ASME SMASIS 2022

The ASME 2022 Conference on Smart Materials, Adaptive Structures and Intelligent Systems

CONFERENCE
Sept 12 – 14, 2022

Location:
The Dearborn Inn
Dearborn, MI

Program

https://event.asme.org/SMASIS

The American Society of Mechanical Engineers®
ASME®

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SETTING THE STANDARD

Dear SMASIS Community:

On behalf of the organizing committee, we welcome you to the 2022 ASME Conference on Smart Materials Adaptive Structures and Intelligent Systems. This year marks the 15th consecutive SMASIS conference, and we are glad that you are a part of it.

After two years of virtual conferences, we are enthusiastic for this in-person gathering for SMASIS 2022 to see each other and to share exciting scientific achievements. We would like to thank you for your support during the previous remote conferences and especially during this year. SMASIS is a cohesive community, and we did receive a lot of support organizing this year's event. We are grateful for the dependable familial ethos that our founders and former organizers successfully distilled into this yearly event. We are indeed a family that hosts a technical conference, and we hope that SMASIS 2022 will help you interact with, learn from, and mentor those around you.

We are enthusiastic for the reunion that SMASIS provides, the opportunities to collaborate, and the chances to see, firsthand, the technical and professional development of our students. Highlights of this year's three-day meeting include keynote presentations from Dr. Charles Farrar (Los Alamos National Laboratory), Dr. Paul Krajewski (General Motors), and Prof. James Hubbard (Texas A&M)—the 2022 Adaptive Structures and Material Systems Award Winner! We will host parallel virtual sessions organized by the following technical tracks.

- Symposium 1: Development & Characterization of Multifunctional Materials
- Symposium 2: Mechanics and Behavior of Active Materials
- Symposium 3: Modeling, Simulation and Control of Adaptive Systems
- Symposium 4: Integrated System Design and Implementation
- Symposium 5: Structural Health Monitoring
- Symposium 6: Bioinspired Smart Materials and Systems
- Symposium 7: Energy Harvesting
- Symposium 8: Emerging Technologies

The Pioneer banquet will be held on the Detroit Princess Riverboat, which offers a breathtaking panorama of the Detroit River and skyline. There are numerous opportunities to expand your own personal community and broaden your horizons, including Technical Committee Meetings, Journal Meetings, and the ASME SMASIS division meeting.

SMASIS is dedicated to developing future leaders in science, technology, and engineering. This is an emphasis of our Student and Young Professional Development group. Highlights of their symposium are the two student competitions on Monday with the Best Paper Competition and Hardware Competition. In additional, several student events are planned to provide networking. We are proud that our students and young professionals are always seeking ways to give back to the community. Please take advantage of these opportunities to see our rising stars and to meet your future colleagues and our future leaders!

We did receive full support from our SMASIS community for organizing this conference. Returning to the in-person conference had many challenges and if it were not for this support, we would have not been able to make it. We especially would like to thank Prof. Diann Brei from the University of Michigan and Dr. Nancy Johnson from General Motors for their tremendous help and involvement. We are grateful to ASME staff, the ASME SMASIS Division, the ASME SMASIS Symposia Chairs and Co-Chairs, and the Technical Committees and organizing committees for their arduous work and guidance. Our thanks go to Symposia Chairs and Co-Chairs for assembling such outstanding technical programs. We also recognize all the authors, keynote and invited speakers, and panel participants who are the major contributors to the success of SMASIS. Finally, we have received generous support from our sponsors: General Motors, Polytec, Inc., Fort Wayne Metals, the University of Michigan and NextGen Aeronautics, Inc., all of which are greatly appreciated.

We want to thank each of you for participating in this event and reunion after two years and look forward to hopefully seeing you every year!

Amin Karami
General Conference Chair
University at Buffalo

James Gibert
Technical Conference Chair
Purdue University

Shahrzad Towfighian
Technical Program Co-Chair
Binghamton University

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REGISTRATION INFORMATION

Registration will be located each day in the Banquet Foyer located on the first floor.

The hours are as follows:

Sunday, September 11
3:00PM–6:00PM

Monday, September 12
7:00AM–6:00PM

Tuesday, September 13
7:00AM–5:30PM

Wednesday, September 14
7:00AM–11:00AM

ACKNOWLEDGMENT

The ASME Conference on Smart Materials, Adaptive Structures, and Intelligent Systems is sponsored by the Aerospace Division of the American Society of Mechanical Engineers.

HOTEL

Built in 1931 on the former grounds of the Ford Motor Company, The Dearborn Inn, A Marriott Hotel, is a historic destination amid celebrated attractions. Surrounded by 23 lush, landscaped acres, our stately hotel inspires effortless relaxation with elegant rooms and suites, two colonial lodges and five homes, each appointed with modern essentials, plush furnishings, and thoughtful amenities. Ignite your senses with delectable fare, fine wines, and creative cocktails at our two restaurants, Edison's, and Ten Eyck Tavern. Explore some of the most popular attractions in Michigan, including the Henry Ford Museum, Greenfield Village, and Automotive Hall of Fame. Meetings are held in inspiring event spaces, enhanced by stunning chandeliers and classic refinements. Cap your day with a swim in our sparkling pool and work out in our modern fitness center. Escape to sophistication at our hotel near Detroit, MI, and experience refined comfort in the Detroit area.

NAME BADGES

Please always wear your name badge for all functions. Admission to all conference functions will be by name badge. Your badge also provides a helpful introduction to other attendees.

TICKETED FUNCTIONS

Entrance to all social functions is allowable by wearing your conference badge. If you have purchased an additional ticket for the Pioneer Awards Banquet on the Detroit Princess Riverboat for Monday, September 12, for your spouse and/or guests, "Banquet" will be printed on your registration badge.

TAX DEDUCTIBILITY

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

HANDICAPPED REGISTRANTS

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

HAVE QUESTIONS ABOUT THE MEETING?

If you have any questions or need assistance, an ASME representative will be located at the registration area.

Conference Events

BREAKFAST

Monday, September 12
7:00AM–8:00AM
Tuesday, September 13
7:00AM–8:20AM
Alexandria Ballroom, Third Floor

Starting with Tuesday morning prior to the start of the technical sessions, a continental breakfast will be provided. All registered conference attendees are welcome! Immediately following the breakfast will be the daily Keynote Presentation from 8:00AM to 9:00AM. See the Keynote section of this program for more details as well as information about our Invited Speakers.

COFFEE BREAKS

Monday, September 12
10:30AM–10:50AM and 3:20PM–3:40PM
Tuesday, September 13
9:30AM–10:20AM and 3:20PM–3:40PM
Wednesday, September 14
9:20AM–9:30AM
Banquet Foyer, First Floor

LUNCHES

Monday, September 12–Tuesday, September 13
12:10PM–1:40PM
Alexandria Ballroom, Third Floor

EXHIBIT

Tuesday, September 13
10:00AM–5:00PM
Banquet Foyer, First Floor

Please Take advantage of the opportunity to visit the booths of the leading industries in the field that are making it happen! Experts will be on hand to speak with you from Polytec, Inc. Please stop by. Our exhibitors help support the conference, so let us support them!

SPECIAL SESSION ON ENGINEERED LIVING MATERIALS

Tuesday, September 13
9:50AM–11:10AM
Salon II, First Floor
Engineered Living Materials I - (Joint Sessions 6-6 and 8-3)

Wednesday, September 14
9:30AM–10:40AM
Salon II, First Floor
Engineered Living Materials II - (Joint Sessions 6-9 and 8-6)

Organizers: **Jovana Jovanova**, *TU Delft, Netherlands* **Joseph Najem**, *The Pennsylvania State University*

This vision session will introduce the emergent concept of “Living Materials” as next generation materials that are essential at advancing the science, technologies, policies, and practices needed for a sustainable world. In particular, discussions will center on engineered materials systems that have the essential characteristics of living things. Materials research has advanced significantly through groundbreaking work on bioinspired materials, smart, adaptive and multi-field responsive materials, self-healing and self-powered materials. With engineered living materials, researchers are seeking to combine and integrate these different aspects in a single materials system, that leverages the adaptive response, self-replicating potential, and robustness of biological systems for the programmed assembly and modulation of novel materials.

Experts from diverse backgrounds will answer the WHAT, WHY, and HOW questions concerning their vision for Engineered Living Materials and their potential impact on society. The session will include a 40-minute vision talk (Zoubeida Ounaies, Penn State) and a 40-minute interactive panel of experts (TBA).

PIONEER AWARDS CEREMONY BANQUET

Monday, September 12
6:30PM–8:45PM
Detroit Princess Riverboat Dinner Cruise

Please note: Buses will depart from the hotel at 6:00PM Sharp and we will depart the boat by 8:45PM, arriving back at the hotel by 9:15PM. Times are approximate.

Please join us for a special evening on the beautiful Detroit Princess Riverboat that will include the Awards ceremony and a wonderful buffet dinner.

A Brief History...
The Detroit Princess has been entertaining Detroit in its current location since 2005, docked just downriver from Hart Plaza, but it has quite an interesting history prior to that. It was originally named the Players Riverboat Casino II and was built in Jennings, Louisiana in 1993. It ran as a Merv Griffin establishment for a number of years, located on the Mississippi River in Metropolis, Illinois.

Harrah's Hotel & Casinos eventually purchased the boat, bringing it back down south to Lake Charles, Louisiana where it ran as a casino boat for a number of years before being stripped of all its gambling decor and abandoned for a larger boat. The boat sat in Orange, Texas for a few years, not operating. The owners had plans to scrap the boat, but at the final hour some folks up north decided to step in.

The current owners purchased the riverboat in 2004, and the vessel made her first and last journey to her new home in Detroit. The boat was too large to make its way through the northern portions of the Mississippi River, so it had to be towed around Florida, up the inter-coastal waterway, past Nova Scotia, and through the St. Lawrence Seaway to reach the Great Lakes and a temporary home, Toledo.

The boat spent a number of months in Ohio being refitted to operate as a restaurant, adding a full kitchen with eight convection ovens, ten steam cabinets, ten movable heater cabinets, two walk in coolers, a fully functioning dish room, and serving kitchens on each level that would soon serve Detroiters and tourists alike. After retooling, the vessel was ready to come home.

Although the boat may have been built in the Mississippi Delta in the early 1990s, the Detroit Princess has been well received from day one. When researching the options to bring a boat-style restaurant to Detroit, we really wanted to provide something that Detroit that had been missing since the late 1980s. For almost a century the Boblo Boats SS Ste. Claire and SS Columbia entertained Detroiters on the river, but they sadly were sold in 1991. Until the Detroit Princess Riverboat's arrival in 2005 the riverfront felt a tad bit empty, and we have happily filled the role as Detroit's premier riverboat experience ever since.

Student Events

LET'S ZOOM OUT!

Sunday, September 11
3:30PM–6:30PM
Fairlane Ballroom, Third Floor

The wait is finally over! You are invited to attend an IN-PERSON lighthearted meet and greet event. Leave your webcam at home and come hang out with your peers. Don't worry about having to mute yourself or find that one perfect background for this meeting. Bring the beverage of your choice and share your experience over the last couple of years, your worst Zoom moments, or anything you need to let out before heading to the conference the next day.

EDUCATIONAL OUTREACH

Monday, September 12–Wednesday, September 14

Educational outreach is a conference website and app-based campaign. So, head over to the conference website to check out what the SMASIS community is doing to engage with the next generation of scientists and engineers. Scan the QR code at registration located in Banquet Foyer on the first floor.

STUDENT TRIVIA LUNCH

Monday, September 12
12:10PM–1:40PM
Rouge River, First Floor

Everyone is invited to test their knowledge of random facts during the Trivia Lunch. Participants are encouraged to form multicultural, intergenerational teams by sitting at the same lunch table. A quizmaster will guide the teams through a multi-round "Pub" Style trivia competition, which covers a wide array of nontechnical topics.

NETWORKING OVER COFFEE

Monday, September 12 and Tuesday, September 13
3:20PM–3:40PM
Banquet Foyer, First Floor

It's time to grab your coffee and stretch your legs! Go check out the exhibitors, or talk to that person sipping their coffee, who might share your research interests, may be hiring, or just wants to chat! Share your profile via in-app QR code in a second.

STUDENT CAREER PANEL

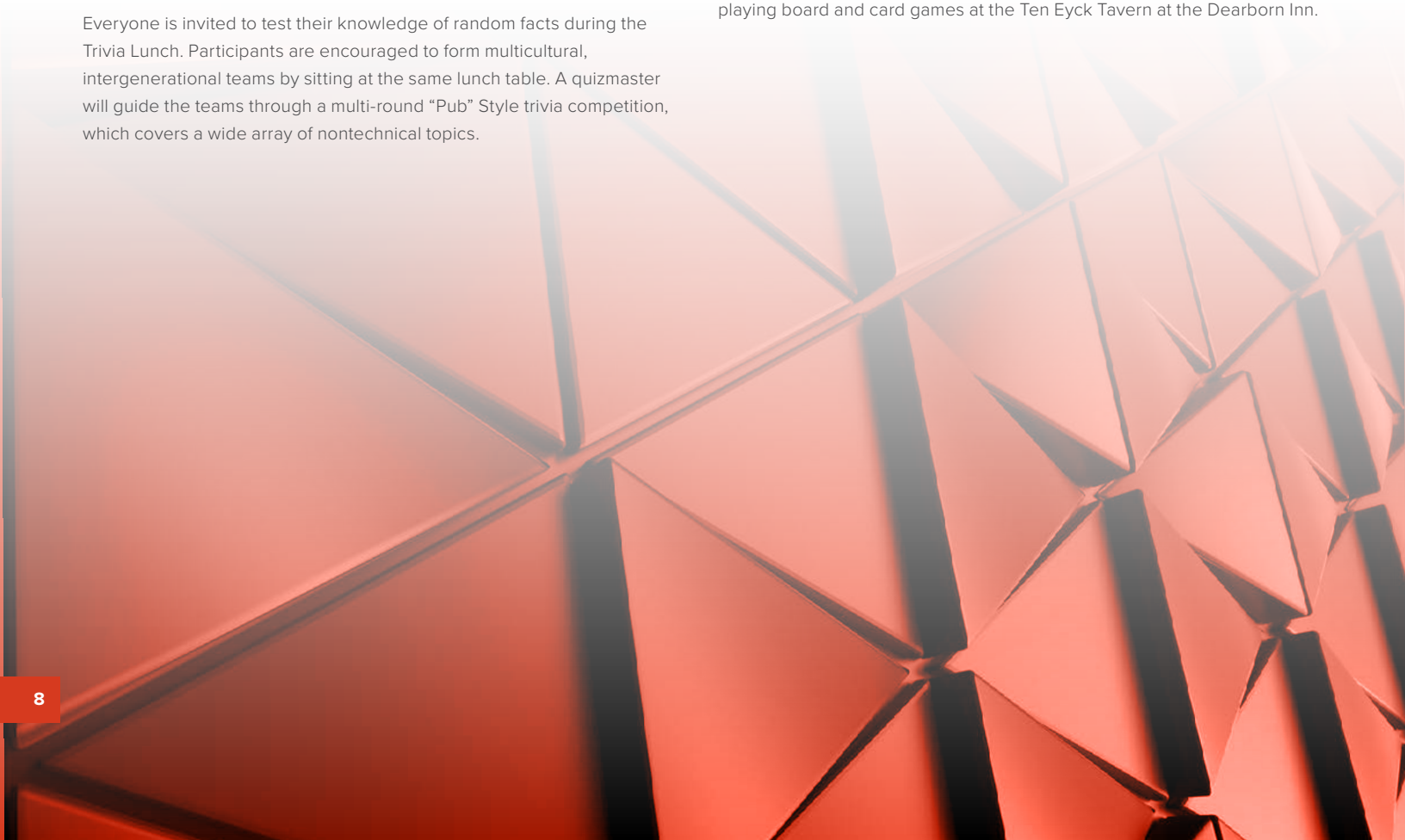
9:30AM–10:10AM
Tuesday, September 13
Rouge River, First Floor

Academia and industry and national lab, oh my! A panel of professionals from academia, industry, and government laboratories will be at lunch to discuss their career trajectories and responsibilities and answer questions about career options in their positions!

STUDENT GAME NIGHT

8:30PM–10:30PM
Tuesday, September 13
Ten Eyck Tavern

Let's get the party on at game night! Everyone is welcome to mingle while playing board and card games at the Ten Eyck Tavern at the Dearborn Inn.



SYMPOSIUM 9
BEST STUDENT PAPER COMPETITION I – FINALISTS

Monday, September 12
9:30AM–10:40AM
Grosse Pointe, Third Floor

BEST STUDENT PAPER COMPETITION II – FINALISTS

Monday, September 12
10:50AM–12:10PM
Grosse Pointe, Third Floor

The ASME Adaptive Structures and Material Systems branch organized the Best Student Paper Competition as part of the ASME/AIAA Conference on Smart Materials, Adaptive Structures, and Integrated Systems (SMASIS).

A committee of smart materials and structures experts judged entrants. Finalists are required to present their papers at The Student Best Paper Sessions on Monday, September 9. All finalists will be honored during the Pioneer Banquet, Monday, September 12.

BEST STUDENT HARDWARE COMPETITION I – FINALISTS

Monday, September 12
1:40PM–3:20PM
Grosse Pointe, Third Floor

BEST STUDENT HARDWARE COMPETITION II – FINALISTS

Monday, September 12
3:40PM–5:20PM
Grosse Pointe, Third Floor

The ASME Adaptive Structures and Material Systems branch organized the Best Student Hardware Paper Competition as part of the ASME/AIAA Conference on Smart Materials, Adaptive Structures, and Intelligent Systems (SMASIS). Entrants in the competition will be judged by a committee of smart materials and structures experts, and a list of finalists will be determined based upon their technical papers. Finalists are required to present their papers at a regular conference session and must participate in a special exhibit session on Monday, September 12. All finalists will be honored during the Pioneer Banquet on Monday, September 12, 2022.

Committee Meeting Schedule

SUNDAY, SEPTEMBER 11		
MEETING	**TIME**	**ROOM**
Leadership Summit (By Invitation Only)	1:00PM–5:00PM	Fairlane
Leadership Dinner (By Invitation Only)	6:00PM–8:00PM	Ten Eyck Tavern
Let's Zoom Out Student Event	3:30PM–6:30PM	Fairlane Ballroom

MONDAY, SEPTEMBER 12		
TECHNICAL COMMITTEE MEETINGS	**TIME**	**ROOM**
Bio Inspired Structures and Systems	12:10PM–1:40PM	Salons II
Active Materials and Multifunctional Materials	12:10PM–1:40PM	Salon III
Active Material Technologies and Integrated Systems	12:10PM–1:40PM	Salon IV
Energy Harvesting	12:10PM–1:40PM	Salon I
Structural Health Monitoring	12:10PM–1:40PM	Firestone

Keynote Speakers

MONDAY, SEPTEMBER 12
8:00AM–9:20 AM **SALONS I & II, FIRST FLOOR**

James Hubbard, Jr., Ph.D.
Texas A&M University
College Station, TX

BIOGRAPHY: James E. Hubbard, Jr., Ph.D. is the Oscar S. Wyatt, Jr. Chair I professor at the Texas A&M University. He is internationally known for control of adaptive structures, and spatially distributed systems for the real-time control. He is widely viewed as a founding father of the field of Smart Structures. He is the recipient of the SPIE Lifetime Achievement Award, the SPIE Innovative Product of the Year Award, and is a Permanent Fellow of the Hagler Institute for Advanced Studies. He holds 24 patents and is the founder of 4 companies. He has published 4 books and more than 100 technical articles in peer reviewed journals. Hubbard is a Fellow of the AIAA, SPIE, ASME and a member of the National Academy of Engineering, The Academy of Medicine, Engineering and Science of Texas, and the Virginia Academy of Science, Engineering and Medicine.

THE SMART STRUCTURE OF THE MIND

ABSTRACT: We present our most recent research in the development of a Modal Approach to the Space Time Dynamics of Cognitive Biomarkers. More specifically, we apply well-known “black box” output only system identification techniques to the biomarker of electroencephalogram (EEG) data. The result is a Linear Time Invariant model that admits brain wave modes of human cognitive states. The weak nonlinearities and stochasticity present in the data is accommodated using an adaptive feedback scheme that adjust the model in near real-time to yield less than 1% error with the concomitant data stream. The brain wave “modes” are linearly independent and can be likened to the keys on a piano. Weighted linear combinations can produce “chords” which can be combined to produce music and reveal the symphony of the brain. The space-time modal patterns of the brain have the potential for widespread application in the diagnosis of Alzheimer’s disease, dementia, seizures, human emotions, and the like.

TUESDAY, SEPTEMBER 13
12:10PM–1:40PM **ALEXANDRIA BALLROOM, THIRD FLOOR**

Paul E. Krajewski, Ph.D.
General Motors Global Research and Development Center
Warren, MI

BIOGRAPHY: Dr. Paul E. Krajewski is the Director of the Vehicle Systems Research Lab at the General Motors Global Research and Development Center. His laboratory is responsible for R&D in a variety of areas including Interior and Safety Systems, Autonomous Driving, Connectivity, User Experience, Cybersecurity, Displays, and Electrical Architecture. Paul also represents GM as the USCAR Leadership Group Director, as a JOG member for USDRIVE, and as the Technical Director for HRL. Dr. Krajewski is a global expert in vehicle lightweighting and lightweight materials. He received his Bachelor’s and Doctorate in Materials Science and Engineering from the University of Michigan. Dr. Krajewski has over 75 publications and has been awarded 54 U.S. Patents. He has been recognized by Fortune Magazine (40 under 40) and MIT’s Technology Review (TR100) as a leading innovator and is a Fellow of ASM International. He was inducted into the National Academy of Engineering in 2020. Paul has also published three children’s STEM/STEAM books entitled “What’s In Your Car,” “What’s In Your Body,” and “What’s In Your Plane.”

AUTOMOTIVE UNOBTANIUM: MATERIAL CHALLENGES FOR THE FUTURE OF TRANSPORTATION

ABSTRACT: The future of ground transportation promises significant changes to how vehicles travel, how they are propelled, and how customers experience the trip. Materials are the common enabler for this future, with the ability to impact autonomous driving, electrification, cabin experience and connectivity while providing superior performance and sustainable, green vehicles. This talk will first provide a vision for the future of automobiles and then identify key challenges in each of these areas including materials for batteries, sensors, displays, structures, and a variety of interior systems. The goal is to provide targets for the materials research community to help drive the development of these enabling materials.

Keynote Speakers

WEDNESDAY, SEPTEMBER 14
8:00AM–9:20 AM **SALONS I & II, FIRST FLOOR**

Charles R. (Chuck) Farrar, Ph.D., PE

The Engineering Institute
Los Alamos National Laboratory
Los Alamos, NM

BIOGRAPHY: Chuck Farrar is currently the leader of Los Alamos National Laboratory's (LANL) Engineering Institute, a research and education collaboration between LANL and the Univ. of California San Diego's (UCSD) Jacobs School of Eng. His research interests focus on developing integrated hardware and software solutions to structural health monitoring (SHM) and damage prognosis problems. The results of this research have been documented in many journal publications, conference proceedings and a book entitled Structural Health Monitoring A Machine Learning Perspective. Each year he teaches a graduate course on SHM for UCSD. Additional professional activities include the development of a structural health monitoring short course that has been offered more than 45 times to industry and government agencies in Asia, Australia, Europe and the U.S. He is the founder of the Los Alamos Dynamics Summer School (now in its 23rd year) and he is a co-developer of the Los Alamos Judicial Science School (now in its 10th year). In 2012 he was elected as a Fellow of Los Alamos National Laboratory. He is also a Fellow of the American Society of Mechanical Engineers, the American Society of Civil Engineers, and the Society for Experimental Mechanics.

ADDING RIGOR TO STRUCTURAL HEALTH MONITORING THROUGH STATISTICAL PHYSICS

ABSTRACT: This presentation will begin by briefly summarizing the historical developments of structural health monitoring (SHM) technology that have occurred over the last 30 years and outstanding challenges for this technology. With this background, the discussion will them focus on how developments in statistical physics can be applied to SHM and possibly address some of these remaining challenges. Here three topics will be introduced. First, damage increases the complexity of a system. Second, damage alters the causal relationship between sensor measurements. Third, the fluctuation-dissipation theorem provides insight into the selection of effective damage-sensitive features. Complexity and causality measures from statistical physics as well as econometrics, neuro-science and data science will be introduced. These measures will be applied to the monitoring of critical infrastructure and are assessed for robustness to monitoring such systems under varying operational and environmental conditions. Then the fluctuation-dissipation theorem will be described and more recent developments in the fluctuation theorem applied to non-equilibrium phase transitions will be examined in the context of SHM. The talk will conclude with a discussion of how these approaches from statistical physics can be used to generate a more principled approach to SHM damage-sensitive feature selection, which is the basis for all artificial intelligence approaches to critical infrastructure monitoring.

MONDAY, SEPTEMBER 12
9:30AM–10:10PM **FIRESTONE, THIRD FLOOR**

Ken Loh, Ph.D.
University of San Diego
San Diego, CA

BIOGRAPHY: Ken Loh is a professor and was the former Vice Chair (2018–2021) of the Department of Structural Engineering at UC San Diego. He is the Director of the Active, Responsive, Multifunctional, and Ordered-materials Research (ARMOR) Lab and is the Director of the UC San Diego, Jacobs School of Engineering, Center for Extreme Events Research (CEER). He is also an affiliate faculty member of the Materials Science & Engineering Program and the Center for Wearable Sensors. Dr. Loh received his B.S. in Civil Engineering from Johns Hopkins University in 2004. His graduate studies were at the University of Michigan, where he completed two M.S. degrees in Structural Engineering (2005) and Materials Science & Engineering (2008), as well as a Ph.D. in Structural Engineering in 2008. He started his Assistant Professor career in January 2009 in the Department of Civil & Environmental Engineering at UC Davis, before joining UC San Diego in January 2016. His research interests are in multifunctional and stimuli-responsive materials, tomographic imaging techniques, wearable sensors, active metamaterials, and soft material actuators applied towards solving problems related to human performance, structural sustainment, and human-structure interactions.

DISTRIBUTED DAMAGE CHARACTERIZATION ENABLED BY TOMOGRAPHIC METHODS

ABSTRACT: Structural systems are susceptible to damage caused by deterioration, changing operating conditions, natural disasters, or unexpected events. Undetected damage can propagate and cause catastrophic failure. Thus, structural health monitoring (SHM) is crucial for identifying damage initiation, directing repair, and ensuring system safety/reliability. This presentation outlines a new paradigm shift in SHM, where sensors are designed from a materials perspective stemming from a "bottom-up" design methodology. By manipulating materials at the molecular level and then scaling them up to tangible length scales, one can engineer novel stimuli-responsive materials that respond to structural response (or damage) features of interest. By coupling these materials with tomographic methods, spatial structural sensing could be achieved. This seminar will highlight a few examples. First, nanocomposite thin films are coupled with electrical impedance tomography (EIT) to realize densely distributed 2D sensing. Damage, such as cracks, strain fields, and pH/corrosion, could be identified and localized. EIT can also be extended to map the conductivity of patterned nanocomposites for strain field monitoring. Second, subsurface structural sensing could be achieved by embedding passive thin film sensors in structural components and then interrogating them using an electrical capacitance tomography (ECT) measurement strategy and algorithm. Cross-sectional images of structural components could be used to directly visualize and characterize defects (e.g., voids or cracks) in the component. In addition, noncontact and subsurface pH/corrosion and strain sensing was also validated.

MONDAY, SEPTEMBER 12
10:50AM–11:10AM **SALON V, FIRST FLOOR**

Farhan Gandhi
Rensslear Polytechnic Institute
Troy, NY

BIOGRAPHY: Farhan Gandhi obtained his PhD in Aerospace Engineering from U of Maryland's Alfred Gessow Rotorcraft Center in 1995. After 17 years on the Penn State Aerospace Faculty, he transferred to Rensselaer Polytechnic Institute in 2012 as the Redfern Chair in Aerospace Engineering. He assumed responsibilities as RPI's Aerospace Program Director in 2014, and as Founding Director of RPI's Center for Mobility with Vertical Lift (MOVE) in Spring 2018. Gandhi is an AIAA Fellow, a Technical Fellow of the Vertical Flight Society (formerly the American Helicopter Society), and a Fellow of the Royal Aeronautical Society. He has chaired multiple major technical conferences and technical committees. One of the nation's top experts in VTOL aircraft aeromechanics, advanced VTOL configurations (including multi-rotor aircraft), and reconfigurable vertical lift, he held a Joint Faculty Appointment with the US Army Research Lab, Vehicle Technology Directorate (2018–2021). Over a 27-year academic career, Gandhi has published over 340 technical papers, advised 26 PhD students to graduation, and currently maintains a vibrant research group comprising of 2 research scientists, 11 PhD students, and several MS and undergrad students.

AUTONOMOUS MORPHING IN ROTARY-WING SYSTEMS

ABSTRACT: Since the optimal geometric configuration for an aircraft (and other vehicles) can differ depending on the operating condition, morphing provides the ability to operate close to optimality at multiple diverse operating conditions, and even expand the operating envelope considerably. The big fundamental challenge with morphing aerospace structures has been the design of structures that are simultaneously rigid enough to carry the external aerodynamics and inertial loads, and at the same time compliant enough so that the actuation requirements (actuation power, actuator size, etc.) are not prohibitive. Other challenges include material strain capability and requirement for flexible skins. The use of novel materials and innovative structural design has certainly advanced morphing technology over the last decade-and-a-half. This presentation delves into a specific morphing concept—that of autonomous shape change—and seeks to advance this concept by providing several examples and discussing future opportunities. Examples covered will include those where RPM change of rotor blades (e.g., helicopter and wind-turbine blades), and the resulting change in centrifugal force are exploited to morph rotor blade span, and chord and twist distribution. Examples will also be provided where temperature change can be used to produce wing camber morphing to expand the operating envelope of the vehicle. Other possibilities, where change in pressure distribution can be used to induce or assist in shape morphing will also be discussed.

Symposia Invited Speakers

MONDAY, SEPTEMBER 12
11:30PM–12:10PM **SALONS I & II, FIRST FLOOR**

Michael D. Dickey
North Carolina State University
Raleigh, NC

BIOGRAPHY: Michael Dickey received a BS in Chemical Engineering from Georgia Institute of Technology (1999) and a PhD from the University of Texas (2006) under the guidance of Professor Grant Willson. From 2006-2008 he was a post-doctoral fellow in the lab of Professor George Whitesides at Harvard University. He is currently the Camille and Henry Dreyfus Professor in the Department of Chemical & Biomolecular Engineering at NC State University. He completed a sabbatical at Microsoft in 2016. Michael's research interests include soft matter (liquid metals, gels, polymers) for soft and stretchable devices (electronics, energy harvesters, textiles, and soft robotics).

LIQUID METAL FOR SOFT, STRETCHABLE, AND ADAPTIVE SYSTEMS

ABSTRACT: Liquid metals based on gallium are often overlooked materials despite their remarkable properties: melting points below room temperature, water-like viscosity, low-toxicity, and effectively zero vapor pressure (they do not evaporate). They also have, by far, the largest interfacial tension of any liquid at room temperature. Normally small volumes of liquids with large tension form spherical or hemi-spherical structures to minimize surface energy. Yet, these liquid metals can be patterned into non-spherical shapes (cones, wires, antennas) due to a thin, oxide skin that forms rapidly on its surface. This talk will describe efforts in our research group to harness this oxide to pattern and manipulate metal into useful shapes—such as circuits, optical components, and particles—that are useful for applications that call for soft, responsive, and adaptive features. Because it is a liquid, it is possible to pattern the metal in unique ways, such as injection or direct-write 3D printing at room temperature to form ultra-stretchable wires, self-healing circuits, and soft logic devices (the latter of which perform logic without semiconductors). The liquid metals can also be utilized for energy harvesting to convert waste heat or mechanical energy into electricity.

MONDAY, SEPTEMBER 12
2:20PM–3:20PM **SALONS III, FIRST FLOOR**

Christopher Tabor
Air Force Research Laboratory
Dayton, OH

BIOGRAPHY: Dr. Christopher Tabor is a Materials Research Scientist within the Air Force Research Laboratory (AFRL), located at Dayton, Ohio. He has been with AFRL for over 12 years, first as a National Research Council Fellow and then as a staff scientist, following his graduation with a Ph.D. in chemistry from Georgia Tech in 2009. He leads a multidiscipline team exploring room temperature liquid metals for embodiments such as stretchable skin electrodes, physically reconfigurable antennas, and soft robotics. Dr. Tabor's work has been highlighted in the defense technology media on multiple occasions and he has published over 40 peer-reviewed journal articles in the area of optical and electronic properties of metals with 8 patents awarded.

LIQUID METAL ELECTRONICS

ABSTRACT: Next-generation requirements for electronics will demand new materials and paradigms to address emerging areas such as smart wearables, resilient electronics, and advanced manufacturing such as printing. This talk will focus on one class of emerging materials, which has been gaining significant momentum in both the academic and industrial research fields, namely low temperature gallium based liquid metal alloys. These materials provide the potential for superior conductivity with the added benefit of the mechanical properties of a liquid. The formation of surface oxides on the liquid provides a tunable surface that can lend unprecedented control of the mechanical properties and responsivity to the liquid. Under-standing the surface chemistry on these thin oxide interfaces has been a key focus of our research, enabling us to create mechanically tunable microparticles, printed ultra-stretchable electronics, programmable RF hardware, and self-healing circuits.

TUESDAY, SEPTEMBER 13
8:30AM–9:10AM **ROUGE RIVER, FIRST FLOOR**

Maria Sakovsky
Stanford University
Stanford, CA

BIOGRAPHY: Maria Sakovsky is an Assistant Professor in the Aeronautics and Astronautics Department at Stanford University. Her work focuses on the use of shape adaptation to realize space structures with reconfigurable geometry, stiffness, and even non-mechanical performance (ex. electromagnetic, optical). Particular focus is placed on the mechanics of thin fiber reinforced composite structures, the interplay between composite material properties and structural geometry, as well as embedded functionality and actuation of lightweight structures.

She received her BSc in Aerospace Engineering from the University of Toronto and MSc and PhD in Space Engineering at Caltech, where she developed a deployable satellite antenna based on origami concepts utilizing elastomer composites. She concurrently worked with NASA's Jet Propulsion Laboratory on developing cryogenically rated thin-ply composite antennas for deep space missions. After her PhD, she was awarded the ETH Zürich postdoctoral fellowship to investigate reconfigurable antennas based on mechanical metamaterials.

RE-PROGRAMMING MECHANICAL AND MULTI-PHYSICS RESPONSE IN METASTRUCTURES

ABSTRACT: Structures typically have fixed properties representing a compromise between optimal performance in a wide range of operating conditions. Adaptation of performance in response to a changing or unknown environment can increase efficiency in applications ranging from morphing wings to smart space structures to soft robotics. This talk will explore examples from our research that combine active structural elements into metastructures to enable robust re-programming of shape, stiffness, and even non-mechanical performance. In a first example, we will discuss the development of composite laminates with reversible lamination that enable rapid and stable re-programming of stiffness. In a second project, we demonstrate the use of flexible metamaterials to program coupling between mechanical strains and electromagnetic performance. We will specifically address the role of anisotropy and the multi-scale nature of the structures in enhancing functionality, discuss efficient embedded actuation of structures with many degrees of freedom, and open up discussion on the controllability of these new re-programmable systems.

TUESDAY, SEPTEMBER 13
8:50AM–9:10AM **SALON V, FIRST FLOOR**

Burkhard Maass
Ingpuls GmbH
Bochum, Germany

BIOGRAPHY: Burkhard Maass is the founder and CTO of Ingpuls GmbH, a German producer and developer of shape memory alloys and SMA-based products. He founded the company in 2009. Maass is also the managing director of Ingpuls Medical GmbH & Ingpuls Smart Shadings, the first subsidiaries and joint ventures of Ingpuls (2021–present). From 2002 to 2008, he was at Ruhr-University Bochum in Mechanical Engineering & Materials Science and spent a year abroad at the Escuela Superior de Ingenieros in Seville, Spain. In 2012, Maass earned his PhD in materials science from Ruhr-University Bochum. His focus was on the development of novel quaternary shape memory alloys. Aside from his science and entrepreneur activities, Maass has lectured on SMA for undergraduate students at the university and has been a speaker at TedX & other similar venues. He is also passionate about martial arts, trail running, sustainable technologies, and healthy living. And he's even more passionate about his wife and two children.

SHAPE MEMORY ALLOY ACTUATORS: A KEY TECHNOLOGY FOR INTEGRATED SYSTEMS

ABSTRACT: In the last decades, technical products for both B2C and B2B sectors have become more and more sophisticated, with an ever-increasing number and hence, demand, for integrated systems. Actuator systems are found in a variety of applications and devices, from cell phones and cars to industrial automatization. The properties of these actuator systems are defined by the need to provide mechanical work in the shape of a linear or rotary movement combined with a force or torque under certain environmental conditions and requirements defined by the task at hand. The scale of actuator systems ranges from microscopic autofocus systems in cellphone cameras to high force locking mechanisms. Solutions based on conventional materials are often heavy, bulky and complex systems. Smart and functional materials such as Shape Memory Alloys (SMAs) allow for the design of simple, light and reliable actuator systems for many applications. Far from being a magic all-in-one solution or replacement for "old" technologies, the potential of SMA actuators can be exploited when the combination of force, speed, frequency and other conditions overlap with the properties of the SMA. To understand how to combine the customization of the SMA properties with the design of a system or product is paramount for the successful implementation of these functional alloys. If done correctly, SMAs are a scale-bridging and market-independent key technology, providing degrees of freedom for design and the functional material with the highest energy density known today. In this presentation, we give an overview of existing solutions and recent advances in the alloy and processing development addressing both challenges and opportunities for this fascinating class of materials.

Symposia Invited Speakers

TUESDAY, SEPTEMBER 13
9:50AM–10:30AM **SALONS I & II, FIRST FLOOR**

Zoubeida Ounaies
Pennsylvania State University
University Park, PA

BIOGRAPHY: Zoubeida Ounaies is a professor of mechanical engineering and director of the Convergence Center for Living Multifunctional Material Systems (LiMC2) at the Pennsylvania State University. She joined Penn State in January 2011 as an associate professor with the Dorothy Quiggle Career Development Professorship in Mechanical Engineering. Previously, she was an associate professor of Aerospace Engineering and Material Science and Engineering at Texas A&M University (2005-2010). Her research focuses on the design and development of responsive polymer-based materials with unique combinations of mechanical, electrical, magnetic, and coupled properties. Broadly speaking, she aims to develop new lightweight smart materials for applications as varied as advanced electronics, autonomous robotics, aerospace, automotive, medical and consumer industries. At Penn State, she established the Electroactive Materials Characterization Laboratory (EMCLab), where she and her students focus on advancing the application of smart materials in energy storage, energy conversion and energy harvesting. She is associate editor of the Smart Materials and Structures Journal, and a fellow of ASME and SPIE.

LIVING MULTIFUNCTIONAL MATERIALS: OPPORTUNITIES FOR COLLABORATIONS, COMMUNITY BUILDING AND RESEARCH INNOVATIONS

ABSTRACT: Materials research has advanced significantly through groundbreaking work on bioinspired materials, smart, adaptive and responsive materials, self-healing materials, and redesign of living cells through synthetic biology. A new paradigm is envisaged using biological rules and bioinspired approaches to develop materials with living attributes, that include resilience, adaptability, and self-powering, while enhancing their sustainability and broadening the educational mission around academic convergence. These living multifunctional materials would leverage a synergy of materials and processing to achieve unprecedented control of material properties and functions. In addition to defining living materials and discussing research opportunities in this growing field, this talk will introduce recent research at the Convergence Center for Living Multifunctional Materials (LiMC2), where a holistic approach to living materials seeks to bring team members spanning science, engineering, arts, social sciences, and ethics, as well as members of multiple institutes at Penn State. Finally, we will share examples of research developments in three of our core research areas: adaptive architecture; advanced manufacturing; and materials for sensing, diagnostics and actuation.

TUESDAY, SEPTEMBER 13
10:30AM–12:10AM **FAIRLANE BALLROOM, FIRST FLOOR**

Dr. Prof. Jian Zhao
Dalian University of Technology
Dalian, Liaoning, China

BIOGRAPHY: Dr. Prof. Jian Zhao (M, 2009) is currently the Dean of the School of Automotive Engineering, Dalian University of Technology, China. He received the Excellent Ph. D Graduate Award in Xidian University in 2009. He was granted 30 innovation patents and has published over 100 papers in a wide variety of MEMS fields, including intelligent structures, compliant mechanisms, MEMS, shock sensors, and acceleration switches. He was awarded as the excellent young scientist at Dalian City, the "Xinghai Excellent Youth" at Dalian University of Technology, Qianlingxi Excellent Teacher Award, the second prize of Chinese Institute of Electronics, the second prize for science & technology achievement from China Academy of Engineering Physics, the first prize of excellent technical research papers in Liaoning Province, the best paper award in IDETC/CIE MNS 2018, the special award of excellent technical research papers in Dalian City, and the best paper award from Chinese Journal of Sensors and Actuators. He has been chairs for many IEEE/ASME symposiums and sessions. Prof. Zhao was also elected as the technical committee member in the Chinese Society of Micro-Nano Technology, a member of the National Standard Committee for Audio and Video. And also, he has given many invited talks in many different international conferences, including ASME/IDETC 2018, MEMS sensors 2016, and young scientist symposium 2016 and 2018.

ULTRASENSITIVE MASS SENSING UTILIZING NONLINEAR COMPLIANT MICROBEAMS

ABSTRACT: Nonlinear resonant microsensors (NRS) can detect any tiny changes of mass, stress or damping in environment by detecting the bifurcation frequency shift. However, the uncontrollable bifurcation is the bottleneck problem for their engineering applications for monitoring the environment pollution and the hazardous article leakage in real time. In this report, a series of nonlinear mass sensors utilizing compliant structures and functional materials have been proposed, which include: 1) innovative design of compliant sensing structures, and the mass sensor with linear and nonlinear combined structures has been proposed for the incremental threshold values; 2) nonlinear bifurcation control method based on the piezoelectric parameters, a dynamic design model of the nonlinear sensor considering the absorption film, piezoelectric layer and excitation load, and the relationship between the bifurcation topology and the physical system parameters for controlling the bifurcation; and 3) a measuring strategy in the damping environment for online measurement have been manufactured and for completing and validating the proposed design methodology.

TUESDAY, SEPTEMBER 13
2:20PM–3:20PM **SALONS I & II, FIRST FLOOR**

Prof. Alon A. Gorodetsky
University of California
Irvine, CA

BIOGRAPHY: Dr. Alon Gorodetsky is an Associate Professor in the Department of Chemical and Biomolecular Engineering at UC Irvine. Dr. Gorodetsky obtained dual B.S. degrees in Engineering Physics and Materials Science at Cornell University and a Ph.D. in Chemistry at the California Institute of Technology. He then completed postdoctoral work as an NSF American Competitiveness in Chemistry Fellow at Columbia University. At UC Irvine, his group has focused on developing adaptive infrared and thermoregulatory systems inspired by cephalopods, as well as on studying the materials properties and biomedical applications of cephalopod proteins called reflectins. For his research, Dr. Gorodetsky has received international recognition and numerous accolades, including the AFOSR Young Investigator Award, the DARPA Young Faculty Award with the Director's Option, the Presidential Early Career Award for Scientists and Engineers, the NIH Director's New Innovator Award, and the DARPA Embedded Entrepreneurship Initiative Award.

DYNAMIC MATERIALS INSPIRED BY CEPHALOPODS

ABSTRACT: Cephalopods (e.g., squids, octopuses, and cuttlefish) have captivated the imagination of both the general public and scientists alike due to their sophisticated nervous systems, complex behavioral patterns, and visually stunning camouflage displays. Given their unique capabilities and characteristics, it is not surprising that these marine invertebrates have emerged as exciting models for novel adaptive optical and photonic materials. Within this context, our laboratory has developed cephalopod-derived and cephalopod-inspired systems with dynamic functionalities within the visible and infrared regions of the electromagnetic spectrum. These findings hold implications for next-generation biomedical imaging technologies and adaptive camouflage devices.

Symposia Invited Speakers

TUESDAY, SEPTEMBER 13
3:40PM–4:20PM **GROSSE POINTE, FIRST FLOOR**

Chris Vermillion
North Carolina State University
Raleigh, NC

BIOGRAPHY: Chris Vermillion received his Ph.D. in Electrical Engineering from the University of Michigan in 2009 and received his undergraduate degrees in Aerospace and Mechanical Engineering from the University of Michigan in 2004. Immediately following his Ph.D. work, Dr. Vermillion worked on advanced automotive powertrain control, focusing on constrained optimal control approaches that simultaneously addressed the competing performance interests of fuel economy, emissions, drivability, and torque delivery. Subsequently he served as a Lead Engineer for Altaeros Energies and managed all of the dynamic modeling, control system design, software development, and embedded hardware development for Altaeros' lighter-than-air wind energy system. Dr. Vermillion has participated in the full-scale fight testing of two of Altaeros' designs. He is currently an Associate Professor at NC State, where his research focuses on the dynamic characterization, design optimization, and optimal control of airborne wind energy systems, marine hydrokinetic energy systems, and energy-efficient connected and autonomous vehicles. Dr. Vermillion was the recipient of the National Science Foundation's CAREER Award in 2015, the UNC-Charlotte Maxheim Research Fellowship in 2016, the UNC-Charlotte College of Engineering Excellence in Teaching Award in 2017, and the NC State Mechanical and Aerospace Engineering Research Award in 2021.

MOTION IN THE OCEAN: REVOLUTIONIZING MARINE HYDROKINETIC ENERGY HARVESTING THROUGH THE DESIGN AND PERIODIC MOTION CONTROL OF UNDERWATER KITES

ABSTRACT: Tidal and ocean current resources in the United States have been collectively estimated to contain over 250 TWh/year of extractable hydrokinetic energy. This equates to powering tens of millions of homes, in addition to providing the opportunity to power so-called "blue economy" off-grid applications, such as supplying power to ocean observing platforms and autonomous underwater vehicles. The extraction of marine hydrokinetic energy in a 1 m/s flow speed through a fixed turbine requires approximately the same geometric sizing per unit of power as a wind turbine operating in a 10 m/s wind speed. However, complications associated with undersea installation result in dramatically higher costs than comparably scaled wind energy counterparts. This talk will examine the design and control of underwater kites as a game-changing solution for extracting ocean current and tidal resources. Compared with a fixed turbine design, an underwater kite eliminates massive rotating underwater machinery and in fact reduces the size and mass per unit power of the underwater system by more than an order of magnitude. The achievement of these levels of performance is dependent, however, on addressing two periodic optimal motion control challenges, which must be performed concurrently and robustly, within a flow environment that is varying in both space and time. First, the kite must follow efficient periodic flight paths (typically figure-8 or elliptical paths) to achieve the requisite high-speed operation for maximizing power output. Second, the kite must employ a periodic power take-off (PTO) system that harvests energy either through on-board rotors whose operating parameters vary over the course of each repeated flight path, or through cyclic spooling motion. This seminar will illustrate how techniques from iterative learning control and continuous-time optimal control theory have been adapted to tackle these challenges. Furthermore, the seminar will highlight ongoing experimental efforts to validate dynamic models and control strategies for a prototype underwater kite design.

Our group is also studying encasing materials for these materials, such as tough elastomers and gels that can be used to create robust devices. Perhaps the most fascinating aspect of liquid metals it the ability to use interfacial electrochemistry chemistry to remove/deposit the oxide to manipulate the surface tension of the metal over unprecedented ranges (from the largest tension of any known liquid to near zero!). This allows manipulating the shape, position, and optical properties of the metal for reconfigurable devices. This work has implications for soft and stretchable electronics; that is, devices with desirable mechanical properties for human-machine interfacing, soft robotics, and wearable electronics.

ADAPTIVE STRUCTURES AND MATERIALS SYSTEMS AWARD

James Hubbard, Jr., Ph.D.
Texas A&M University
College Station, TX

BIOGRAPHY: James E. Hubbard, Jr., Ph.D. is the Oscar S. Wyatt, Jr. Chair I professor at the Texas A&M University. He is internationally known for control of adaptive structures, and spatially distributed systems for the real-time control. He is widely viewed as a founding father of the field of Smart Structures. He is the recipient of the SPIE Lifetime Achievement Award, the SPIE Innovative Product of the Year Award, and is a Permanent Fellow of the Hagler Institute for Advanced Studies. He holds 24 patents and is the founder of 4 companies. He has published 4 books and more than 100 technical articles in peer reviewed journals. Hubbard is a Fellow of the AIAA, SPIE, ASME and a member of the National Academy of Engineering, The Academy of Medicine, Engineering and Science of Texas, and the Virginia Academy of Science, Engineering and Medicine.

THE SMART STRUCTURE OF THE MIND

ABSTRACT: We present our most recent research in the development of a Modal Approach to the Space Time Dynamics of Cognitive Biomarkers. More specifically we apply well known “black box” output only system identification techniques to the biomarker of electroencephalogram (EEG) data. The result is a Linear Time Invariant model that admits brain wave modes of human cognitive states. The weak non-linearities and stochasticity present in the data is accommodated using an adaptive feedback scheme that adjust the model in near real-time to yield less than 1 % error with the concomitant data stream. The brain wave “modes” are linearly independent and can be likened to the keys on a piano. Weighted linear combinations can produce “chords” which can be combined to produce music and reveal the symphony of the brain. The space-time modal patterns of the brain have the potential for widespread application in the diagnosis of Alzheimer’s disease, dementia, seizures, human emotions and the like.

ASME DEDICATED SERVICE AWARD

Janet Sater
The Institute for Defense Analyses (IDA)
Washington, DC

BIOGRAPHY: Janet Sater graduated from Grove City College with a B.S. in Metallurgical Engineering and from Purdue University with a M.S. and Ph.D. in Materials Science and Engineering. She has been employed for 34 years in the Science and Technology Division of the Institute for Defense Analyses, a Federally Funded Research and Development Center that works only for the Department of Defense and its agencies. She is a Fellow of ASME and of ASM International (materials professional society). She has been a member of the ASME Adaptive Structures and Materials Technical Committee and Branch for 27 years (first woman on the TC!), including a stint as Secretary and as Special Finance Committee Chair as well as a founding member and Executive Advisory Board member for the SMASIS conference. She also has been involved extensively in the Aerospace Division as Treasurer (12 years and counting!), Secretary, Executive Committee Member, and speaker at several Leadership Summits (educational seminar on Aerospace Division processes and procedures).

Awards

GARY ANDERSON AWARD

Youngsu Cha
Korea University
Seoul, South Korea

BIOGRAPHY: Dr. Youngsu Cha is currently an Assistant Professor in the School of Electrical Engineering at Korea University, Seoul, South Korea. He received the B.S. degree from Korea University, Seoul, South Korea, in 2004, and the M.S. degree from Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea, in 2007, both in electrical engineering, and the Ph.D. degree in mechanical engineering from New York University, New York, NY, USA, in 2015. After receiving the Ph.D., he was a Principal Research Scientist with the Center for Intelligent and Interactive Robotics, Korea Institute of Science and Technology (KIST), Seoul, South Korea, and he moved to Korea University in 2021. His current research interests include smart materials and structures, multiphysics modeling, flexible sensors and actuators, energy harvesting, and soft robotics. His research has generated 26 patents, 64 journal publications, and 38 conference proceedings.

SOFT ROBOTIC APPLICATIONS OF SMART MATERIALS

ABSTRACT: Smart materials have received considerable attention with various applications. Dr. Youngsu Cha has researched on soft robotics using the smart materials. His current work is the integration of piezoelectric materials into soft mobile robots, the development of soft robotic hands, and the development of soft wearable interface system for virtual reality and teleoperation. Specifically, he has done incredible work on thin, soft piezoelectric mobile robots, soft pneumatic hands using origami structure, human posture monitoring system for wearable healthcare, and human-computer interface gloves for virtual reality via flexible piezoelectric sensors. In addition, he has tried to adapt the smart materials to conventional robots through artificial piezoelectric skin for object classification using neural network and teleoperation system between a robot and human wearing a soft interface suit.

EPHRAHIM GARCIA AWARD

Priyanka Bhovad
Bionaut Labs
Los Angeles, CA

BIOGRAPHY: Priyanka Bhovad graduated from Clemson University with Ph.D. in Mechanical Engineering in December 2021. While at Clemson, she worked under the mentorship of Dr. Suyi Li on developing the design and analysis framework for hybrid mechanical-digital control of Soft Origami Robots. Currently, Priyanka is working at Bionaut Labs, a medical robotics startup headquartered in Los Angeles, California. As a Controls Engineer, she has developed the algorithms for untethered control of magnetic micro-bots. Prior to obtaining his Ph.D., she worked at the Indian Space Research Organisation (ISRO) as Aerospace Engineer for four years.

PHYSICAL RESERVOIR COMPUTING WITH ORIGAMI AND ITS APPLICATION TO ROBOTIC CRAWLING

ABSTRACT: A new paradigm called physical reservoir computing has recently emerged, where the nonlinear dynamics of high-dimensional and fixed physical systems are harnessed as a computational resource to achieve complex tasks. Via extensive simulations based on a dynamic truss-frame model, this study shows that an origami structure can perform as a dynamic reservoir with sufficient computing power to emulate high-order nonlinear systems, generate stable limit cycles, and modulate outputs according to dynamic inputs. This study also uncovers the linkages between the origami reservoir's physical designs and its computing power, offering a guideline to optimize the computing performance. Comprehensive parametric studies show that selecting optimal feedback crease distribution and fine-tuning the underlying origami folding designs are the most effective approach to improve computing performance. Furthermore, this study shows how origami's physical reservoir computing power can apply to soft robotic control problems by a case study of earthworm-like peristaltic crawling without traditional controllers. These results can pave the way for origami-based robots with embodied mechanical intelligence.

ADAPTIVE STRUCTURES AND MATERIAL SYSTEMS BEST PAPER AWARD IN STRUCTURES AND STRUCTURAL DYNAMICS

FLEXURAL-MODE SOLID-STATE THERMOACOUSTICS (MECHANICAL SYSTEMS AND SIGNAL PROCESSING 148, 107143, 2021)

H. Hao
Purdue University
West Lafayette, IN

BIOGRAPHY: Dr. Haitian Hao received his M.S. and Ph.D. degrees from the Department of Mechanical Engineering at Purdue University. Haitian attended college and received B.S. in Mechanical Engineering at Shanghai Jiao Tong University in China. His research interests include thermoacoustic phenomena in solid and fluid media, acoustic metamaterial, and structural vibration. Haitian currently works as an N&V instrumentation engineer at Apple Inc.

C. Scarlo
Purdue University
West Lafayette, IN

BIOGRAPHY: Dr. Carlo Scalo is an Associate Professor in the School of Mechanical, and Aeronautical and Astronautical Engineering (by courtesy) at Purdue University. His research interests focus on computational aeroacoustics, vortex dynamics, low- and high-speed turbulent boundary layers, and hypersonics. In particular, Dr. Scalo has developed computational techniques for prediction of acoustic noise propagation and control in hypersonic boundary layers, low-speed and high-speed transitional and fully developed turbulence and thermoacoustic instability in combustion systems. Scalo has received three distinct Young Investigator Program (YIP) Awards from the Department of Defense in: hypersonic boundary layer transition (Air Force), hypersonic boundary layer turbulence (Navy) and vortex dynamics (Army). He is also the founder of HySonic Technologies – a Purdue start-up that received ONR funding to develop passive control of hypersonic boundary layers and high-speed propulsion systems.

F. Semperlotti
Purdue University
West Lafayette, IN

BIOGRAPHY: Dr. Fabio Semperlotti is a Professor and the Perry Academic Excellence Scholar in the School of Mechanical Engineering at Purdue University and holds a courtesy appointment in the School of Aeronautics and Astronautics Engineering. He received a M.S. in Aerospace Engineering (2000), and a M.S. in Astronautic Engineering (2002) both from the University of Rome “La Sapienza” (Italy), and a Ph.D. in Aerospace engineering (2009) from the Pennsylvania State University (USA). Prior to joining Penn State, Dr. Semperlotti served as a structural engineer for a few European aerospace industries, including the French Space Agency (CNES), working on the structural design of space launch systems (such as Ariane 5 and Vega) and satellite platforms.

Dr. Semperlotti is a member of the Ray W. Herrick laboratory and directs the Structural Health Monitoring and Dynamics laboratory (SHMD) where he conducts, together with his research group, research on several aspects of structures and materials including structural dynamics and wave propagation, elastic metamaterials, structural health monitoring, and computational mechanics. Dr. Semperlotti has been the recipient of national awards including the National Science Foundation CAREER award (2015), the Air Force Office of Scientific Research Young Investigator Program (YIP) (2015), the DARPA Young Faculty Award (YFA) 2019, and the ASME C.D. Mote Jr. Early Career Award 2019.

ADAPTIVE STRUCTURES AND MATERIAL SYSTEMS BEST PAPER AWARD IN MECHANICS AND MATERIAL SYSTEMS

Jesse Callanan
Los Alamos National Laboratory
Los Alamos, NM

BIOGRAPHY: Jesse Callanan is a Post-Doctoral Research Associate at Los Alamos National Laboratory. He received a BA in Physics from SUNY Geneseo and a PhD in Mechanical and Aerospace Engineering from the University at Buffalo, where his work focused on active wave control and dynamic system prototyping with an emphasis on advanced manufacturing.

Awards

Carson Willey
UES, Inc.
Beavercreek,OH

BIOGRAPHY: Carson Willey is a research scientist at UES, Inc. in Beavercreek, OH. He received a BS in Mechanical Engineering and an MS in Computational Science and Engineering from Miami University, and a PhD in Engineering Mechanics from the University of Cincinnati. His research is focused on the development of phononic crystals and resonant metamaterials for wave propagation and vibration control, with an aim towards practical applications. Dr. Willey was a visiting professor at Miami University in 2019, and currently serves on the ASME Technical Committee on Vibration and Sound.

Vincent Chen
UES, Inc.
Beavercreek, OH

BIOGRAPHY: Vincent Chen is a research scientist at UES, Inc. in Beavercreek, OH. He received a BA from Boston College and a PhD in Chemistry from the Georgia Institute of Technology. His research is focused on additive manufacturing and implementation of acoustic and mechanical metamaterials for practical applications.

Jonathan Liu
Miami University,
Oxford, OH

BIOGRAPHY: Jonathan Liu received his BS and MS degrees in Mechanical Engineering from Miami University. He enrolled at Wright State University in August 2021 to begin graduate level courses in computational methods, advanced fluid dynamics, computational fluid dynamics, and hypersonics. He will be attending North Carolina State University in August 2022 where he is pursuing his PhD.

Mostafa Nouh
University at Buffalo
Buffalo, NY

BIOGRAPHY: Mostafa Nouh is an Associate Professor of Mechanical and Aerospace Engineering at the University at Buffalo (SUNY). He received a BS from Cairo University and earned his MS and PhD in Mechanical Engineering from the University of Maryland. His research focuses on smart materials, structural dynamics, and acoustic metamaterials. He is a recipient of the NSF CAREER and ASME's Gary Anderson Early Achievement awards. He currently serves as an associate editor of the Journal of Vibration and Acoustics.

Abigail Juhl
Air Force Research Laboratory
Dayton, Ohio

BIOGRAPHY: Abigail Juhl is a Materials Research Engineer in the Materials and Manufacturing Directorate at Air Force Research Laboratory (AFRL). She received a BS in Materials Science and Engineering from North Carolina State University, and a PhD in Materials Science and Engineering from the University of Illinois Urbana-Champaign. Dr. Juhl's research is focused on dynamic control of mechanical wave propagation using architected materials with applications in acoustic and vibration mitigation. She is the 2020 recipient of the AFRL Early Career and the DOD Lab Scientist of the Quarter awards.

UNCOVERING LOW-FREQUENCY BAND GAPS IN ELECTRICALLY RESONANT METAMATERIALS THROUGH TUNED DISSIPATION AND NEGATIVE IMPEDANCE CONVERSION

ABSTRACT: A new electromechanically-coupled metamaterial is presented which relies on magnetic field interactions between the host structure and a local resonator circuit to realize novel vibration control capabilities. The electromechanical metamaterial exhibits a unique electrical metadampingphenomenon which is activated via the circuit's resistance, and a highly tunable band gap which can be easily placed at a desired frequency using the resonant circuit parameters, providing a robust mechanism to independently alter the band gap width, depth, and frequency of maximum attenuation. A robust experimental realization of the system is constructed which achieves strong electromechanical coupling through a moving coil and magnet system, and reveals fundamentally new properties of damped electrically-resonant structures.

ACTIVE MATERIAL TECHNOLOGIES AND INTEGRATED SYSTEMS BEST PAPER AWARD

Ting Tan
Shanghai Jiao Tong University
China

BIOGRAPHY: Ting Tan is currently an associate professor at the School of Mechanical Engineering, Shanghai Jiao Tong University, China. She received her B.S. and M.S. degrees in Civil Engineering from Chongqing University, China, and Ph.D. degree in Engineering Mechanics from Virginia Tech, USA. Her current research interests include piezoelectric self-powered sensor, soft electricity generator, and acoustic metamaterial based voice interaction.

DUAL-BAND PIEZOELECTRIC ACOUSTIC ENERGY HARVESTING BY STRUCTURAL AND LOCAL RESONANCES OF HELMHOLTZ METAMATERIAL

ABSTRACT: The current study on acoustic energy harvesting is based on a single-band vibroacoustic conversion performed by either structural resonance or local resonance. In this paper, we propose a Helmholtz acoustic metamaterial (HAM) piezoelectric device having dual-band acoustic energy harvesting characteristics. The Helmholtz resonator of the metamaterial amplifies both structural and local resonances. HAM is designed based on the Bloch theorem, plane wave expansion method, and electroacoustic impedance analogy. Numerical simulation is performed to show the sound pressure amplification effect of HAM. A piezoelectric disk is bonded on the point defect of the Helmholtz metamaterial for energy localization and conversion, and HAM is clamped on a self-made experimental platform by simply supported boundary conditions on four sides. The time–frequency image of the voltage output from the swept frequency experiment shows two distinct bands corresponding to the structural resonance frequency of 381 Hz with the band width of 45 Hz and the local resonance frequency of 1526 Hz with the band width of 290 Hz. The peak-to-peak power of HAM is 0.13 mW, and its peak-to-peak voltage is 3.2 V at 391 Hz with the sound pressure of 31 Pa. At the input sound pressure of 23.32 Pa and frequency of 1526 Hz, the output voltage and power are found to be 1.5 V and 0.11 mW, respectively. Under the same amplitude of the input sound pressure, the output power of HAM is found 12.7 times and 4.4 times higher than those of the traditional acoustic metamaterial in the structural and local resonance bands, respectively. Field tests validate the superiority of the designed structure. In the milling environment, the voltage–pressure transmission rate reaches 0.11 V/Pa. The acoustic energy wall composed of HAM will be capable to provide a power solution for an intelligent factory.

ADAPTIVE SYSTEMS DYNAMICS AND CONTROLS BEST JOURNAL PAPER AWARD

Jesse Callanan
Los Alamos National Laboratory
Los Alamos, NM

BIOGRAPHY: Jesse Callanan is a Post-Doctoral Research Associate at Los Alamos National Laboratory. He received a BA in Physics from SUNY Geneseo and a PhD in Mechanical and Aerospace Engineering from the University at Buffalo, where his work focused on active wave control and dynamic system prototyping with an emphasis on advanced manufacturing.

Carson Willey
UES, Inc.
Beavercreek,OH

BIOGRAPHY: Carson Willey is a research scientist at UES, Inc. in Beavercreek, OH. He received a BS in Mechanical Engineering and an MS in Computational Science and Engineering from Miami University, and a PhD in Engineering Mechanics from the University of Cincinnati. His research is focused on the development of phononic crystals and resonant metamaterials for wave propagation and vibration control, with an aim towards practical applications. Dr. Willey was a visiting professor at Miami University in 2019, and currently serves on the ASME Technical Committee on Vibration and Sound.

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Miami University,
Oxford, OH

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Mostafa Nouh
University at Buffalo
Buffalo, NY

BIOGRAPHY: Mostafa Nouh is an Associate Professor of Mechanical and Aerospace Engineering at the University at Buffalo (SUNY). He received a BS from Cairo University and earned his MS and PhD in Mechanical Engineering from the University of Maryland. His research focuses on smart materials, structural dynamics, and acoustic metamaterials. He is a recipient of the NSF CAREER and ASME's Gary Anderson Early Achievement awards. He currently serves as an associate editor of the Journal of Vibration and Acoustics.

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Air Force Research Laboratory
Dayton, Ohio

BIOGRAPHY: Abigail Juhl is a Materials Research Engineer in the Materials and Manufacturing Directorate at Air Force Research Laboratory (AFRL). She received a BS in Materials Science and Engineering from North Carolina State University, and a PhD in Materials Science and Engineering from the University of Illinois Urbana-Champaign. Dr. Juhl's research is focused on dynamic control of mechanical wave propagation using architected materials with applications in acoustic and vibration mitigation. She is the 2020 recipient of the AFRL Early Career and the DOD Lab Scientist of the Quarter awards.

UNCOVERING LOW-FREQUENCY BAND GAPS IN ELECTRICALLY RESONANT METAMATERIALS THROUGH TUNED DISSIPATION AND NEGATIVE IMPEDANCE CONVERSION

ABSTRACT: A new electromechanically-coupled metamaterial is presented which relies on magnetic field interactions between the host structure and a local resonator circuit to realize novel vibration control capabilities. The electromechanical metamaterial exhibits a unique electrical metadampingphenomenon which is activated via the circuit's resistance, and a highly tunable band gap which can be easily placed at a desired frequency using the resonant circuit parameters, providing a robust mechanism to independently alter the band gap width, depth, and frequency of maximum attenuation. A robust experimental realization of the system is constructed which achieves strong electromechanical coupling through a moving coil and magnet system, and reveals fundamentally new properties of damped electrically-resonant structures.

ADAPTIVE SYSTEMS DYNAMICS AND CONTROLS BEST SYMPOSIUM PAPER AWARD

Mario Baggetta
University of Genova
Italy

BIOGRAPHY: Mario Baggetta received the B.S. and M.S. degrees in mechanical engineering from the University of Genova (Italy) in 12/2016 and 03/2019, respectively. He worked on the Ansaldo Energia's "Lighthouse Plant" project as a predoctoral Fellow from 06/2019 to 10/2020 and he is currently (11/2020-today) a Ph.D. student at DIME, Mechanical Engineering Department, University of Genova. He is interested on the integrated design of compliant mechanisms, variable stiffness actuators and collaborative robots. His doctoral research is mainly focused on the virtual and physical prototyping of compliant mechanisms and underactuated robotic hands.

Giovanni Berselli
University of Genova
Italy

BIOGRAPHY: Giovanni Berselli is Full Professor and Chair of Design Methods for Industrial Engineering at the University of Genova, Italy, where he coordinates the PhD Degree in Mechanical, Energy and Management Engineering. He is also Affiliated Researcher with the Advanced Robotics Department at the Italian Institute of Technology (IIT). Prof. Berselli is currently the Chair of the American Society of Mechanical Engineers (ASME) – Italy Section and the past Chair of the ASME Technical Committee on Modeling, Dynamics, and Control of Adaptive Systems. He has been Visiting & Affiliated Scientist of the Medical Device and Simulation Lab. at Massachusetts General Hospital & Harvard Medical School, Visiting Scientist at the German Aerospace Agency (DLR), Visiting Professor at the University of Twente, and Research Associate at Monash University, Australia, and with the School of Advanced Studies of the University of Navarra, Spain. Within his Department, Prof. Berselli coordinates the Erasmus Program and he is Delegate for International Relations. He has authored more than 200 publications in peer-reviewed international journals or conference proceedings, and edited two international books. Recipient of several IFToMM, ASME and IEEE Best Paper Awards and finalist for an ERC starting grant. He is currently Associate Editor for IEEE/ASME Transactions on Mechatronics, International Journal of Interactive Design & Manufacturing, and Mechanical Science. Prof. Berselli's scientific activity is focused on the design, modelling and experimental evaluation of: i) robot hands and grippers; ii) compliant mechanisms and soft actuators for safe human-robot interaction; iii) energy-aware industrial robotics.

Gianluca Palli
University of Bologna
Italy

BIOGRAPHY: Gianluca Palli received the M.Sc. and Ph.D. degrees in automation engineering from the University of Bologna, Bologna, Italy, in 2003 and 2007, respectively. He was a Visiting Student at the Robotic Institute of the German Aerospace Center (DLR), Munich, Germany, in 2006. He is currently Full Professor at the University of Bologna. His research interests include many aspects related to the development of robots able to interact with unstructured environments, deformable objects and to cooperate with humans. He coordinated the WIRES FP7 projects, which aim was to automatize the switchgears wiring process, and he is now the coordinator of the REMODEL H2020 project, aiming at the development of robotic technologies for the manipulation of complex deformable linear objects, and of the HE IntelliMan project, which aims to develop an artificial intelligence-based manipulation system for advanced robotic services, industrial manufacturing and prosthetics.

Claudio Melchiorri
University of Bologna
Italy

BIOGRAPHY: Claudio Melchiorri graduated in 1985 in Electronic Engineering and obtained the PhD in 1990 at the University of Bologna. He began his research activity in 1985 at DEIS, the Department of Computer Electronics and Systems of the University of Bologna, where in 1990 he became a Researcher and in 2001 Full Professor in Industrial Robotics. He currently is with DEI, the Department of Electrical Energy and Information Engineering "Guglielmo Marconi". In the period 2007 - 2013 he was President of the Course of Studies in Automation Engineering at the Faculty of Engineering of the University of Bologna, and in the period 2004-2010 he was Coordinator of the PhD program in "Automation and Operations Research" at DEIS. From 2014 to 2016 he was Coordinator of the PhD program in "Biomedical, Electrical and Systems Engineering" (IBES). He is in charge of the Almatong program, an educational and scientific cooperation with Tongji University, Shanghai, China, where since 2015 he has also held the position of "High End Expert" of the Chinese University Ministry. Since 2014 he has been a member of the Academy of Sciences, Institute of Bologna, and since 2020 he is Fellow of the IEEE. He was Director of the Department of Electrical, Energy and Information Engineering "Guglielmo Marconi" in the period 2015-2021, and is currently the Rector's Delegate for Relations with Businesses and Industrial Research.

MECHATRONIC DESIGN AND PHYSICAL PROTOTYPING OF A THREE-FINGERED GRIPPER FOR UNDERWATER MANIPULATION

ABSTRACT: Researchers involved in the development of dexterous robotic hands agree that a mechatronics approach to hand design is the only way to generate new levels of functional capabilities. As reported by several authors, the problems relative to the single component or subsystem design must be solved within a general frame of compatibility and integrability. In this paper the virtual and physical prototyping of a three-fingered gripper designed to be mounted on an autonomous underwater vehicle (AUV) for underwater manipulation as well as sampling specimens is reported. In particular, an overall description of the gripper design is discussed, with special attention to the required actuation and tendon transmission system, its integration within the mechanical structure and the required control architecture. Different solutions for the joint configuration and the structure of the tendon network adopted for the transmission system are presented. The integrated design of the finger is reported and the motivations leading to this particular implementation are thoroughly addressed, taking into account both the mechanical constraints and the control requirements. The overall finger design is modular, so that other design solutions comprising multiple fingers (e.g. for in-hand manipulation purposes or realization of cage gripper) are easily achievable by adding further modules without increase the overall dimensions of the device. Virtual prototype results are finally provided and discussed to prove the gripper behaviour and capabilities.

STRUCTURAL HEALTH MONITORING

2021 BEST JOURNAL PAPER AWARD

Susu Xu
Stonybrook University
Stonybrook, NY

BIOGRAPHY: Dr. Susu Xu is an assistant professor at Department of Civil Engineering, Stony Brook University. She received her Ph.D. in Civil Engineering and Master in Machine Learning from Carnegie Mellon University, and her bachelor's degree from Tsinghua University. She has been a postdoctoral research fellow at Stanford University and research scientist at the AI research team in Qualcomm Technologies. Her research focuses on crowdsensing, physics-informed machine learning, and causal Bayesian inference for enabling resilient, effective, and equitable infrastructure systems. She received the Best Paper Award at the IEEE International Conference of Machine Learning and Applications (ICMLA) in 2018, and the champion of NeurIPS 2018 Adversarial Vision Challenge. She is also the recipient of 2019 MIT CEE Rising Star and Dowd Fellowship.

Hae Young Noh
Stanford University
Stanford, CA

BIOGRAPHY: Dr. Hae Young Noh is an Associate Professor in the Department of Civil and Environmental Engineering at Stanford University. Her research focuses on indirect sensing and physics-guided data analytics to enable low-cost non-intrusive monitoring of cyber-physical-human systems. She is particularly interested in developing structures to be self-, user-, and surrounding-aware to improve users' quality of life and provide a safe and sustainable built environment. The results of her work have been deployed in a number of real-world applications from trains, to the Amish community, to eldercare centers, to pig farms. Before joining Stanford, she was a faculty member at Carnegie Mellon University. She received her Ph.D. and M.S. degrees in Civil and Environmental Engineering and the second M.S. degree in Electrical Engineering at Stanford University. She earned her B.S. degree in Mechanical and Aerospace Engineering at Cornell University. She received several awards, including the Google Faculty Research Awards (2013, 2016), the Dean's Early Career Fellowship (2018), the NSF CAREER Award (2017), and various Best Paper Awards from ASCE, ASME, ACM, IEEE, and SEM conferences.

Awards

PHYMDAN: PHYSICS-INFORMED KNOWLEDGE TRANSFER BETWEEN BUILDINGS FOR SEISMIC DAMAGE DIAGNOSIS THROUGH ADVERSARIAL LEARNING

ABSTRACT: Automated structural damage diagnosis after earthquakes is important for improving efficiency of disaster response and city rehabilitation. Conventional supervised learning requires historical structural response data and corresponding damage states (i.e., labels). However, historical data with labels are often not immediately available for many buildings in the affected area after earthquakes. Further, directly using the historical data from previous buildings and earthquakes to construct a damage diagnosis model for the target building would lead to inaccurate results, as each building has unique physical properties and thus unique data distribution. To this end, we introduce a new framework, Physics-Informed Multi-source Domain Adversarial Networks (PhyMDAN), to transfer the model learned from other buildings to diagnose structural damage states in the target building without any labels. This framework is based on an adversarial domain adaptation approach that extracts domain-invariant feature representations of data from different buildings. We evaluate our framework on both numerical simulation and field data collected from multiple building structures. The results show a significant damage detection and quantification accuracy improvement by successfully fusing and transferring the knowledge from multiple simulated buildings to real-world frame, compared to the state-of-the-art benchmark methods.

ENERGY HARVESTING BEST PAPER AWARD

Xiaofan Li
Virginia Tech
Blacksburg, VA

BIOGRAPHY: Xiaofan Li currently is a postdoc research associate in the Department of Mechanical Engineering at Virginia Tech. He received his BS degree in Mechanical Engineering from Xi'an Jiaotong University, Xi'an, China, in 2015 and his PhD degree in Mechanical Engineering from Virginia Tech, Blacksburg, USA, in 2020. His research interest includes design, dynamic analysis and optimization of the ocean renewable energy systems. He has published more than 20 journal and conference papers in the related fields and holds two patents. He served as an advisor and won 3rd place in DOE Marine Energy Collegiate Competition for 2 years in a row in 2020 and 2021.

Dillon Martin
Virginia Tech
Blacksburg, VA

BIOGRAPHY: Dillon Martin is currently working as a Project Mechanical Engineer at Oceaneering. He received his MS degree in Mechanical Engineering in 2017, and his BS degree in Mechanical Engineering in 2013, both from Virginia Tech, Blacksburg, VA, USA. After graduating with his MS, Dillon worked as a post-master's associate in the Energy Harvesting and Mechatronics Research Lab at Virginia Tech. From his thesis research, Dillon has published multiple conference papers and journal articles. His research interests are energy harvesting and vibration control.

Changwei Liang
Virginia Tech
Blacksburg, VA

BIOGRAPHY: Changwei Liang is a mechanical engineer working at Advanced Micro Devices, Inc. Prior joining to AMD, he obtained his PhD from State University of New York at Stony Brook in 2016 under the supervision of Prof. Lei Zuo. He was a visiting PhD student at Virginia Tech from 07/2014-12/2016. His research interest includes energy harvesting, vibration & control, mechatronics design, and wave energy conversion. He has published more than 10 research papers. He won EPA P3 award in 2014 and R&D 100 Awards in 2015. Changwei Liang completed his BS (07/2006) and MS (07/2010) in Engineering Mechanics from Harbin Institute of Technology.

Chien-An Chen
Virginia Tech
Blacksburg, VA

BIOGRAPHY: Chien-An Chen currently works as a senior system application engineer at Vicor Corporation. He received the BS degree in electrical and control engineering from National Chiao-Tung University, Hsinchu, Taiwan, in 2005 and the MS degree in electrical engineering from National Tsing-Hua University, Hsinchu, Taiwan, in 2007. He received his PhD degree in electrical engineering with the Center for Power Electronics Systems, Virginia Tech, Blacksburg, VA, USA. He was a Senior Electrical Engineer with Delta Electronics, Inc., Taiwan, from 2008 to 2014. He held a summer position in 2019 with Eaton Corporation, Pittsburgh, CA, USA, where he worked on the wide-bandgap solid-state circuit breaker. His research interests include power electronics converters and applications in renewable energy systems, adjustable-speed drive, and reliability.

Robert G. Parker
University of Utah
Salt Lake city, UT

BIOGRAPHY: Robert G. Parker is a Professor in the Mechanical Engineering Department at the University of Utah. Previously he was Department Head at Virginia Tech and Executive Dean at the University of Michigan-Shanghai Jiao Tong University Joint Institute. He served 13 years on the faculty at Ohio State. He received MS and PhD degrees from the University of California, Berkeley. His expertise is in mechanical system vibration and dynamics. He has published about 140 journal papers, been cited well over 10,000 times. He is a Fellow of the American Society of Mechanical Engineers (ASME), the American Association for the Advancement of Science, and the International Institute of Acoustics and Vibration. He received the 2015 ASME N. O. Myklestad Award for "major innovation in vibration research and engineering." He has received the US Presidential Early Career Award for Scientists and Engineers ("the highest honor awarded by the US government to scientists and engineers early in their independent research careers"), the National Science Foundation CAREER, and the US Army Young Investigator Awards, as well as the ASME Gustus Larson Award, Ford Chief Engineer Award, French government Poste Rouge Award, SAE Ralph Teetor Educational Award, and ASEE's Global Engineering Educator and Outstanding Faculty Awards.

Lei Zuo
Virginia Tech
Blacksburg, VA

BIOGRAPHY: Lei Zuo is currently an endowed professor of Naval Architecture and Marine Engineering at the University of Michigan. He was previously the Robert E. Hord Jr. Professor of Mechanical Engineering at Virginia Tech, and the director of NSF IUCRC Center for Energy Harvesting Materials and Systems. His research interest includes marine renewable energy (ocean waves, tidal currents, offshore wind), blue economy, energy harvesting, vibration and control, mechatronics design, vehicles and transportation, and advanced manufacturing. His research has been funded with over 80 projects of USD $25M by various funding agencies and industries. He has authored about 360 papers including over 10 with the best paper awards. He has supervised 16 Ph.D. and 52 master students to completion of their degrees, mentored over 10 postdocs, and advised about 200 undergraduates in senior designs or research. Lei Zuo was the sole recipient of the 2017 ASME Leonardo da Vinci Award and the 2015 ASME Thar Energy Design Award. He also received R&D 100 Awards twice (2015 and 2011) and received 2014 SAE Ralph R. Teetor Educational Award. Lei Zuo completed his BS in Automotive Engineering (07/1997) from Tsinghua University and his MS (02/2002) and Ph.D. (02/2005) in Mechanical Engineering from MIT. He also held a MS (02/2002) in Electrical Engineering from MIT.

CHARACTERIZATION AND VERIFICATION OF A TWO-BODY WAVE ENERGY CONVERTER WITH A NOVEL POWER TAKE-OFF

ABSTRACT: The lack of high efficient, predictable, and reliable power take-off (PTO) systems limits developments of ocean wave energy technology. In this paper, a two-body self-reacting wave energy converter (WEC) with a novel PTO is designed, modelled and implemented for efficiency enhancement. A novel mechanical motion rectifier (MMR) using a ball screw mechanism and an enclosed gear set is integrated to improve the energy harvesting efficiency and reliability by rectifying the oscillatory wave motion into unidirectional rotation of the generator. Detailed design and dynamic modelling for the proposed WEC are presented. A prototype of the PTO is tested in a dry lab to characterize and refine the dynamic modelling. The characterized PTO model is combined with the WEC model to create an overall system model. A water tank test is conducted to verify the overall system dynamics, which proves the accuracy of the model and shows the advantages of the proposed WEC on efficiency and predictability. Following the method of how the WEC system is characterized, performance prediction of the proposed WEC with MMR PTO can be achieved with high accuracy.

ACTIVE AND MULTIFUNCTIONAL MATERIALS TC BEST PAPER AWARD

Cerwyn Chiew
University of Washington
Seattle, WA

BIOGRAPHY: Cerwyn Chiew is a Ph.D. candidate at the Department of Mechanical Engineering in the University of Washington – Seattle. He is currently a graduate researcher in iMatter Lab, a research group led by Prof. Mohammad Malakooti. Cerwyn is interested in modeling the complex behaviors of soft functional composites which can serve as intelligent materials that can advance the performance of existing wearable devices. To achieve this, his dissertation aims to develop, modify, and apply micromechanics models that can help better understand the mechanics and rapidly predict the multifunctional nonlinear behaviors of novel soft matter composites. Cerwyn received his B.S. and M.S. in Mechanical Engineering from the University of Washington in 2018 and 2022, respectively.

Awards

Mohammad H. Malakooti
University of Washington
Seattle, WA

BIOGRAPHY: Mohammad H. Malakooti is an Assistant Professor of Mechanical Engineering at the University of Washington – Seattle. He leads the iMatter Lab, a research group dedicated to creating materials that match the extraordinary adaptability, rich multi-functionality, and embodied intelligence of natural material systems by bridging the gap between nanoscale engineering and system-level functionality. He received his PhD at the University of Florida in 2015, had a Postdoctoral Fellowship at the University of Michigan (2015-2017), and was a Research Scientist at Carnegie Mellon University (2017-2019). Dr. Malakooti has published 38 peer-reviewed articles with an h-index of 25 and has given 15 invited talks at top engineering schools in the United States.

A DOUBLE INCLUSION MODEL FOR LIQUID METAL POLYMER COMPOSITES

ABSTRACT: Liquid metal elastomer composites have gained significant attention in advanced technologies including wearable electronics, soft robotics, and human-computer interactions. This is due to the combination of metallic conductivity and fluidic properties of liquid metal (LM) inclusions in addition to their facile fabrication process. With the emergence of gallium-based liquid metal nanocomposites and advances in synthesis and integration of LM nanoparticles in a variety of polymer matrices, there is a pressing need for a materials design tool to accelerate the development of these multifunctional composites. Here, we introduce a double inclusion (DI) model capable of predicting the properties of polymer composites with core-shell liquid metal droplets. The size-dependent elasticity of LM inclusions is modeled by considering the solid gallium oxide interphase between the liquid metal core and the solid polymer matrix. As the size of inclusions reduces from tens of microns to tens of nanometers, the role of the oxide interface (shell) becomes more dominant. The results of the DI model show excellent agreement with finite element analysis and experimental results for a wide range of droplet sizes and volume fractions. This model provides a design framework for the synthesis of LM composites with tailored multifunctional properties.

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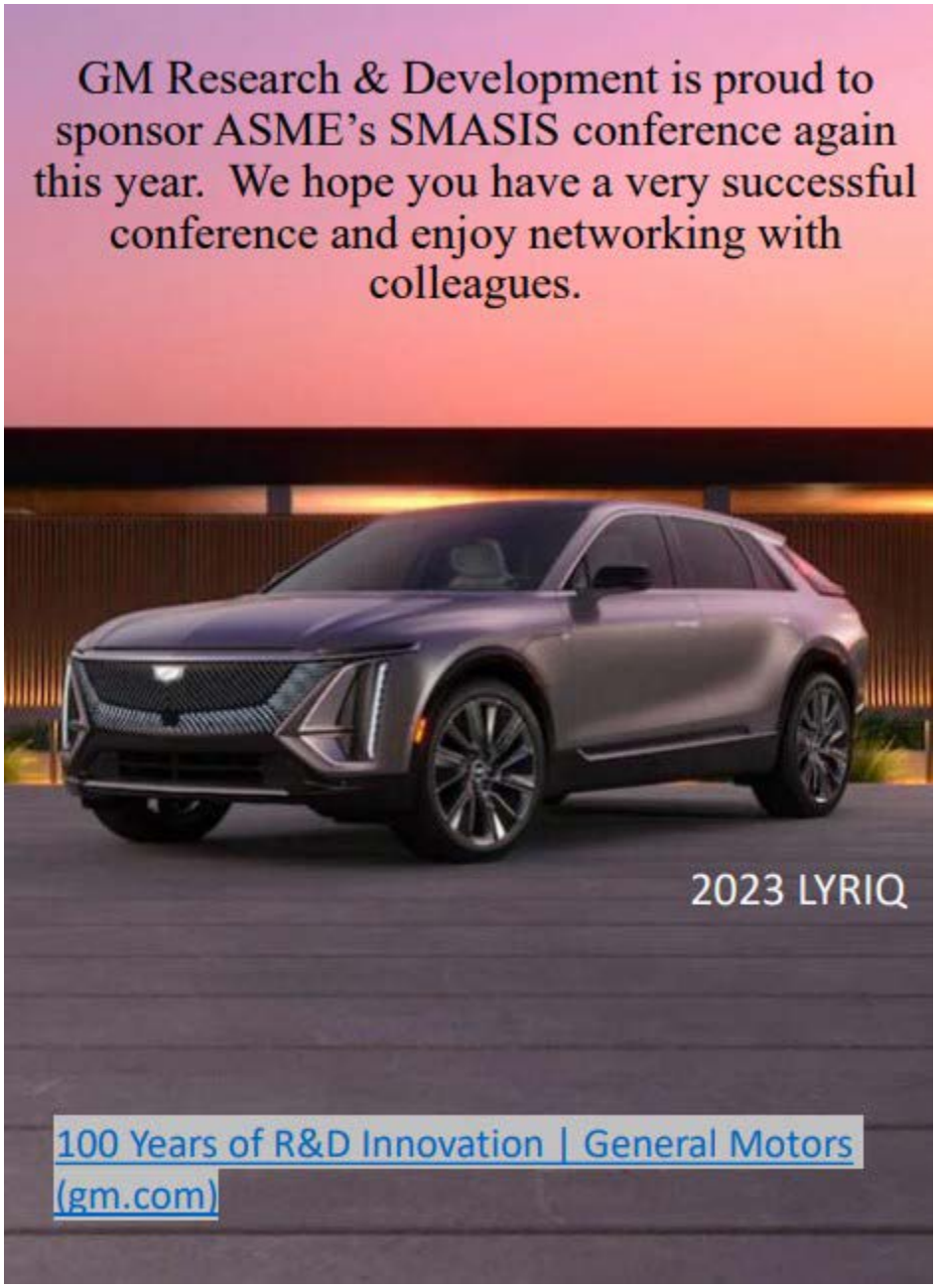
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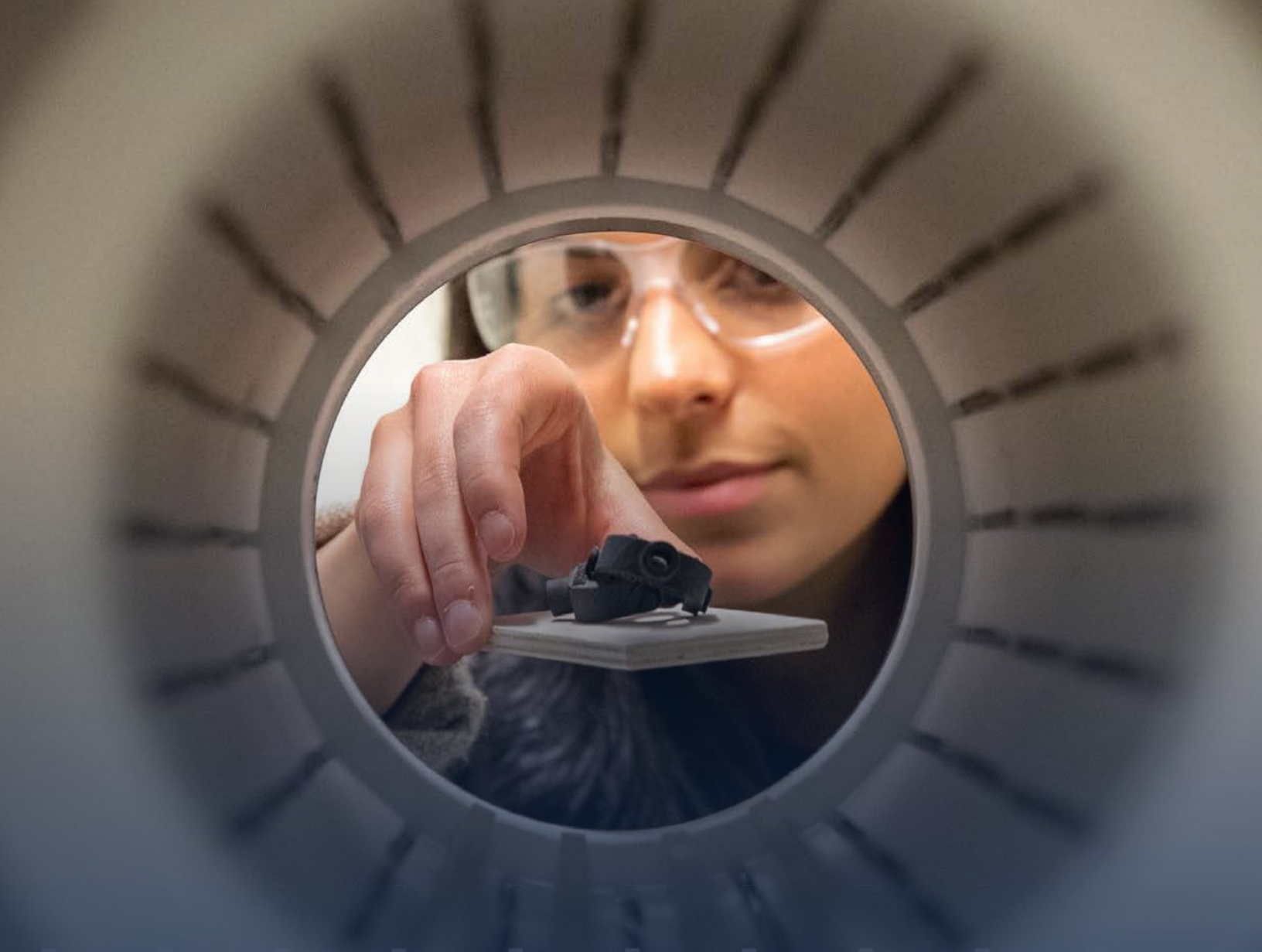

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THANK YOU!

MONDAY, SEPTEMBER 12 - 8:00AM–9:20AM		
8:30AM	8:50AM	9:10AM

	Salon II
Day 1 Keynote: James E. Hubbard Chairs: **Amin Karami**, *University at Buffalo*, **James Gibert**, *Purdue University*, **Shahrzad Towfighian**, *Binghamton University*	
The Smart Structure of the Mind **Invited Speaker Presentation:** SMASIS2022-100365 **James Hubbard** - *Texas A&M University*	

Technical Sessions

MONDAY, SEPTEMBER 12 - 9:30AM–10:40AM

9:30AM	9:50AM	10:10AM

Symposium 1 - Development and Characterization of Multifunctional Materials — Salon III

01-01: Shape Memory Alloy Characterization I

Chair: **Guher Pelin Tokar**, *University of Kentucky*
Co-Chair: **Reza Rizvi** – *York University*

Effects of Heat Treatments on the Shape Memory Behavior of NiTiHf High Temperature Shape Memory Alloys Fabricated by Laser Powder Bed Fusion

Technical Presentation Only: SMASIS2022-91014

Guher Pelin Toker - *University of Kentucky,* **Mohammadreza Nematollahi** - *University of Toledo,* **Keyvan Safaei** - *University of Toledo,* **Othmane Benafan** - *NASA Glenn Research Center,* **Osman Anderoglu** - *University of New Mexico,* **Mohammad Elahinia** - *University of Toledo,* **Haluk Ersin Karaca** - *University of Kentucky*

Empirical Relationships for Calculating the Fracture Toughness of Ni2MnGa Magnetic Shape Memory Alloys Accounting for Their Elastic Anisotropy and Magneto-Mechanical Loading

Technical Presentation Only: SMASIS2022-98015

Glen D'Silva - *Northern Arizona University,* **Constantin Ciocanel** - *Northern Arizona University*

Miniature Self-Biasing High Temperature SMA Actuators: Production and Characterization

Technical Presentation Only: SMASIS2022-98912

Jak Li - *Smarter Alloys,* **Siu Kei Tang** - *Smarter Alloys,* **Michael Kuntz** - *Smarter Alloys,* **Ibraheem Khan** - *Smarter Alloys*

Symposium 2 - Mechanics & Behavior Active Materials — Salon IV

02-01: Multiferroics

Chair: **Paris Von Lockette** - *Pennsylvania State University*
Co-Chair: **Douglas Nicholson** - *The Boeing Company*

Magnetoelectric Response of Multiferroic Polymeric Composites Containing a Magnetoactive Elastomer

Technical Presentation Only: SMASIS2022-90574

Gašper Glavan - *East Bavarian Centre for Intelligent Materials, Ostbayerische Technische Hochschule Regensburg,* **Inna Belyaeva** - *East Bavarian Centre for Intelligent Materials, Ostbayerische Technische Hochschule Regensburg,* **Mikhail Shamonin** - *East Bavarian Centre for Intelligent Materials, Ostbayerische Technische Hochschule Regensburg*

Effect of Viscoelasticity on Tunneling Conduction of Piezoresistive Carbon Nanotube Polymer Composites

Technical Presentation Only: SMASIS2022-90591

Kawai Kwok - *University of Central Florida,* **Wolfgang Klimm** - *University of Central Florida*

Multiscale Modeling of Mangetostriction; a Probabilistic Approach to Magnetic Domain Structures

Technical Presentation Only: SMASIS2022-91058

Alecsander Imhof - *Virginia Tech,* **John Domann** - *Virginia Tech*

MONDAY, SEPTEMBER 12 - 9:30AM–10:40AM

9:30AM	9:50AM	10:10AM

Symposium 3 - Modeling, Simulation and Control of Adaptive Systems — **Fairlane Ballroom**

03-01: Design of Smart and Adaptive Systems I

Chair: **Andres Arrieta** - *Purdue University*
Co-Chair: **Jovana Jovanova** - *TUDelft, Netherlands*

Actuation of Fiber-Reinforced Polymer Surfaces with Multiple Programmable Shapes **Technical Presentation Only:** SMASIS2022-88954 **Giada Risso** - *ETH Zürich,* **Maria Sakovsky** - *Stanford University,* **Paolo Ermanni** - *ETH Zurich*	**Implementation of an Origami Dynamics Model Based on the Absolute Nodal Coordinate Formulation (ANCF)** **Technical Paper Publication:** SMASIS2022-89315 **Jiayue Tao** - *Clemson University,* **Suyi Li** - *Clemson University*	**Self-Assembly by 4D Printing: Design and Fabrication of Sequential Self-Folding** **Technical Paper Publication:** SMASIS2022-89459 **Siyuan Zeng** - *Zhejiang University,* **Yicong Gao** - *Zhejiang University,* **Jianrong Tan** - *Zhejiang University,* **Zhe Wei** - *Shenyang University of Technology*

Symposium 4 - Integrated System Design and Implementation — **Salon I**

04-01: Adaptive Aerospace Structures I

Chair: **Srinivas Vasista** – *German Aerospace Center (DLR)*
Co-Chair: **Farhan Gandhi** – *Rensslear Polytechnic Institute*

Design and Manufacture of a Fluid-Actuated Morphing Winglet Trailing Edge Control Surface **Technical Paper Publication:** SMASIS2022-91054 **Srinivas Vasista** - *German Aerospace Center,* **Felix Nolte** - *Technische Universitaet Braunschweig,* **Michael Schäfer** - *German Aerospace Center,* **Johannes Riemenschneider** - *German Aerospace Center*	**Aerodynamic Modeling and Analysis of a Variable Camber Piezocomposite Rotor** **Technical Paper Publication:** SMASIS2022-91111 **Bharg Shah** - *Rutgers University,* **Onur Bilgen** - *Rutgers University*	**A Reduced-Order Multi-Body Model for Ornithopters with Piezocomposite Flapping Wings** **Technical Paper Publication:** SMASIS2022-90409 **Xin Shan** - *Rutgers University,* **Onur Bilgen** - *Rutgers University*

Technical Sessions

MONDAY, SEPTEMBER 12 - 9:30AM–10:40AM

9:30AM	9:50AM	10:10AM

Symposium 5 - Structural Health Monitoring — Firestone

05-01: Machine Learning

Chair: **Nathan Salowitz** - *University of Wisconsin-Milwaukee*
Co-Chair: **Rishikesh Srinivasaraghavan Govindaraj** - *Embry Riddle Aeronautical University*

Distributed Damage Characterization Enabled by Tomographic Methods

Invited Speaker Presentation: SMASIS2022-98033

Kenneth Loh - *University of California, San Diego*

An Information Theory Approach for Internet of Things Enabled Damage Monitoring

Technical Paper Publication: SMASIS2022-91119

Sarah Malik - *Drexel University*, **Antonios Kontsos** - *Drexel University*

Symposium 6 - Bioinspired Smart Materials and Systems — Salon II

06-01: Design and Modeling of Bioinspired Systems I

Chair: **Eric Freeman** - *University of Georgia*
Co-Chair: **Jeong Yong Kim** – *North Carolina State University*

On the Paradox of Twisted and Coiled Polymer Actuators (Matt, this moved from Wednesday to Monday)

Technical Presentation Only: SMASIS2022-91495

Qiong Wang - *University of Illinois*, **Liuyang Cheng** - *University of Illinois at Urbana-Champaign*, **Anan Ghrayeb** - *University of Illinois at Urbana-Champaign*, **Jeongmin Kim** - *University of Illinois at Urbana-Champaign*, **Seong Hyeon Kim** - *University of Illinois at Urbana-Champaign*, **Samuel Tsai** - *University of Illinois at Urbana-Champaign*, **Sameh Tawfick** - *University of Illinois at Urbana-Champaign*

Workspace Evolution of Hard Magnetic Soft Elastica

Technical Paper Publication: SMASIS2022-91001

Juturu Swetha - *Indian Institute of Technology Madras*, **Ganesh Tamadapu** - *Indian Institute of Technology Madras*, **Shaikh Faruque Ali** - *Indian Institute of Technology Madras*

Rapid Design Cycles of Insect Scale Jumping Robot Phenotypes

Technical Presentation Only: SMASIS2022-91234

Yuzhe Wang - *University of Illinois at Urbana-Champaign*, **Qiong Wang** - *University of Illinois at Urbana-Champaign*, **Mingchao Liu** - *University of Oxford*, **Yimeng Qin** - *University of Illinois at Urbana-Champaign*, **Liuyang Cheng** - *University of Illinois at Urbana-Champaign*, **Ophelia Bolmin** - *University of Illinois at Urbana-Champaign*, **Marianne Alleyne** - *University of Illinois at Urbana-Champaign*, **Aimy Wissa** - *Princeton University*, **Ray H. Baughman** - *The University of Texas at Dallas*, **Dominic Vella** - *University of Oxford*, **Sameh Tawfick** - *University of Illinois at Urbana-Champaign*

MONDAY, SEPTEMBER 12 - 10:50AM–12:10PM			
10:50AM	11:10AM	11:30AM	11:50AM

Symposium 1 - Development and Characterization of Multifunctional Materials			Salon III
01-02: Active Polymers and Elastomers Chair: **Ji Su** – *University of Kentucky* Co-Chair: **Mason Zadan** – *Carnegie Mellon*			
Fabrication of 3D Printed Thermoelectric Devices for Integration into Liquid Crystal Elastomer Actuators **Technical Paper Publication:** SMASIS2022-91144 **Mason Zadan** - *Carnegie Mellon University,* **Dinesh K. Patel** - *Carnegie Mellon University,* **Mohammad Malakooti** - *University of Washington,* **Lining Yao** - *Carnegie Mellon University,* **Carmel Majidi** - *Carnegie Mellon University*	**Thermomechanical Properties of Liquid Crystal Elastomer Films** **Technical Presentation Only:** SMASIS2022-91149 **Russell Mailen -** Auburn University	**Effect of Multilayer Dielectric Elastomer Actuator (DEA) Construction on Performance and Breakdown Strength** **Technical Paper Publication:** SMASIS2022-93851 **Md Abdulla Al Masud** - *3M Company,* **Lindsey Hines** - *3M Company,* **Chin-Yee Ng** - *3M Company,* **Jia Hu** - *3M Company*	

Technical Sessions

MONDAY, SEPTEMBER 12 - 10:50AM–12:10PM			
10:50AM	**11:10AM**	**11:30AM**	**11:50AM**

Symposium 2 - Mechanics & Behavior Active Materials — **Salon IV**

02-02: Performance of Shape Memory Alloys

Chair: **Douglas Nicholson** – *The Boeing Company*
Co-Chair: **Drew Forbes** – *Fort Wayne Metals*

Investigations of the Long-Term Behavior of Electrically Heated Shape Memory Alloy Wires Deflected by a 90° Pulley

Technical Paper Publication:
SMASIS2022-88502

Tobias Schmelter - *Ruhr-University Bochum,* **Benedict Theren** - *Ruhr-University Bochum,* **Adrian Kielczewski** - *Ruhr-University Bochum,* **Bernd Kuhlenkötter** - *Ruhr-University Bochum*

Influence of the Phase Transformation Behaviour of NiTi Shape Memory Alloy Wires on the Predictability of Strain During Operation

Technical Paper Publication:
SMASIS2022-88882

Benedict Theren - *Ruhr-University Bochum,* **Philipp Heß** - *Bergische Universität Wuppertal,* **Stefan Bracke** - *Bergische Universität Wuppertal,* **Bernd Kuhlenkötter** - *Ruhr-University Bochum*

Design of a Modular Lifespan Test Bench for Shape Memory Alloy Wires

Technical Paper Publication:
SMASIS2022-90483

Joshua Mayer - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Philipp Molitor** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Yannik Goergen** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Paul Motzki** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH)*

A Thermodynamically-Informed Phase-Field Model to Study the Martensite Formation in a Novel Type of Iron-Based SMA

Technical Presentation Only:
SMASIS2022-90911

Bjoern Kiefer - *TU Bergakademie Freiberg,* **Vincent Von Oertzen** - *TU Bergakademie Freiberg,* **Andreas Leineweber** - *TU Bergakademie Freiberg,* **Alexander Walnsch** - *TU Bergakademie Freiberg*

MONDAY, SEPTEMBER 12 - 10:50AM–12:10PM			
10:50AM	11:10AM	11:30AM	11:50AM

Symposium 3 - Modeling, Simulation and Control of Adaptive Systems — **Fairlane Ballroom**

03-02: Acoustics and Vibration Control

Chair: **Uwe Marschner** - *Technische Universität Dresden*
Co-Chair: **Jovana Jovanova** - *TU Delft, Netherlands*

2D Active Liner Experimental Results in Acoustic Flow Duct Facility

Technical Paper Publication:
SMASIS2022-88324

Kevin Billon - *Université de Lyon,* **Manuel Collet** - *Université de Lyon,* **Edouard Salze** - *Université de Lyon,* **Martin Gillet** - *Université de Bourgogne Franche-Comté,* **Morvan Ouisse** - *Université de Bourgogne Franche-Comté,* **Maxime Volery** - *Ecole Polytechnique Fédérale de Lausanne,* **Hervé Lissek** - *Ecole Polytechnique Fédérale de Lausanne,* **Jacky Mardjono** - *Safran Aircraft Engines*

Numerical Computation of the Acoustic Response of an Active Airfoil With Impedance Boundary Conditions to a Turbulent Wake

Technical Paper Publication:
SMASIS2022-90914

Mouhamed Mounibe Ezzine - *Université de Lyon,* **Jonathan Rodriguez** - *Université de Lyon,* **Matthias Perez** - *Université de Lyon,* **Kevin Billon** - *Université de Lyon,* **Jacky Mardjono** - *Safran Aircraft Engines,* **Vincent Clair** - *Université de Lyon,* **Manuel Collet** - *Université de Lyon*

Electroelastic Metasurface With Multi-Resonant Piezoelectric Shunts for Simultaneous Anomalous Wavefront Control Over Distinct Frequencies

Technical Presentation Only:
SMASIS2022-98911

Zhenkun Lin - *University of Michigan,* **Serife Tol** - *University of Michigan*

Characterization of Adaptive Piezoelectric Elastic Waveguiding Metasurfaces

Technical Presentation Only:
SMASIS2022-98824

Joshua Dupont - *University of Connecticut,* **Ting Wang** - *University of Connecticut,* **Yang Zhang** - *University of Connecticut,* **Jiong Tang** - *University of Connecticut*

Technical Sessions

MONDAY, SEPTEMBER 12 - 10:50AM–12:10PM			
10:50AM	11:10AM	11:30AM	11:50AM

Symposium 4 - Integrated System Design and Implementation — **Salon I**

04-02: Adaptive Aerospace Structures II

Chair: **Johannes Riemenschneider** - *German Aerospace Center (DLR)*
Co-Chair: **Patrick Musgrave** - *University of Florida*

Autonomous Morphing

Invited Speaker Presentation: SMASIS2022-91083

Farhan Gandhi - *Rensselaer Polytechnic University*

Aeroacoustic and Structural Achievements for a Morphing Blade Twist System Developed for the European Project: Shape Adaptive Blades for Rotorcraft Efficiency

Technical Paper Publication:
SMASIS2022-90790

Salvatore Ameduri - *Italian Aerospace Research Centre,* **Antonio Concilio** - *Centro Italiano Ricerche Aerospaziali,* **Antonio Visingardi** - *Centro Italiano Ricerche Aerospaziali,* **Luigi Federico** - *Centro Italiano Ricerche Aerospaziali,* **Mattia Barbarino** - *Centro Italiano Ricerche Aerospaziali,* **Pier Luigi Vitagliano** - *Centro Italiano Ricerche Aerospaziali*

Experimental Tests of a SMA Based Blade Twist System: Wind Tunnel and Whirl Tower Outcomes

Technical Paper Publication:
SMASIS2022-91454

Salvatore Ameduri - *Italian Aerospace Research Centre,* **Monica Ciminello** - *Centro Italiano Ricerche Aerospaziali,* **Antonio Concilio** - *Centro Italiano Ricerche Aerospaziali,* **Ignazio Dimino** - *Centro Italiano Ricerche Aerospaziali,* **Bernardino Galasso** - *Centro Italiano Ricerche Aerospaziali,* **Mariano Guida** - *Centro Italiano Ricerche Aerospaziali,* **Marco Miceli** - *Aerospace Laboratory for Innovative Components,* **Johannes Riemenschneider** - *Deutsches Zentrum für Luft- und Raumfahrt,* **Steffen Kalow** - *Deutsches Zentrum für Luft- und Raumfahrt,* **Jannis Luebker** - *Deutsches Zentrum für Luft- und Raumfahrt,* **Stephane Fournier** - *University of Bristol,* **Andres E Rivero** - *University of Bristol,* **Benjamin King Sutton Woods** - *University of Bristol*

MONDAY, SEPTEMBER 12 - 10:50AM–12:10PM			
10:50AM	11:10AM	11:30AM	11:50AM

Symposium 5 - Structural Health Monitoring — **Firestone**

05-02: Impedance Based Methods

Chair: **Daewon Kim** - *Embry Riddle Aeronautical University*
Co-Chair: **Muhammad Istiaque Haider** - *University of Wisconsin Milwaukee*

On the Development of a Concentric Cylindrical Model for the Deformation-Dependent Electrical Resistivity of Fiber-Reinforced Composites **Technical Paper Publication:** SMASIS2022-89142 **Sultan Ghazzawi** - *Purdue University,* **Tyler Tallman** - *Purdue University*	**Temperature Compensation for Electromechanical Impedance Signatures with Data-Driven Modeling** **Technical Paper Publication:** SMASIS2022-91151 **James Femi-Oyetoro** - *Tennessee Technological University,* **Sourabh Sangle** - *Texas A&M University,* **Pablo Tarazaga** - *Texas A&M University,* **Mohammad Albakri** - *Virginia Tech*	**Towards Meta-Fixture Design for Indirect Electromechanical Impedance Measurements: On the Effects of Elastic Metastructures on Defect Detection Capabilities** **Technical Paper Publication:** SMASIS2022-91160 **Peter Oyekola** - *Tennessee Technological University,* **Mohammad Albakri** - *Tennessee Technological University,* **Rogers William** - *Tennessee Technological University*	

Technical Sessions

MONDAY, SEPTEMBER 12 - 10:50AM–12:10PM			
10:50AM	**11:10AM**	**11:30AM**	**11:50AM**

Symposium 6 - Bioinspired Smart Materials and Systems			**Salon II**
06-02: Microfabrication and Soft Tissues Chair: **Caterina Lamuata** – *University of Iowa* Co-Chair: **Steven Anton** - *Tennessee Tech University*			
Analyzing the Mechanical Properties Along the Length of Human Achilles Tendon **Technical Paper Publication:** SMASIS2022-91158 **Miguel Angel Fuentes Garcia** - *Tennessee Technological University,* **Abigail Wohlfert** - *Alma College,* **David Chesson** - *Tennessee Technological University,* **Jennifer Vranish** - *Alma Collage,* **Steven Anton** - *Tennessee Technological University*	**Bioprinted Droplet Network Functionalized Tissues** **Technical Presentation Only:** SMASIS2022-91060 **Jessie D. Ringley** - *University of Tennessee,* **Mckayla Torbett** - *University of Tennessee,* **Aída Fica-Conejeros** - *University of Texas at Austin,* **Manish Kumar** - *University of Texas at Austin,* **Stephen A. Sarles** - *University of Tennessee*	**Invited Speaker Presentation** **Michael Dickey** *North Carolina State University*	

MONDAY, SEPTEMBER 12 - 1:40PM–3:20PM			
1:40PM	2:00PM	2:20PM	3:00PM

Symposium 1 - Development and Characterization of Multifunctional Materials — **Salon III**

01-03: Liquid Metal Composites

Chair: **Mohammed Malakooti** - *University of Washington*
Co-Chair: **Eric Markvicka** - *University of Nebraska*

Elastomer Composites with Hybrid Liquid Metal Fillers for Independently Controllable Properties

Technical Presentation Only: SMASIS2022-88921

Ethan Krings - *University of Nebraska-Lincoln*, **Haipeng Zhang** - *University of Nebraska-Lincoln*, **Suchit Sarin** - *University of Nebraska-Lincoln*, **Jeffery Shield** - *University of Nebraska-Lincoln*, **Sangjin Ryu** - *University of Nebraska-Lincoln*
Eric Markvicka - *University of Nebraska-Lincoln*

Functional Elastomer Composites for Wearable Thermoelectric Energy Scavengers

Technical Presentation Only: SMASIS2022-88584

Youngshang Han - *University of Washington*, **Leif-Erik Simonsen** - *University of Washington*, **Mohammad H. Malakooti** - *University of Washington*

Liquid Metal Electronics

Invited Speaker Presentation: SMASIS2022-100315

Christopher Tabor - *Air Force Research Laboratory*

Technical Sessions

MONDAY, SEPTEMBER 12 - 1:40PM–3:20PM			
1:40PM	**2:00PM**	**2:20PM**	**3:00PM**

Symposium 2 - Mechanics & Behavior Active Materials			Salon IV
02-03: Shape Memory Alloys Chair: **Mike Kuntz** – *Smarter Alloys* Co-Chair: **Douglas Nicholson** – *The Boeing Company*			
Micro Laser Welding of NiTi Shape Memory Wires and Printed Circuit Boards **Technical Paper Publication:** SMASIS2022-90970 **Marvin Schuleit** - *Ruhr-Universität Bochum,* **Benedict Theren** - *Ruhr-Universität Bochum,* **Burkhard Maaß** - *Ingpuls GmbH,* **Bernd Kuhlenkoetter** - *Ruhr-Universität Bochum,* **Cemal Esen** - *Ruhr University Bochum*	**Shape Memory Alloy Rendering of Experimental Analysis and Calibration Tool** **Technical Presentation Only:** SMASIS2022-91582 **Suhrit Lavu** - *Texas A&M University,* **Tiago Gunter** - *Texas A&M University,* **Muning Fan** - *Texas A&M University,* **Priscilla Nizio** - *Texas A&M University,* **Patrick Walgren** - *Texas A&M University,* **Jacob Mingear** - *Texas A&M University,* **Darren Hartl** - *Texas A&M University*	**Design of Soft Magnetic Materials** **Technical Presentation Only:** SMASIS2022-98307 **Ananya Renuka Balakrishna** - *University of Southern California*	

MONDAY, SEPTEMBER 12 - 1:40PM–3:20PM			
1:40PM	2:00PM	2:20PM	3:00PM

Symposium 3 - Modeling, Simulation and Control of Adaptive Systems — **Fairlane Ballroom**

03-03: Modeling Complex Materials and Systems

Chair: **Uwe Marschner** – *Technische Universität Dresden*

Mechatronic Design and Physical Prototyping of a Three-Fingered Gripper for Underwater Manipulation

Technical Paper Publication:
SMASIS2022-92010

Mario Baggetta - *University of Genoa,* **Giovanni Berselli** - *University of Genoa,* **Gianluca Palli** - *University of Bologna,* **Claudio Melchiorri** - *University of Bologna*

Dynamic Modelling and Robust Control for Twisted and Coiled Artificial Muscles

Technical Presentation Only:
SMASIS2022-89013

Thilina Weerakkody - *University of Iowa,* **Maxwell Hammond** - *University of Iowa,* **Venanzio Cichella** - *University of Iowa,* **Caterina Lamuta** - *University of Iowa*

Analogies Between Stimuli-Responsive (Smart) Hydrogel-Based Microfluidic Valves and Electronic Transistors

Technical Paper Publication:
SMASIS2022-91225

Uwe Marschner - *Technische Universität Dresden,* **Anthony Beck** - *Technische Universität Dresden,* **Philipp Mehner** - *Technische Universität Dresden,* **Georgi Paschew** - *Technische Universität Dresden,* **Andreas Voigt** - *Technische Universität Dresden,* **Andreas Richter** - *Technische Universität Dresden*

Electromechanical Model of Dielectric Elastomer Transducers

Technical Paper Publication:
SMASIS2022-90955

Petko Bakardjiev - *Technische Universität Dresden,* **Uwe Marschner** - *Technische Universität Dresden,* **Andreas Richter** - *Technische Universität Dresden,* **M. Ercan Altinsoy** - *Technische Universität Dresden*

Technical Sessions

MONDAY, SEPTEMBER 12 - 1:40PM–3:20PM			
1:40PM	**2:00PM**	**2:20PM**	**3:00PM**

Symposium 4 - Integrated System Design and Implementation — Salon I

04-03: Optimization and Control of Active Systems

Chair: **Patrick Musgrave** – *University of Florida*
Co-Chair: **Onur Bulgen** – *Rutgers University*

Feedback Control for Traveling Wave Generation with Bending Actuators

Technical Paper Publication:
SMASIS2022-90695

Amit Bhayadia - *University at Buffalo,* **Anthony Olivett** - *University at Buffalo,* **M. Amin Karami** - *University at Buffalo*

Modified Triply Periodic Actuator Topologies

Technical Paper Publication:
SMASIS2022-91015

Marc Sparenberg - *German Aerospace Center Braunschweig,* **Jörg Melcher** - *German Aerospace Center Braunschweig*

Experimental Validation for a Multi-Objective Optimized Piezocomposite Morphing Airfoil

Technical Paper Publication:
SMASIS2022-90581

Cody Wright - *Rutgers University* **Onur Bilgen** - *Rutgers University*

Design Optimization of a Piezocomposite Ornithopter Wing Planform Using a Genetic Algorithm

Technical Paper Publication:
SMASIS2022-90706

Mohammad Katibeh - *Rutgers University* **Onur Bilgen** - *Rutgers University*

Symposium 5 - Structural Health Monitoring — Firestone

05-03: Vibration Based Methods

Chair: **Tyler Tallman** – *Purdue University*
Co-Chair: **Daewon Kim** - *Embry Riddle Aeronautical University*

Random Vibration Based Robust Damage Detection on an Operating Wind Turbine Blade Under Variable Natural Excitation Conditions

Technical Paper Publication:
SMASIS2022-90936

Panagiotis Konis - *University of Patras,* **Dmitri Tcherniak** - *Bruel & Kjaer,* **Spilios Fassois** - *University of Patras*

Vibration-Based Bridge Damage Detection Using Image-Based Pre-Trained Deep Learning Network

Technical Paper Publication:
SMASIS2022-88421

Xi Song - *University of Hawaii at Manoa,* **Joshua Dyogi** - *University of Hawaii at Manoa,* **Chunhee Cho** - *University of Hawaii at Manoa*

Towards Computational Super-Resolution Ultrasonic Array Imaging of Material Defects via Hierarchical Multi-Scale Deep Learning

Technical Presentation Only:
SMASIS2022-97722

Homin Song - *Gachon University,* **Yongchao Yang** - *Michigan Technological University*

MONDAY, SEPTEMBER 12 - 1:40PM–3:20PM			
1:40PM	2:00PM	2:20PM	3:00PM

Symposium 6 - Bioinspired Smart Materials and Systems — **Salon II**

06-03: Artificial Synapses and Electroactive Materials

Chair: **Andy Sarles** – *University of Tennessee*
Co-Chair: **Steve Anton** – *Tennessee Tech University*

Biomolecular Membrane-Based Soft Materials for Multifunctional, Adaptive, and Neuromorphic Systems **Technical Presentation Only:** SMASIS2022-91217 **Michelle Makhoul-Mansour** - *The University of Tennessee,* **Joshua Maraj** - *The University of Tennessee,* **Stephen A. Sarles** - *The University of Tennessee*	**Novel Geopolymer Based Artificial Synapses** **Technical Presentation Only:** SMASIS2022-89025 **Mahmudul Alam Shakib** - *The University of Iowa,* **Zhaolin Gao** - *The University of Iowa,* **Caterina Lamuta** - *The University of Iowa*	**Biorealistic Short-Term Plasticity in Biomolecular Synapses Enhances Reservoir Computing Classification** **Technical Presentation Only:** SMASIS2022-89181 **Joshua Maraj** - *The University of Tennessee,* **Stephen A. Sarles** - *The University of Tennessee*	**Investigation Into Piezoelectric Nanoparticle Dispersion in Polymethyl Methacrylate Bone Cement** **Technical Paper Publication:** SMASIS2022-91020 **Brandon Hines** - *Tennessee Tech University,* **Steven Anton** - *Tennessee Tech University,* **Holly Stretz** - *Tennessee Tech University*

Technical Sessions

MONDAY, SEPTEMBER 12 - 3:40PM–5:20PM			
3:40PM	**4:00PM**	**4:20PM**	**5:00PM**

Symposium 1 - Development and Characterization of Multifunctional Materials — **Salon III**

01-04: Modeling and Characterization of Multifunctional Materials

Chair: **Sumit Gupta** – *Oak Ridge National Laboratory*
Co-Chair: **Gary Siedel** – *Virginia Tech*

Effective Property Prediction of Multifunctional CNT-Polymer Nanocomposites via Reduced-Order Two-Point Cluster and Blocking Functions

Technical Presentation Only:
SMASIS2022-91426

Kavan Shah - *Virginia Tech*
Gary Seidel - *Virginia Tech*

Simulating the Effects of Porosity on the D31 Piezoelectric Coefficient of Polyvinylidene Fluoride

Technical Paper Publication:
SMASIS2022-90607

Jack Kloster - *University of Minnesota Duluth*
Matthew Danley - *University of Minnesota Duluth*
Victor Lai - *University of Minnesota Duluth*
Ping Zhao - *University of Minnesota Duluth*
Tony Struntz - *University of Minnesota Duluth*

Effect of Heterogeneity and Voids on the Piezoresistive Response of CNT-Based Polymer Bonded Energetics Using Statistical Correlation Functions

Technical Presentation Only:
SMASIS2022-91429

Pranay Anekal - *Virginia Tech*
Gary Seidel - *Virginia Tech*

Shape Morphing Mechanical Metamaterials for Multifunctional Robots

Technical Presentation Only:
SMASIS2022-91256

Michael D. Bartlett - *Virginia Tech*

MONDAY, SEPTEMBER 12 - 3:40PM–5:20PM			
3:40PM	4:00PM	4:20PM	5:00PM

Symposium 2 - Mechanics & Behavior Active Materials — **Salon IV**

02-04: Modeling and Simulation of Active Materials

Chair: **Paris Von Lockette** - *Pennsylvania State University*
Co-Chair: **Douglas Nicolson** – *The Boeing Company*

Multi-Objective Optimization of Predicted Magnetic Properties from Multifield Processing Conditions in Polymer Matrix Particle Composites

Technical Paper Publication:
SMASIS2022-91175

Denise Widdowson - *The Pennsylvania State University,* **Anil Erol** - *Air Force Research Lab,* **Dashiell Papula** - *The Pennsylvania State University,* **Zoubeida Ounaies** - *The Pennsylvania State University,* **Paris Von Lockette** - *The Pennsylvania State University*

Finite Element Analysis of the Nonlinear Material Behavior of Ferroelectrics Under Complex Load Scenarios

Technical Presentation Only:
SMASIS2022-91710

Felix Sutter - *Karlsruhe Institute of Technology,* **Marc Kamlah** - *Karlsruhe Institute of Technology*

A Comparison of Meshfree and Finite Element Based Magnetostatic Modeling

Technical Presentation Only:
SMASIS2022-92672

Bala Shanmugam - *Virginia Tech,* **John Domann** - *Virginia Tech*

A Common Simulating Model on Complicated Self-Deformation of 4D Printed Bilayer Structures

Technical Paper Publication:
SMASIS2022-89036

Yixiong Feng - *Zhejiang University*, **Junjie Song** - *Zhejiang University,* **Yong Wang** - *Zhejiang University,* **Siyuan Zeng** - *Zhejiang University,* **Zhaoxi Hong** - *Zhejiang University,* **Hao Qiu** - *Zhejiang University,* **Jianrong Tan** - *Zhejiang University*

Technical Sessions

MONDAY, SEPTEMBER 12 - 3:40PM–5:20PM			
3:40PM	4:00PM	4:20PM	5:00PM

Symposium 3 - Modeling, Simulation and Control of Adaptive Systems — **Fairlane Ballroom**

03-04: Shape Memory Alloy Characterization II

Chair: **Kenny Pagel**, *Fraunhofer Institute for Machine Tools and Forming Technology*
Co-Chair: **Jovana Jovanova**, *TU Delft, Netherlands*

Characterization and Modeling of the System Behavior of High Load SMA Actuators

Technical Paper Publication:
SMASIS2022-88892

Daniel Maiwald - Fraunhofer IWU, **Toennis Trittler** - *Fraunhofer Institute for Machine Tools and Forming*, **André Bucht** - *Fraunhofer Institute for Machine Tools and Forming*, **Kenny Pagel** - *Fraunhofer Institute for Machine Tools and Forming*, **Welf-Guntram Drossel** - *Fraunhofer Institute for Machine Tools and Forming*

Effect of Coating on the Continuous Cycle Actuation of Shape Memory Alloy Wires: Analyses and Experiments

Technical Paper Publication:
SMASIS2022-90983

Ahmad Shaikh - *Indian Institute of Science*, **Shardul Panwar** - *Toyota Research Institute of North America*, **Ryohei Tsuruta** - *Toyota Research Institute of North America*, **Umesh Gandhi** - *Toyota Research Institute of North America*

A Finite-Strain Phase-Field Model for Fracture in Shape Memory Alloys: Modeling Framework and Experimental Validation

Technical Presentation Only:
SMASIS2022-88386

Theocharis Baxevanis - *University of Houston*, **Mehedi Md Hasan** - *University of Houston*

MONDAY, SEPTEMBER 12 - 3:40PM–5:20PM			
3:40PM	4:00PM	4:20PM	5:00PM

Symposium 4 - Integrated System Design and Implementation — Salon I

04-04: Integrated Smart Systems

Chair: **Brent Utter** – *Lafayette College*
Co-Chair: **Jonathan Luntz** – *University of Michigan*

Investigation of Mounting Techniques for Concrete Floor-Mounted Accelerometers Used in Smart Buildings

Technical Paper Publication:
SMASIS2022-91178

Jacob Hott - *Tennessee Technological University,* **Steven Anton** - *Tennessee Technological University*

Hinged Tile-Based Air Surface for Morphing Windshield Cowling

Technical Paper Publication:
SMASIS2022-91443

Tiantian Li - *University of Michigan,* **Jonathan Luntz** - *University of Michigan,* **Diann Brei** - *University of Michigan,* **Wonhee Kim** - *General Motors Research and Development,* **Paul Alexander** - *General Motors Research and Development*

Challenges of Upscaling Power Composites for Aerospace Applications

Technical Paper Publication:
SMASIS2022-91201

Sebastian Geier - *German Aerospace Center,* **Jan Petersen** - *German Aerospace Center,* **Peter Wierach** - *German Aerospace Center*

Integrated Piezoceramic Sensors for Local Ice Detection

Technical Presentation Only:
SMASIS2022-91089

Johannes Riemenschneider - *German Aerospace Center,* **Julia Feder** - *Technical University of Braunschweig,* **Martin Pohl** - *German Aerospace Center,* **Michael J. Sinapius** - *Technical University of Braunschweig*

Symposium 5 - Structural Health Monitoring — Firestone

05-04: Sensor Design

Chair: **Rishikesh Srinivasaraghavan Govindaraj** - *Embry Riddle Aeronautical University*
Co-Chair: **Tyler Tallman** - *Purdue University*

Flexible Piezoelectric Wave-Based Sensor: Numerical Analysis and Validation

Technical Paper Publication:
SMASIS2022-91069

Rishikesh Srinivasaraghavan Govindarajan - *Embry-Riddle Aeronautical University,* **Foram Madiyar** - *Embry-Riddle Aeronautical University,* **Daewon Kim** - *Embry-Riddle Aeronautical University*

Additive Manufacturing of Advanced Active Sensing Tags for Structural Health Monitoring Systems

Technical Presentation Only:
SMASIS2022-91045

Jeffrey Bergman - *NextFlex,* **Alexander Cook** - *NextFlex,* **Kevin Durkee** - *Aptima, Inc.,* **John Feeney** - *Aptima, Inc.,* **Ian Trase** - *Aptima, Inc.,* **Robert Mcmanus** - *NextFlex,* **Alexander Brandt** - *NextFlex*

Development of Embeddable Additive Manufacturing Microsensors for Structural Health Monitoring

Technical Paper Publication:
SMASIS2022-91047

Nicholas Reed - *Embry-Riddle Aeronautical University,* **Daewon Kim** - *Embry-Riddle Aeronautical University*

Technical Sessions

MONDAY, SEPTEMBER 12 - 3:40PM–5:20PM			
3:40PM	**4:00PM**	**4:20PM**	**5:00PM**

Symposium 6 - Bioinspired Smart Materials and Systems — Salon II

06-04: Design and Modeling of Bioinspired Systems II

Chair: **Eric Freeman** – *University of Georgia*
Co-Chair: **Michael Philen** – *Virginia Tech*

Modeling of a Nonlinear Superelastic Thermally Actuated Compliant Mechanism

Technical Presentation Only:
SMASIS2022-90690

Brianne Hargrove - *The Pennsylvania State University,* **Mary Frecker** - *The Pennsylvania State University,* **Jovana Jovanova** - *TU Delft, Netherlands*

A Method to Generate 3D Patient-Specific Total Knee Arthroplasty Tibia Models

Technical Paper Publication:
SMASIS2022-91008

Andrew Gothard - *Tennessee Technological University,* **Steven Anton** - *Tennessee Technological University*

Optimal Bipennate Fluidic Artificial Muscle Bundle Design for Ankle Joint Motion with Limited Volumetric Capacity

Technical Paper Publication:
SMASIS2022-92022

Emily Duan - *North Carolina State University,* **Matthew Bryant** - *North Carolina State University*

Implications of Resistive Force on Variable Recruitment Fluidic Artificial Muscle Bundle State Transition

Technical Paper Publication:
SMASIS2022-91587

Jeong Yong Kim - *North Carolina State University,* **Matthew Bryant** - *North Carolina State University*

Symposium 8 - Emerging Technologies — Rouge River

08-01: Design and Optimization

Chair: **Richard Beblo** - *Air Force Research Laboratory/RQVC*
Co-Chair: **Paul Motzki** - *Saarland University*

Dispersion Optimization of Phononic Crystals Using Learning-Based Approach

Technical Presentation Only:
SMASIS2022-98861

Wei-Chun Lu - *University of Michigan,* **Hrishikesh Danawe** - *University of Michigan,* **Serife Tol** - *University of Michigan*

Development of Material Property Feasibility Constraints for a Multiscale Topology Optimization Framework Using Radial Basis Function Interpolations

Technical Paper Publication:
SMASIS2022-97312

Brent Bielefeldt - *National Research Council,* **Richard Beblo** - *Air Force Research Laboratory,* **Kevin Lawson** - *University of Dayton, Robert Lowe - University of Dayton*

Broadband Subwavelength Imaging via Phononic Crystal Flat Lenses

Technical Presentation Only:
SMASIS2022-98817

Hrishikesh Danawe - *University of Michigan,* **Serife Tol** - *University of Michigan*

In-Plane Mechanical Properties of an Adaptive Honeycomb Structure

Technical Presentation Only:
SMASIS2022-90737

Ting Li - *Harbin Institute of Technology,* **Jian Sun** - *Harbin Institute of Technology,* **Jinsong Leng** - *Harbin Institute of Technology,* **Yanju Liu** - *Harbin Institute of Technology*

TUESDAY, SEPTEMBER 13 - 8:30AM–9:40AM

8:30AM	8:50AM	9:10AM

Symposium 1 - Development and Characterization of Multifunctional Materials — Salon III

01-05: Composites and Hybrid Systems

Chair: **Amir Ameli**, *University of Massachusetts Lowell*
Co-Chair: **Tyler Tallman** - *Purdue University*

Electrical Conductivity of Multifunctional Blend Composites of Polycarbonate and Polyethylene with Hybrid Fillers

Technical Paper Publication: SMASIS2022-97843

Ahmed Naji - *University of Babylon*, **Petra Pötschke** - *Leibniz-Institut für Polymerforschung Dresden e.V.*, **Amir Ameli** - *University of Massachusetts Lowell*

On the Use of Magnetic Fields for Dispersing Steel Fibers in Silicone

Technical Presentation Only: SMASIS2022-93699

M. Amin Jamshidi - *University of Toronto*, **Melissa Ma** - *University of Toronto*, **Chul B. Park** - *University of Toronto*, **Fae Azhari** - *University of Toronto*

Investigation Into Etching Effects on the Interface Strength Between Nickel Titanium and Bismuth Tin for the Creation of Metal Matrix Self-Healing Composites

Technical Paper Publication: SMASIS2022-90256

Muhammad Istiaque Haider - *University of Wisconsin-Milwaukee*, **Benjamin Church** - *University of Wisconsin-Milwaukee*, **Pradeep Rohatgi** - *University of Wisconsin-Milwaukee*, **Nathan Salowitz** - *University of Wisconsin-Milwaukee*

Symposium 2 - Mechanics & Behavior Active Materials — Salon IV

02-05: Development of Advanced Actuators and Sensors

Chair: **Patrick Walgren** – *Texas A&M University*
Co-Chair: **Mike Kuntz** – *Smarter Alloys*

High Strength Actuators

Technical Presentation Only: SMASIS2022-90797

Biswanath Paira - *The Ohio State University*, **Jianxiong Li** - *The Ohio State University*, **Boyd Panton** - *The Ohio State University*, **Anupam Vivek** - *The Ohio State University*, **Glenn Daehn** - *The Ohio State University*

Self-Folding Polymer Origami as a Deployable Spacecraft Structure

Technical Presentation Only: SMASIS2022-91134

Ryan Long - *Auburn University*, **Russell Mailen** - *Auburn University*

Reconfigurable Metamaterials for Aerospace Applications

Technical Presentation Only: SMASIS2022-98904

Latha Nataraj - *CCDC-ARL*, **Todd Henry** - *CCDC-ARL*, **Nic Herard** - *University of California, San Diego*, **Nicholas Boechler** - *University of California, San Diego*, **Shengqiang Cai** - *University of California, San Diego*

Technical Sessions

TUESDAY, SEPTEMBER 13 - 8:30AM–9:40AM

8:30AM	8:50AM	9:10AM

Symposium 3 - Modeling, Simulation and Control of Adaptive Systems — **Fairlane Ballroom**

03-05: Advanced Materials and Transduction Applications

Chair: **Oliver Myers** – *Clemson University*
Co-Chair: **Maria Sakovsky** – *Stanford University*

Simulating Age Related Radial Pulses Using Magneto-Rheological Fluids

Technical Paper Publication: SMASIS2022-90793

Miranda Eaton - *Miami University,* **Jeong-Hoi Koo** - *Miami University,* **Tae-Heon Yang** - *Korea National University of Transportation,* **Young-Min Kim** - *Korea Institute of Oriental Medicine*

Numerical Investigation of Bistable Energy Harvesting Based on Silicone Dielectric Elastomer Generators

Technical Paper Publication: SMASIS2022-90988

Giacomo Moretti - *Saarland University,* **Gianluca Rizzello** - *Saarland University*

Design Tradeoffs and Meso-Architecture in a Magnetorheological Elastomer Peristaltic Pump

Technical Presentation Only: SMASIS2022-91114

Niknam Momenzadeh – *Pennsylvania State University,* **Christian Bergen** - *Pennsylvania State University,* **Paris Vonlockette** - *Pennsylvania State University*

Symposium 4 - Integrated System Design and Implementation — **Salon I**

04-05: Shape Memory Alloy Applications in Integrated Systems

Chair: **Johannes Riemenschneider** - *German Aerospace Center (DLR)*
Co-Chair: **Srinivas Vasista** - *German Aerospace Center (DLR)*

Shape Memory Alloy Actuator: A Key Technology for Integrated Systems

Invited Speaker Presentation: SMASIS2022-91898

Burkhard Maass - *Ingpuls GmbH*

High-Power SMA Bowling Ball Catapult

Technical Paper Publication: SMASIS2022-90573

Philipp Molitor - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Rouven Britz** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Yannik Goergen** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Paul Motzki** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH)*

TUESDAY, SEPTEMBER 13 - 8:30AM–9:40AM

8:30AM	8:50AM	9:10AM

Symposium 5 - Structural Health Monitoring — Firestone

05-05: Boundary Condition Considerations

Chair: **Muhammad Istiaque Haider** - *University of Wisconsin Milwaukee*
Chair: **Nathan Salowitz** - *University of Wisconsin Milwaukee*

Methods for the Rapid Detection of Boundary Condition Variations in Structural Systems

Technical Paper Publication: SMASIS2022-90377

Xuyang Li - *Michigan State University,* **Talal Salem** - *Michigan State University,* **Hamed Bolandi** - *Michigan State University,* **Vishnu Boddeti** - *Michigan State University,* **Nizar Lajnef** - *Michigan State University*

Damage Assessment from Attractor Boundary Deformation

Technical Paper Publication: SMASIS2022-88793

Andrew Sloboda - *Bucknell University,* **Chin Ting Kong** - *Bucknell University*

Symposium 6 - Bioinspired Smart Materials and Systems — Salon II

06-05: Design and Modeling of Bioinspired Systems III

Chair: **Mary Frecker** – *Pennsylvania State University*
Co-Chair: **Emily Duan** – *North Carolina State University*

Computational Validation That Whiffling- Inspired Gaps Require Less Work for Roll Control Than Conventional Ailerons at High Rolling Moment Coefficients

Technical Paper Publication: SMASIS2022-89275

Piper Sigrest - *University of Michigan,* **Neil Wu** - *University of Michigan,* **Daniel Inman** - *University of Michigan*

Modeling Shape-Shifting Networks of Biologically Inspired Membranes

Technical Presentation Only: SMASIS2022-91026

Joyce El-Beyrouthy - *University of Georgia,* **Michelle Makhoul-Mansour** - *The University of Tennessee,* **Eric Freeman** - *University of Georgia*

Analytical Modeling of Segmented Magneto-Active Elastomer Unimorph Actuators with Soft or Hard Magnetic Particles

Technical Presentation Only: SMASIS2022-91123

Tan Pan - *Pennsylvania State University* , **Rui Leng** - *Pennsylvania State University,* **Zoubeida Ounaies** - *Pennsylvania State University,* **Mary Frecker** - *Pennsylvania State University*

Technical Sessions

TUESDAY, SEPTEMBER 13 - 8:30AM–9:40AM		
8:30AM	**8:50AM**	**9:10AM**

Symposium 8 - Emerging Technologies		**Rouge River**
08-02: Advanced Manufacturing Chair: **Jovana Jovanova** - *TU Delft, Netherlands* Co-Chair: **Juliana Abel** - *University of Minnesota*		
Automated Manufacturing Process for Carbon Fiber Twisted and Coiled Artificial Muscles (TCAMs) **Technical Presentation Only:** SMASIS2022-88987 **Samantha Bell** - *The University of Iowa,* **Arnold Bangel** - *The University of Iowa,* **Xuan Song** - *The University of Iowa,* **Caterina Lamuta** - *The University of Iowa*	**Re-Programming Mechanical andMulti-Physics Response in Metastructures** **Invited Speaker Presentation** **Maria Sakovsky** -*Stanford University*	

TUESDAY, SEPTEMBER 13 - 10:20AM–11:40AM			
10:20AM	**10:40AM**	**11:00AM**	**11:20AM**

Symposium 7 - Energy Harvesting — Gross Pointe

07-01: Applications in Energy Harvesting

Chair: **Hrishikesh Danawe** - *University of Michigan*
Co-Chair: **Serif Tole** - *University of Michigan*

Energy Harvesting from Motions of a Robotic Worm

Technical Paper Publication:
SMASIS2022-90798

Sara Aghazadeh - *Binghamton University,* **Mark Zajkowski** - *GE Research,* **Svetlana Bakhmatova** - *GE Research,* **Emily Marie Boggs** - *GE Research,* **Pei-Hsin Kuo** - *GE Research,* **Deepak Trivedi** - *GE Research,* **Pu Zhang** - *Binghamton University,* **Shahrzad Towfighian** - *Binghamton University*

Characterization of Work Output for NiTi-Based SMA Accounting for Application Based Transient Thermo-Mechanical Behaviour

Technical Presentation Only:
SMASIS2022-98913

Siu Kei Tang - *Extract Energy*
Shahzad Ahsan - *Extract Energy*
Michael Kuntz - *Extract Energy*
Ibraheem Khan - *Extract Energy*

An Equivalent Circuit Model for the Reconfigurable Ducted Turbine Array Concept

Technical Paper Publication:
SMASIS2022-91270

Nazim Erol - *Rutgers University*
Xin Shan - *Rutgers University*
Onur Bilgen - *Rutgers University*

Symposium 1 - Development and Characterization of Multifunctional Materials — Salon III

01-06: Additive Fabrication and Manufacturing of Materials and Novel Material Systems

Chair: **Christopher Bowland** – *Oak Ridge National Laboratory*
Co-Chair: **Constantin Ciocanel** – *Northern Arizona State University*

3D Printed Flexible Dielectric Electroactive Polymer Sensors

Technical Paper Publication:
SMASIS2022-91072

David Gonzalez Rodriguez - *Purdue University,* **Cole Maynard** - *Purdue University,* **Julio Hernandez** - *Purdue University,* **Corey O'brien** - *Purdue University,* **Tyler Tallman** - *Purdue University,* **Brittany Newell** - *Purdue University,* **Jose Garcia** - *Purdue University*

Material Characterization of Fused Filament Fabrication for Lower-Limb Prosthetic Sockets

Technical Paper Publication:
SMASIS2022-88833

Clara Phillips - *University of Toronto,* **Mark Kortschot** - *University of Toronto,* **Fae Azhari** - *University of Toronto*

4D Printing of Thermosetting Shape Memory Polymer for Active Deformation Structures

Technical Presentation Only:
SMASIS2022-90852

Linlin Wang - *Harbin Institute of Technology,* **Fenghua Zhang** - *Harbin Institute of Technology,* **Yanju Liu** - *Harbin Institute of Technology,* **Jinsong Leng** - *Harbin Institute of Technology*

Digital Information Storage Mechanical Metamaterials

Technical Paper Publication:
SMASIS2022-90268

Qianyun Zhang - *University of Pittsburgh,* **Kaveh Barri** - *University of Pittsburgh,* **Zhong Lin Wang** - *Georgia Institute of Technology,* **Amir Alavi** - *University of Pittsburgh*

Technical Sessions

TUESDAY, SEPTEMBER 13 - 10:20AM–11:40AM			
10:20AM	**10:40AM**	**11:00AM**	**11:20AM**

Symposium 2 - Mechanics & Behavior Active Materials — **Salon IV**

02-06: Characterization of Advanced Sensors and Actuators

Chair: **Drew Forbes** – *Fort Wayne Metals*
Co-Chair: **Patrick Walgren** – *Texas A&M University*

Quantifying Stored Energy for Shape Recovery via Enthalpy Relaxation

Technical Presentation Only:
SMASIS2022-91124

Midhan Siwakoti - *Auburn University,* **Russell Mailen** - *Auburn University*

Characterization and Uncertainty Analysis of Heat Transport in 3D Printed Multifractal Media

Technical Paper Publication:
SMASIS2022-89537

Dinesh Ramesh - *Florida A&M/Florida State University,* **Eugenia Stanisauskis** - *Florida A&M/Florida State University,* **Jakob Consoliver-Zack** - *Florida A&M/Florida State University,* **Basanta Pahari** - *Florida A&M/Florida State University,* **William Oates** - *Florida A&M/Florida State University*

Fatigue Analysis of Bistable Composite Laminate

Technical Paper Publication:
SMASIS2022-90215

Shoab Ahmed Chowdhury - *Clemson University,* **Suyi Li** - *Clemson University,* **Oliver J. Myers** - *Clemson University*

Experimental Investigation of Strain and Damage Sensing of Binder With MWCNTs and Conductive Grains Under Cyclic Compressive Loads

Technical Presentation Only:
SMASIS2022-91428

Viswajit Talluru - *Virginia Tech,* **Nishant Shirodkar** - *Virginia Tech,* **Gary Seidel** - *Virginia Tech*

TUESDAY, SEPTEMBER 13 - 10:20AM–11:40AM			
10:20AM	10:40AM	11:00AM	11:20AM

Symposium 3 - Modeling, Simulation and Control of Adaptive Systems			Fairlane Ballroom
03-06: Reduced Order Modeling Chair: **Hongcheng Tao** – *Purdue University* Co-Chair: **Yongchao Yang** – *Michigan Technological University*			
Can the Mathematics of Constitutive Plasticity Describe Structural Nonlinearities? Reduced Order Modeling for Efficient Adaptive Structures Design **Technical Presentation Only:** SMASIS2022-93713 **Patrick Walgren** - *Texas A&M University,* **Walker Buckle** - *Texas A&M University,* **Darren Hartl** - *Texas A&M University*	**A Physics-Integrated Deep Learning Framework for Discovering Reduced-Order Models of Nonlinear Dynamical Systems** **Technical Presentation Only:** SMASIS2022-97724 **Shanwu Li** - *Michigan Technological University,* **Yongchao Yang** - *Michigan Technological University*	**Ultrasensitive Mass Sensing Utilizing Nonlinear Compliant Microbeams** **Invited Speaker Presentation** **Jian Zhao**	

Technical Sessions

TUESDAY, SEPTEMBER 13 - 10:20AM–11:40AM			
10:20AM	**10:40AM**	**11:00AM**	**11:20AM**

Symposium 4 - Integrated System Design and Implementation — **Salon I**

04-06: Shape Memory Alloy Enabled Mechanisms I

Chair: **Paul Motzki** - *Saarland University*
Co-Chair: **Brent Utter** – *Lafayette College*

A Novel Compact Concept Design of an SMA Based Endoscope

Technical Paper Publication:
SMASIS2022-90957

Yannik Goergen - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Rouven Britz** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Michele Mandolino** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Gianluca Rizzello** - *Saarland University,* **Paul Motzki** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH)*

Design and Control Strategy of Tip Manipulation for Shape Memory Alloy Actuated Steerable Needle

Technical Paper Publication:
SMASIS2022-91002

Sharad Acharya - *Temple University,* **Parsaoran Hutapea** - *Temple University*

Development of Contacting Solutions for Shape Memory Alloy Wires

Technical Paper Publication:
SMASIS2022-90586

Benjamin John - *Fraunhofer Institute for Machine Tools and Forming Technology,* **Kenny Pagel** - *Fraunhofer Institute For Machine Tools and Forming,* **Sven Langbein** - *Feindrahtwerk Adolf Edelhoff GmbH & Co. KG,* **Welf-Guntram Drossel** - *Fraunhofer Institute for Machine Tools and Forming Technology*

Symposium 6 - Bioinspired Smart Materials and Systems and Symposium 8 - Emerging Technologies — **Salon II**

06-06 and 08-03: Vision Session - Engineered Living Materials I

Chair: **Joseph Njem** – *Pennsylvania State University*
Co-Chair: **Jovana Jovanova** – *TU Delft, Netherlands*

Living Multifunctional Materials: Opportunities for Collaborations

Invited Speaker Presentation

Zoubeida Ounaies – *Pennsylvania State University*

Discussion Panel on Engineered Living Materials

TUESDAY, SEPTEMBER 13 - 12:10PM–1:40PM

12:10PM	12:30PM	12:50PM	1:10PM

Alexandria Ballroom

Day 2 Keynote: Paul E. Krajewski

Chairs: **Amin Karami**, *University at Buffalo*, **James Gibert**, *Purdue University*, **Shahrzad Towfighian**, *Binghamton University*

Automotive Unobtanium: Material Challenges for the Future of Transportation

Invited Speaker Presentation

Paul E. Krajewski, *General Motors Global Research and Development Center*

TUESDAY, SEPTEMBER 13 - 1:40PM–3:20PM

1:40PM	2:00PM	2:20PM	3:00PM

Symposium 1 - Development and Characterization of Multifunctional Materials — **Salon III**

01-07: Composites for Actuation and Sensing

Chair: **Mohammed Malakooti** – *University of Washington*
Co-Chair: **Christopher Bowland** – *Oak Ridge National Laboratory*

Morphing Composite Membrane with Temperature Induced Shape-Shifting Capabilities

Technical Presentation Only:
SMASIS2022-89153

Vanessa Restrepo - *Texas A&M University,* **Oscar Ojeda** - *Texas A&M University*

Design and Testing of a Variable Stiffness Honeycomb Composite

Technical Paper Publication:
SMASIS2022-90788

Carson Squibb - *Virginia Polytechnic Institute and State University,* **Michael Philen** - *Virginia Polytechnic Institute and State University*

Model-Enabled Design of Multifunctional Composites for Passive Self-Sensing and Energy Harvesting With Improved Mechanical Strength

Technical Presentation Only:
SMASIS2022-93821

Sumit Gupta - *Oak Ridge National Laboratory,* **Amit Naskar** - *Oak Ridge National Laboratory,* **Christopher Bowland** - *Oak Ridge National Laboratory*

Adaptive Magneto-Responsive Surfaces Fabricated by Laser-Based Microstructuring

Technical Paper Publication:
SMASIS2022-90742

Gaia Kravanja - University of Ljubljana, **Inna A. Belyaeva** - *East Bavarian Centre for Intelligent Materials, Ostbayerische Technische Hochschule,* **Luka Hribar** - *University of Ljubljana,* **Irena Drevenšek-Olenik** - *J. Stefan Institute,* **Mikhail Shamonin** - *East Bavarian Centre for Intelligent Materials, Ostbayerische Technische Hochschule,* **Matija Jezeršek** - *University of Ljubljana*

Technical Sessions

TUESDAY, SEPTEMBER 13 - 1:40PM–3:20PM			
1:40PM	**2:00PM**	**2:20PM**	**3:00PM**

Symposium 3 - Modeling, Simulation and Control of Adaptive Systems — **Fairlane Ballroom**

03-07: Dynamics and Control of Morphing Wing

Chair: **Anthony Olivett** - *University at Buffalo*
Co-Chair: **Rafael Heeb** - *University of Bristol*

Dynamics and Stability of Camber Morphing Wing with Time-Varying Stiffness **Technical Paper Publication:** SMASIS2022-90198 **Manoj Prabhakar** - *Indian Institute of Technology Madras*, **Senthil Murugan** - *Indian Institute of Technology Madras*	**MFC Morphing Aileron Control with Intelligent Sensing** **Technical Paper Publication:** SMASIS2022-92009 **Kevin Haughn** - *University of Michigan*, **Lawren Gamble** - *Exponent Inc.*, **Daniel Inman** - *University of Michigan*	**Analysis of Aeroelastic Deformation in Reconfigurable Wings** **Technical Presentation Only:** SMASIS2022-93736 **Francis Phillips** - *DEVCOM Army Research Laboratory*, **Trent White** - *Texas A&M University*, **Darren Hartl** - *Texas A&M University*	**Design Space Exploration and Modelling of GATOR 3D Printed Morphing Skins** **Technical Paper Publication:** SMASIS2022-93488 **Rafael Heeb** - *University of Bristol*, **Michael Dicker** - *University of Bristol*, **Benjamin King Sutton Woods** - *University of Bristol*

TUESDAY, SEPTEMBER 13 - 1:40PM–3:20PM			
1:40PM	2:00PM	2:20PM	3:00PM

Symposium 4 - Integrated System Design and Implementation — **Salon I**

04-07: Shape Memory Alloy Enabled Mechanisms II

Chair: **Kenny Pagel** - *Fraunhofer Institute for Machine Tools and Forming Technology*
Co-Chair: **Brent Utter** – *Lafayette College*

Control of Rotatory Decoupled Antagonistic SMA Actuators

Technical Paper Publication:
SMASIS2022-90552

Tom Gorges - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Philipp Molitor** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Rouven Britz** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Yannik Goergen** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH),* **Paul Motzki** - *Center for Mechatronics and Automation Technology (ZeMA gGmbH*

Characteristic Value-Based Design System for Shape Memory Springs

Technical Presentation Only:
SMASIS2022-90335

Alexander Hiekel - *Fraunhofer IWU,* **Fabian Hoffmann** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Kenny Pagel** - *Fraunhofer IWU,* **Romina Krieg** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Ralf Theiß** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Simon Horn** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Welf-Guntram Drossel** - *Fraunhofer IWU,* **Peter Dültgen** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.*

Development of Design Principles for SMA Wave Springs

Technical Paper Publication:
SMASIS2022-90364

Kenny Pagel - *Fraunhofer Institute for Machine Tools and Forming,* **Marco Gnauck** - *Fraunhofer Institute for Machine Tools and Forming Technology,* **Tom Stapf** - *Fraunhofer Institute for Machine Tools and Forming Technology,* **Welf-Guntram Drossel** - *Fraunhofer Institute for Machine Tools and Forming Technology*

Technical Sessions

TUESDAY, SEPTEMBER 13 - 1:40PM–3:20PM

1:40PM	2:00PM	2:20PM	3:00PM
Symposium 6 - Bioinspired Smart Materials and Systems			**Salon II**
06-07: Cephalopods-Inspired Systems Chair: **Caterina Lamuta** – *University of Iowa* Co-Chair: **Jeong Yong Kim** – *North Carolina State University*			
Marine Biofilm Removal via Cephalopod-Inspired Smart Skin **Technical Presentation Only:** SMASIS2022-89004 **Tatum Johnson** - *The University of Iowa,* **Parth Kotak** - *The University of Iowa,* **Caterina Lamuta** - *The University of Iowa*	**Muscular Hydrostats Inspired by Cephalopods** **Technical Presentation Only:** SMASIS2022-89024 **Sean Maxson** - *The University of Iowa,* **Caterina Lamuta** - *The University of Iowa,* **Parth Kotak** - *The University of Iowa*	**Dynamic Materials Inspired by Cephalopods** **Invited Speaker Presentation** **Alon Gorodetsky** – *University of California, Irvine*	
Symposium 7 - Energy Harvesting			**Gross Pointe**
07-02: Energy Harvesting Structures Chair: **Hongcheng Tao** – *Purdue University*			
Energy Harvesting from Transition Waves in Bistable Metamaterials **Technical Presentation Only:** SMASIS2022-98866 **Myungwon Hwang** - *Purdue University,* **Yeongeun Ki** - *Purdue University,* **Andres Arrieta** - *Purdue University*	**Strain Based Tire Pressure Monitoring Systems (TPMS) With Synchronous Electric Charge Extraction (SECE)** **Technical Paper Publication:** SMASIS2022-91168 **Maxim Germer** - *Technische Universität Dresden,* **Uwe Marschner** - *Technische Universität Dresden,* **Andreas Richter** - *Technische Universität Dresden*	**Nonlinear Dynamics of a Two Members Angle-Shaped Energy Harvester** **Technical Paper Publication:** SMASIS2022-90623 **Francesco Danzi** - *Purdue University,* **Hongcheng Tao** - *Purdue University,* **Amin Joodaky** - *Michigan State University,* **James Gibert** - *Purdue University*	

TUESDAY, SEPTEMBER 13 - 1:40PM–3:20PM			
1:40PM	2:00PM	2:20PM	3:00PM

Symposium 8 - Emerging Technologies — **Rouge River**

08-04: Design of Smart Structures

Chair: **Guangbo Hao** - *University College Cork*
Co-Chair: **Andres Arrieta** – *Purdue University*

Preliminary Design of Martian Rover Wheels Using Superelastic NiTi Textiles **Technical Presentation Only:** SMASIS2022-93859 **Berik Kallevig** - *University of Minnesota Twin Cities*, **Julianna Abel** - *University of Minnesota Twin Cities*	**Controlled Underactuated Soft Robotics from Hierarchical Multistability** **Technical Presentation Only:** SMASIS2022-99787 **Andres Arrieta** - *Purdue University*, **Juan Osorio** - *Purdue University*, **Harith Morgan** - *Purdue University*	**Enchanced Functionality Design of Soft Grabbing Robot with Virtual Reality** **Technical Paper Publication:** SMASIS2022-90772 **Tashko Rizov** - *Ss. Cyril and Methodius University*, **Jelena Djokikj** - *Ss. Cyril and Methodius University*, **Jovana Jovanova** - *Transport Engineering and Logistics*	

Technical Sessions

TUESDAY, SEPTEMBER 13 - 3:40PM–5:20PM

3:40PM	4:00PM	4:20PM	5:00PM	5:20PM

Symposium 1 - Development and Characterization of Multifunctional Materials — **Salon III**

01-08: Shape Memory Materials

Chair: **Ji Su** - *NASA*
Co-Chair: **Amir Ameli** - *University of Massachusetts Lowell*

Shape Memory Epoxy Resin and Its Composites with Narrow Transition Temperature **Technical Presentation Only:** SMASIS2022-90905 **Lan Luo** - *Harbin Institute of Technology,* **Fenghua Zhang** - *Harbin Institute of Technology,* **Jinsong Leng** - *Harbin Institute of Technology*	**The Dependency of Twinning Stress on the Magneto-Mechanical Loading in Ni2MnGa Magnetic Shape Memory Alloys** **Technical Presentation Only:** SMASIS2022-98731 **Glen D'Silva** - *Northern Arizona University,* **Heidi Feigenbaum** - *Northern Arizona University,* **Constantin Ciocanel** - *Northern Arizona University*	**Investigation of Transformation Temperatures, Microstructure, and Deformation Behavior of a Pseudoelastic Cu-Based Shape Memory Alloy** **Technical Paper Publication:** SMASIS2022-90933 **Christian Krancher** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Benjamin Schelnberger** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Fabian Hoffmann** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Romina Krieg** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Ralf Theiß** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Peter Dültgen** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.*	**Bridging the Scales Between Twin Level and Component Level Models of Magnetic Shape Memory Alloys** **Technical Paper Publication:** SMASIS2022-91681 **Robert Courant** - *Technische Universität Berlin,* **Jürgen Maas** - *Technische Universität Berlin*	**Examination of the Interdependency of Applied Load, Realizable Stroke and Transition Temperatures in Cyclic Tests Concerning Lifetime of Single Crystalline CuAlNi** **Technical Paper Publication:** SMASIS2022-90963 **Moritz Langhoff** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Simon Horn** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Romina Krieg** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Christian Krancher** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Fabian Hoffmann** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Ralf Theiß** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.,* **Peter Dültgen** - *Forschungsgemeinschaft Werkzeuge und Werkstoffe e.V.*

TUESDAY, SEPTEMBER 13 - 3:40PM–5:20PM				
3:40PM	4:00PM	4:20PM	5:00PM	5:20PM

Symposium 3 - Modeling, Simulation and Control of Adaptive Systems — **Fairlane Ballroom**

03-08: Design of Smart and Adaptive Systems II

Chair: **Manuel Collet** - *Université de Lyon*
Co-Chair: **Uwe Marschner** - *Technische Universität Dresden*

Low-Energy Stiffness Modulation in Laminated Hinges **Technical Presentation Only:** SMASIS2022-89963 **Maria Sakovsky** - *Stanford University*	**Digital Inertial Programming** **Technical Presentation Only:** SMASIS2022-91622 **Xinhao Quan** - *Purdue University,* **James Gibert** - *Purdue University,* **Hongcheng Tao** - *Purdue University*	**Conceptual Design of a Shape-Adaptive Structure with Tailored Structural Instability** **Technical Paper Publication:** SMASIS2022-88355 **Ed Wheatcroft** - *University of Bristol,* **Jiajia Shen** - *University of Bristol,* **Rainer Groh** - *University of Bristol,* **Alberto Pirrera** - *University of Bristol,* **Mark Schenk** - *University of Bristol*	**Machine Learning and Finite Element Hybrid Analysis for Reduced Cost Flow Simulations** **Technical Presentation Only:** SMASIS2022-88516 **Kazuko Fuchi** - *University of Dayton Research,* **Eric Wolf** - *Ohio Aerospace Institute,* **David Makhija** - *Lateral Unbounded Software, LLC,* **Christopher Schrock** - *Air Force Research Laboratory,* **Philip Beran** - *Air Force Research Laboratory*	

Technical Sessions

TUESDAY, SEPTEMBER 13 - 3:40PM–5:20PM				
3:40PM	**4:00PM**	**4:20PM**	**5:00PM**	**5:20PM**
Symposium 4 - Integrated System Design and Implementation				**Salon I**
04-08: Emerging Integrated System Applications Chair: **Wonhee Kim** – *General Motors* Co-Chair: **Amit Bhayadia** -*University at Buffalo*				
Power Efficiency of Drag Reduction Using Traveling Waves for Morphing Wing Airfoils **Technical Presentation Only:** SMASIS2022-91090 **Anthony Olivett** - *University at Buffalo,* **Amit Bhayadia** - *University at Buffalo,* **Amin Karami** - *University at Buffalo*	**Analysis and Design of an Adaptive Turbofan Engine Inlet** **Technical Presentation Only:** SMASIS2022-91040 **Srinivas Vasista** - *German Aerospace Center,* **Giada Abate** - *German Aerospace Center,* **Michael Rose** - *German Aerospace Center,* **Johannes Riemenschneider** - *German Aerospace Center*	**Novel Method to Fabricate Monolithic NiTi Based Torque Tubes Using Electrical Discharge Machining** **Technical Presentation Only:** SMASIS2022-98915 **Siu Kei Tang** - *Smarter Alloys,* **Jak Li** - *Smarter Alloys,* **Hadi Razmpoosh** - *Smarter Alloys,* **Michael Kuntz** - *Smarter Alloys,* **Ibraheem Khan** - *Smarter Alloys*	**Charging Plug with Smart Clamp Contacts for Fast Charging of Electric Cars** **Technical Presentation Only:** SMASIS2022-90430 **Sven Langbein** - *Adolf Edelhoff Gmbh & Co. KG,* **Dietrich Lembke** - *BEST!LE Technologies GmbH,* **Kenny Pagel** - *Fraunhofer Institute for Machine Tools and Forming Technology*	**Planar Design of Multi-Axial Rigid Load-Bearing Tendon Constrained Inflatables** **Technical Presentation Only:** SMASIS2022-99246 **Ellen Kim** - *University of Michigan,* **Jonathan Luntz** - *University of Michigan,* **Diann Brei** - *University of Michigan*

TUESDAY, SEPTEMBER 13 - 3:40PM–5:20PM				
3:40PM	**4:00PM**	**4:20PM**	**5:00PM**	**5:20PM**

Symposium 6 - Bioinspired Smart Materials and Systems — **Salon II**

06-08: Bioinspired Vehicles and Mechanisms

Chair: **Zahra Soltani** - *Pennsylvania State University*
Co- Chair: **Michael Philen** – *Virginia Tech*

Free Flight Experiment and Design of a Deployable Wing Mechanism of an Insect-Inspired Glider Based on Morphological and Aerodynamic Characterization of Dissosteira Carolina Grasshoppers **Technical Presentation Only:** SMASIS2022-93775 **Kyung Jun "Paul" Lee** - *Princeton University,* **Siti Fauziyah** - *University of Illinois at Urbana-Champaign,* **Marianne Alleyne** - *University of Illinois at Urbana-Champaign,* **Aimy Wissa** - *Princeton University*	**The Role of Compliance in Generating Traveling Waves on a Bio-Inspired Flexible Propulsor** **Technical Paper Publication:** SMASIS2022-88529 **Isabel Hess** - *University of Florida,* **Patrick Musgrave** - *University of Florida*	**Design, Fabrication, and Evaluation of a Flying Fish Inspired Robotic Model Organism** **Technical Presentation Only:** SMASIS2022-93727 **Valeria Saro-Cortes** - *Princeton University,* **Aimy Wissa** - *Princeton University*	**Coverts as Yaw and Roll Bio-Inspired Control Devices for Tailless UAVs** **Technical Presentation Only:** SMASIS2022-93789 **Diaa Zekry** - *Princeton University,* **Aimy Wissa** - *Princeton University*	**Traveling Waves for Flow Control: Biological Mechanisms in Aquatic Life Guide Design of Efficient Morphing Wing Aircraft** **Technical Presentation Only:** SMASIS2022-91075 **Anthony Olivett** - *University at Buffalo,* **Amit Bhayadia** - *University at Buffalo,* **Amin Karami** - *University at Buffalo*

Technical Sessions

TUESDAY, SEPTEMBER 13 - 3:40PM–5:20PM				
3:40PM	4:00PM	4:20PM	5:00PM	5:20PM

Symposium 7 - Energy Harvesting			Gross Pointe
07-03: Emerging Frontiers in Energy Harvesting Chair: **Serif Tol** – *University of Michigan*			
Motion in the Ocean – Revolutionizing Marine Hydrokinetic Energy Harvesting Through the Design and Periodic Motion Control of Underwater Kites **Invited Speaker Presentation** **Chris Vermillion** – *North Carolina State University*	**Micro Triboelectric Generators to Toggle Mems Switches** **Technical Presentation Only:** SMASIS2022-91165 **Mohammad Mousavi** - *SUNY at Binghamton,* **Mohammad Alzgool** - *Binghamton University,* **Benyamin Davaji** - *Northeastern University,* **Shahrzad Towfighian** - *Binghamton University*		

TUESDAY, SEPTEMBER 13 - 3:40PM–5:20PM				
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Symposium 8 - Emerging Technologies — **Firestone**

08-05: Sensing and Actuation

Chair: **Juliana Abel** – *University of Minnesota*
Co-Chair: **Paul Motzki** – *Saarland University*

Characterizing the Effects of Annealing Temperature on Knitted Shape Memory Actuators

Technical Paper Publication: SMASIS2022-90779

Robert Pettys-Baker - *University of Minnesota,* **Niharikha Subash** - *University of Minnesota,* **Isidora Mack** - *University of Minnesota,* **Surbhi Shah** - *Mayo Clinic,* **Julianna Abel** - *University of Minnesota,* **Brad Holschuh** - *University of Minnesota*

Investigation of the Resistive Response of Reduced Graphene Oxide for Sensing Large Strains (>10%)

Technical Paper Publication: SMASIS2022-90349

Armin Yazdi - *University of Wisconsin-Milwaukee,* **Li-Chih Tsai** - *University of Wisconsin-Milwaukee,* **Nathan Salowitz** - *University of Wisconsin-Milwaukee*

Soft Actuators From Auxetic Structures and Shape Memory Alloys

Technical Presentation Only: SMASIS2022-89055

Janghoon Woo - *University of Minnesota Twin Cities,* **Julianna Abel** - *University of Minnesota Twin Cities*

Design of a Flexible Transducer Array and Characterisation of Piezoelectric Sensors for Curvature Compensation

Technical Paper Publication: SMASIS2022-90707

Christiaan Boerkamp - *Delft University of Technology,* **Tiago Costa** - *Delft University of Technology,* **Jovana Jovanova** - *Delft University of Technology*

Technical Sessions

WEDNESDAY, SEPTEMBER 14 - 8:00AM–9:20AM		
8:00AM	**8:20AM**	**8:40AM**

Salon II

Day 3 Keynote: Chuck Farrar

Chairs: **Amin Karami**, *University at Buffalo*, **James Gibert**, *Purdue University*, **Shahrzad Towfighian**, *Binghamton University*

Adding Rigor to Structural Health Monitoring Through Statistical Physics

Invited Speaker Presentation

Charles R. (Chuck) Farrar – *The Engineering Institute*

WEDNESDAY, SEPTEMBER 14 - 9:30AM–10:40AM		
9:30AM	**9:50AM**	**10:10AM**

Symposium 1 - Development and Characterization of Multifunctional Materials — **Salon III**

01-09: Advanced Electronic Materials

Chair: **Reza Rizvi** - *York University*
Co-Chair: **Sumit Gupta** - *Oak Ridge National Laboratory*

Enhanced Electrical Conductivity of Functionally Graded Graphene Oxide Films for Transient Electronics

Technical Presentation Only: SMASIS2022-93861

Aref Soltani Tehrani - *York University*
Reza Rizvi - *York University*

A Special Electrode Can Be Bonded to Stainless Steel for High Temperature Application in MEMS Structure

Technical Paper Publication: SMASIS2022-89332

Yi-Yen Liu - *National Taiwan University*, **Shun-Chiu Lin** - *National Taiwan University*, **Wen-Jong Wu** - *National Taiwan University*

WEDNESDAY, SEPTEMBER 14 - 9:30AM–10:40AM

9:30AM	9:50AM	10:10AM

Symposium 6 - Bioinspired Smart Materials and Systems, Symposium 8 - Emerging Technologies — **Salon II**

06-09 and 08:06: Vision Session: Engineered Living Materials II

Chair: **Caterina Lamuta** - *University of Iowa*
Co-Chair: **Jovana Jovanova** - *TU Delft, Netherlands*

Chains of Miura-Ori Spring Origami Blocks **Technical Presentation Only:** SMASIS2022-91281 **Salvador Rojas** - *Purdue University,* **Andres F. Arrieta** - *Purdue University*	**Shark Skin Inspired Lattice Structure for Drag Reduction** **Technical Presentation Only:** SMASIS2022-90743 **Jovana Jovanova** - *Technische Universität Delft,* **Sepideh Ghodrat** - *Technische Universität Delft* , **Aimée Sakes Jovanova** - *Technische Universität Delft*	**Electrostatic Artificial Muscle Soft Actuators** **Technical Presentation Only:** SMASIS2022-98870 **Maduran Palaniswamy** - *Toyota Research Institute of North America,* **Erin Rutledge** - *Toyota Research Institute of North America,* **Michael Rowe** - *Toyota Research Institute of North America*

Symposium 7 - Energy Harvesting — **Salon IV**

07-04: Triboelectric Energy Harvesting

Chair: **Zenkun Lin** - *University of Michigan*
Co-Chair: **Mohammad Alzgool** - *Binghamton University*

A Triboelectric Transduction Mechanism from Flow Induced Low-Frequency Structural Resonance **Technical Paper Publication:** SMASIS2022-89368 **Xiaowei Li** - *Shanghai University,* **Yuan Zhou** - *Shanghai University,* **Zhongjie Li** - *University of Toronto,* **Dan Zhang** - *Shanghai University,* **Hao Wu** - *Shanghai University,* **Ying Gong** - *Shanghai University,* **Di Zhang** - *Shanghai University,* **Xuzhang Peng** - *Shanghai University*	**Comparison of Power Density of Triboelectric Generators via Frequency-Up-Conversion Method** **Technical Paper Publication:** SMASIS2022-90875 **Zhongjie Li** - *Shanghai University,* **Chao Yang** - *Shanghai University,* **Yan Peng** - *Shanghai University,* **Fan Shen** - *Shanghai University*	**A Liquid Metal-Based Flexible and Stretchable Triboelectric Generator for Soft Robotic Applications** **Technical Presentation Only:** SMASIS2022-91120 **Nabid Aunjum Hossain** - *Binghamton University,* **Sara Aghazadeh** - *Binghamton University,* **Pu Zhang** - *Binghamton University,* **Shahrzad Towfighian** - *Binghamton University*

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91114	Momenzadeh	Niknam	Design Tradeoffs and Meso-Architecture in a Magnetorheological Elastomer Peristaltic Pump	03-05: Advanced Materials and Transduction Applications
90988	Moretti	Giacomo	Numerical Investigation of Bistable Energy Harvesting Based on Silicone Dielectric Elastomer Generators	03-05: Advanced Materials and Transduction Applications
98904	Nataraj	Latha	Reconfigurable Metamaterials for Aerospace Applications	02-05: Development of Advanced Actuators and Sensors
91072	Newell	Brittany	3D Printed Flexible Dielectric Electroactive Polymer Sensors	01-06: Additive Fabrication and Manufacturing of Materials and Novel Material Systems
89537	Oates	William	Characterization and Uncertainty Analysis of Heat Transport in 3D Printed Multifractal Media	02-06: Characterization of Advanced Sensors and Actuators
91075	Olivett	Anthony	Traveling Waves for Flow Control: Biological Mechanisms in Aquatic Life Guide Design of Efficient Morphing Wing Aircraft	06-08: Bioinspired Vehicles and Mechanisms
91090	Olivett	Anthony	Power Efficiency of Drag Reduction Using Traveling Waves for Morphing Wing Airfoils	04-08: Emerging Integrated System Applications
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90335	Pagel	Kenny	Characteristic Value-Based Design System for Shape Memory Springs	04-07: Shape Memory Alloy Enabled Mechanisms II
90364	Pagel	Kenny	Development of Design Principles for SMA Wave Springs	04-07: Shape Memory Alloy Enabled Mechanisms II
90586	Pagel	Kenny	Development of Contacting Solutions for Shape Memory Alloy Wires	04-06: Shape Memory Alloy Enabled Mechanisms I
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91015	Sparenberg	Marc	Modified Triply Periodic Actuator Topologies	04-03: Optimization and Control of Active Systems
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91054	Vasista	Srinivas	Design and Manufacture of a Fluid-Actuated Morphing Winglet Trailing Edge Control Surface	04-01: Adaptive Aerospace Structures I
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90852	Wang	Linlin	4D Printing of Thermosetting Shape Memory Polymer for Active Deformation Structures	01-06: Additive Fabrication and Manufacturing of Materials and Novel Material Systems
91495	Wang	Qiong	On the Paradox of Twisted and Coiled Polymer Actuators	06-01: Design and Modeling of Bioinspired Systems I
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88355	Wheatcroft	Ed	Conceptual Design of a Shape-Adaptive Structure With Tailored Structural Instability	03-08: Design of Smart and Adaptive Systems II
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01-02: Active Polymers and Elastomers	Su	Ji	NASA	Zadan	Mason	Carnegie Mellon
01-03: Liquid Metal Composites	Malakooti	Mohammed	University of Washington	Markvicka	Eric	University of Nebraska
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01-05: Composites and Hybrid Systems	Ameli	Amir	University of Massachusetts Lowell	Tallman	Tyler	Purdue University
01-06: Additive Fabrication and Manufacturing of Materials and Novel Material Systems	Bowland	Christopher	Oak Ridge National Laboratory	Ciocanel	Constantin	Northern Arizona State University
01-07: Composites for Actuation and Sensing	Malakooti	Mohammed	University of Washington	Bowland	Christopher	Oak Ridge National Laboratory
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01-09: Advanced Electronic Materials	Rizvi	Reza	York University	Gupta	Sumit	Oak Ridge National Laboratory
02-01: Multiferroics	Von Lockette	Paris	Penn State University	Nicholson	Douglas	The Boeing Company
02-02: Performance of Shape Memory Alloys	Nicholson	Douglas	The Boeing Company	Forbes	Drew	Fort Wayne Metals
02-03: Shape Memory Alloys	Kuntz	Mike	Smarter Alloys	Nicholson	Douglas	The Boeing Company
02-04: Modeling and Simulation of Active Materials	Von Lockette	Paris	Pennsylvania State University	Nicholson	Douglas	The Boeing Company
02-05: Development of Advanced Actuators and Sensors	Walgren	Patrick	Texas A&M University	Kuntz	Mike	Smarter Alloys
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03-03: Modeling Complex Materials and Systems	Marschner	Uwe	Technische Universität Dresden	NA	NA	NA
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03-05: Advanced Materials and Transduction Applications	Myers	Oliver	Clemson University	Sakovsky	Maria	Stanford University
03-06: Reduced Order Modeling	Tao	Hongcheng	Purdue University	Yang	Yongchao	Michigan Technological University
03-07: Dynamics and Control of Morphing Wing	Olivett	Anthony	University at Buffalo	Heeb	Rafael	University of Bristol
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04-02: Adaptive Aerospace Structures II	Riemenschneider	Johannes	German Aerospace Center (DLR)	Musgrave	Patrick	University of Florida
04-03: Optimization and Control of Active Systems	Musgrave	Patrick	University of Florida	Bulgen	Onur	Rutgers University
04-04: Integrated Smart Systems	Utter	Brent	Lafayette College	Luntz	Jonathan	University of Michigan
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04-06: Shape Memory Alloy Enabled Mechanisms I	Motzki	Paul	Saarland University	Utter	Brent	Lafayette College
04-07: Shape Memory Alloy Enabled Mechanisms II	Pagel	Kenny	Fraunhofer Institute for Machine Tools and Forming Technology	Utter	Brent	Lafayette College
04-08: Emerging Integrated System Applications	Kim	Wonhee	General Motors	Bhayadia	Amit	University of Buffalo

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05-02: Impedance Based Methods	Kim	Daewon	Embry Riddle Aeronautical University	Istiaque Haider	Muhammad	University of Wisconsin Milwaukee
05-03: Vibration Based Methods	Tallman	Tyler	Purdue University	Kim	Daewon	Embry Riddle Aeronautical University
05-04: Sensor Design	Srinivasaraghavan Govindaraj	Rishikesh	Embry Riddle Aeronautical University	Tallman	Tyler	Purdue University
05-05: Boundary Condition Considerations	Istiaque Haider	Muhammad	University of Wisconsin Milwaukee	Salowitz	Nathan	University of Wisconsin Milwaukee
06-01: Design and Modeling of Bioinspired Systems I	Freeman	Eric	University of Georgia	Yong Kim	Jeong	North Carolina State University
06-02: Microfabrication and Soft Tissues	Lamuata	Caterina	University of Iowa	Anton	Steve	Tennessee Tech University
06-03: Artificial Synapses and Electroactive Materials	Sarles	Andy	University of Tennessee	Anton	Steve	Tennessee Tech University
06-04: Design and Modeling of Bioinspired Systems II	Freeman	Eric	University of Georgia	Philen	Michael	Virginia Tech
06-05: Design and Modeling of Bioinspired Systems III	Frecker	Mary	Pennsylvania State University	Duan	Emily	North Carolina State University
06-07: Cephalopods-Inspired Systems	Lamuta	Caterina	University of Iowa	Yong Kim	Jeong	North Carolina State University
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06-08: Bioinspired Vehicles and Mechanisms	Soltani	Zahra	University at Buffalo	Philen	Michael	Virginia Tech
06-09 and 08:06: Vision Session: Engineered Living Materials II	Lamuta	Caterina	University of Iowa	Jovanova	Jovana	TU Delft, Netherlands
07-01: Applications in Energy Harvesting	Danawe	Hrishikesh	University of Michigan	Tole	Serif	University of Michigan

Session Chairs

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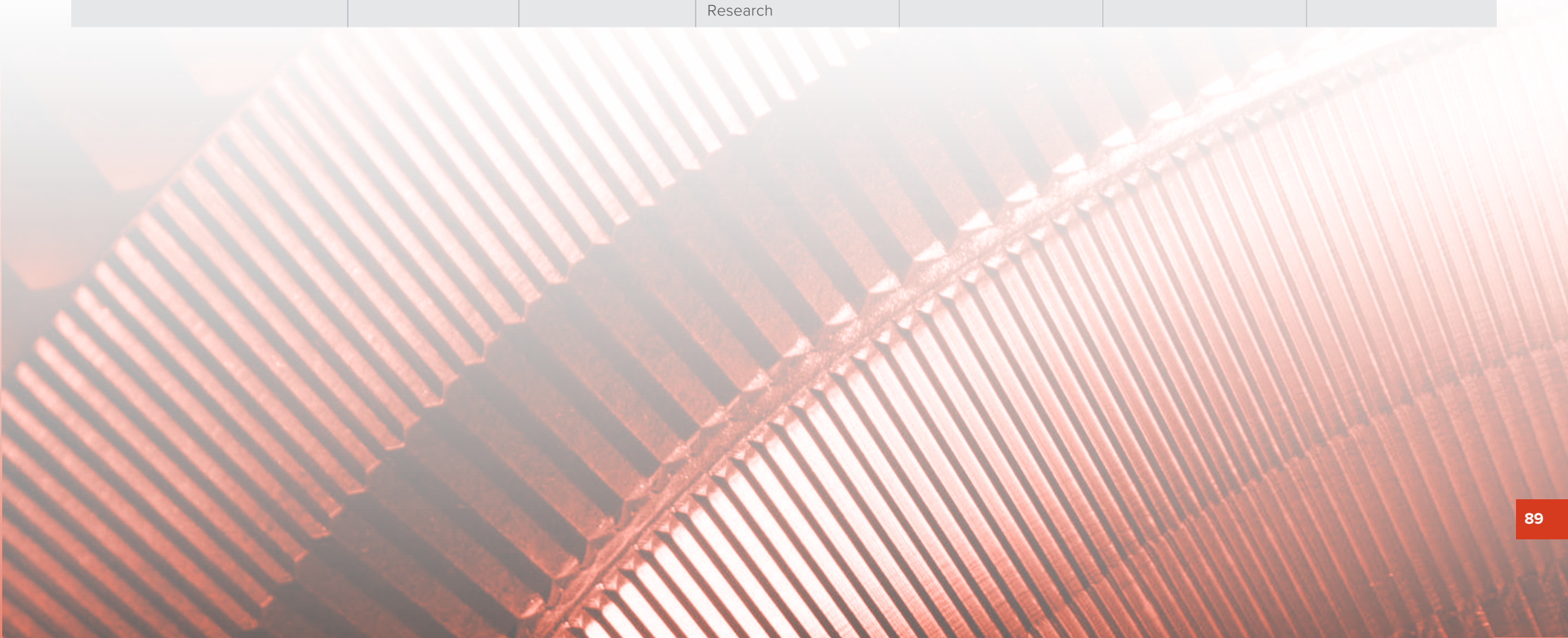
07-02: Energy Harvesting Structures	Tao	Hongcheng	Purdue University	NA	NA	NA
07-03: Emerging Frontiers in Energy Harvesting	Tol	Serif	University of Michigan	NA	NA	NA
07-04: Triboelectric Energy Harvesting	Lin	Zenkun	University of Michigan	Alzgool	Mohammad	Binghamton University
08-01: Design and Optimization	Beblo	Richard	Air Force Research Laboratory/RQVC	Motzki	Paul	Saarland University
08-02: Advanced Manufacturing	Jovanova	Jovana	TU Delft, Netherlands	Abel	Julianna	University of Minnesota
08-04: Design of Smart Structures	Hao	Guangbo	University College Cork	Arrieta	Andres	Purdue University
08-05: Sensing and Actuation	Abel	Juliana	University of Minnesota	Motzki	Paul	Saarland University
Symp 09: Student Paper & Hardware Competition	Bibo	Amin	Clemson University	Berselli	Giovanni	University of Genoa
Student Development Events	Fuchi	Kazuko	University of Dayton Research	Siwakoti	Midhan	Auburn University



Symposia Chairs

NUMBER	SYMPOSIUM NAME	ROLE	NAME	AFFILIATION
1	Development and Characterization of Multifunctional Materials	Chair Co-Chair Co-Chair	Ji Su Mohammad Malakooti Reza Rizvi	NASA University of Washington York University
2	Mechanics & Behavior Active Materials	Chair Co-Chair Co-Chair Co-Chair	Paris Von Lockette Darren Hartl Douglas Nicholson John Gallagher	Penn State University Texas A&M University Boeing Merrimack College
3	Modeling, Simulation and Control of Adaptive Systems	Chair Co-Chair Co-Chair	Amin Bibo Giovanni Berselli Abdessattar Abdelkefi	Clemson University University of Genoa New Mexico State University
4	Integrated System Design and Implementation	Chair Co-Chair Co-Chair	Johannes Riemenschneider Brent Utter Patrick Musgrave	German Aerospace Center (DLR), Germany Lafayette College University of Florida
5	Structural Health Monitoring	Chair Co-Chair	Nathan Salowitz Daewon Kim	University of Wisconsin-Milwaukee Embry Riddle Aeronautical University
6	Bioinspired Smart Materials and Systems	Chair Co-Chair Co-Chair	Caterina Lamuta Matthew Bryant Joe Calogero	University of Iowa North Carolina State University Pratt & Whitney
7	Energy Harvesting	Chair Co-Chair Co-Chair	Christopher Cooley Soobum Lee Wei-Che Tai	Oakland University University of Maryland Baltimore County Michigan State University
8	Emerging Technologies	Chair Co-Chair Co-Chair	Jovana Jovanoval Paul Motzki Juliana Abel	TU Delft, Netherlands Saarland University University of Minnesota
9	Student Best Paper and Hardware Competitions	Chair Co-Chair	Giovanni Berselli Amin Bibo	University of Genoa Clemson University
	Student Development Events	Chair Co-Chair	Kazuko Fuchi Midhan Siwakoti	University of Dayton Research Auburn University
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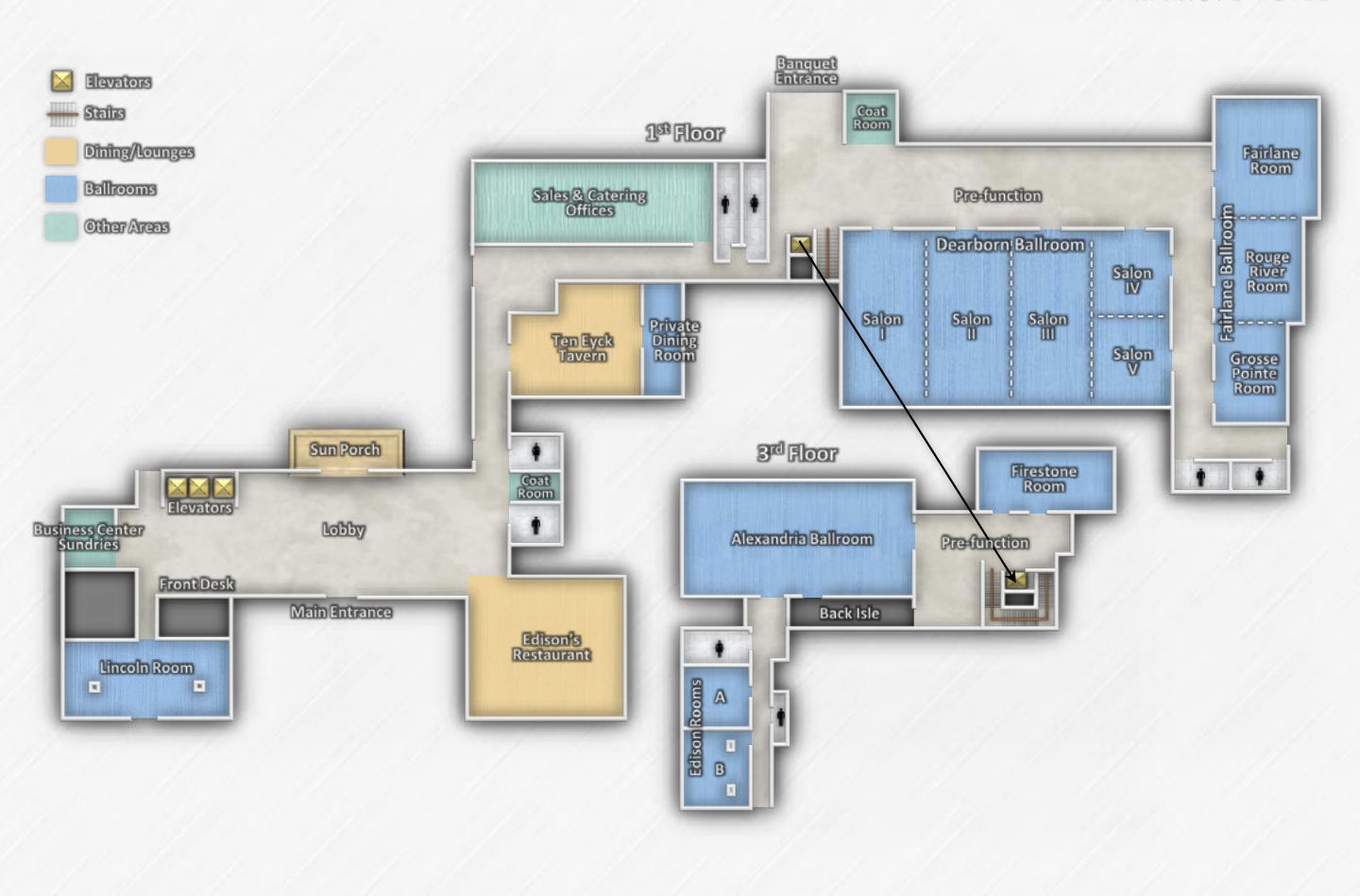

SMASIS Conference Synopsis

Adaptive Structures and Materials Systems by definition are intelligent systems that have sentience and responsiveness to changing environments. The field has rapidly matured due to interdisciplinary efforts across universities, government, and industry. To continue the high impact growth of this field, the purpose of this conference is to assemble world experts across engineering and scientific disciplines (mechanical, aerospace, electrical, materials, and civil engineering, biology, physics chemistry, etc.) to actively discuss the latest breakthroughs in smart materials, the cutting edge in adaptive structure applications and the recent advances in new device technologies and basic engineering research. The conference is divided into symposia ranging from basic research to applied technological design and development to industrial and governmental integrated system and application demonstrations.

Schedule

January 2, 2023: 400 word abstract due
January 30, 2023: Abstract acceptance notification
Mar 13, 2023: Full-length draft paper due
Apr 24, 2023: Paper acceptance notification
June 9, 2023: Copyright form due
June 12, 2023: Final revised paper due

Full papers will appear in an archival ASME Conference Proceedings. Selected papers will be published in archival Journals.

Authors please note: Only 2 presentations per author with one full registration.

Participation

Authors should submit a 400 word abstract to the conference web site **https://event.asme.org/smasis**

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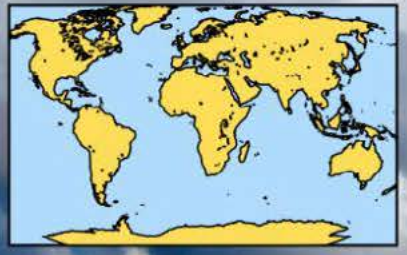

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Call for Abstracts

ASME Conference on

SMART MATERIALS, ADAPTIVE STRUCTURES AND INTELLIGENT SYSTEMS

September 11 – 13, 2023
Austin, TX

Sponsored by the Adaptive Structures & Material Systems Branch, Aerospace Division

The conference is divided into symposia broadly ranging from basic research to applied technological design and development to industrial and governmental integrated system and application demonstrations. The symposia and their topical areas specifically are:

Development and Characterization of Multifunctional Materials

Multifunctional material formulations, evaluation, synthesis, and processing; multifunctional composites and hybrid materials; bio-inspired and nano-composites; self-healing, shape memory, piezoelectric, electrostrictive and magnetostrictive materials; material property enhancement; interface and interaction science; data and AI/machine learning driven multifunctional materials discovery.

Bioinspired Smart Materials and Systems

Convergent topics in engineering and biology such as modeling and simulation of biological systems; biomechanics; biomimetic and bioinspired devices and materials; biomolecular assemblies, bioinspired or soft robotics; biohybrid or living machines; smart prosthetics and implants.

Modeling, Simulation and Control of Adaptive Systems

Micro and macro level modeling; vibration and acoustic control; passive/semi-active/active damping and stiffness variation; actuation and motion control; intelligent and adaptive control; nonlinear control; hysteresis control; modeling simulation and control of micro/nano systems; nonlinear dynamics, and nonlinear vibration.

Energy Harvesting

Modeling and experiments of energy harvesting transducers and applied systems using piezoelectric and magnetostrictive materials; electroactive polymers; inductive and capacitive devices; MEMS and NEMS configurations; novel circuits and storage devices; novel applications/analysis of traditional transduction (e.g., solar, thermoelectric); energy harvesting using metamaterials.

Structural Health Monitoring

Structural asset and life cycle monitoring; condition-based and predictive maintenance; damage detection; digital twin; digital thread and authoritative source of truth; product lifecycle management; industrial IOT; AI and machine learning; physics-informed machine learning; data analytics, data science and big data; wireless and remote monitoring; edge computing; distributed sensing; human performance monitoring; HSI.

Integrated System Design and Implementation

Adaptive/intelligent/integrated systems design; smart structures design processes and tools; smart devices and technologies; compliant mechanism design; Industrial and government smart products and system applications; sensors and actuators; power and control electronics; smart electronics and devices; MEMS.

Mechanics & Behavior of Active Materials

Advanced constitutive measurements; micro- and nano-mechanics of actuator & sensor materials; phase field modeling; multi-scale and multi-physics material models; finite element implementations; reliability issues: aging, fatigue, and fracture; materials for energy storage; multi-ferroic materials.

Emerging Technologies

Emerging research works that are aligned with the general theme of SMASIS but may not fit in the other symposia. E.g.: advanced and additive manufacturing; nano-manufacturing; topology optimization; soft robot- ics; human performance sensing and augmentation; wearable technologies, uncertainty analysis in materials and structures; among others.

ASME
SETTING THE STANDARD

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THANK YOU FOR YOUR PARTICIPATION!

SEE YOU IN AUSTIN, TX IN 2023!