)</p> <p>9:20 am: <b>Detection of functional states of a resident using sensor agent robot</b>, Sho Konno, Akira Mita, Keio Univ. (Japan) . . . . . [9061-64]</p> <p>9:40 am: <b>A novel human-machine interface for communicating the orientation of multicopters to human operators</b>, Enrique Sevillano, Los Alamos National Lab. (USA) and Univ. Politécnica de Madrid (Spain); Aaron Curtis, Charles R. Farrar, David L. Mascareñas, Los Alamos National Lab. (USA) . . . . . [9061-65]                      Coffee Break . . . Wed 10:00 am to 10:30 am</p> </td> </tr> </table>		<p><b>Session 8a</b></p> <p><b>Location: Pacific Salon Seven</b>  <b>Wed 9:20 am to 10:00 am</b></p> <p><b>Thin-Film Crack Sensors</b>                      Session Chairs: <b>Dennis Backer</b>, Technische Univ. Bergakademie Freiberg (Germany); <b>David L. Mascarenas</b>, Los Alamos National Lab. (USA)</p> <p>9:20 am: <b>Measurement of Kirchoff's stress intensity factors in bending plates</b>, Dennis Bäcker, Meinhard Kuna, Christoph Häusler, Technische Univ. Bergakademie Freiberg (Germany). . . . . [9061-62]</p> <p>9:40 am: <b>Crack detection sensor layout and bus configuration analysis</b>, Nathan D. Sharp, Purdue Univ. (USA) and Los Alamos National Lab. (USA); Alan Kuntz, The Univ. of New Mexico (USA); Cole Brubaker, Colorado State Univ. (USA); Stephanie Amos, Georgia Institute of Technology (USA); Gautam Gupta, Wei Gao, Aditya Mohite, Charles R. Farrar, David L. Mascarenas, Los Alamos National Lab. (USA) . . . . . [9061-63]                      Coffee Break . . . Wed 10:00 am to 10:30 am</p>	<p><b>Session 8b</b></p> <p><b>Location: Pacific Salon Five</b>  <b>Wed 9:20 am to 10:00 am</b></p> <p><b>Robotic Platforms for Sensing</b>                      Session Chair: <b>Yang Wang</b>, Georgia Institute of Technology (USA)</p> <p>9:20 am: <b>Detection of functional states of a resident using sensor agent robot</b>, Sho Konno, Akira Mita, Keio Univ. (Japan) . . . . . [9061-64]</p> <p>9:40 am: <b>A novel human-machine interface for communicating the orientation of multicopters to human operators</b>, Enrique Sevillano, Los Alamos National Lab. (USA) and Univ. Politécnica de Madrid (Spain); Aaron Curtis, Charles R. Farrar, David L. Mascareñas, Los Alamos National Lab. (USA) . . . . . [9061-65]                      Coffee Break . . . Wed 10:00 am to 10:30 am</p>	<p><b>Session 6</b></p> <p><b>Location: Royal Palm Four</b>  <b>Wed 9:20 am to 12:30 pm</b></p> <p><b>Bridge Inspection and Monitoring Using NDE/SHM Technologies</b>                      Session Chairs: <b>Genda Chen</b>, Missouri Univ. of Science and Technology (USA); <b>Lingyu Yu</b>, Univ. of South Carolina (USA)</p> <p>9:20 am: <b>Cyber-enabled wireless monitoring systems for the health management of bridges: a retrospective summary of technology development and field validation</b> (<i>Keynote Presentation</i>), Jerome P. Lynch, Univ. of Michigan (USA) . . . . . [9063-32]                      Coffee Break . . . Wed 10:00 am to 10:30 am</p>	<p><b>Session 8</b></p> <p><b>Location: Royal Palm Six</b>  <b>Wed 9:20 am to 10:00 am</b></p> <p><b>Metamaterial I</b>                      Session Chairs: <b>Amr M. Baz</b>, Univ. of Maryland, College Park (USA); <b>Guoliang Huang</b>, Univ. of Arkansas at Little Rock (USA)</p> <p>9:20 am: <b>Realising elastodynamic cloaking</b>, Emilio P. Calius, Callaghan Innovation (New Zealand); Philippe Morel, Callaghan Innovation (New Zealand) and The Univ. of Auckland (New Zealand); James Hammond, Callaghan Innovation (New Zealand); Chew Chun How, Jason Chung, Raj Das, The Univ. of Auckland (New Zealand) . . . . . [9064-69]</p> <p>9:40 am: <b>Micropolar elastic theory for orthotropic chiral lattice and elastic metamaterials</b>, Yi Chen, Xiaoning Liu, Gengkai Hu, Beijing Institute of Technology (China) . . . . . [9064-70]                      Coffee Break . . . Wed 10:00 am to 10:30 am</p>
<p><b>Session 8a</b></p> <p><b>Location: Pacific Salon Seven</b>  <b>Wed 9:20 am to 10:00 am</b></p> <p><b>Thin-Film Crack Sensors</b>                      Session Chairs: <b>Dennis Backer</b>, Technische Univ. Bergakademie Freiberg (Germany); <b>David L. Mascarenas</b>, Los Alamos National Lab. (USA)</p> <p>9:20 am: <b>Measurement of Kirchoff's stress intensity factors in bending plates</b>, Dennis Bäcker, Meinhard Kuna, Christoph Häusler, Technische Univ. Bergakademie Freiberg (Germany). . . . . [9061-62]</p> <p>9:40 am: <b>Crack detection sensor layout and bus configuration analysis</b>, Nathan D. Sharp, Purdue Univ. (USA) and Los Alamos National Lab. (USA); Alan Kuntz, The Univ. of New Mexico (USA); Cole Brubaker, Colorado State Univ. (USA); Stephanie Amos, Georgia Institute of Technology (USA); Gautam Gupta, Wei Gao, Aditya Mohite, Charles R. Farrar, David L. Mascarenas, Los Alamos National Lab. (USA) . . . . . [9061-63]                      Coffee Break . . . Wed 10:00 am to 10:30 am</p>	<p><b>Session 8b</b></p> <p><b>Location: Pacific Salon Five</b>  <b>Wed 9:20 am to 10:00 am</b></p> <p><b>Robotic Platforms for Sensing</b>                      Session Chair: <b>Yang Wang</b>, Georgia Institute of Technology (USA)</p> <p>9:20 am: <b>Detection of functional states of a resident using sensor agent robot</b>, Sho Konno, Akira Mita, Keio Univ. (Japan) . . . . . [9061-64]</p> <p>9:40 am: <b>A novel human-machine interface for communicating the orientation of multicopters to human operators</b>, Enrique Sevillano, Los Alamos National Lab. (USA) and Univ. Politécnica de Madrid (Spain); Aaron Curtis, Charles R. Farrar, David L. Mascareñas, Los Alamos National Lab. (USA) . . . . . [9061-65]                      Coffee Break . . . Wed 10:00 am to 10:30 am</p>						

Conference 9055	Conference 9056	Conference 9057	Conference 9058		
<p style="text-align: center;"><b>Session 10</b></p> <p style="text-align: center;"><b>Location: Sunrise</b> <b>Wed 10:30 am to 11:20 am</b></p> <p style="text-align: center;"><b>Optics/Photonics II</b></p> <p>Session Chair: <b>Michael H. Bartl</b>, The Univ. of Utah (USA)</p> <p>10:30 am: <b>Waveguiding in nature</b> (<i>Invited Paper</i>), Vasudevan Lakshminarayanan, Univ. of Waterloo (Canada) . . . . . [9055-28]</p> <p>11:00 am: <b>Analysis of light-coupling efficiency of a solar cell with bioinspired pit texturing</b>, Francesco Chiadini, Univ. degli Studi di Salerno (Italy); Vincenzo Fiumara, Univ. degli Studi della Basilicata (Italy); Antonio Scaglione, Univ. degli Studi di Salerno (Italy); Akhlesh Lakhtakia, The Pennsylvania State Univ. (USA) . . [9055-29]</p> <p style="text-align: center;"><b>Session 11</b></p> <p style="text-align: center;"><b>Location: Sunrise</b> <b>Wed 11:20 am to 12:10 pm</b></p> <p style="text-align: center;"><b>Flight II</b></p> <p>Session Chair: <b>Vasudevan Lakshminarayanan</b>, Univ. of Waterloo (Canada)</p> <p>11:20 am: <b>Polymer based flapping-wing robotic insect: progress in design, fabrication, and characterization</b> (<i>Invited Paper</i>), Alexandre Bontemps, Thomas Vanneste, Univ. des Sciences et Technologies de Lille (France); Caroline Soyer, Sebastien Grondel, Eric Cattan, Univ. des Sciences et Technologies de Lille (France) and Univ. de Valenciennes et du Hainaut-Cambrésis (France). . . . [9055-30]</p> <p>11:50 am: <b>A three-dimensional iterative panel method and boundary layer model for bioinspired multi-body wings</b>, Christopher J. Blower, Adam M. Wickenheiser, The George Washington Univ. (USA) . . . . . [9055-31]</p> <p>Lunch Break . . . . Wed 12:10 pm to 2:00 pm</p>	<p style="text-align: center;"><b>Session 7a continued</b></p> <p>10:30 am: <b>Novel dielectric elastomer sensors for compression load detection</b> (<i>Invited Paper</i>), Holger Böse, Fraunhofer-Institut für Silicatforschung (Germany). . . . . [9056-39]</p> <p>11:10 am: <b>Bi-stable dielectric elastomer actuator</b>, Samuel Shian, Roger M. Diebold, David R. Clarke, Harvard Univ. (USA) . . . . . [9056-40]</p> <p>11:30 am: <b>Artificial muscles of dielectric elastomers attached to artificial tendons of functionalized carbon fibers</b>, Zhihang Ye, Shahnewaz Sabit Faisal, Ramazan Asmatulu, Zheng Chen, Wichita State Univ. (USA) . . . . . [9056-42]</p> <p>11:50 am: <b>Elastic dielectric composites: a microscopic field theory and applications</b>, Oscar Lopez-Pamies, Univ. of Illinois at Urbana-Champaign (USA) . . . . . [9056-43]</p> <p>Lunch/Exhibition Break . . . . . Wed 12:10 am to 1:20 pm</p>	<p style="text-align: center;"><b>Session 7b continued</b></p> <p>10:30 am: <b>Electromechanical sensing of ionic polymer metal composites</b>, Youngsu Cha, Filippo Cellini, Maurizio Porfiri, Polytechnic Institute of New York Univ. (USA) . . . . . [9056-45]</p> <p>10:50 am: <b>A holistic strain sensing approach</b>, Daniel Xu, Iain A. Anderson, The Univ. of Auckland (New Zealand) [9056-46]</p> <p>11:10 am: <b>Identification of the mechanical state of DEAP transducers based on integrated DEAP sensors</b>, Martin Griese, Thorben Hoffstadt, Jürgen Maas, Ostwestfalen-Lippe Univ. of Applied Sciences (Germany) . . . . . [9056-47]</p> <p>11:30 am: <b>Highly sensitive proximity and tactile sensor based on composite with dielectric elastomer and carbon microcoils</b>, Hyouk Ryeol Choi, Tien Dat Nguyen, Canh Toan Nguyen, DongHyuk Lee, Uikyum Kim, Choonghan Lee, Hoa Phung, Hyungpil Moon, Ja Choon Koo, Sungkyunkwan Univ. (Korea, Republic of) . . . . . [9056-48]</p> <p>Lunch/Exhibition Break . . . . . Wed 11:50 am to 1:20 pm</p>	<p style="text-align: center;"><b>Session 9a</b></p> <p style="text-align: center;"><b>Location: Royal Palm Five</b> <b>Wed 10:50 am to 12:10 pm</b></p> <p style="text-align: center;"><b>Aircraft, MAV/UAV, and Morphing Systems</b></p> <p>Session Chairs: <b>Ephraim Garcia</b>, Cornell Univ. (USA); <b>Farhan S. Gandhi</b>, Rensselaer Polytechnic Institute (USA)</p> <p>10:50 am: <b>Piezoelectric assisted smart satellite structure (PEASSS): an innovative low cost nano-satellite</b>, Haim Abramovich, Technion-Israel Institute of Technology (Israel); Daniel K. Rockberger, NSL Satellites Ltd. (Israel) . . . . . [9057-39]</p> <p>11:10 am: <b>Design, characterization, and testing of macro-fiber composite actuators for integration on a fixed-wing UAV</b>, Richard J. Prazenica, Daewon Kim, Hever Moncayo, Embry-Riddle Aeronautical Univ. (USA) . . . . . [9057-40]</p> <p>11:30 am: <b>Aeroelastic performance evaluation of flexure box morphing airfoil concept</b>, Alexander M. Pankonien, Daniel J. Inman, Univ. of Michigan (USA) . . [9057-41]</p> <p>11:50 am: <b>Variable stiffness cellular structures using pneumatic artificial muscles</b>, Michael E. Pontecorvo, Robert Niemiec, Farhan S. Gandhi, Rensselaer Polytechnic Institute (USA). . . . [9057-42]</p> <p>Lunch/Exhibition Break . . . . . Wed 12:10 pm to 1:40 pm</p>	<p style="text-align: center;"><b>Session 9b</b></p> <p style="text-align: center;"><b>Location: Towne</b> <b>Wed 10:50 am to 12:10 pm</b></p> <p style="text-align: center;"><b>Piezo-Based Materials and Systems</b></p> <p>Session Chairs: <b>Steve Southward</b>, Virginia Polytechnic Institute and State Univ. (USA); <b>JinHyeong Yoo</b>, U.S. Army Research Lab. (USA)</p> <p>10:50 am: <b>Inducing nonlinear structural dynamic response via piezoelectric circuitry integration</b>, Jiawen Xu, Jiong Tang, Univ. of Connecticut (USA). [9057-43]</p> <p>11:10 am: <b>Design and simulation of PZT-based MEMS piezoelectric sensors</b>, Doyle J. Baker, Casey A. Gonder, Frances Williams, Messaoud J. Bahoura, Norfolk State Univ. (USA); Oliver J. Myers, Mississippi State Univ. (USA) . . . [9057-44]</p> <p>11:30 am: <b>Vibration characteristics of a discal piezoelectric transducer with spiral interdigitated electrodes</b>, Chengliang Pan, Hefei Univ. of Technology (China); Wei-Hsin Liao, The Chinese Univ. of Hong Kong (Hong Kong, China); Yongbin Liu, Anhui Univ. (China) and Univ. of Science and Technology of China (China); Zhihua Feng, Univ. of Science and Technology of China (China) . . . . . [9057-45]</p> <p>11:50 am: <b>Experimental studies of a piezoelectric micropump using piezoelectric valves with annular boundary</b>, Chun-Peng Pan, Dai-Hua Wang, Chongqing Univ. (China) . . . . . [9057-46]</p> <p>Lunch/Exhibition Break . . . . . Wed 12:10 pm to 1:40 pm</p>	<p style="text-align: center;"><b>Session 9</b></p> <p style="text-align: center;"><b>Location: Sunset</b> <b>Wed 10:40 am to 12:40 pm</b></p> <p style="text-align: center;"><b>SMA Materials and Design</b></p> <p>Session Chairs: <b>Mohammad H. Elahinia</b>, The Univ. of Toledo (USA); <b>Constantin Ciocanel</b>, Northern Arizona Univ. (USA)</p> <p>10:40 am: <b>Thermal response of novel shape memory polymer: shape memory alloy hybrids</b>, Jonathan M. Rossiter, Univ. of Bristol (United Kingdom); Toshiharu Mukai, RIKEN (Japan); Kazuto Takashima, Kyushu Institute of Technology (Japan) . . . . . [9058-37]</p> <p>11:00 am: <b>Internal loops in torsional response of superelastic SMA wires: an experimental investigation</b>, Arun R. Srinivasa, Ashwin Rao, Annie Ruimi, Texas A&amp;M Univ. (USA). . . . . [9058-38]</p> <p>11:20 am: <b>A rate-dependent tension-torsion constitutive model for superelastic Nitinol under non-proportional</b>, Rasool Rahmandan, The Univ. of Toledo (USA) . . . . . [9058-39]</p> <p>11:40 am: <b>A three-species model for simulating torsional response of shape memory alloys</b>, Arun R. Srinivasa, Ashwin Rao, Texas A&amp;M Univ. (USA) . . [9058-40]</p> <p>12:00 pm: <b>Load bearing and stiffness tailored nitinol implants produced by additive manufacturing</b>, Mohammad H. Elahinia, Christoph Haberland, The Univ. of Toledo (USA) . . . . . [9058-41]</p> <p>12:20 pm: <b>Three dimensional magnetomechanical response of a NiMnGa magnetic shape memory alloy</b>, Constantin Ciocanel, Heidi P. Feigenbaum, Isaac D. Nelson, Douglas H. LaMaster, Northern Arizona Univ. (USA) . . . . . [9058-42]</p> <p>Conference End.</p>



Conference 9059	Conference 9060	Conference 9061		Conference 9063	Conference 9064
<p style="text-align: center;"><b>Session 1 continued</b></p> <p style="text-align: center;"><b>Location: Royal Palm Two</b></p> <p>10:50 am: <b>Displacement amplified synthetic jets</b>, Steven F. Griffin, Shawn Haar, Boeing LTS Inc. (USA); Edward A. Whalen, The Boeing Co. (USA) . . . . . [9059-3]</p> <p>11:10 am: <b>An overview of active flow control actuators and applications</b>, Daniel Brzozowski, Edward A. Whalen, The Boeing Co. (USA) . . . . . [9059-4]</p> <p>Lunch/Exhibition Break . . . . . Wed 11:30 am to 1:00 pm</p>	<p style="text-align: center;"><b>Session 12</b></p> <p style="text-align: center;"><b>Location: Royal Palm Three</b> <b>Wed 10:50 am to 12:30 pm</b></p> <p style="text-align: center;"><b>Fabrication and Characterization</b></p> <p>Session Chair: <b>Ajit Khosla</b>, Concordia Univ. (Canada)</p> <p>10:50 am: <b>3D printing of soft and wet systems benefit from hard-to-soft transition of transparent shape memory gels</b>, Hidemitsu Furukawa, Jin Gong, Masato Makino, Md. Hasnat Kabir, Yamagata Univ. (Japan) . . . . . [9060-33]</p> <p>11:10 am: <b>Material characterizations and electrical transport in Sn-, Se-, and Te-based binary/ternary semiconductors alloys and Schottky diodes</b>, Naresh Padha, Univ. of Jammu (India); Ajit Khosla, Concordia Univ. (Canada) . . . . . [9060-34]</p> <p>11:30 am: <b>CuIn0.81Al0.19Se2 materials and Schottky diodes for solar cell application</b> (<i>Invited Paper</i>), Naresh Padha, Univ. of Jammu (India); Chetan J. Panchal, The Maharaja Sayajirao Univ. of Baroda (India); Usha Parihar, Univ. of Jammu (India); Ajit Khosla, Concordia Univ. (Canada) . . . . . [9060-35]</p> <p>11:50 am: <b>Dielectric relaxation in Sr(Co1/3Nb2/3)O3 compound: a candidate for microwave applications</b> (<i>Invited Paper</i>), Chetan J. Panchal, P. K. Mehta, The Maharaja Sayajirao Univ. of Baroda (India) . . . . . [9060-36]</p> <p>12:10 pm: <b>Flexible printable electronics and sensors in engineering and medicine</b>, Vijay K. Varadan, Univ. of Arkansas (USA) . . . . . [9060-37]</p> <p>Lunch/Exhibition Break . . . . . Wed 12:30 pm to 1:30 pm</p>	<p>Concurrent Sessions</p> <hr/> <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p style="text-align: center;"><b>Session 9a</b></p> <p style="text-align: center;"><b>Location: Pacific Salon Seven</b> <b>Wed 10:30 am to 12:10 pm</b></p> <p style="text-align: center;"><b>Wireless Sensor Networks for SHM</b></p> <p>Session Chairs: <b>Haiying Huang</b>, The Univ. of Texas at Arlington (USA); <b>Yuequan Bao</b>, Harbin Institute of Technology (China)</p> <p>10:30 am: <b>Development of an extensible dual-core wireless sensing node for intelligent infrastructure monitoring and controls</b>, Michael Kane, Univ. of Michigan (USA); Dapeng Zhu, Georgia Institute of Technology (USA) and Univ. of Michigan (USA); Xinjun Dong, Georgia Institute of Technology (USA); Benjamin Winter, Michigan Technological Univ. (USA); Jerome P. Lynch, Univ. of Michigan (USA); Yang Wang, Georgia Institute of Technology (USA); R. Andrew Swartz, Michigan Technological Univ. (USA) . . . . . [9061-69]</p> <p>10:50 am: <b>Quasi-static self-powered sensing and data logging</b>, Nizar Lajnef, Shantanu Chakrabarty, Rigoberto Burgueno, Wassim Borchani, Michigan State Univ. (USA) . . . . . [9061-67]</p> <p>11:10 am: <b>Compressive sensing based wireless sensor for structural health monitoring</b>, Yuequan Bao, Zilong Zou, Hui Li, Harbin Institute of Technology (China) . . . . . [9061-68]</p> <p>11:30 am: <b>Dynamic interrogation of passive wireless antenna sensor</b>, Jun Yao, Saibun Tjijatja, Haiying Huang, The Univ. of Texas at Arlington (USA) . . . . . [9061-66]</p> <p>11:50 am: <b>Integrated wireless sensor network and real time smart controlling and monitoring system for efficient energy management in standalone photovoltaic systems</b>, Ali Abou-Elmour, Ajman Univ. of Science &amp; Technology (United Arab Emirates) . . . . . [9061-70]</p> <p>Lunch/Exhibition Break . . . . . Wed 12:10 pm to 2:20 pm</p> </div> <div style="width: 48%;"> <p style="text-align: center;"><b>Session 9b</b></p> <p style="text-align: center;"><b>Location: Pacific Salon Five</b> <b>Wed 10:30 am to 12:10 pm</b></p> <p style="text-align: center;"><b>Carbon Nanotube-Based Sensing</b></p> <p>Session Chairs: <b>Satish Nagarajaiah</b>, Rice Univ. (USA); <b>Jerome Peter Lynch</b>, Univ. of Michigan (USA)</p> <p>10:30 am: <b>Alignment and dispersion of functionalized carbon nanotubes in carbon fiber composites for enhanced sensing capabilities</b>, Yingtao Liu, Aditi Chattopadhyay, Arizona State Univ. (USA) . . . . . [9061-71]</p> <p>10:50 am: <b>Strain paint: non-contact strain measurement using single-walled carbon nanotube composite coatings</b>, Peng Sun, Ji Hoon Kim, Sergei Bachilo, Satish Nagarajaiah, R. Bruce Weisman, Rice Univ. (USA) . . . . . [9061-72]</p> <p>11:10 am: <b>The importance of interfacial resistance on the thermal behavior of CNF/epoxy composites</b>, Frank Gardea, Mohammad Naraghi, Dimitris C. Lagoudas, Texas A&amp;M Univ. (USA) . . . . . [9061-73]</p> <p>11:30 am: <b>Fabrication of single-walled carbon nanotube sensor arrays by laser-induced forward transfer</b>, Alexandra L. Palla-Papavlu, Paul Scherrer Institut (Switzerland) and National Institute for Lasers, Plasma and Radiation Physics (Romania); Maria Dinescu, National Institute for Lasers, Plasma and Radiation Physics (Romania); Thomas K. Lippert, Alexander J. Wokaun, Paul Scherrer Institut (Switzerland) [9061-74]</p> <p>11:50 am: <b>Lithographically patterned carbon nanotube thin films for distributed strain sensing</b>, Jerome P. Lynch, Andrew Burton, Univ. of Michigan (USA); Masahiro Kurata, Kyoto Univ. (Japan) . . . . . [9061-35]</p> <p>Lunch/Exhibition Break . . . . . Wed 12:10 pm to 1:40 pm</p> </div> </div>		<p style="text-align: center;"><b>Session 6 continued</b></p> <p>10:30 am: <b>Automated analysis of long-term bridge behavior using a cyber-enables wireless monitoring system</b>, Jerome P. Lynch, Sean O'Connor, Univ. of Michigan (USA) . . . . . [9063-33]</p> <p>10:50 am: <b>Multi-hazards monitoring of pin hangers</b>, Mohammed M. Ettouney, Weidlinger Associates, Inc. (USA); Sharada Alampalli, Prospect Solutions, LLC (USA); Sreenivas Alampalli, New York State Dept. of Transportation (USA) . . . . . [9063-34]</p> <p>11:10 am: <b>Bayesian risk monitoring of bridge components</b>, Mohammed M. Ettouney, Weidlinger Associates, Inc. (USA); Sharada Alampalli, Prospect Solutions, LLC (USA); Sreenivas Alampalli, New York State Dept. of Transportation (USA) . . . . . [9063-35]</p> <p>11:30 am: <b>Real-time estimation of the structural response using limited measured data</b>, Hassan Sederat, Iman Talebinejad, Abbas Emami-Naeini, David Falck, Gwendolyn W. van der Linden, Farid Nobari, Alex Krivotat, SC Solutions, Inc. (USA); Jerome P. Lynch, Univ. of Michigan (USA) . . . . . [9063-36]</p> <p>11:50 am: <b>Implementation of damage detection algorithms for the Alfred Zampa memorial suspension bridge</b>, Iman Talebinejad, Hassan Sederat, Abbas Emami-Naeini, Alex Krivotat, SC Solutions, Inc. (USA); Jerome P. Lynch, Univ. of Michigan (USA) . . . . . [9063-37]</p> <p>12:10 pm: <b>Vehicle-induced dynamic response of expansion joints in long span bridges</b>, Zhen Sun, Yufeng Zhang, Jiangsu Transportation Research Institute Co., Ltd. (China) . . . . . [9063-38]</p> <p>Lunch/Exhibition Break . . . . . Wed 12:30 pm to 2:00 pm</p>	<p style="text-align: center;"><b>Session 9</b></p> <p style="text-align: center;"><b>Location: Royal Palm Six</b> <b>Wed 10:30 am to 12:50 pm</b></p> <p style="text-align: center;"><b>Metamaterial II</b></p> <p>Session Chairs: <b>Guoliang Huang</b>, Univ. of Arkansas at Little Rock (USA); <b>Jihong Wen</b>, National Univ. of Defense Technology (China)</p> <p>10:30 am: <b>Active acoustic metamaterials with double negative effective density and elasticity using a fractional derivative controller</b>, Amr M. Baz, Univ. of Maryland, College Park (USA) . . . . . [9064-71]</p> <p>10:50 am: <b>Wave propagation in 2D and 3D magneto-elastic meta-structures</b>, Massimo Ruzzene, Marshall Schaeffer, Georgia Institute of Technology (USA) . . . . . [9064-72]</p> <p>11:10 am: <b>Acoustic metamaterial structures based on multi-frequency vibration absorbers</b>, Pengjin F. Pai, Univ. of Missouri-Columbia (USA) . . . . . [9064-73]</p> <p>11:30 am: <b>Vibration characteristics of metamaterial beams with periodic local resonances</b>, Amr M. Baz, Univ. of Maryland, College Park (USA) . . . . . [9064-74]</p> <p>11:50 am: <b>Flexural vibration band gap and stress concentration properties of periodic beam with functionally graded materials</b>, Jihong Wen, Dianlong Yu, Yong Xiao, Mingyao Yang, National Univ. of Defense Technology (China) . . . . . [9064-75]</p> <p>12:10 pm: <b>Elastic metamaterial beam with periodic arrays of beam-like resonators: theory and experiment</b>, Yong Xiao, Jihong Wen, Dianlong Yu, Xisen Wen, National Univ. of Defense Technology (China) . . . . . [9064-76]</p> <p>12:30 pm: <b>Grazing incidence modeling of a metamaterial-inspired dual-resonance acoustic liner</b>, Benjamin S. Beck, NASA Langley Research Ctr. (USA) . . . . . [9064-105]</p> <p>Lunch/Exhibition Break . . . . . Wed 12:50 pm to 2:00 pm</p>

## Conference 9055

### Panel Discussion: Biomimicry, Bioinspiration, and the San Diego Zoo

**Location: Sunrise  
2:15 pm to 3:30 pm**

SPIE and the SS/NDE symposium have partnered with the San Diego Zoo to promote the value of biomimicry as a paradigm for engineering research and practice. A representative from the San Diego Zoo will introduce the audience to an 'animal ambassador' and explain some of the remarkable features that can provide inspiration for the work of engineers and scientists. Panelists will discuss the current state of bioinspiration in the research lab., design challenges, and future solutions.

This panel is open for all attendees and will focus on all aspects of engineered biomimicry, including education, awareness, applications, research, and funding sources.

Panel Moderators: **Dr. Gabriel Miller**, Centre for Bioinspiration, San Diego Zoo Global (United States); **Raúl J. Martín-Palma**, Univ. Autónoma de Madrid (Spain)

Panelists include: **Joseph E. Jakes**, U.S. Forest Service (USA); **Mato Knez**, CIC nanoGUNE Consolider (Spain); **Tony J. Prescott**, The Univ. of Sheffield (United Kingdom); **Akira Saito**, Osaka Univ. (Japan); **Georg Studor**, NASA Johnson Space Ctr. (USA)

For more information about the San Diego Zoo's Biomimicry project, please visit their website: <http://www.sandiegozoo.org/conservation/biomimicry/>

Conference End.

## Conference 9056

### Concurrent Sessions

#### Session 8a

**Location: Town and Country  
Wed 1:20 pm to 3:00 pm**

### Energy Harvesting Using EAP IV

Session Chairs: **Holger Böse**, Fraunhofer-Institut für Silicatiforschung (Germany); **Oscar Lopez-Pamies**, Univ. of Illinois at Urbana-Champaign (USA)

1:20 pm: **The effect of converter efficiency on DEAP-based energy conversion: an overview and optimization method**, Rick C. L. van Kessel, SBM Offshore (Monaco) and Technische Univ. Delft (Netherlands); Pavol Bauer, Jan Abraham Ferreira, Technische Univ. Delft (Netherlands); Ambroise Wattiez, SBM Offshore (Monaco) . . . . . [9056-49]

1:40 pm: **DEAP-based energy harvesting using vortex induced vibrations**, Thorben Hoffstadt, Ostwestfalen-Lippe Univ. of Applied Sciences (Germany); Robert Heinze, Tim Wahl, Frank Kameier, Fachhochschule Düsseldorf (Germany); Jürgen Maas, Ostwestfalen-Lippe Univ. of Applied Sciences (Germany) . . . . . [9056-50]

2:00 pm: **Loading system and control electronics for equi-biaxial dielectric elastomer generator**, Claudio Luzzio, Marco Fontana, Rocco Vertechy, Scuola Superiore Sant'Anna (Italy) . . . . . [9056-51]

2:20 pm: **Hardware in the loop simulation of dielectric elastomer generator for wave energy harvesting**, Gastone Pietro Rosati Papini, Marco Fontana, Rocco Vertechy, Scuola Superiore Sant'Anna (Italy) [9056-52]

2:40 pm: **Energy scavenging strain absorber: application to kinetic dielectric elastomer generator**, Claire Jean-Mistral, Maxime Beaune, Institut National des Sciences Appliquées de Lyon (France); Thanh Vu-Cong, Alain Sylvestre, G2Elab (France) . . . . . [9056-53]

Coffee Break . . . . Wed 3:00 pm to 3:30 pm

#### Session 8b

**Location: Royal Palm One  
Wed 1:20 pm to 3:00 pm**

### Applications of EAP to Optics

Session Chairs: **Christoph Keplinger**, Harvard Univ. (USA); **Benjamin M. O'Brien**, StretchSense (New Zealand)

1:20 pm: **Beyond artificial muscle: bio-inspired transformative skin and microlens based on dielectric elastomers** (*Invited Paper*), Xuanhe Zhao, Duke Univ. (USA) . . . . . [9056-54]

2:00 pm: **Challenges of using dielectric elastomer actuators for eye-like-focus tunable lens**, Lau-Gih Keong, Thanh-Giang La, Li-Lynn Shiau, Adrian W. Y. Tan, Nanyang Technological Univ. (Singapore) . . . . . [9056-55]

2:20 pm: **Transparency-switching shape memory gels**, Jin Gong, Masanori Arai, Shota Murata, Md. Hasnat Kabir, Masato Makino, Hidemitsu Furukawa, Yamagata Univ. (Japan) . . . . . [9056-56]

2:40 pm: **Optical functionality of natural photonic structures on the transparent insect wings for bio-mimetic applications**, Pramod Kumar, Indian Institute of Science Education and Research (India) . . [9056-57]

Coffee Break . . . . Wed 3:00 pm to 3:30 pm

## Conference 9057

### Concurrent Sessions

#### Session 10a

**Location: Royal Palm Five  
Wed 1:40 pm to 3:00 pm**

### Energy Harvesting and Scavenging: Modeling

Session Chairs: **Amr M. Baz**, Univ. of Maryland, College Park (USA); **Yi-Chung Shu**, National Taiwan Univ. (Taiwan)

1:40 pm: **Modeling and enhancement of piezoelectric power extraction from one-dimensional bending waves**, Serife Tol, F. Levent Degertekin, Alper Erturk, Georgia Institute of Technology (USA) . . . [9057-47]

2:00 pm: **Finite element modeling of piezoelectric energy harvesters**, Yi-Chung Shu, P. H. Wu, National Taiwan Univ. (Taiwan) . . . . . [9057-48]

2:20 pm: **Novel model for arbitrary shape bistable piezoelectric-composite plates for vibration-based energy harvesting**, David N. Betts, Christopher R. Bowen, Univ. of Bath (United Kingdom); Daniel J. Inman, Univ. of Bristol (United Kingdom); Hyunsun A. Kim, Univ. of Bath (United Kingdom) . . . . . [9057-49]

2:40 pm: **Dielectric loss against piezoelectric power generation**, Junrui Liang, ShanghaiTech Univ. (China); Shuo Shi, Wei-Hsin Liao, The Chinese Univ. of Hong Kong (Hong Kong, China) . . [9057-50]

Coffee Break . . . . Wed 3:00 pm to 3:30 pm

#### Session 10b

**Location: Towne  
Wed 1:40 pm to 3:00 pm**

### SMA-Based Materials and Systems

Session Chairs: **Diann E. Brei**, Univ. of Michigan (USA); **Dimitris C. Lagoudas**, Texas A&M Univ. (USA)

1:40 pm: **Folding patterns and shape optimization using SMA-based self-folding laminates**, Edwin A. Peraza-Hernandez, Katherine R. Frei, Darren J. Hartl, Dimitris C. Lagoudas, Texas A&M Univ. (USA) . . . . . [9057-51]

2:00 pm: **Low-cost flexible Cu-based shape memory alloys**, Stian Ueland, Kinalco (USA); Vivek Dave, Kinalco (USA) and Kinalco (USA); Christopher Schuh, Massachusetts Institute of Technology (USA) . . . . . [9057-52]

2:20 pm: **Smart hybrid rotary damper**, Chuang-Sheng Walter Yang, Georgia Institute of Technology (USA) . . [9057-53]

2:40 pm: **Joining shape memory alloys to bismaleimide-based polymer matrix composites: an interfacial study**, Hieu Truong, Ozden Ochoa, Dimitris C. Lagoudas, Texas A&M Univ. (USA) . . . . . [9057-54]

Coffee Break . . Wed 3:00 pm to 3:30 pm

## Conference 9059

### Session 2

**Location: Royal Palm Two  
Wed 1:00 pm to 2:40 pm**

### Ultrasonic Additive Manufacturing

Session Chair: **Steven F. Griffin**, Boeing LTS Inc. (USA)

1:00 pm: **Stiffness tuning of FeGa structures manufactured by ultrasonic additive manufacturing**, Justin J. Scheidler, Marcelo J. Dapino, The Ohio State Univ. (USA) . . . . . [9059-7]

1:20 pm: **Ultrasonic additive manufacturing of smart structures** (*Invited Paper*), Marcelo J. Dapino, The Ohio State Univ. (USA) . . . . . [9059-5]

2:00 pm: **Interfacial shear strength estimates of NiTi-aluminum matrix composites fabricated via ultrasonic additive manufacturing**, Adam J. Hehr, Joshua D. Pritchard, Marcelo J. Dapino, The Ohio State Univ. (USA) . . . . [9059-6]

2:20 pm: **Optimal welding parameters for very high power ultrasonic additive manufacturing of smart structures with aluminum 6061 matrix**, Paul J. Wolcott, Adam J. Hehr, Marcelo J. Dapino, The Ohio State Univ. (USA) . . . . . [9059-8]

Conference 9060	Conference 9061	Conference 9063	Conference 9064
<p style="text-align: center;"><b>Session 13</b></p> <p><b>Location: Royal Palm Three</b> Wed 1:30 pm to 2:10 pm</p> <p><b>Keynote Session VI</b> Session Chair: <b>Sang H. Choi</b>, NASA Langley Research Ctr. (USA)</p> <p>1:30 pm: <b>Principle and applications of micro-spectrometers</b> (<i>Keynote Presentation</i>), Yeonjoon Park, National Institute of Aerospace (USA); Sang H. Choi, NASA Langley Research Ctr. (USA); Hargsoon Yoon, Norfolk State Univ. (USA); Uhn Lee M.D., Gachon Univ. Gil Medical Ctr. (Korea, Republic of) ..... [9060-38]</p> <p style="text-align: center;"><b>Session 14</b></p> <p><b>Location: Royal Palm Three</b> Wed 2:10 pm to 3:20 pm</p> <p><b>Nanocomposites and Actuators</b> Session Chair: <b>Su-Yeon Kim</b>, Inha Univ. (Korea, Republic of)</p> <p>2:10 pm: <b>Cellulose-based soft gel like actuator for reconfigurable lens array</b> (<i>Invited Paper</i>), Kishore Kumar, Inha Univ (Korea, Republic of); Mithilesh Yadav, Xiaoyuan Gao, Inha Univ. (Korea, Republic of); Seongcheol Mun, Inha Univ (Korea, Republic of); Jaehwan Kim, Inha Univ. (Korea, Republic of) [9060-39]</p> <p>2:40 pm: <b>Transparent and flexible haptic array actuator made with cellulose acetate for tactile sensation</b>, Md. Mohiuddin, Hyun-Chan Kim, Inha Univ. (Korea, Republic of); Sang-Yeon Kim, Korea Univ. of Technology and Education (Korea, Republic of); Jaehwan Kim, Inha Univ. (Korea, Republic of) ..... [9060-40]</p> <p>3:00 pm: <b>PZT-actuated, 2D optical scanning image acquisition</b> (<i>Invited Paper</i>), Wei-Chih Wang, Univ. of Washington (USA) ..... [9060-41]</p> <p>Coffee Break. .... Wed 3:20 pm to 3:40 pm</p>	<p style="text-align: center;">Concurrent Sessions</p> <hr/> <div style="display: flex; justify-content: space-between;"> <div style="width: 48%; vertical-align: top; padding: 5px;"> <p style="text-align: center;"><b>Session 10a</b></p> <p><b>Location: Pacific Salon Seven</b> Wed 2:20 pm to 3:00 pm</p> <p><b>Fiber Optic-Based Sensing Methods I</b> Session Chairs: <b>Ying Huang</b>, North Dakota State Univ. (USA); <b>Branko Glisic</b>, Princeton Univ. (USA)</p> <p>2:20 pm: <b>Optical fibre Raman spectroscopy: a potential system for monitoring the durability of concrete structures</b>, Yun Bai, Yanfei Yue, Univ. College London (United Kingdom); P. A. Muhammed Basheer, Queen's Univ. Belfast (United Kingdom); John J. Boland, Jing Jing Wang, Trinity College Dublin (Ireland). .... [9061-76]</p> <p>2:40 pm: <b>Fiber optic sensing system for in-situ simultaneous monitoring of water stage, quality, and temperature</b>, Ying Huang, North Dakota State Univ. (USA) ..... [9061-77]</p> <p>Coffee Break. .... Wed 3:00 pm to 3:30 pm</p> </div> <div style="width: 48%; vertical-align: top; padding: 5px;"> <p style="text-align: center;"><b>Session 10b</b></p> <p><b>Location: Pacific Salon Five</b> Wed 1:40 pm to 3:00 pm</p> <p><b>Multifunctional Material Sensors</b> Session Chairs: <b>Faramarz Gordaninejad</b>, Univ. of Nevada, Reno (USA); <b>Yingzi Lin</b>, Northeastern Univ. (USA)</p> <p>1:40 pm: <b>Strain and damage self-sensing cement composites with conductive graphene nanoplatelet</b>, Sze Dai Pang, Hongjian Du, Ser Tong Quek, National Univ. of Singapore (Singapore) ..... [9061-80]</p> <p>2:00 pm: <b>The poling of PVDF matrix composites for integrated structural load sensing</b>, Ghazaleh Haghashtiani, Michael A. Greminger, Ping Zhao, Univ. of Minnesota, Duluth (USA) ..... [9061-81]</p> <p>2:20 pm: <b>Development of micro-sized slip sensors using dielectric elastomer for incipient slippage</b>, Ja Choon Koo, Do-Yeon Hwang, Baek-chul Kim, Han Joung Cho, Zhengyuan Li, Hyungpil Moon, Hyouk Ryeol Choi, Sungkyunkwan Univ. (Korea, Republic of) ..... [9061-82]</p> <p>2:40 pm: <b>Morphing electro-adhesive interface to manipulate uncooperative objects</b>, Livia Savioli, Francesco Branz, Alessandro Francesconi, Univ. degli Studi di Padova (Italy). .... [9061-83]</p> <p>Coffee Break. .... Wed 3:00 pm to 3:30 pm</p> </div> </div>	<p style="text-align: center;"><b>Session 7</b></p> <p><b>Location: Royal Palm Four</b> Wed 2:00 pm to 3:00 pm</p> <p><b>Piezoelectric Sensing Technologies for SHM/NDE</b> Session Chairs: <b>Valery F. Godinez-Azcuaga</b>, MISTRAS Group, Inc. (USA); <b>Yan Wan</b>, Univ. of North Texas (USA)</p> <p>2:00 pm: <b>Numerical analysis of PZT rebar active sensing system for structural health monitoring of RC structure</b>, Fan Wu, Yuan Yi, Wan Jun Li, Shanghai Jiao Tong Univ. (China) ..... [9063-39]</p> <p>2:20 pm: <b>Damage localization by active guided waves utilizing reflection and scattering features</b>, Hwee Kwon Jung, HyeJin Jo, Gyuhae Park, Chonnam National Univ. (Korea, Republic of) ..... [9063-40]</p> <p>2:40 pm: <b>Early-age concrete strength estimation based on piezoelectric sensor using artificial neural network</b>, Junkyeong Kim, Ju-Won Kim, Changgil Lee, Seunghee Park, Sungkyunkwan Univ. (Korea, Republic of) ..... [9063-41]</p> <p>Coffee Break. .... Wed 3:00 pm to 3:30 pm</p>	<p style="text-align: center;"><b>Session 10</b></p> <p><b>Location: Royal Palm Six</b> Wed 2:00 pm to 3:00 pm</p> <p><b>Guided Waves for SHM in Aerospace Applications I</b> Session Chairs: <b>Hoon Sohn</b>, KAIST (Korea, Republic of); <b>Sourav Banerjee</b>, Univ. of South Carolina (USA)</p> <p>2:00 pm: <b>Damage location by ultrasonic Lamb waves and piezoelectric rosettes</b>, Piotr Kijanka, AGH Univ. of Science and Technology (Poland); Arun Manohar, Francesco Lanza di Scalea, Univ. of California, San Diego (USA); Wieslaw J. Staszewski, AGH Univ. of Science and Technology (Poland) ..... [9064-77]</p> <p>2:20 pm: <b>Guided wave interaction with defects in isotropic and composite plates</b>, Matthew B. Obenchain, Carlos E. S. Cesnik, Univ. of Michigan (USA) ..... [9064-78]</p> <p>2:40 pm: <b>Lamb wave-based damage detection using matching pursuit and support vector machine classifier</b>, Sushant Agarwal, Mira Mitra, Indian Institute of Technology Bombay (India) ..... [9064-79]</p> <p>Coffee Break. .... Wed 3:00 pm to 3:30 pm</p>

## Conference 9056

### Concurrent Sessions

#### Session 9a

**Location: Town and Country**  
Wed 3:30 pm to 5:50 pm

#### **Dielectric Elastomers EAP III**

Session Chairs: **Hyouk Ryeol Choi**, Sungkyunkwan Univ. (Korea, Republic of); **Xuanhe Zhao**, Duke Univ. (USA)

3:30 pm: **Dielectric elastomer cantilever beam sensor**, Na Ni, Ling Zhang, Jinxiong Zhou, Yin Wang, Fan Liu, Xi'an Jiaotong Univ. (China) . . . . . [9056-58]

3:50 pm: **Parallel input parallel output high voltage bi-directional converters for driving dielectric electro active polymer actuators**, Prasanth Thummala, Zhe Zhang, Michael A. E. Andersen, Technical Univ. of Denmark (Denmark); Rahimullah Sarban, Danfoss PolyPower A/S (Denmark) . . . . . [9056-59]

4:10 pm: **Aluminum nanoparticle/acrylate copolymer nanocomposites for dielectric elastomers with high dielectric constants**, Wei Hu, Suki N. Zhang, Xiaofan Niu, Qibing Pei, Univ. of California, Los Angeles (USA) . . . . . [9056-60]

4:30 pm: **How does static stretching decreases the dielectric constant of VHB 4910 elastomer?**, Thanh Vu-Cong, Ngoc Nguyen-Thi, G2Elab (France); Claire Jean-Mistral, Institut National des Sciences Appliquées de Lyon (France); Alain Sylvestre, G2Elab (France) . . . . . [9056-61]

4:50 pm: **Periodic compression of small cell cultures: harnessing stress in passive regions of dielectric elastomer actuators**, Alexandre Poulin, Samuel Rosset, Herbert R. Shea, Ecole Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [9056-62]

5:10 pm: **Model-based optimization of DEAP-roll-actuators with a polymer core**, Thorben Hoffstadt, Jürgen Maas, Ostwestfalen-Lippe Univ. of Applied Sciences (Germany) . . . . . [9056-63]

5:30 pm: **Open-access dielectric elastomer property database**, George Stiubianu, Petru Poni Institute of Macromolecular Chemistry (Romania); Rocco Vertechy, Marco Fontana, Scuola Superiore Sant'Anna (Italy); Maria Cazacu, Petru Poni Institute of Macromolecular Chemistry (Romania) . . . . . [9056-64]

#### Session 9b

**Location: Royal Palm One**  
Wed 3:30 pm to 5:50 pm

#### **Conducting Polymers and IMPC**

Session Chairs: **Frédéric Vidal**, Univ. de Cergy-Pontoise (France); **Holger Böse**, Fraunhofer-Institut für Silicatforschung (Germany)

3:30 pm: **On the geometrical and mechanical multi-aspect optimization of PPy/MWCNT actuators**, Nazanin Khalili, Hani E. Naguib, Roy H. Kwon, Univ. of Toronto (Canada) . . . . . [9056-65]

3:50 pm: **Non-linear time variant model of PPy-based actuator**, Meisam Farajollahi, The Univ. of British Columbia (Canada) . . . . . [9056-66]

4:10 pm: **Robust control of a trilayer conducting polymer actuator**, Mehmet Itik, Karadeniz Teknik Univ. (Turkey); Fatma D. Ulker, Massachusetts Institute of Technology (USA); Gursel Alici, Univ. of Wollongong (Australia) . . . . . [9056-67]

4:30 pm: **Carbon-derived carbon (CDC) linear actuator properties in combination with conducting polymers**, Rudolf Kiefer, Univ. of Tartu (Estonia); Nihan Aydemir, The Univ. of Auckland (New Zealand); Janno Torop, Friedrich Kaasik, Univ. of Tartu (Estonia); Jadranka Travas-Sejdic, The Univ. of Auckland (New Zealand); Alvo Aabloo, Univ. of Tartu (Estonia) . . . . . [9056-68]

4:50 pm: **Development, analysis, and comparison of electromechanical properties of Buckypaper IPMC actuator**, Balaji Sivasubramanian, Daewon Kim, Embry-Riddle Aeronautical Univ. (USA) . . . . . [9056-69]

5:10 pm: **Buckling of an ionic polymer metal composite shell under uniaxial compression**, Linfeng Shen, Youngsu Cha, Adel Shams, Maurizio Porfiri, Polytechnic Institute of New York Univ. (USA) . . . . . [9056-70]

5:30 pm: **Force control of ionic polymer-metal composite actuators with carbon-based electrodes**, Veiko Vunder, Univ. of Tartu (Estonia); Mehmet Itik, Karadeniz Teknik Univ. (Turkey); Andres Punning, Alvo Aabloo, Univ. of Tartu (Estonia) . . . . . [9056-71]

## Conference 9057

### Concurrent Sessions

#### Session 11a

**Location: Royal Palm Five**  
Wed 3:30 pm to 5:30 pm

#### **Modeling, Simulation, Optimization, Signal Processing, Control, and Design of Integrated Systems I**

Session Chairs: **Nam Seo Goo**, Konkuk Univ. (Korea, Republic of); **C. W. Lim**, City Univ. of Hong Kong (Hong Kong, China)

3:30 pm: **Design considerations for small-scale wind energy harvesters driven by broadband vortex-induced vibrations**, Benjamin Paxson, Adam M. Wickenheiser, The George Washington Univ. (USA) . . . . . [9057-118]

3:50 pm: **Active healing of delaminated composite structure using piezoelectric actuator**, Jung Woo Sohn, Kumoh National Institute of Technology (Korea, Republic of); Heung Soo Kim, Dongguk Univ. (Korea, Republic of) . . . . . [9057-56]

4:10 pm: **Design of acoustic lenses by means of granular chains**, Kaiyuan Li, Piervincenzo Rizzo, Univ. of Pittsburgh (USA); Xiangli Ni, INTECSEA (USA) . . . . . [9057-57]

4:30 pm: **Implementation of modified positive velocity feedback controller for active vibration control in smart structures**, Ehsan Omid, S. Nima Mahmoodi, The Univ. of Alabama (USA) [9057-58]

4:50 pm: **Design of acoustic waveguides using multiresolution topology optimization**, Sandro L. Vatanabe, Emilio Carlos N. Silva, Univ. de São Paulo (Brazil) . . . . . [9057-59]

5:10 pm: **Implementation of a modal disturbance estimator for vibration suppression**, Simone Cinquemani, Gabriele Cazzulani, Ferruccio Resta, Francesco Ripamonti, Politecnico di Milano (Italy) . . . . . [9057-60]

#### Session 11b

**Location: Royal Palm Five**  
Wed 3:30 pm to 5:30 pm

#### **Passive and Active Vibration Isolation Systems II**

Session Chairs: **Jiong Tang**, Univ. of Connecticut (USA); **Andres F. Arrieta**, ETH Zürich (Switzerland)

3:30 pm: **Broadband sound attenuation on a periodic array of rectangular profile holes in plate**, Rayisa P. Moiseyenko, Yan Pennec, Univ. des Sciences et Technologies de Lille (France); Rémi Marchal, Bernard Bonello, Univ. Pierre et Marie Curie (France); Bahram Djafari-Rouhani, Univ. des Sciences et Technologies de Lille (France) . . . . . [9057-61]

3:50 pm: **Semi-active vibration control of a flexible space structure using MFC actuators**, Hongji Ji, Jinhao Qiu, Hong Nie, Nanjing Univ. of Aeronautics and Astronautics (China); Li Cheng, The Hong Kong Polytechnic Univ. (China) . . . . . [9057-62]

4:10 pm: **A study on vibration control method of building structure using macro-fiber composite**, Hitoshi Matsushita, Hirokazu Yoshioka, Yoshinori Takahashi, Takenaka Corp. (Japan) . . . . . [9057-63]

4:30 pm: **Optimal synthesis of passive adaptive structural networks for damping and stiffness improvement**, Soobum Lee, Univ. of Maryland, Baltimore County (USA); Fabio Semperlotti, Univ. of Notre Dame (USA) . . . . . [9057-64]

4:50 pm: **An optimal approach in negative derivative feedback control gain synthesis**, Francesco Ripamonti, Ferruccio Resta, Flavio Cola, Politecnico di Milano (Italy) . . . . . [9057-65]

5:10 pm: **Seismic responses of asymmetric reinforce concrete framed structures equipped with viscous wall dampers**, Farzad Hejazi, Alireza Zabihi, Ali Toussi, Mohd Saleh Jaafar, Univ. Putra Malaysia (Malaysia) . . . . . [9057-66]

## Conference 9059

### Session 3

**Location: Royal Palm Two**  
Wed 2:40 pm to 4:10 pm

#### **Smart Systems: Enabling Technologies**

Session Chairs: **Gyuhae Park**, Chonnam National Univ. (Korea, Republic of); **Alan L. Browne**, General Motors Corp. (USA)

2:40 pm: **Piezoelectric-based electrical energy harvesting and storage methods and electronics for munitions**, Jahangir S. Rastegar, Omnitek Partners, LLC (USA); Carlos M. Pereira, U.S. Army Armament Research, Development and Engineering Ctr. (USA); Matthew H. Ervin, U.S. Army Research Lab. (USA); Dake Feng, Omnitek Partners, LLC (USA) . . . . . [9059-9]

Coffee Break . . . . . Wed 3:00 pm to 3:30 pm

3:30 pm: **Preparation and characterization of thick films PU/PZT for energy harvesting**, Christian Courtois, Univ. de Valenciennes et du Hainaut-Cambresis (France); Abdelwahed Hajjaji, Univ. Chouaib Doukkali (Morocco); Mohamed Rguiti, Sophie d'Astorg, Anne Leriche, Univ. de Valenciennes et du Hainaut-Cambresis (France) . . [9059-10]

3:50 pm: **Power optimization technique using frequency tuning concept for cantilever piezoelectric energy harvester**, Abhay M. Khalatkar, Vijay Kumar Gupta, PDPM IIITDM Jabalpur (India) [9059-11]

### Session 4

**Location: Royal Palm Two**  
Wed 4:10 pm to 6:10 pm

#### **Smart Systems: Examples**

Session Chair: **Kevin M. Farinholt**, Luna Innovations Inc. (USA)

4:10 pm: **Model for friction and wear reduction through piezoelectrically-assisted ultrasonic lubrication**, Sheng Dong, Marcelo J. Dapino, The Ohio State Univ. (USA) . . . . . [9059-12]

4:30 pm: **Application of active camber morphing concept based on compliant structures to a regional aircraft**, Sergio Ricci, Alessandro De Gaspari, Politecnico di Milano (Italy) . . . . . [9059-13]

4:50 pm: **Damper-controlled switch for SMA motion smoothing**, Clover Aguayo, Brent A. Utter, Jonathan E. Luntz, Diann E. Brei, Univ. of Michigan (USA) . . . . . [9059-22]

5:10 pm: **A study on dynamics of submerged pipe with side supports and flange**, Hwee Kwon Jung, Gyuhae Park, Jang Won Seo, Chonnam National Univ. (Korea, Republic of) . . . . . [9059-14]

5:30 pm: **Epoxy microcrack density tracking in composite overwrapped pressure vessels using embedded FBGs**, Scott M. Strutner, Univ. of California, Los Angeles (USA); Francisco Pena, California State Univ., Los Angeles (USA); Anthony Piazza, Allen R. Parker Jr., W. Lance Richards, NASA Dryden Flight Research Ctr. (USA); Gregory P. Carman, Univ. of California, Los Angeles (USA) . . . . . [9059-15]

5:50 pm: **Evaluation of embedded FBGs in composite overwrapped pressure vessels for strain based structural health monitoring**, Francisco Pena, California State Univ., Los Angeles (USA); Scott M. Strutner, Univ. of California, Los Angeles (USA); W. Lance Richards, Anthony Piazza, Allen R. Parker Jr., NASA Dryden Flight Research Ctr. (USA) . . . . . [9059-16]

Conference End.

Conference 9060	Conference 9061	Conference 9063	Conference 9064
<p style="text-align: center;"><b>Session 15</b></p> <p style="text-align: center;"><b>Location: Royal Palm Three Wed 3:40 pm to 6:00 pm</b></p> <p style="text-align: center;"><b>Microwave, RF, Metamaterials, and Optical Applications</b></p> <p>Session Chair: <b>Vijay K. Varadan</b>, Univ. of Arkansas (USA)</p> <p>3:40 pm: <b>Development of electrical impedance tomography for microwave ablation</b> (<i>Invited Paper</i>), Alistair L. McEwan, The Univ. of Sydney (Australia); Doan Trang Nguyen, Peter Jones, The Univ. of New South Wales (Australia); Vincent Lam, Wayne Hawthorne, Michael Anthony Barry, Westmead Hospital (Australia); Tong In Oh, Kyung Hee Univ. (Korea, Republic of) . . . . . [9060-42]</p> <p>4:10 pm: <b>Parylene-C passivation and effects on rectennas' wireless power transfer performance</b>, Kyo D. Song, Camille Cooper, Keisharra Eldridge, Darryl W. Scott, Min H. Kim, Hargsoon Yoon, Norfolk State Univ. (USA); Jaehwan Kim, Inha Univ. (Korea, Republic of) . . . . . [9060-43]</p> <p>4:30 pm: <b>Efficient RF energy harvesting by using a fractal structured rectenna system</b>, Sechang Oh, Mouli Ramasamy, Vijay K. Varadan, Univ. of Arkansas (USA) . . . . . [9060-44]</p> <p>4:50 pm: <b>3D scanning of internal structure in gel engineering materials with visible scanning microscopic light scattering</b>, Yosuke Watanabe, Jin Gong, Masato Makino, Md. Hasnat Kabir, Hidemitsu Furukawa, Yamagata Univ. (Japan) . . . . . [9060-45]</p> <p>5:10 pm: <b>Yttrium oxide-based three-dimensional metamaterials for visible light cloaking</b>, Pratyush Rai, Prashanth S. Kumar, Vijay K. Varadan, Univ. of Arkansas (USA); Paul B. Ruffin, U.S. Army Research, Development and Engineering Command (USA); Christina L. Brantley, US Army RDECOM (USA) and US Army Research, Development and Engineering Command (USA); Eugene Edwards, U.S. Army Research, Development and Engineering Command (USA) . . . . . [9060-46]</p> <p>5:30 pm: <b>Studies of ZrO<sub>2</sub> electrolyte thin film thickness on the all-solid-thin film electrochromic devices</b> (<i>Invited Paper</i>), Chetan J. Panchal, The Maharaja Sayajirao Univ. of Baroda (India); Keyur J. Patel, Science and Humanities Department, BITS Education campus, (India); Mukesh S. Desai, Prashant K. Mehta, The M.S. University of Baroda (India); I Yu Protosenko, Sumy State University (Ukraine); Ajit Khosla, Concordia Univ. (Canada) . . . . . [9060-47]</p> <p>Conference End.</p>	<p style="text-align: center;">Concurrent Sessions</p> <hr/> <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p style="text-align: center;"><b>Session 11a</b></p> <p style="text-align: center;"><b>Location: Pacific Salon Seven Wed 3:30 pm to 5:30 pm</b></p> <p style="text-align: center;"><b>ID and Health Monitoring of Civil Structures</b></p> <p>Session Chairs: <b>Chin-Hsiung Loh</b>, National Taiwan Univ. (Taiwan); <b>Daniele Zonta</b>, Univ. degli Studi di Trento (Italy)</p> <p>3:30 pm: <b>Analyzing the dynamic response of rotating blades in small-scale wind turbines</b>, Wan-Ying Hsiung, Yu-Ting Huang, Chin-Hsiung Loh, National Taiwan Univ. (Taiwan); Kenneth J. Loh, Robert J. Karnisky, Danny Nip, Cornelis P. van Dam, Univ. of California, Davis (USA) . . . . . [9061-84]</p> <p>3:50 pm: <b>On estimating the accuracy of monitoring methods using Bayesian error propagation technique</b>, Carlo Cappello, Daniele Zonta, Univ. degli Studi di Trento (Italy); Matteo Pozzi, Carnegie Mellon Univ. (USA) . . . . . [9061-86]</p> <p>4:10 pm: <b>Wireless sensing based bridge decentralized condition monitoring</b>, Zhi Sun, Baolong Zhou, Tongji Univ. (China) . . . . . [9061-87]</p> <p>4:30 pm: <b>Global assessment of a cable-stayed bridge model using SNLSE approach</b>, Hongwei Huang, Yisha Sun, Tongji Univ. (China); Jann N. Yang, Univ. of California, Irvine (USA) . . . . . [9061-88]</p> <p>4:50 pm: <b>Cyber-physical system for building structures using a flexibility-based damage detection method</b>, Rosana Martinez-Castro, Edward Eskew, Shinae Jang, Univ. of Connecticut (USA) . . . . . [9061-89]</p> <p>5:10 pm: <b>Substructure parameter estimation for shear structures with limited measurements and unknown structural mass</b>, Dongyu Zhang, Hui Li, Harbin Institute of Technology (China) . . . . . [9061-90]</p> </div> <div style="width: 48%;"> <p style="text-align: center;"><b>Session 11b</b></p> <p style="text-align: center;"><b>Location: Pacific Salon Five Wed 3:30 pm to 6:10 pm</b></p> <p style="text-align: center;"><b>Next-Generation Sensor and Technologies</b></p> <p>Session Chairs: <b>Didem Ozevin</b>, Univ. of Illinois at Chicago (USA); <b>Shantanu Chakrabarty</b>, Michigan State Univ. (USA)</p> <p>3:30 pm: <b>Numerical and experimental characterizations of piezoresistive MEMS strain sensors</b>, Hossain Saboonchi, Didem Ozevin, Univ. of Illinois at Chicago (USA) . . . . . [9061-91]</p> <p>3:50 pm: <b>Very low frequency/high sensitivity triaxial monolithic inertial sensor</b>, Fabrizio Barone, Fausto Acernese, Univ. degli Studi di Salerno (Italy); Rosario De Rosa, Univ. degli Studi di Napoli Federico II (Italy); Gerardo Giordano, Rocco Romano, Univ. degli Studi di Salerno (Italy) . . . . . [9061-92]</p> <p>4:10 pm: <b>The model and scale factor of a MEMS vibratory rotation rate sensor</b>, S. A. M. Lajimi, G. Heppler, Univ. of Waterloo (Canada) . . . . . [9061-93]</p> <p>4:30 pm: <b>Compressive Piezo-floating-gate sensors for self-powered sensing of wide-dynamic-range mechanical events</b>, Shantanu Chakrabarty, Nizar Lajnef, Michigan State Univ. (USA) . . . . . [9061-94]</p> <p>4:50 pm: <b>Development of metamaterial based low cost passive wireless temperature sensor</b>, Hasanul Karim, Mohammad Arif I. Shuvo, Diego Delfin, Raymond C. Rumpf, Ahsan Choudhuri, Yirong Lin, The Univ. of Texas at El Paso (USA) . . . . . [9061-95]</p> <p>5:10 pm: <b>Investigation of a novel two dimensional photonic crystal sensor using microcantilever embedded with nano-ring resonators</b>, Longqiu Li, Tianlong Li, Wenping Song, Guangyu Zhang, Yao Li, Harbin Institute of Technology (China) . . . . . [9061-96]</p> <p>5:30 pm: <b>Capacitance-based damage detection sensing for aerospace structural composites</b>, Poyan Bahrami, Namiko Yamamoto, Jet Propulsion Lab. (USA) and California Institute of Technology (USA); Yong Chen, Univ. of California, Los Angeles (USA); Harish M. Manohara, Jet Propulsion Lab. (USA) . . . . . [9061-97]</p> <p>5:50 pm: <b>Optimal design of a mechanically decoupled six-axis force/torque sensor based on the principal cross coupling minimization</b>, Min-Kyung Kang, Yonsei Univ. (Korea, Republic of); Soobum Lee, Univ. of Maryland, Baltimore County (USA); Jung-Hoon Kim, Yonsei Univ. (Korea, Republic of) . . . . . [9061-98]</p> </div> </div>	<p style="text-align: center;"><b>Session 8</b></p> <p style="text-align: center;"><b>Location: Royal Palm Four Wed 3:30 pm to 5:50 pm</b></p> <p style="text-align: center;"><b>Radar and Microwave NDE Technologies</b></p> <p>Session Chairs: <b>Tzu-Yang Yu</b>, Univ. of Massachusetts Lowell (USA); <b>Dryver R. Huston</b>, The Univ. of Vermont (USA)</p> <p>3:30 pm: <b>Phased array and nonlinear penetrating radar for concrete inspection</b>, Dryver R. Huston, Dylan Burns, Jonathan Razinger, The Univ. of Vermont (United States) . . . . . [9063-42]</p> <p>3:50 pm: <b>Advanced signal processing method for ground penetrating radar feature detection and enhancement</b>, Tian Xia, The Univ. of Vermont (USA) . . . . . [9063-43]</p> <p>4:10 pm: <b>Assessment of various methods for evaluating ground penetrating radar (GPR) data of concrete bridge decks</b>, Kien Dinh, Tarek Zayed, Concordia Univ. (Canada); Alexander Tarussov, Détection RadEX Inc. (Canada) . . . . . [9063-44]</p> <p>4:30 pm: <b>Noising analysis of synthetic aperture radar images using discrete wavelet transform for the radar NDE of concrete specimens</b>, Tzu-Yang Yu, Univ. of Massachusetts Lowell (USA) . . . . . [9063-45]</p> <p>4:50 pm: <b>Dielectric modeling of cementitious specimens using an open-ended coaxial probe in the frequency range of 0.5GHz to 4.5 GHz</b>, Jones Owusu Twumasi, Tzu-Yang Yu, Univ. of Massachusetts Lowell (USA) . . . . . [9063-46]</p> <p>5:10 pm: <b>Modeling the x-ray process and x-ray flaw size parameter for probability of detection studies</b>, Ajay M. Koshti, NASA Johnson Space Ctr. (USA) . . . . . [9063-47]</p> <p>5:30 pm: <b>Distributed point source method for the modeling of a three-dimensional eddy current NDE problem</b>, Thierry Bore, Dominique Placko, Pierre-Yves Joubert, Ecole Normale Supérieure de Cachan (France) . . . . . [9063-48]</p>	<p style="text-align: center;"><b>Session 11</b></p> <p style="text-align: center;"><b>Location: Royal Palm Six Wed 3:30 pm to 5:30 pm</b></p> <p style="text-align: center;"><b>Guided Waves for SHM in Aerospace Applications II</b></p> <p>Session Chairs: <b>Francesco Lanza di Scalea</b>, Univ. of California, San Diego (USA); <b>Hoon Sohn</b>, KAIST (Korea, Republic of)</p> <p>3:30 pm: <b>Ultrasonic monitoring suitable for the detection of loose joints and cracks in aircraft structures</b>, Wolfgang Grill, ASI Analog Speed Instruments GmbH (Germany) . . . . . [9064-80]</p> <p>3:50 pm: <b>Guided ultrasonic waves for the monitoring of hidden fatigue crack growth in multi-layer aerospace structures</b>, Erik Kostson, Isabelle Najjarre, Paul Fromme, Univ. College London (United Kingdom) . . . . . [9064-81]</p> <p>4:10 pm: <b>Approaches to hybrid SHM and NDE of composite aerospace structures</b>, Jennifer E. Michaels, Thomas E. Michaels, Massimo Ruzzene, Georgia Institute of Technology (USA) . . . . . [9064-82]</p> <p>4:30 pm: <b>Monitoring bolt torque levels through signal processing of full-field ultrasonic data</b>, Colin Haynes, Michael D. Todd, Univ. of California, San Diego (USA) . . . . . [9064-83]</p> <p>4:50 pm: <b>A data fusion approach to detect the onset of damage in aerospace components</b>, Prashanth Abraham Vanniampambal, Jefferson Cuadra, Matteo Mazzotti, Ivan Bartoli, Antonios Kontsos, Kavan Hazeli, Drexel Univ. (USA) . . . . . [9064-84]</p> <p>5:10 pm: <b>2D aperture synthesis for Lamb wave imaging using co-arrays</b>, Lukasz Ambrozinski, Tadeusz Stepinski, Tadeusz Uhl, AGH Univ. of Science and Technology (Poland) . . . . . [9064-85]</p> <p>5:30 pm: <b>Estimation of fatigue damage parameters using guided wave technique</b>, D. Roy Mahapatra, Vivek T. Rathod, Indian Institute of Science (India) . . . . . [9064-86]</p>

**Announcements, Awards, and Plenary Presentation**

*Location: Town and Country*

**8:10 to 8:25 am**

- SPIE/ASME Best Student Paper Award
- Bioinspiration, Biomimetics, and Bioreplication Best Student Paper Award: In Memory of H. Don Wolpert

**Plenary Presentation · 8:25 to 9:10 am**



**Intelligent Adaptive Fluid-Structure Interaction Systems**

Roger Ohayon, Conservatoire National des Arts et Métiers (France)

Concurrent Sessions

Concurrent Sessions

**Session 10a**

**Location: Town and Country**  
Thu 9:20 am to 11:50 am

**General Applications of EAP Materials**

Session Chairs: **Geoffrey M. Spinks**, Univ. of Wollongong (Australia); **Christoph Keplinger**, Harvard Univ. (USA)

9:20 am: **Stretchable, transparent, ionic conductors: sound from a transparent, soft membrane** (*Invited Paper*), Christoph Keplinger, Harvard Univ. (USA) . . . . . [9056-72]

Coffee Break . . . . . Thu 10:00 am to 10:30 am

**Session 10b**

**Location: Royal Palm One**  
Thu 9:20 am to 11:50 am

**EAP Mechanisms and Processes**

Session Chairs: **Ingrid M. Graz**, Johannes Kepler Univ. Linz (Austria); **Jonathan M. Rossiter**, Univ. of Bristol (United Kingdom)

9:20 am: **Mechanism of stroke enhancement by coiling in carbon nanotube hybrid yarn artificial muscles**, Carter S. Haines, Márcio D. Lima, Na Li, The Univ. of Texas at Dallas (USA); Geoffrey M. Spinks, Javad Foroughi, ARC Ctr. of Excellence for Electromaterials Science and Intelligent Polymer Research Institute (Australia); John D. W. Madden, The Univ. of British Columbia (Canada); Shaoli Fang, Monica J. De Andrade, The Univ. of Texas at Dallas (USA); Fatma Göktepe, Ozer Göktepe, Namik Kemal Univ. (Turkey); Seyed M. Mirvakili, The Univ. of British Columbia (Canada); Sina Naficy, ARC Ctr. of Excellence for Electromaterials Science and Intelligent Polymer Research Institute (Australia); Xavier Lepró, Jiyoung Oh, Mikhail E. Kozlov, The Univ. of Texas at Dallas (USA); Seon-Jeong Kim, Hanyang Univ. (Korea, Republic of); Xiuru Xu, The Univ. of Texas at Dallas (USA); Gordon G. Wallace, ARC Ctr. of Excellence for Electromaterials Science and Intelligent Polymer Research Institute (Australia); Ray H. Baughman, The Univ. of Texas at Dallas (USA) . . . . . [9056-77]

9:40 am: **Artificial muscles on heat**, Thomas G. McKay, Dong Ki Shin, The Univ. of Auckland (New Zealand); Steven Percy, Scott A. McGarry, Christopher G. Knight, Commonwealth Scientific and Industrial Research Organisation (Australia); Iain A. Anderson, The Univ. of Auckland (New Zealand) . . . . . [9056-78]

Coffee Break . . . . . Thu 10:00 am to 10:30 am

**Session 12a**

**Location: Royal Palm Five**  
Thu 9:20 am to 10:20 am

**Energy Harvesting and Scavenging: General II**

Session Chairs: **Hyung-Jo Jung**, KAIST (Korea, Republic of); **Adam M. Wickenheiser**, The George Washington Univ. (USA)

9:20 am: **Nonlinear modeling, strength-based design, and testing of flexible piezoelectric energy harvesters under large dynamic loads for rotorcraft applications**, Stephen M. Leadnam, Alper Erturk, Georgia Institute of Technology (USA) . . . . . [9057-67]

9:40 am: **Electret properties of PVDF film material: flexible and lightweight energy harvesting device**, Enrico Bischur, Norbert Schwesinger, Technische Univ. München (Germany) . . . . . [9057-68]

10:00 am: **Performance enhancement of piezoelectric energy harvesting system using corrugated cantilever beam**, Jeongsu Park, Hyung-Jo Jung, SeungSeop Jin, In-ho Kim, KAIST (Korea, Republic of) . . . . . [9057-69]

Coffee Break . . . . . Thu 10:20 am to 10:50 am

**Session 12b**

**Location: Towne**  
Thu 9:20 am to 10:20 am

**Passive and Active Vibration Isolation Systems III**

Session Chairs: **Alison B. Flatau**, Univ. of Maryland, College Park (USA); **Benjamin S. Beck**, NASA Langley Research Ctr. (USA)

9:20 am: **Improved negative capacitance shunt damping with the use of acoustic black holes**, Benjamin S. Beck, National Institute of Aerospace (USA) and NASA Langley Research Ctr. (USA); Kenneth A. Cunefare, Georgia Institute of Technology (USA) . . . . . [9057-70]

9:40 am: **Optimal placement of piezoelectric actuators on plate structures for active vibration control using genetic algorithm**, Suresh K. Vashist, Univ. Institute of Engineering and Technology (India) and Maharshi Dayanand Univ., Rohtak (India); Deepak Chhabra, Maharshi Dayanand Univ., Rohtak (India) . . . . . [9057-71]

10:00 am: **Application of viscous damper devices in light rail transit station**, Amir Fateh, Farzad Hejazi, Ramesh A. Ramanathan, Mohd Saleh Jaafar, Univ. Putra Malaysia (Malaysia) . . . . . [9057-72]

Coffee Break . . . . . Thu 10:20 am to 10:50 am

Conference 9061

Conference 9063

Conference 9064

**Announcements, Awards, and Plenary Presentation**

*Location: Town and Country*

**8:10 to 8:25 am**

- SPIE/ASME Best Student Paper Award
- Bioinspiration, Biomimetics, and Bioreplication Best Student Paper Award: In Memory of H. Don Wolpert

**Plenary Presentation · 8:25 to 9:10 am**



**Intelligent Adaptive Fluid-Structure Interaction Systems**

**Roger Ohayon**, Conservatoire National des Arts et Métiers (France)

Concurrent Sessions

Concurrent Sessions

Session 12

**Session 12a**

**Location: Pacific Salon Seven  
Thu 9:20 am to 10:00 am**

**Wind Loads on Complex Structural Systems**

Session Chairs: **Shamim N. Pakzad**, Lehigh Univ. (USA); **Neil A. Hoult**, Queen's Univ. (Canada)

9:20 am: **Monitoring of wind pressure distribution at a supertall structure above maximum gradient wind level**, Y. Q. Ni, Hong Kong Polytechnic Univ (Hong Kong, China); Y. W. Wang, The Hong Kong Polytechnic Univ. (Hong Kong, China); S. D. Song, Dalian Univ. of Technology (China) . . . . . [9061-160]

9:40 am: **Predicting full-field dynamic strain on a three-bladed wind turbine using three-dimensional point tracking and expansion techniques**, Javad Baqersad, Christopher Niezrecki, Peter Avitabile, Univ. of Massachusetts Lowell (USA) . . . . . [9061-100]

Coffee Break . . . . . Thu 10:00 am to 10:30 am

**Session 12b**

**Location: Pacific Salon Five  
Thu 9:20 am to 10:00 am**

**Railway Health Monitoring**

Session Chairs: **Jiong Tang**, Univ. of Connecticut (USA); **Shinae Jang**, Univ. of Connecticut (USA)

9:20 am: **Implementation of a piezoelectric energy harvester in railway health monitoring**, Jingcheng Li, Shinae Jang, Jiong Tang, Univ. of Connecticut (USA) . . . . . [9061-101]

9:40 am: **Fault detection in railway track using piezoelectric transducer**, Matthew Cremins, Qi Shuai, Jiawen Xu, Jiong Tang, Univ. of Connecticut (USA) . . . . . [9061-102]

Coffee Break . . . . . Thu 10:00 am to 10:30 am

**Session 9a**

**Location: Royal Palm Four  
Thu 9:20 am to 12:30 pm**

**NDE/SHM for Civil Infrastructure**

Session Chairs: **Peter J. Shull**, The Pennsylvania State Univ. (USA); **Nenad Gucunski**, Rutgers, The State Univ. of New Jersey (USA)

9:20 am: **ANDERS: merging of automated and minimally invasive technologies for concrete bridge deck evaluation and rehabilitation** (*Keynote Presentation*), Nenad Gucunski, Rutgers, The State Univ. of New Jersey (USA) . . . . . [9063-49]

Coffee Break . . . . . Thu 10:00 am to 10:30 am

**Session 9b**

**Location: Royal Palm Two  
Thu 9:20 am to 12:30 pm**

**NDE/SHM for Composites I**

Session Chairs: **Kenneth J. Loh**, Univ. of California, Davis (USA); **Oliver J. Myers**, Mississippi State Univ. (USA)

9:20 am: **NDE of ceramic matrix composites subjected to impact damage**, Andrew L. Gyekenyesi, Ohio Aerospace Institute (USA); Christopher Baker, Gregory N. Morscher, The Univ. of Akron (USA); Richard E. Martin, Cleveland State Univ. (USA) . . . . . [9063-56]

9:40 am: **Non-destructive evaluation of composite materials using optical coherence tomography**, Ping Liu, Roger M. Groves, Rinze Benedictus, Technische Univ. Delft (Netherlands) . . . . . [9063-57]

Coffee Break . . . . . Thu 10:00 am to 10:30 am

**Location: Royal Palm Six  
Thu 9:20 am to 10:20 am**

**Metamaterial III**

Session Chairs: **Paul Fromme**, Univ. College London (United Kingdom); **Tadeusz Uh**, AGH Univ. of Science and Technology (Poland); **Guoliang Huang**, Univ. of Arkansas at Little Rock (United States)

9:20 am: **Rotational modes in photonic crystals**, Ying Wu, King Abdullah Univ. of Science and Technology (Saudi Arabia) . . . . . [9064-87]

9:40 am: **Dirac and Dirac-like cones for classical waves in periodic systems**, Jun Mei, South China Univ. of Technology (China); Ying Wu, King Abdullah Univ. of Science and Technology (Saudi Arabia); Che Ting Chan, Zhao-Qing Zhang, Hong Kong Univ. of Science and Technology (Hong Kong, China) . . . . . [9064-88]

10:00 am: **Coupled vibroacoustic modeling of membrane-type acoustic metamaterials**, Guoliang Huang, Yangyang Chen, Univ. of Arkansas at Little Rock (United States) . . . . . [9064-31]

Coffee Break . . . . . Thu 10:20 am to 10:50 am

Conference 9056

Concurrent Sessions

Session 10a continued

Location: Town and Country

10:30 am: **Colour gamuts in polychromatic dielectric elastomer artificial chromatophores**, Jonathan M. Rossiter, Univ. of Bristol (United Kingdom); Antonio Cerruto, Stanford Univ. (USA); Andrew T. Conn, Univ. of Bristol (United Kingdom) .....[9056-73]

10:50 am: **A new bistable electroactive polymer for prolonged cycle lifetime of refreshable braille displays**, Zhi Ren, Xiaofan Niu, Dustin Chen, Wei Hu, Qibing Pei, Univ. of California, Los Angeles (USA) .....[9056-74]

11:10 am: **Bio-inspired autonomous crawling robot with an ionic EAP actuator**, Indrek Must, Mart Weber, Raido Uudel, Friedrich Kaasik, Inga Põldsalu, Lauri Mihkels, Urmas Johanson, Andres Punning, Alvo Aabloo, Univ. of Tartu (Estonia) .....[9056-75]

11:30 am: **Carbon nanotube biscrew yarn supercapacitors for microdevices**, Jaeah Lee, Min Kyoan Shin, Shi-Hyeong Kim, Hyun-U Cho, Hanyang Univ. (Korea, Republic of); Geoffrey M. Spinks, Gordon G. Wallace, Univ. of Wollongong (Australia); Márcio D. Lima, Xavier Lepro, Mikhail E. Kozlov, Ray H. Baughman, The Univ. of Texas at Dallas (USA); Seon-Jeong Kim, Hanyang Univ. (Korea, Republic of) .....[9056-76]

Lunch Break ..... Thu 11:50 am to 1:20 pm

Session 10b continued

Location: Royal Palm One

10:30 am: **Artificial muscles based on coiled carbon nanotube yarns**, Márcio D. Lima, Ray H. Baughman, The Univ. of Texas at Dallas (USA) ..... [9056-79]

10:50 am: **Automated manufacturing process for DEAP stack-actuators**, Dominik Tepel, Thorben Hoffstadt, Jürgen Maas, Ostwestfalen-Lippe Univ. of Applied Sciences (Germany) . [9056-80]

11:10 am: **Polypyrrole as a precursor of choice for micromanufacturing of microelectrodes**, Lawrence Kulinsky, Univ. of California, Irvine (USA) ..... [9056-81]

11:30 am: **3D printing for dielectric elastomers**, Andrew S. Creegan, Iain A. Anderson, The Univ. of Auckland (New Zealand) ..... [9056-82]

Lunch Break ..... Thu 11:50 am to 1:20 pm

Conference 9057

Concurrent Sessions

Session 13a

Location: Royal Palm Five  
Thu 10:50 am to 12:10 pm

Micro- and Nano-Integrated Systems

Session Chairs: **Gregory P. Carman**, Univ. of California, Los Angeles (USA); **Wen-Jong Wu**, National Taiwan Univ. (Taiwan)

10:50 am: **Nonlinear forced response of piezoelectric microcantilevers with application to tapping mode atomic force microscopy**, Rachael McCarty, S. Nima Mahmoodi, The Univ. of Alabama (USA) ..... [9057-73]

11:10 am: **Chemical wet etching of PZT (lead-zirconate-titanate)**, Marc C. Wurz, Sebastian Bengsch, Lutz Rissing, Leibniz Univ. Hannover (Germany) ..... [9057-74]

11:30 am: **Theory of suspended carbon nanotube thinfilm as a thermal-acoustic source**, L. H. Tong, Univ. of Science and Technology of China (China); C. W. Lim, City Univ. of Hong Kong (Hong Kong, China); Y. C. Li, Univ. of Science and Technology of China (China) ..... [9057-75]

11:50 am: **A novel interdigitated, inductively tuned, metal contact capacitive shunt RF-MEMS switch for X and K band applications**, Mahesh Angira, Birla Institute of Technology and Science, Pilani (India); Kamaljit Rangra, Central Electronics Engineering Research Institute (India) ..... [9057-76]

Lunch Break ..... Thu 12:10 pm to 1:40 pm

Session 13b

Location: Towne  
Thu 10:50 am to 12:10 pm

Smart Structures and Applications

Session Chairs: **Nakhiah C. Goulbourne**, Univ. of Michigan (USA); **Hwan-Sik Yoon**, The Univ. of Alabama (USA)

10:50 am: **Micro-fiber composites performance under thermal cycling for SHM applications**, Cassio T. Faria, Virginia Polytechnic Institute and State Univ. (USA); Robert B. Owen, Extreme Diagnostics, Inc. (USA); Daniel J. Inman, Univ. of Michigan (USA) .....[9057-77]

11:10 am: **A structure damage detection method based on wavelet analysis and type-2 fuzzy logic system**, Sy Dzung Nguyen, Inha Univ. (Korea, Republic of); Kieu Nhi Ngo, Ho Chi Minh Univ. of Technology (Viet Nam); Phu Xuan Do, Inha Univ. (Korea, Republic of); Thinh Quang Tran, Laboratory of Applied Mechanics (LAM) of Ho Chi Minh University of Technology. (Viet Nam); Seung-Bok Choi, Inha Univ (Korea, Republic of) . . .[9057-78]

11:30 am: **Haptics using a smart material for eyes free interaction in personal devices**, Huihui Wang, Williams B. Lane, Jacksonville Univ. (USA) ..... [9057-79]

11:50 am: **All-printed smart structures: a viable option?**, Hwan-Sik Yoon, The Univ. of Alabama (USA); Farzad Ahmadkhanlou, Gregory Washington, Univ. of California, Irvine (USA) . . . [9057-80]

Lunch Break ..... Thu 12:10 pm to 1:40 pm



## Conference 9061

Concurrent Sessions

### Session 13a

**Location: Pacific Salon Seven  
Thu 10:30 am to 11:50 am**

#### Smart Building Technology I

Session Chairs: **Chih-Chen Chang**, Hong Kong Univ. of Science and Technology (Hong Kong, China); **Jung-Wuk Hong**, KAIST (Korea, Republic of)

10:30 am: **Affordable and personalized lighting using inverse modeling and virtual sensors**, Chandrayee Basu, Jacob Richards, Benjamin Chu, Aparna Dhinakaran, Alice Agolino, Univ. of California, Berkeley (USA); Rodney Martin, NASA Ames Research Ctr. (USA) . . . . . [9061-103]

10:50 am: **Lighting control system reflecting both human movement and feelings using voice**, Yoko Yamagishi, Akira Mita, Keio Univ. (Japan) [9061-104]

11:10 am: **Smart lighting control system using sensor agent robots based on Homeostasis and nervous system**, Momoko Tokiwa, Akira Mita, Keio Univ. (Japan) . . . . . [9061-105]

11:30 am: **A model for earthquake acceleration monitoring with wireless sensor networks in a structure**, Takahiro Fujiwara, Yugo Nakamura, Hakodate National College of Technology (Japan); Kousei Jinno, Hideyuki Uehara, Toyohashi Univ. of Technology (Japan) . . . . . [9061-106]

Lunch Break . . . . . Thu 11:50 am to 1:20 pm

### Session 13b

**Location: Pacific Salon Five  
Thu 10:30 am to 11:50 am**

#### Data Processing Methods for SHM

Session Chairs: **Dumitru Caruntu**, The Univ. of Texas-Pan American (USA); **Junhee Kim**, Dankook Univ. (Korea, Republic of)

10:30 am: **Compressed sensing techniques for arbitrary frequency-sparse signals in structural health monitoring**, Zhongdong Duan, Jie Kang, Harbin Institute of Technology (China) . . . . . [9061-107]

10:50 am: **A novel unknown feature searching algorithm at pre-processing of data analysis**, Inho Kim, Aditi Chattopadhyay, Arizona State Univ. (USA) . . . . . [9061-108]

11:10 am: **A new extension of unscented Kalman filter for structural health assessment with unknown input**, Abdullah Al-Hussein, Achintya Haldar, The Univ. of Arizona (USA) . . . . . [9061-109]

11:30 am: **Online damage detection based on the combination of successive displacement curvature under the influence of environmental temperature**, Yabin Liang, Dalian Univ. of Technology (China) . . . . . [9061-110]

Lunch Break . . . . . Thu 11:50 am to 1:20 pm

## Conference 9063

Concurrent Sessions

### Session 9a continued

10:30 am: **Recent development on remote sensing and wireless communication with distributed smart rocks in bridge scour monitoring**, Genda Chen, Andriy Radchenko, Brandon P. Schafer, David Pommerkne, Yahong Rosa Zheng, Missouri Univ. of Science and Technology (USA) . . . . . [9063-50]

10:50 am: **Comparative testing of nondestructive evaluation techniques for concrete structures**, Dwight A. Clayton, Cyrus M. Smith, Oak Ridge National Lab. (USA) . . . . . [9063-51]

11:10 am: **A modular backend computing system for continuous civil structural health monitoring**, Ting-Chou Chien, Pai H. Chu, Chengjia Huo, Univ. of California, Irvine (USA) . . . . . [9063-52]

11:30 am: **Wireless monitoring of the height of condensed water in steam pipes**, Hyeong Jae Lee, Yoseph Bar-Cohen, Shyh-Shiuh Lih, Mircea Badescu, Arsham Dingiziam, Nobuyuki Takano, Julian Blossi, Jet Propulsion Lab. (USA) . . . . . [9063-53]

11:50 am: **Remote monitoring and nondestructive evaluation of wind turbine towers**, Chih-Hung Chiang, Chih-Peng Yu, Keng-Tsang Hsu, Chia-Chi Cheng, Ying-Tzu Ke, Chaoyang Univ. of Technology (Taiwan) . . . . . [9063-54]

12:10 pm: **Design, fabrication, and validation of passive wireless resonant sensors for NDT/SHM**, Michele Meo, Univ. of Bath (United Kingdom) [9063-55]

Lunch Break . . . . . Thu 12:30 pm to 2:00 pm

### Session 9b continued

10:30 am: **Detecting subsurface damage in composites using embedded multilayered thin film sensor**, Yingjun Zhao, Jennifer Yasui, Kenneth J. Loh, Valeria La Saponara, Univ. of California, Davis (USA) . . . . . [9063-58]

10:50 am: **Guided wave propagation study on laminated composites by frequency-wavenumber technique**, Zhenhua Tian, Lingyu Yu, Univ. of South Carolina (USA); Cara A. Leckey, NASA Langley Research Ctr. (USA) . . . . . [9063-59]

11:10 am: **Patch antenna based temperature sensor**, Jeremiah Sanders, Hao Jiang, Haiying Huang, The Univ. of Texas at Arlington (USA) . . . . . [9063-60]

11:30 am: **Modeling stability of flap-enabled HAWT blades using spinning finite elements**, Antonio H. Valazquez, R. Andrew Swartz, Qingli Dai, Xiao Sun, Michigan Technological Univ. (USA) . . . . . [9063-61]

11:50 am: **Delamination detection in composite beams using system identification**, Md. Younus Ali, Krishnakumar Shankar, Md. Shakar U. Chowdhury, The Univ. of New South Wales (Australia) . . [9063-62]

12:10 pm: **Use of nondestructive inspection and fiber optic sensing for damage characterization in carbon fiber fuselage structure**, Stephen Neidigk, Sandia National Labs. (USA); Jacqui Le, Univ. of California, San Diego (USA); Dennis Roach, Randy Duvall, Tom Rice, Sandia National Labs. (USA) . . . . . [9063-63]

Lunch Break . . . . . Thu 12:30 pm to 2:00 pm

## Conference 9064

Session 13

**Location: Royal Palm Six  
Thu 10:50 am to 11:50 pm**

### Guided Wave-Based SHM and Other Advanced Techniques

Session Chairs: **Wieslaw Mleczyslaw Ostachowicz**, The Szwedalski Institute of Fluid-Flow Machinery (Poland); **Tadeusz Uhl**, AGH Univ. of Science and Technology (Poland)

10:50 am: **Monitoring of corrosion damage using high-frequency guided ultrasonic waves**, Paul Fromme, Univ. College London (United Kingdom) . . . . . [9064-89]

11:10 am: **Power law behavior in acoustic emissions of composites aged under cyclic loading: implications for health monitoring of the composite structures**, Ali Kahrdeh, Michael M. Khonsari, Louisiana State Univ. (USA) . . . . [9064-90]

11:30 am: **A vision-based technique for damage assessment of reinforced concrete structures**, Alireza Farhizadeh, Ehsan Dehghan-Niri, Salvatore Salamone, Univ. at Buffalo (USA) . . . . . [9064-91]

Lunch Break . . . . . Thu 11:50 am to 12:50 pm

### Session 14

**Location: Royal Palm Six  
Thu 12:50 pm to 1:50 pm**

### Guided Wave-Based SHM and Other Advanced Techniques II

Session Chairs: **Wieslaw Mleczyslaw Ostachowicz**, The Szwedalski Institute of Fluid-Flow Machinery (Poland); **Tadeusz Uhl**, AGH Univ. of Science and Technology (Poland)

12:50 pm: **Using the ultrasonic LCR waves to measure welding residual stresses in stainless steel pressure vessel**, Mohammadreza Hadizadeh Raeisi, Amirkabir Univ. of Technology (Iran, Islamic Republic of); Yashar Javadi, Islamic Azad Univ. of Tabriz (Iran, Islamic Republic of); Seyedali Sadeghi, Mehdi Ahmadi Najafabadi, Amirkabir Univ. of Technology (Iran, Islamic Republic of) . . . . [9064-92]

1:10 pm: **Simultaneous identification of loads and structural damages using state observer**, Qingxia Zhang, Dalian Nationalities Univ. (China) . . [9064-93]

1:30 pm: **The investigation for fiber Bragg grating strain sensor used in the cable tension monitoring of FAST**, Qi Ming Wang, Ming Zhu, National Astronomical Observatories (China) . . . . . [9064-94]

Conference End.

Conference 9056

Concurrent Sessions

Session 11a

Location: Town and Country  
Thu 1:20 pm to 3:00 pm

Characterization of EAP Materials

Session Chairs: **Jonathan M. Rossiter**, Univ. of Bristol (United Kingdom); **Geoffrey M. Spinks**, Univ. of Wollongong (Australia)

1:20 pm: **Electromechanical and electro-optical properties of PEDOT based IPNs** (*Invited Paper*), Frédéric Vidal, Cédric Plesse, Pierre-Henri Aubert, Univ. de Cergy-Pontoise (France); Eric Cattan, Caroline Soyer, Univ. des Sciences et Technologies de Lille (France); Giao T.M. M. Nguyen, Univ. de Cergy-Pontoise (France); Jean-Paul Dudon, Thales Alenia Space (France); Dominique Teyssié, Claude Chevrot, Univ. de Cergy-Pontoise (France) . . . . . [9056-83]

2:00 pm: **In situ measurements with CPC micro-actuators using SEM**, Friedrich Kaasik, Indrek Must, Enn Lust, Univ. of Tartu (Estonia); Meelis Jürgens, Estiko Plaster AS (Estonia); Volker Presser, Leibniz-Institut für Neue Materialien gGmbH (Germany); Andres Punning, Alvo Aabloo, Univ. of Tartu (Estonia) . . . . . [9056-84]

2:20 pm: **Evaluation of area strain response of dielectric elastomer actuator using image processing technique**, Raj K. Sahu, Koyya Sudarshan, Karali Patra, Shovan Bhaumik, Indian Institute of Technology Patna (India) . . . . . [9056-85]

2:40 pm: **Stability, failure, voltage-induced deformation and temperature change of dielectric elastomers**, Liwu Liu, Fan Fei, Yixing Wang, Yanju Liu, Jinsong Leng, Harbin Institute of Technology (China) . . . . . [9056-86]

Coffee Break . . . . . Thu 3:00 pm to 3:30 pm

Session 11b

Location: Royal Palm One  
Thu 1:20 pm to 4:50 pm

Robotic Applications II

Session Chairs: **Jadranka Travas-Sejdic**, The Univ. of Auckland (New Zealand); **Carter S. Haines**, The Univ. of Texas at Dallas (USA)

1:20 pm: **Approaches to soft electronic skin** (*Invited Paper*), Ingrid M. Graz, Johannes Kepler Univ. Linz (Austria) . . . . . [9056-87]

2:00 pm: **Artificial heart for humanoid**, Pedro F. Gaete, Yonas T. Tadesse, The Univ. of Texas at Dallas (USA) . . . . . [9056-88]

2:20 pm: **Towards a deployable satellite gripper based on multisegment dielectric elastomer minimum energy structures**, Oluwaseun A. Araromi, Irina Gavrilovich, Jun Shintake, Samuel Rosset, Herbert R. Shea, Ecole Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [9056-89]

2:40 pm: **The mechanical design of a humanoid robot with flexible skin sensor for use in psychiatric therapy**, Alec R. Burns, Manoj Kumar Palanisamy, Yonas T. Tadesse, The Univ. of Texas at Dallas (USA) . . . . . [9056-90]

Coffee Break . . . . . Thu 3:00 pm to 3:30 pm

3:30 pm: **Modeling of a PVDF-based gesture controller using energy methods**, Kyle Van Volkinburg, Gregory Washington, Univ. of California, Irvine (USA) . . . . . [9056-91]

3:50 pm: **Multi degree of freedom IPMC sensor**, Tyler Stalbaum, Univ. of Nevada, Las Vegas (USA); Viljar Palmre, Univ. of Nevada, Las Vegas (USA) and Univ. of Nevada, Reno (USA); Kwang Jin Kim, Univ. of Nevada, Las Vegas (USA) . . . . . [9056-92]

4:10 pm: **Optimal haptic feedback control of artificial muscles**, Daniel Chen, Thor Besier, Iain A. Anderson, Thomas G. McKay, The Univ. of Auckland (New Zealand) . . . . . [9056-93]

4:30 pm: **Soft segmented inchworm robot with dielectric elastomer muscles**, Andrew T. Conn, Andrew D. Hinit, Pengchuan Wang, Univ. of Bristol (United Kingdom) . . . . . [9056-94]

Session 11c

Location: Town and Country  
Thu 3:30 pm to 4:50 pm

Dielectric Elastomers EAP IV

Session Chairs: **John D. W. Madden**, The Univ. of British Columbia (Canada); **Thomas G. McKay**, The Univ. of Auckland (New Zealand)

3:30 pm: **Niobium nanowire yarns and their application as artificial muscle**, Seyed M. Mirvakili, John D. W. Madden, The Univ. of British Columbia (Canada) . . . . . [9056-95]

3:50 pm: **A tuneable RF phase shifter driven by dielectric elastomer actuators**, Oluwaseun A. Araromi, Pietro Romano, Samuel Rosset, Julien Perruisseau-Carrier, Herbert R. Shea, Ecole Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [9056-96]

4:10 pm: **A novel duct silencer by using dielectric elastomer absorbers**, Zhenbo Lu, Yongdong Cui, Jian Zhu, National Univ. of Singapore (Singapore) . . . . . [9056-97]

4:30 pm: **Artificial vibrissae DEA-based module**, Tareq Assaf, Andrew T. Conn, Jonathan M. Rossiter, Peter J. Walters, Martin J. Pearson, Bristol Robotics Lab. (United Kingdom) . . . . . [9056-98]

Conference End.

Conference 9057

Concurrent Sessions

Session 14a

Location: Royal Palm Five  
Thu 1:40 pm to 3:00 pm

Energy Harvesting and Scavenging: General III

Session Chairs: **Michael D. Todd**, Univ. of California, San Diego (USA); **Jinhao Qiu**, Nanjing Univ. of Aeronautics and Astronautics (China)

1:40 pm: **Modeling and design of Galfenol unimorph energy harvester**, Zhangxian Deng, Marcelo J. Dapino, The Ohio State Univ. (USA) . . . . . [9057-81]

2:00 pm: **Tapered piezoelectric devices for vibration energy harvesting**, Naved A. Siddiqui, Barton C. Prorok, Dong-Joo Kim, Ruel A. Overfelt, Auburn Univ. (USA) . . . . . [9057-82]

2:20 pm: **Low-frequency acoustic energy harvesting**, Bin Li, Jeong Ho You, Southern Methodist Univ. (USA) . . . . . [9057-83]

2:40 pm: **Concepts in energy harvesting for marine wildlife monitoring**, Michael W. Shafer, Northern Arizona Univ. (USA) . . . . . [9057-84]

Coffee Break . . . . . Thu 3:00 pm to 3:30 pm

Session 14b

Location: Towne  
Thu 1:40 pm to 3:00 pm

Passive and Active Vibration Isolation Systems IV

Session Chairs: **Haim Abramovich**, Technion-Israel Institute of Technology (Israel); **Min-Chun Pan**, National Central Univ. (Taiwan)

1:40 pm: **Vibration control of plates through a periodic array of shunted piezoelectric patches with negative capacitance circuits**, Flaviano Tateo, FEMTO-ST (France); Benjamin S. Beck, National Institute of Aerospace (USA) and NASA Langley Research Ctr. (USA); Manuel Collet, Ecole Centrale de Lyon (France); Morvan Ouisse, FEMTO-ST (France); Kenneth A. Cunefare, Georgia Institute of Technology (USA); Mohamed N. Ichchou, Ecole Centrale de Lyon (France) . . . . . [9057-85]

2:00 pm: **Evaluation of magnetostrictive shunt damper performance using Iron (Fe)-Gallium (Ga) alloy**, JinHyeong Yoo, U.S. Army Research Lab. (USA); Andrew Murray, The Pennsylvania State Univ. (USA); Alison B. Flatau, Univ. of Maryland, College Park (USA) . . . . . [9057-86]

2:20 pm: **Suppression of mechanical vibrations in a building-like structure using a passive/active autparametric absorber**, Hugo F. Abundis, Gerardo Silva-Navarro, Ctr. de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (Mexico); Benjamin Vazquez, Univ. Autónoma Metropolitana (Mexico) . . . . . [9057-87]

2:40 pm: **Study on vibration control of reinforced concrete structures based on OpenSees platform**, Jian Wang, Harbin Institute of Technology (China) . . . . . [9057-88]

Coffee Break . . . . . Thu 3:00 pm to 3:30 pm

Conference 9061

Concurrent Sessions

Session 14a

Location: Pacific Salon Seven  
Thu 1:20 pm to 3:00 pm

**Fiber Optic-Based Sensing Methods II**

Session Chairs: **Neil A. Hoult**, Queen's Univ. (Canada); **Genda Chen**, Missouri Univ. of Science and Technology (USA)

1:20 pm: **Research on fatigue damage detection for wind turbine blade based on high-spatial-resolution DPP-BOTDA**, Jinlong Xu, Hui Li, Yongkang Dong, Harbin Institute of Technology (China) ..... [9061-99]

1:40 pm: **Distributed strain monitoring for bridges: temperature effects**, Ryan Regier, Neil A. Hoult, Queen's Univ. (Canada) ..... [9061-112]

2:00 pm: **Optical fiber sensors with flexible encapsulation for pavement behavior monitoring**, Wanqiu Liu, Yanqing Zhao, Huaping Wang, Xiaoying Xing, Dandan Cao, Zhi Zhou, Dalian Univ. of Technology (China) ..... [9061-113]

2:20 pm: **On the use of electrical and optical strain gauges paired to magnetostrictive patch actuators**, Simone Cinquemani, Francesco Braghin, Gabriele Cazzulani, Lorenzo Comolli, Politecnico di Milano (Italy) ..... [9061-114]

2:40 pm: **Novel braided composites with integrated optical fibre sensors**, Andrzej Czulak, Werner Hufenbach, Maik Gude, Technische Univ. Dresden (Germany) ..... [9061-115]

Coffee Break. ....Thu 3:00 pm to 3:30 pm

Session 14b

Location: Pacific Salon Five  
Thu 1:20 pm to 3:00 pm

**Applications of Piezoelectric-Based Health Monitoring**

Session Chairs: **Jung-Wuk Hong**, KAIST (Korea, Republic of); **Massimo Ruzzene**, Georgia Institute of Technology (USA)

1:20 pm: **Fourier-based design of acoustic strain rosettes**, Massimo Ruzzene, Matteo Carrara, Georgia Institute of Technology (USA) ..... [9061-116]

1:40 pm: **Miscellaneous Lamb wave phased array imaging with hybrid PZT-SLDV sensing**, Zhenhua Tian, Lingyu Yu, Univ. of South Carolina (USA) ..... [9061-117]

2:00 pm: **Simulation of shear wave propagation induced by acoustic radiation force**, Jae-Wook Jung, Jung-Wuk Hong, KAIST (Korea, Republic of) ..... [9061-118]

2:20 pm: **Thermoacoustic effects on layered structures for the evaluation of structural parameters**, Olivier A. Bareille, Ecole Centrale de Lyon (France); Dimitrios Chronopoulos, The Univ. of Nottingham (United Kingdom); Mohamed N. Ichchou, Ecole Centrale de Lyon (France); Bernard Troclet, EADS Astrium (France) [9061-119]

2:40 pm: **Recent trends in reinforcement corrosion assessment using Piezo sensors via electro mechanical impedance (EMI) technique**, Visalakshi Talakokula, Indian Institute of Technology Delhi (India) ..... [9061-120]

Coffee Break. ....Thu 3:00 pm to 3:30 pm

Conference 9063

Concurrent Sessions

Session 10a

Location: Royal Palm Four  
Thu 2:00 pm to 3:00 pm

**Modeling and Simulation Techniques in NDE/SHM I**

Session Chairs: **Tian Xia**, The Univ. of Vermont (USA); **Piotr Omenzetter**, Univ. of Aberdeen (United Kingdom)

2:00 pm: **Quantifying uncertainties in structural dynamic characteristics using hybrid modeling through Bayesian inference**, Kai Zhou, Univ. of Connecticut (USA); Gang Liang, Shanghai Maritime Univ. (China); Jiong Tang, Univ. of Connecticut (USA) ..... [9063-64]

2:20 pm: **A comparison of several global optimization algorithms with sequential niche technique for structural model updating**, Faisal Shabbir, Univ. of Engineering and Technology Taxila (Pakistan); Piotr Omenzetter, Univ. of Aberdeen (United Kingdom) . . . [9063-65]

2:40 pm: **Substructure model updating through iterative minimization of modal dynamic residual**, Dapeng Zhu, Xinjun Dong, Yang Wang, Georgia Institute of Technology (USA) . . . . . [9063-66]

Coffee Break. ....Thu 3:00 pm to 3:30 pm

Session 10b

Location: Royal Palm Two  
Thu 2:00 pm to 3:00 pm

**NDE/SHM for Composites II**

Session Chairs: **Andrew L. Gyekenyesi**, Ohio Aerospace Institute (USA); **Fan Wu**, Shanghai Jiao Tong Univ. (China)

2:00 pm: **The evaluation of moisture damage for CFRC pipes in conjunction with acoustic emission**, Yu Chen, Yanjun Liu, Beijing Bldg. Materials Academy of Science Research (China); Mang Tia, Univ. of Florida (USA); Yu-Min Su, National Central Univ. (Taiwan) ..... [9063-67]

2:20 pm: **Evaluation of micro-damage accumulation in holed plain-woven CFRP composite under fatigue loading**, Jia Ying, Masaaki Nishikawa, Kyoto Univ. (Japan); Masaki Hojo, Keio Univ. (Japan) ..... [9063-68]

2:40 pm: **Nondestructive inspection of composite plates using A0 mode of Lamb waves**, Rahim Gorgin, Zhanjun Wu, Dongyue Gao, Yishou Wang, Dalian Univ. of Technology (China) [9063-69]

Coffee Break. ....Thu 3:00 pm to 3:30 pm

Session 15a

Location: Royal Palm Five  
Thu 3:30 pm to 5:30 pm

**Modeling, Simulation, Optimization, Signal Processing, Control, and Design of Integrated Systems II**

Session Chairs: **Roger Ohayon**, Conservatoire National des Arts et Métiers (France); **Jae-Hung Han**, KAIST (Korea, Republic of)

3:30 pm: **Mathematical modeling and numerical simulation of an actively stabilized beam column with circular cross section**, Maximilian Schaeffner, Georg C. Enss, Technische Univ. Darmstadt (Germany); Roland Platz, Fraunhofer-Institut für Betriebsfestigkeit und Systemzuverlässigkeit (Germany) [9057-89]

3:50 pm: **Piezogenerator impedance matching using Mason equivalent circuit for harvester identification**, Yang Li, Claude Richard, Institut National des Sciences Appliquées de Lyon (France) [9057-90]

4:10 pm: **A simplified evaluation and design procedure for frame buildings with viscous dampers based on probability of collapse**, Mohammadjavad Hamidia, Andre Filiatrault, Amjad Aref, Univ. at Buffalo (USA) [9057-91]

4:30 pm: **A comparison between non linear control logics applied to a 3-segments manipulator**, Francesco Ripamonti, Ferruccio Resta, Egidio Leo, Politecnico di Milano (Italy) [9057-92]

4:50 pm: **Photoresponsive polymer design for solar concentrator self-steering heliostats**, William S. Oates, The Florida State Univ. (USA); Jessica Barker, Univ. of Massachusetts Lowell (USA); Amod Basnet, Univ. of North Carolina at Charlotte (USA); Moinak Bhaduri, Univ. of Nevada, Las Vegas (USA); Caroline Burch, Clemson Univ. (USA); Amenda Chow, Univ. of Waterloo (Canada); Xue Li, The Univ. of Texas at Dallas (USA); Jordan E. Massad, Sandia National Labs. (USA); Ralph C. Smith, North Carolina State Univ. (USA) [9057-93]

5:10 pm: **Numerical assessment of seismic performance of steel building with recentering damper under near-fault ground motions**, Hui Qian, Zhengzhou Univ. (China); Hongnan Li, Dalian Univ. of Technology (China); Gangbing Song, Univ. of Houston (USA) [9057-94]

Session 15b

Location: Towne  
Thu 3:30 pm to 5:30 pm

**Magneto Rheological Systems III**

Session Chairs: **Faramarz Gordaninejad**, Univ. of Nevada, Reno (USA); **Dai-Hua Wang**, Chongqing Univ. (China)

3:30 pm: **Multi-objective optimal design of magnetorheological engine mount based on an improved non-dominated sorting genetic algorithm**, Ling Zheng, Xuwei Duan, Chongqing Univ. (China) [9057-95]

3:50 pm: **Control of 4-DOF MR haptic master for medical application**, Jong-Seok Oh, Seung-Hyun Choi, Seung-Bok Choi, Inha Univ. (Korea, Republic of) [9057-96]

4:10 pm: **Design and characteristics of MRF-based actuators for torque transmission under influence of high shear rates up to 10,000s<sup>-1</sup>**, Dirk G. Güth, Vadim Erbis, Jürgen Maas, Ostwestfalen-Lippe Univ. of Applied Sciences (Germany) [9057-97]

4:30 pm: **A flexible magnetically field-controllable fluid transport system**, Majid Behrooz, Faramarz Gordaninejad, Univ. of Nevada, Reno (USA) [9057-98]

4:50 pm: **Application fuzzy neural network control algorithm to a seismically isolated bridge using magneto-rheological damper**, Yong-Quan Ma, Hong-Xing Qiu, Southeast Univ. (China) [9057-99]

5:10 pm: **Prosthetic leg powered by MR brake and SMA wires**, The M Nguyen, California State University Fresno (USA); Vicente J. Munguia, Jose Calderon, California State Univ., Fresno (USA) [9057-100]

Conference End.

Session 15a

Location: Pacific Salon Seven  
Thu 3:30 pm to 5:50 pm

**Smart Building Technology II**

Session Chairs: **Akira Mita**, Keio Univ. (Japan); **Jong-Jae Lee**, Sejong Univ. (Korea, Republic of)

3:30 pm: **FE model updating considering boundary conditions**, Jong-Jae Lee, Sejong Univ. (Korea, Republic of) [9061-121]

3:50 pm: **Evaluating damage potential of cryogenic concrete using acoustic emission and LVDT sensors**, Reginald B. Kogbara, Texas A&M Univ. at Qatar (Qatar); Boback Parsaei, Texas A&M Univ. (USA); Srinath R. Iyengar, Texas A&M Univ. at Qatar (Qatar); Zachary C. Grasley, Virginia Polytechnic Institute and State Univ. (USA); Eyad A. Masad, Texas A&M Univ. at Qatar (Qatar) and Texas A&M Univ. (USA); Dan G. Zollinger, Texas A&M Univ. (USA) [9061-122]

4:10 pm: **Design of strain sensors based on the resistivity percolation curves and piezoresistivity curves of conductive composites**, Jinbao Jiang, Huigang Xiao, Hui Li, Harbin Institute of Technology (China) [9061-123]

4:30 pm: **Structural condition assessment of reticulated shell structures and cable-net structures**, Grace Yan, The Univ. of Texas at El Paso (USA) [9061-124]

4:50 pm: **Using multi-taper method to improve the accuracy of substructure identification for shear structures**, Dongyu Zhang, Li Ni, Harbin Institute of Technology (China) [9061-125]

5:10 pm: **Damage analysis tool package for steel and reinforced concrete buildings using acceleration data**, Yu Suzuki, Akira Mita, Keio Univ. (Japan) [9061-126]

5:30 pm: **Improvement of SA-based concrete crack monitoring with efficient data processing**, Shuang Hou, Heying Zheng, Dalian Univ. of Technology (China) [9061-127]

Session 15b

Location: Pacific Salon Five  
Thu 3:30 pm to 5:50 pm

**Adaptive Structures and Controlled Systems**

Session Chairs: **Nicos Makris**, Univ. of Patras (Greece); **Paul Reynolds**, Univ. of Exeter (United Kingdom)

3:30 pm: **Design and optimization of a morphing aileron control surface using FMC actuators**, Edward B. Doepke, Michael K. Philen, Virginia Polytechnic Institute and State Univ. (USA) [9061-128]

3:50 pm: **Health monitoring of fluid dampers for vibration control of structures: experimental investigation**, Dimitrios Konstantinidis, McMaster Univ. (Canada); Nicos Makris, Univ. of Patras (Greece); James M. Kelly, Univ. of California, Berkeley (USA) [9061-129]

4:10 pm: **Miniature cryogenic valves for a Titan Lake sampling system**, Stewart Sherrit, Wayne F. Zimmerman, Jet Propulsion Lab. (USA); Nobuyuki Takano, California State Polytechnic Univ., Pomona (USA); Louisa Avellar, Univ. of California, Berkeley (USA) [9061-130]

4:30 pm: **Actively controlled ultrasonic squeeze film bearings: lateral movement and stability**, Sebastian Mojrzisch, Leibniz Univ. Hannover (Germany) [9061-131]

4:50 pm: **Shape memory alloy (SMA)-based launch lock**, Mircea Badescu, Yoseph Bar-Cohen, Xiaoqi Bao, Jet Propulsion Lab. (USA) [9061-132]

5:10 pm: **Experimental evaluation of a neural-oscillator-driven active mass damper system**, Daisuke Iba, Junichi Hongu, Kyoto Institute of Technology (Japan) [9061-133]

5:30 pm: **Finite element analysis of seal mechanism using SMA for Mars sample return**, Xiaoqi Bao, Paulo J. Younse, Jet Propulsion Lab. (USA) [9061-134]

Conference End.

Conference 9063

Concurrent Sessions

Session 11

Location: Royal Palm Two  
Thu 3:30 pm to 5:10 pm

Modeling and Simulation Techniques  
in NDE/SHM II

Session Chairs: **Piotr Omenzetter**, Univ. of Aberdeen (United Kingdom); **Denvid Lau**, City Univ. of Hong Kong (Hong Kong, China)

3:30 pm: **Coupling mechanism of granular medium and slender beams**, Luyao Cai, Piervincenzo Rizzo, Kaiyuan Li, Univ. of Pittsburgh (USA); Leith Al-Nazer, Federal Railroad Administration (USA) . . . . . [9063-70]

3:50 pm: **Application of a general purpose finite element code investigations of multiple physics in the field of rotordynamics**, Adam C. Wroblewski, Cleveland State Univ. (USA); Andrew L. Gyekenyesi, Ohio Aerospace Institute (USA) . . . . . [9063-71]

4:10 pm: **Non-contact flaw imaging for pipeline structures of nuclear power plants using pulsed laser system**, Changgil Lee, Ju-Won Kim, Junkyeong Kim, Seunghee Park, Sungkyunkwan Univ. (Korea, Republic of) . . . . . [9063-72]

4:30 pm: **Particle filter-based hybrid prognosis for fatigue life prediction in metallic structures**, Rajesh Kumar Neerukatti, Kevin Hensberry, Aditi Chattopadhyay, Arizona State Univ. (USA) . . . . . [9063-73]

4:50 pm: **A multiscale XFEM-based algorithm for detection of multiple flaws in structures**, Hao Sun, Columbia University (USA); Haim Waisman, Columbia Univ. (USA); Raimondo Betti, Columbia University (USA) . . . . . [9063-74]

Conference End.

Panel Discussion: Remaining  
Challenges in Civil Infrastructure

Location: Royal Palm Four  
3:30 pm to 5:00 pm

Panel Moderators: **Caesar Singh**, U.S. Dept. of Transportation (USA); **Tzu-Yang Yu**, Univ. of Massachusetts Lowell (USA)

Panel Members: **Ming L. Wang**, Northeastern Univ. (USA); **Jerome P. Lynch**, Univ. of Michigan (USA); **Nenad Gucunski**, Rutgers, The State Univ. of New Jersey (USA)

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Visit their website: [hotelchildcare.com](http://hotelchildcare.com)

Note: SPIE does not imply an endorsement nor recommendation of these services. They are provided on an "information only" basis for your further analysis and decision. Other services may be available.

### Urgent Message Line

An urgent message line is available during registration hours: 619.908.5040

### Lost and Found

#### SPIE Cashier Station

Found items will be kept at SPIE Registration. At the end of the meeting, all found items will be turned over to Town & Country Lost and Found Department.

## Food and Beverage Services

### Continental

#### Tiki Pavilion

Monday through Thursday . . . . . 7:00 to 8:15 am

A full continental breakfast is available for SPIE hotel guests located in the Tiki Pavilion. Please wear your badge and have your Town & Country room key when you arrive.

### Coffee Breaks

Complimentary coffee will be served twice daily. Check individual conference listings for exact times and locations.

#### Lion Fountain Court

Monday . . . . . 10:00 to 10:30 am; 3:00 to 3:30 pm

#### Exhibition Hall in Golden Ballroom

Tuesday and Wednesday . . . . . 10:00 to 10:30 am; 3:00 to 3:30 pm

#### Lion Fountain Court

Thursday . . . . . 10:00 to 10:30 am; 3:00 to 3:30 pm

## Food & Refreshments for Purchase

### Lunch

A grab and go station with hot and cold snacks, deli sandwiches, salads, pastries and beverages are available for purchase. Cash and credit cards accepted.

#### Lion Fountain Court

Monday . . . . . 11:30 am to 1:30 pm

#### Exhibition Hall in Golden Ballroom

Tuesday & Wednesday . . . . . 11:30 am to 1:30 pm

If you have more time and want to sit during lunch, the Terrace Café, Charlie's Sports Bar and Trellises Restaurant are open as well. For evening dining, Trellises Restaurant, The Terrace Deli, and Charlie's Sports Bar are open. Check for the Special SPIE Value Meal offered.

### Desserts

Complimentary tickets for dessert snacks are included in course and conference attendee registration packets.

## Public Transportation

SuperShuttle offers discounts of \$1 off one way or \$2 off roundtrip for SS/NDE attendees. Discounts do not apply without a reservation. Book Online or call 1-800-258-3826 and refer to SPIE Smart Structures or group code SPIE5. After claiming your luggage, locate the 'Shuttle for Hire' Island and ask the Transportation Coordinator for a SuperShuttle van. Note: you do not have to have an advance reservation to ride SuperShuttle, but without a reservation, you will pay the full rate at the ticket counter.

## The UBER App in San Diego

Need a ride? Request, ride and pay via your mobile phone. UBER uses your phone's GPS to detect your location and connects you with the nearest available driver. Get picked up anywhere, even if you don't know the address. View features - choose your car - request a quote - split cost amongst friends - better, faster, cheaper!

## Taxi

Taxi service from San Diego Airport to the Town & Country Resort and Convention Center is approximately \$24 depending on traffic.

### Driving Directions

Town & Country Resort and Convention Center is located at 500 Hotel Circle North in the Mission Valley area of San Diego, California at Hotel Circle North and Fashion Valley Road. To reach the hotel from north or south, take I-5 to I-8 east. Follow I-8 east to the "Hotel Circle" exit. From I-805, take I-8 west to the Hotel Circle exit and proceed to Hotel Circle North.

### Parking

• Parking at the Town & Country is free for overnight guests. Non-guests pay \$8 per day.

### Car Rental

Hertz Car Rental has been selected as the official car rental agency for this Conference. To reserve a car, identify yourself as a Smart Structures/NDE Conference attendee using the Hertz Meeting Code CV# 029B0019. Discount rates apply for roundtrip rentals up to one week prior through one week after the conference dates. Note: When booking from International Hertz locations, the CV # must be entered with the letters CV before the number, i.e. CV029B0019.

- In the United States call 1-800-654-2240.
- In Canada call 1-800-263-0600, or 1-416-620-9620 in Toronto.
- In Europe and Asia call the nearest Hertz Reservation Center or travel agent. Outside of these areas call 1-405-749-4434.
- Book Online at [www.Hertz.com](http://www.Hertz.com)

### Welcome to San Diego

San Diego, where blue skies keep watch on 70 miles of beaches and a gentle Mediterranean climate begs for a day of everything and nothing. Bordered by Mexico, the Pacific Ocean, the Anza-Borreg Desert and the Laguna Mountains, San Diego county's 4200 square miles offer immense options for business and pleasure.

For more information about San Diego, visit [www.sandiego.org/](http://www.sandiego.org/)



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# General Information

## Policies

### Acceptance of Policies and Registration Conditions

The following Policies and Conditions apply to all SPIE Events. As a condition of registration, you will be required to acknowledge and accept the SPIE Registration Policies and Conditions contained herein.

### Granting Attendee Registration and Admission

SPIE, or their officially designated event management, in their sole discretion, reserves the right to accept or decline an individual's registration for an event. Further, SPIE, or event management, reserves the right to prohibit entry or remove any individual whether registered or not, be they attendees, exhibitors, representatives, or vendors, who in their sole opinion are not, or whose conduct is not, in keeping with the character and purpose of the event. Without limiting the foregoing, SPIE and event management reserve the right to remove or refuse entry to any attendee, exhibitor, representative, or vendor who has registered or gained access under false pretenses, provided false information, or for any other reason whatsoever that they deem is cause under the circumstances.

### Misconduct Policy

SPIE is a professional, not-for-profit society committed to providing valuable conference and exhibition experiences. SPIE is dedicated to equal opportunity and treatment for all its members and meeting attendees. Attendees are expected to be respectful to other attendees, SPIE staff, and contractors. Harassment and other misconduct will not be tolerated; violators will be asked to leave the event.

### Identification

To verify registered participants and provide a measure of security, SPIE will ask attendees to present a government-issued Photo ID at registration to collect registration materials.

Individuals are not allowed to pick up badges for attendees other than themselves. Further, attendees may not have some other person participate in their place at any conference-related activity. Such other individuals will be required to register on their own behalf to participate.

### Capture and Use of a Person's Image

By registering for this event, I grant full permission to SPIE to capture, store, use, and/or reproduce my image or likeness by any audio and/or visual recording technique (including electronic/digital photographs or videos), and create derivative works of these images and recordings in any SPIE media now known or later developed, for any legitimate SPIE marketing or promotional purpose.

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### Payment Method

Registrants for paid elements of the event, who do not provide a method of payment, will not be able to complete their registration. Individuals with incomplete registrations will not be able to attend the conference until payment has been made. SPIE accepts VISA, MasterCard, American Express, Discover, Diner's Club, checks and wire transfers. Onsite registrations can also pay with Cash.

### Authors/Coauthors

By submitting an abstract, you agree to the following conditions:

- An author or coauthor (including keynote, invited, and solicited speakers) will register at the author registration rate, attend the meeting, and make the presentation as scheduled.
- A full-length manuscript (6-page minimum) for any accepted oral or poster presentation will be submitted for publication in the SPIE Digital Library, printed conference Proceedings, and CD. (Some SPIE events have other requirements that the author is made aware of at the time of submission.)
- Only papers presented at the conference and received according to publication guidelines and timelines will be published in the conference Proceedings and SPIE Digital Library (or via the requirements of that event).

### Audio, Video, Digital Recording Policy

Conferences, courses, and poster sessions: For copyright reasons, recordings of any kind are prohibited without prior written consent of the presenter or instructor. Attendees may not capture or use the materials presented in any meeting/course room, or in course notes on display without written permission. Consent forms for material presented in meeting rooms are available at Speaker Check-In. Individuals not complying with this policy will be asked to leave a given session and/or asked to surrender their recording media.

**Exhibition Hall:** For security and courtesy reasons, recordings of any kind are prohibited unless one has explicit permission from on-site company representatives. Individuals not complying with this policy will be asked to surrender their recording media and to leave the exhibition hall.

Your registration signifies your agreement to be photographed or videotaped by SPIE in the course of normal business. Such photos and video may be used in SPIE marketing materials or other SPIE promotional items.

### Laser Pointer Safety Information/Policy

SPIE supplies tested and safety-approved laser pointers for all conference meeting rooms. For safety reasons, SPIE requests that presenters use provided laser pointers.

Use of a personal laser pointer represents user's acceptance of liability for use of a non-SPIE-supplied laser pointer. If you choose to use your own laser pointer, it must be tested to ensure <5 mW power output. Laser pointers in Class II and IIIa (<5 mW) are eye safe if power output is correct, but output must be verified because manufacturer labeling may not match actual output. Come to Speaker Check-In and test your laser pointer on our power meter. You are required to sign a waiver releasing SPIE of any liability for use of potentially non-safe, personal laser pointers. Misuse of any laser pointer can lead to eye damage.

### Access to Technical and Networking Events

Persons under the age of 18 including babies, carried or in strollers, and toddlers are not allowed in technical or networking events. Anyone 18 or older must register as an attendee. All technical and networking events require a valid conference badge for admission.

## Underage Persons on Exhibition Floor Policy

For safety and insurance reasons:

- No persons under the age of 18 will be allowed in the exhibition area during move-in and move-out.
- Children 14 and older, accompanied by an adult, will be allowed in the exhibition area during open exhibition hours only
- All children younger than 14, including babies in strollers and toddlers, are not allowed in the exhibition area at any time.

## Unauthorized Solicitation Policy

Unauthorized solicitation in the Exhibition Hall is prohibited. Any non-exhibiting manufacturer or supplier observed to be distributing information or soliciting business in the aisles, or in another company's booth, will be asked to leave immediately.

## Unsecured Items Policy

Personal belongings should not be left unattended in meeting rooms or public areas. Unattended items are subject to removal by security. SPIE is not responsible for items left unattended.

## Wireless Internet Service Policy

At SPIE events where wireless is included with your registration, SPIE provides wireless access for attendees during the conference and exhibition but cannot guarantee full coverage in all locations, all of the time. Please be respectful of your time and usage so that all attendees are able to access the internet.

Excessive usage (e.g., streaming video, gaming, multiple devices) reduces bandwidth and increases cost for all attendees. No routers may be attached to the network. Properly secure your computer before accessing the public wireless network. Failure to do so may allow unauthorized access to your laptop as well as potentially introduce viruses to your computer and/or presentation. SPIE is not responsible for computer viruses or other computer damage.

## Mobile Phones and Related Devices Policy

Mobile phones, tablets, laptops, pagers, and any similar electronic devices should be silenced during conference sessions. Please exit the conference room before answering or beginning a phone conversation.

## Smoking

For the health and consideration of all attendees, smoking is not permitted at any event elements, such as but not limited to: plenaries, conferences, workshops, courses, poster sessions, hosted meal functions, receptions, and in the exhibit hall. Most facilities also prohibit smoking in all or specific areas. Attendees should obey any signs preventing or authorizing smoking in specified locations.

## Hold Harmless

Attendee agrees to release and hold harmless SPIE from any and all claims, demands, and causes of action arising out of or relating to your participation in the event you are registering to participate in and use of any associated facilities or hotels.

## Event Cancellation

If for some unforeseen reason SPIE should have to cancel the event, registration fees processed will be refunded to registrants. Registrants will be responsible for cancellation of travel arrangements or housing reservations and the applicable fees.

## Confidential Reporting of Unethical or Inappropriate Behavior

SPIE is an organization with strong values of responsibility and integrity. Our Ethics Statement and Code of Professional Conduct contain general guidelines for conducting business with the highest standards of ethics. SPIE has established a confidential reporting system for staff & other stakeholders to raise concerns about possible unethical or inappropriate behavior within our community. Complaints may be filed by phone or through the website, and, if preferred, may be made anonymously. The web address is [www.SPIE.ethicspoint.com](http://www.SPIE.ethicspoint.com) and the toll free hotline number is 1-888-818-6898.

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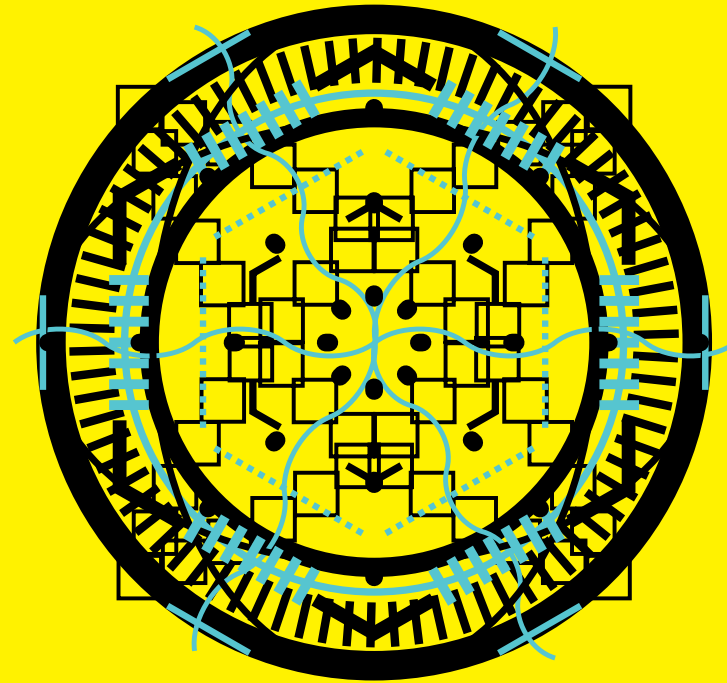
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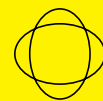
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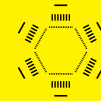
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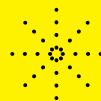
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An aerial photograph of a city skyline, likely San Diego, with a marina in the foreground. The image is overlaid with a semi-transparent teal filter. The text '2015 SMART STRUCTURES NDE' is prominently displayed in white, bold, sans-serif font. A small teal circle is positioned at the end of the word 'NDE'.

# 2015 SMART STRUCTURES NDE.

Where the research, technology and applications of sensors, smart structures and nondestructive evaluation and health monitoring are explored and presented.

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Town & Country Resort and Convention Center  
San Diego, California, USA

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# READ PAPERS ONSITE as they are published

Beginning the first day of the conference, SPIE Smart Structures/NDE pre-registered attendees will have online access to all proceedings papers related to this event as they are published. Papers can be accessed online through the SPIE Digital Library and all downloaded PDFs of papers are yours to keep. Event attendees who register after the pre-registration cutoff, or onsite, will receive access after the meeting.

To access the proceedings (beginning 9 March):

- If you already have an SPIE account, sign in at <https://spiedigitallibrary.org> (click SIGN IN, upper right corner) to gain access to the conference papers. If you do not have an account, create one using the email address you used to register for the SPIE Smart Structures/NDE conference.

- Once you have signed in, you may access the event proceedings via the “My Conference Proceedings” tab in the left column on your My Account page, or use the Browse Proceedings By Conference link and scroll to Smart Structures/NDE.

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