ASME SMASIS 2024

The ASME 2024 Conference on Smart Materials, Adaptive Structures and Intelligent Systems

CONFERENCE
Sept. 9 – 11, 2024

Location:
Atlanta Marriott Buckhead
Atlanta, GA

Program

https://event.asme.org/SMASIS

The American Society of Mechanical Engineers®
ASME®

ASME
SETTING THE STANDARD

Contents

Dear SMASIS Attendee:

Welcome to the 17th annual conference of the Smart Materials, Adaptive Structures, and Intelligent Systems community (SMASIS). Our goal, as in previous years, is to provide a friendly, casual forum for the exchange of ideas and the latest engineering innovations in the field. We sincerely thank all the presenters for choosing to share their work at this conference.

This year's SMAS's has evolved to be div Pre-Function ided into 8 symposia.

Symposium 1: Development and 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

Special Symposium: Embodying Physical Computing and Mechano-Intelligence

This year, we have a special symposium focusing on the emerging topic of mechanical systems capable of learning, memory, and decision making, with applications in autonomous and intelligent engineering systems. In addition, we are adding an industry forum to gather companies in the field to include an exhibition as well as dedicated sessions.

SMASIS is committed to the development of future leaders in science, technology, and engineering. This year's conference will include the SMASIS-in-Action Symposium. This symposium will have three special sessions to engage our community:

Student Paper Competition

Hardware Showcase Competition

Industry Forum

Furthermore, the SMASIS-in-Action also will include high school outreach, and student gatherings to foster networking among the next generation of SMASIS researchers. We are quite proud of the fact that our students and young professionals are constantly looking for opportunities to give back to the community. Please take advantage of these events to meet our emerging stars and future colleagues and leaders!

This year's conference will feature three keynotes given by Dr. Michael Leamy (Georgia Institute of Technology), Dr. Donald Leo (Ohio University), and this year's ASME Adaptive Structures Prize winner, Dr. Paolo Ermanni (ETH Zurich), along with numerous invited talks.

This year's Pioneers Awards Banquet will be at Georgia Aquarium, the largest aquarium in the US. This event should be a wonderful opportunity to network and broaden your horizons, both intellectually and socially, and to enjoy amazing exhibits.

This conference has been planned as a collaborative effort by members of the ASME SMASIS Division. Our executive committee provided invaluable assistance and direction. We would not have been able to proceed without the contributions of the symposium chairs, co-chairs, and organizing committees. They deserve our highest gratitude for putting together an amazing technical program. Also, we extend an abundance of gratitude to the authors, keynote and invited speakers, reviewers, and panel participants who have significantly contributed to the success of SMASIS. Finally, we would like to express our gratitude to our sponsors and exhibitors, General Motors, Boeing, Toyota, Fort Wayne Metals, IngPuls, Artimus Robotics, and mateligent iDEAS GmbH.

We appreciate your participation in this event and commitment to submit your best work. Those of you whom we know personally, we eagerly anticipate our next meeting. And we look forward to introducing ourselves to those of you we have not yet met and participating in thoughtful scientific discussions.

Dr. Shahrzad Towfighian
General Conference Chair
Binghamton University

Dr. Johannes Riemenschneider
Technical Conference Chair
German Aerospace Center (DLR)

Dr. Brent Utter
Technical Program Co-Chair
Lafayette College

SMASIS 2024 SCHEDULE-AT-A-GLANCE

			Symposium 1: Development & Characterization of Multi-Functional 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**	**Special Symposium: Embodying Physical Computing and Mechano-Intelligence**
							Symposium 7: Energy Harvesting		

Sunday, September 8

TIME	**Heritage C (Conference Level)**	**Buckhead A (Conference Level)**	**Suwanee (Conference Level)**	**Oglethorp (Conference Level)**	**Marietta (Terrace Level)**	**Ponce De Leon (Terrace Level)**	**Chastain B (Terrace Level)**	**Chastain A (Terrace Level)**	**Augusta (Conference Level)**
1:00PM–6:00PM	Leadership Summit								

Monday, September 9

	Heritage B (Conference Level)	**Buckhead A (Conference Level)**	**Suwanee (Conference Level)**	**Oglethorp (Conference Level)**	**Marietta (Terrace Level)**	**Ponce De Leon (Terrace Level)**	**Chastain B (Terrace Level)**	**Chastain A (Terrace Level)**	**Augusta (Conference Level)**
7:00AM–8:00AM	Breakfast								
8:00AM–9:00AM		Keynote: Dr. Paolo Ermanni							
9:10AM–10:30AM			1-1: Shape Morphing	2-1: Magneto-Responsive Materials Modeling, Optimization and Performance	3-1: Morphing and Dynamic Structures	4-1: Morphing Aerospace	5-1: Optical SHM Technologies	6-1: Bioelectronics	S-1: Integrated Systems
10:30AM–10:50AM	Coffee Break: Buckhead Pre-function								
10:50AM–12:10PM			1-2: Shape Memory Polymore	2-2: Modeling and Experimental Investigations of Shape Memory Alloy Performance	3-2: Advanced Material Systems	4-2: Design of Adaptive Structures	5-2: Smart Materials and Sensors for SHM	6-2: Energy Harvesting and Wave Dynamics	S-2: Computing Meta-Materials I
12:10PM–1:40PM			TC: Active Material Technologies and/or Multifunctional Materials	TC: Structural Health Monitoring	TC: Adaptive Systems Dynamics and Controls	TC: Active Material Technologies and Integrated Systems	TC: Energy Harvesting	TC: Bio Inspired Structures and Systems	
12:10PM–1:40PM	Lunch								
1:40PM–3:00PM	National Renewable Energy Labatory Meeting Heritage C	Hardware Competition Heritage A	1-3: Machine Learning for Materials	Student Best Paper			5-3: SHM for Extreme Load Applications	6-3: Adaptive Structures in Robotics	
3:00PM–3:30PM	Coffee Break: Buckhead Pre-function								
3:30PM–4:50PM			1-4: Functional Nanomaterials	2-3: Investigations of Shape Memory Alloy Performance	3-3: Advancements in Tensegrity	4-3: Adaptive Aerospace Systems	7-1: Energy Harvesting with Metamaterials	6-4: Smart Materials and Actuators	S-3: Computing Meta-Materials II

5:20PM–6:00PM	Bus loading and Travel to Banquet
6:30 PM–8:45PM	Pioneer Awards Banquet

Tuesday, September 10

	Heritage B (Conference Level)	Buckhead A (Conference Level)	Suwanee (Conference Level)	Oglethorp (Conference Level)	Marietta (Terrace Level)	Ponce De Leon (Terrace Level)	Chastain B (Terrace Level)	Chastain A (Terrace Level)	Augusta (Conference Level)
7:00AM–8:00AM	Breakfast							Leadership Summit	
8:00AM–9:00AM		Keynote: Dr. Donald Leo							
9:10AM–10:30AM			1-5: Piezoelectric Materials	2-4: Structure and Performance of Shape Memory Polymer Actuators	3-4: Programming and Modeling	4-4: Human Integrated Smart Systems	7-2: Heat and Triboelectric Energy Harvesting	6-5: Prosthetics and Implants	S-4: Soft & Intelligent Matter
10:30AM–10:50AM	Coffee Break: Buckhead Pre-function								
10:50AM–12:10PM			1-6: Multi-functional Composites	2-5: Performance of Magneto- and Electro-Responsive Energetic, Alloy, and Composite Materials	3-5: Actuator Systems	4-5: Dielectric Elastomer Technologies	5-4: Fusion of Computation and Sensing for SHM	6-6: Morphing Wings	S-5: Mechano-Intelligent Robots
12:10PM–1:40PM	Lunch & Student Trivia Lunch								
1:40PM–3:00PM			1-7: Functional Printing		3-6: Structural Dynamics	4-6: Vehicle Technologies	7-3: Hydrokinetic Energy Harvesting	6-7: Bioinspired Morphing Structures	S-6: Reservoir Computing & Nonlinear Dynamics
3:00PM–3:30PM	Coffee Break: Buckhead Pre-function								
3:30PM–4:00PM		Industry Forum Room: Heritage A			JIMSS Editorial Meeting Daniel Inman				
4:00PM–4:30PM							JVA Information Session Michael Leamy		
4:30PM-4:50PM									
5:00PM–7:00PM	Networking Reception								
6:30PM–9:30PM		SMASIS Senate Meeting: Buckhead Ballroom							Student Game Night Winning Edge Lobby Level
8:30PM–10:30PM									

Wednesday, September 11

	Heritage B (Conference Level)	Buckhead A (Conference Level)	Suwanee (Conference Level)	Oglethorp (Conference Level)	Marietta (Terrace Level)	Ponce De Leon (Terrace Level)	Chastain B (Terrace Level)	Chastain A (Terrace Level)	Augusta (Conference Level)
7:00AM–8:00AM	Breakfast								
8:00AM–9:00AM		Keynote: Dr. Michael Leamy							
9:10AM–10:30AM			1-8: Wearables			4-7: Multi-stable Smart Systems	5-5: Wave Physics-Based SHM	6-8: Biomimetic Materials and Living Systems	
10:30AM–10:50AM	Coffee Break: Buckhead Pre-function								
10:50AM–12:10PM			1-9: Functional Structures			4-8: Shape Memory Alloy Applications	7-4: Special Session	6-9: Bioinspired Design	
12:10PM–1:40PM	Lunch								
1:00PM–1:40PM					Student Career Panel				
1:40PM–3:00PM			1-10: Shape Memory Alloys				5-6: SHM for Additive Manu-facturing	6-10: Reservoir Computing and Control	

General Information

ACKNOWLEDGMENT

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

REGISTRATION INFORMATION

Registration will be located each day in the Buckhead Ballroom Pre-function Foyer located on the Conference Center Level.

The hours are as follows:

Sunday, September 8	3:00PM–6:00PM
Monday, September 9	7:00AM–5:00PM
Tuesday, September 10	7:00AM–5:00PM
Wednesday, September 11	7:00AM–3:00PM

HOTEL

Retreat, recharge and refocus at Atlanta Marriott Buckhead Hotel & Conference Center. Whether visiting for business or pleasure, travelers find this modern Buckhead, Atlanta hotel to be the perfect hub. Their location is steps from Phipps Plaza, Lenox Square and the Lenox MARTA Station provides easy access to the heart of the city. With 28,000 square feet of conference space, the hotel in Buckhead, Atlanta, GA, offers innovative spaces and personalized service for inspired events. Their on-site restaurant, Sunday Gravy, has an inviting ambiance creating the perfect setting for savoring delicious Italian cuisine and signature cocktails. Bright, modern and chic hotel rooms feature Marriott's luxury bedding package and views of Buckhead. Breathe easy in PURE® allergy-friendly rooms or upgrade to an M Club Room for M Club Lounge VIP services and amenities. Whatever brings you to Buckhead, Marriott is ready to help you travel brilliantly. Because it's not only about where you're staying, it's about where you're going.

NAME BADGES

Please 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 included and allowable by wearing your conference badge. If you have purchased an additional ticket for the Pioneer Awards Banquet at the Georgia Aquarium for Monday, September 9. for your spouse and/or guests, you will receive a ticket for your guest at registration. Please remember to bring it with you as well as your 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.

INTERNET ACCESS

Complimentary basic internet is provided in the sleeping rooms, if you are staying at the Marriott, and in the hotel's public space and meeting space provided by ASME. For access when onsite, please follow these steps:

On your device, connect to "Marriott Bonvoy Conference" and enter the password 2190804 and connect.

MEMBERSHIP TO ASME (4 MONTHS FREE)

Registrants who paid the non-member conference registration fees will receive a four-month complimentary ASME Membership. ASME will automatically activate this complimentary membership for qualified attendees. Please allow approximately four weeks after the conclusion of the conference for your membership to become active. Visit www.asme.org/membership for more information about the benefits of ASME Membership.

PRESENTER ATTENDANCE POLICY

According to ASME's Presenter Attendance Policy, if a paper is not presented at the conference, the paper will not be published in the official Archival Proceedings, which are registered with the Library of Congress and are abstracted and indexed. The paper also will not be published in the ASME Digital Collection and may not be cited as a published paper.

EMERGENCY INFORMATION

If you are experiencing a health emergency, please dial 911. If you are able or someone else is able, please dial zero and inform the operator so that the hotel can be on the alert for the emergency response team. The hotel Security is available from 3:00PM -7:00AM every day. Outside these hours a senior member of the hotel's Leadership can assist.

REGISTRANTS WITH DISABILITIES

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 9 - Wednesday, September 11
7:00AM –8:00AM

Heritage B, Conference Center Level

Starting with Monday morning prior to the start of the technical sessions, a full breakfast will be provided. All registered conference attendees are welcome! Immediately following 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 for information about our Invited Speakers.

COFFEE BREAKS

Monday, September 9–Wednesday, September 11
10:30AM–10:50AM and 3:00PM–3:30PM

Buckhead Ballroom Foyer, Conference Center Level

LUNCHES

Monday, September 9–Wednesday, September 11
12:10PM–1:40PM

Heritage B, Conference Center Level

EXHIBITS

Tuesday, September 10
10:00AM–5:00PM

Buckhead Ballroom Foyer, Conference Center Level

Please take advantage of the opportunity to visit General Motors, Toyota, Fort Wayne Metals, IngPuls Artimus Robotics, and mateligent iDEAS GmbH from the leading industries in the field. They are making things happen, so be sure to stop by and meet them! Their experts will be on hand to speak with you.

So, please remember to please stop by. Our Sponsors/Exhibitors help support the conference, so let us support them!

PIONEER AWARDS CEREMONY BANQUET

Monday, September 9, 6:30PM-8:45PM

GEORGIA AQUARIUM

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

Please join us for a magical evening at The Georgia Aquarium, located in Atlanta, Georgia, a 501(c)(3) non-profit organization The aquarium contains more than 11 million gallons of water. Georgia Aquarium is a scientific institution that entertains and educates, feature exhibits and programs of the highest standards, and offers engaging and exciting guest experiences that promote the conservation of aquatic biodiversity throughout the world. As a leader in aquatic research and exceptional animal care, we are dedicated to fostering a deeper appreciation for our ocean and the animals that call it home.

Alongside other accredited facilities, the team conducts crucial research by working with animals both in human care and in their natural habitats to improve husbandry methods, develop innovative and exciting new exhibits, contribute to the understanding of the underwater world and apply new discoveries to the conservation of aquatic life. Every day, researchers in the Aquarium's exhibits and labs are learning more about marine life in order to develop new methods of animal care and veterinary medicine. By combining field research with the study of on-site animals in a controlled environment, the Aquarium is contributing to the advancement of human knowledge in the area of animal science.

NETWORKING RECEPTION

Tuesday, September 10, 5:00pm – 7:00pm

Heritage B, Conference Center Level

U.S. DEPARTMENT OF ENERGY'S INNOVATING DISTRIBUTED EMBEDDED ENERGY PRIZE (INDEEP) INFO SESSION

Monday, September 9, 1:40PM-3:00PM
Heritage C, Conference Center Level

The National Renewable Energy Laboratory (NREL) is making exciting progress in energy converter design and development. With funding from the U.S. Department of Energy's Water Power Technologies Office, NREL researchers are developing innovative concepts where many small energy converters combine to form smart material structures for larger energy-converting systems. The U.S. Department of Energy's Water Power Technologies Office has launched the Innovating Distributed Embedded Energy Prize (InDEEP). This competition aims to encourage innovators to design and develop novel materials for marine energy applications, laying the foundation for utility-scale electricity generation. The three-phase, two-year competition offers a combined cash prize pool of up to $2.3 million, along with technical support, teaming support, and mentorship to help teams succeed.

An info session about the InDEEP competition will be held at the SMASIS conference to encourage submissions to this program.

INDUSTRY FORUM

Tuesday, September 10, 3:30PM-4:50PM

Heritage A, Conference Center Level

The **2024 SMASIS Industry Forum** will provide companies with a platform having the best visibility. Put your products or materials on display in the exhibition area with stand-up displays and **Table-top Exhibits** and present your innovative company, recent developments, and/or ground-breaking research in a dedicated **Industrial Session** to the audience of international experts and researchers from industry and academia, as well as to excellent graduate and undergraduate students.

TOYOTA PROGRAMMABLE SYSTEMS INNOVATION ACTIVITY - REFLECTIONS

Smart material also known as active materials, have remarkable ability to change their properties such as shape, stiffness, electrical or thermal conductivity, color, opacity etc. This versality can be very useful in designing products that can adopt to the environment and achieve the optimal performance. For the past few years our team at Toyota Research Institute North America (TRINA) is exploring how to design products with such active materials. We are finding that such products, we like to call programmable systems, not only perform better, but also, are lighter in weight and show unique capabilities, which are not possible through conventional methods. We are also recognizing that these materials are still evolving, the programmable systems are not mature yet, there is lot more that needs to be discovered and learned. Programable fellowship was initiated by TRINA to encourage researchers to work in active materials and their applications and develop innovative solutions that can help the whole community in realizing benefits of such developments. In this presentation, we will reflect on our experiences of the past few years in developing programmable systems and discuss the key challenges that remains.

FLEXIBLE ELECTROHYDRAULIC ACTUATORS FOR THE FUTURE OF MOTION

While software and sensing capabilities for robotics have advanced rapidly, actuator hardware has remained largely unchanged. However, new approaches to actuation, based on soft and flexible materials, offer inherent advantages over traditional mechanical hardware and are promising to rapidly advance capabilities for future electromechanical systems. Artimus Robotics has developed a novel soft actuator technology - Hydraulically Amplified Self-healing ELectrostatic (HASEL) actuators - which combines thin film polymers, liquid dielectrics, and flexible conductors to achieve muscle-like performance. HASELs (pronounced 'hazel') offer many benefits over existing electric actuators including wide frequency bandwidth (DC to several 100 Hz), high force-to-weight (>1,000 N/kg), high power-to-weight (>300 W/kg), high actuation strain (>50%), and self-sensing. Importantly, these devices are made from readily available & low cost materials. Instead of utilizing metals, magnets, or lead-based ceramics, HASEL actuators make use of thin film polymers, liquids, and carbon-based conductors - all materials with low embodied energy that are amenable to large scale manufacturing techniques. This talk will include an overview of the HASEL technology, commercial applications, and opportunities for future development.

INDUSTRIALIZED DIELECTRIC SENSORS AND THEIR WEARABLE APPLICATIONS

Dielectric (DE) sensors are soft, thin, conformable devices that can take accurate measurements and readings while being strained up to 100% for millions of cycles. Made of tough silicone, they can withstand the harshest environments from heat, cold, and shock to dust, vibration, and moisture. The DE sensor is a flexible capacitor that acts as a displacement-to-capacitance transducer. These sensors characterized by their flexibility, lightweight nature, and responsiveness to electrical stimuli, present a unique opportunity for creating smart, comfortable, and unobtrusive wearable devices. At Mateligent we customize and produce these DE sensors that bring wearable tech solutions to life. Our sensors are very well suited for precise, fast measurement of human body movement in health care, athletics, and industry. Several examples of our sensors being used in products include measuring musculoskeletal (MSK) movement of the human body, measuring breathing during athletic training, and assessing gait and balance for reducing accidental falling in the elderly. The presentation will give a view into the innovative materials and designs that underpin DE sensors, highlighting their adaptability for various sensing functions such as strain and pressure. Furthermore, it gives an overview of current wearable applications and products pushing to market and it explores potential future directions for DE sensor technology and its role in shaping the industry's future.

SHAPE MEMORY ALLOY ROTARY ACTUATORS FOR AEROSPACE

Shape memory alloys (SMA) provide a compact, robust, lightweight and scalable rotary actuation technology with precise control for many aerospace applications that require high torque, discrete ranged output. With their high energy density, SMA rotary actuators can often be integrated directly into or near the hinge line reducing the need for complex kinematics (e.g., linkages and gears) typically required to transfer the work output from the actuator to the effector system. Despite these benefits, earlier attempts to integrate SMA actuators into aerospace applications were limited by an incomplete understanding of the materials, a lack of engineering design tools, and insufficient experience at designing to meet rigorous requirements. In the last two decades, significant strides were made in addressing key issues limiting the commercialization of SMA actuation technology. These continuous advances include the publication of standard specifications and test methods for SMA actuation, the development and implementation of design and optimization tools, improved alloys and supply chain maturation. With these recent advancements, high technology readiness level demonstrations and production use of scalable SMA rotary actuation technology was demonstrated across several aeronautical platforms including wind tunnel to full-scale flight test of reconfigurable vortex generators, actuated wind tunnel models, ram air door actuators, adaptive trailing edges, power door opening systems and spanwise adaptive wings. The required torque output for these applications and their SMA torque tube elements ranged from 100 N mm to 2200 N m. This presentation will highlight scalability, integration, design best practices, maturity, and business case analysis of this game-changing actuator technology and its potential impact on the aerospace industry through full scale testing including flight tests on aerospace platforms.

BRIDGING THE GAP: EFFECTIVE INTEGRATION OF ACTUATOR WIRE FOR OPTIMAL APPLICATION PERFORMANCE

Shape memory actuator wires, predominantly composed of binary Nitinol, are highly attractive for a number of applications, particularly those requiring lightweight, noiseless actuation and compact packaging. However, a significant gap exists between wire suppliers' material expertise and the effective implementation of these wires in various applications. This discussion explores the challenges and offers potential solutions in bridging this gap, focusing on how the unique properties of actuator wire can be best utilized to be most effective in application. As a supplier specializing in Nitinol materials and processing, Fort Wayne Metals recognizes the need for a deeper understanding of actuator wire properties and their practical implications. Despite significant advancements in the industry, the effective integration of these materials into applications remains key to advancement of the technology in the market more broadly. This talk will address key gaps in the process, discussing current limitations and presenting some of the efforts by Fort Wayne Metals and industry partners to overcome these challenges. By identifying and tackling these issues, we aim to accelerate market adoption and enhance the performance of actuator wire technologies.

KEY FACTORS IN THE NITI-X-Y SHAPE MEMORY ALLOY ACTUATOR DEVELOPMENT OF WIRE, SPRING AND SHEET BASED SHAPE MEMORY ACTUATORS

Since shape memory alloys have been used successfully in medical devices and implants for a long time, there has been great progress in the establishment of actuator applications, especially in the last decade. The complexity of the requirement profile for an SMA actuator goes far beyond what is usually required for highly standardized medical alloys. On the one hand, this presents major challenges, but on the other hand, it provides freedom to develop new products without restrictive regulatory boundaries. In this study we present results on binary wire-based actuators, ternary sheet-based and quaternary spring-based fluid valves to provide an insight into the complexity SMA actuator development. Bias elements adapted to the SMA element and a sufficiently precise understanding of the friction conditions in housings are just as important as the knowledge of the thermomechanical load profiles during operation in order to define an appropriate displacement-temperature hysteresis that enables the desired actuator behavior. Adjustments to the alloy compositions, the processing from melt to component or the control logic for electronically activated SMA components are the rule rather than the exception in product development. Selected details of various actuator applications are highlighted as examples in order to emphasize the need for tailor-made microstructures, as these ultimately represent the foundation of actuator hysteresis.

Student Events

BEST STUDENT PAPER COMPETITION

Monday, September 9
1:40PM–3:00PM

Oglethorp, Conference Center Level

Chair: Vanessa Restrepo Perez, Texas A&M University

Witness top students competing with their cutting-edge research papers, showcasing innovation and passion across Smart Materials and Structures. Join us for an inspiring event that unveils the future of academia and promises to leave you captivated by the power of young intellects.

HARDWARE COMPETITION

Monday, September 9
1:40PM–3:00PM

Heritage A, Conference Center Level

Chair: Maria Sakovsky, Stanford University

Co-Chairs: Paul Gilmore, Toyota Research Institute
Cody Gonzalez, The University of Texas at San Antonio

The hardware showcase features the latest research developments, technology demonstrators, and smart material applications from every symposium. Students and researchers will present their work in live demonstrations and compete for the Fort Wayne Metals best hardware award. Get inspired by creatively realized prototypes and watch smart materials, adaptive structures, and intelligent systems in action!

STUDENT TRIVIA LUNCH

Tuesday, September 10
12:10PM–1:40PM

Heritage B, Conference Center Level

Are your trivia skills sharper than those of your SMASIS peers? Everyone is invited to test their knowledge of random and Georgia-centric 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 trivia competition, and the top teams will be awarded a unique prize!

STUDENT GAME NIGHT

Tuesday, September 10
6:30PM–9:30PM

Winning Edge, Lobby Level

Not ready to call it a night after the fantastic banquet? Look no further. Everyone's welcome to join the game night at Winning Edge, in the hotel lobby. Bring friends, challenge them on board and card games, and keep the fun alive!

STUDENT CAREER PANEL

Wednesday, September 11
12:10PM–1:40PM

Marietta, Terrace Level

Chair: Patrick Walgren, AFRL

Have you ever wondered about the differences between working at a university, a government lab, or for an industrial R&D company? A panel of professionals from all three sectors will be discussing their career trajectories and responsibilities and will be answering questions about career options in their respective positions.

Committee Meeting Schedule

SUNDAY, SEPTEMBER 8		
MEETING	TIME	ROOM
Division Leadership Summit (By Invitation Only)	1:00PM–6:00PM	Heritage C

MONDAY, SEPTEMBER 9		
TECHNICAL COMMITTEE MEETINGS	TIME	ROOM
Bioinspired Structures and Systems	12:10PM–1:40PM	Chastain A
Active Materials and/or Multifunctional Materials	12:10PM–1:40PM	Suwanee
Active Material Technologies and Integrated Systems	12:10PM–1:40PM	Ponce De Leon
Energy Harvesting Technical Committee Meeting	12:10PM–1:40PM	Brookhaven
Adaptive Systems Dynamics and Controls	12:10PM–1:40PM	Marietta
Structural Health Monitoring	12:10PM–1:40PM	Oglethorp

TUESDAY, SEPTEMBER 10		
JIMSS Editorial Meeting	3:30PM–4:30PM	Marietta
JVA Information session	4:00PM–4:50PM	Chastain B
SMASIS Senate Meeting	6:30PM–9:30PM	Buckhead Ballroom

Keynote Speakers

MONDAY SEPTEMBER 9

8:00AM–9:00AM BUCKHEAD BALLROOM. CONFERENCE CENTER LEVEL

Paolo Ermanni
ETH Zurich

Department of Mechanical and Process Engineering

Laboratory of Composite Materials and Adaptive Structures (CMASLab)

Paolo Ermanni is a Professor of Composite Materials and Adaptive Structures, ETH Zurich, Department of Mechanical and Process Engineering. He studied Mechanical Engineering at ETH Zurich and received his Doctoral degree from ETH in 1990 for his Dissertation on novel process technologies for highly integrated Composites fuselage structures. He spent more than five years at Airbus Germany, Hamburg as a senior engineer and later, as a project manager. In 1997 he took on a new challenge as a manager in the strategic consulting firm A.T. Kearney, Milan. Ermanni's research is concerned with the exploration of innovative designs, material architectures, and advanced processing technologies of high-performance composite structures. He is particularly interested in problems related to adaptive structures for stiffness and shape control for aerospace and biomedical applications.

PRESENTATION TITLE: Lighweight Adaptive Systems: From Heart to Space!

Abstract

Exceptional specific stiffness and strength, along with a combination of anisotropic properties and multilayer arrangements make fiber-reinforced polymers (FRP) the ideal material for high performance lightweight structures. Material parameters can be adjusted at different length scales, which result in a vast design space, thus enabling the realization of load-carrying structural systems with amazing structural features, including extreme shape deformation and reconfigurability. The talk presents and discusses structural concepts, actuation mechanisms, and applications studied in recent years at the Laboratory of Composite Materials and Adaptive Structures (CMASLAb). Shape adaptation is achieved through inner compliance and passive and semi-active variable stiffness approaches. Selective elastic instability and integration of multi-stable elements provide additional mechanisms to induce nonlinear variable stiffness responses and, therefore, achieve controlled deformability in load-carrying lightweight structures. The integration of FRPs elements into mechanical metamaterials is further expanding the potential of composite materials for multi-functional lightweight applications, by adding additional geometrical parameters and tunability of the repeating unit cell. A promising concept is relying on FRP shell metastructures consisting of a thin FRP-frame and a pre-stretched soft polymer membrane. The instability of the initially flat component is inducing rich multi-stable behavior, being a first step towards the realization of programmable structures, which can morph to multiple 3D shapes from an initial flat configuration following an external stimulus. Finally, we are currently exploring the mechanical behavior and the potential of very thin composite shells made from continuously fiber reinforced PolyEther Ether Ketone (PEEK). Those composite materials are capable of withstanding large bending curvatures without failure and are, therefore, pre-destined for applications, that require a high degree of deformability for shape adaptation and deployment purposes. Applicability of thin fiber reinforced PEEK shells in selected biomedical and space systems will be discussed.

TUESDAY, SEPTEMBER 10

8:00AM–9:00AM BUCKHEAD BALLROOM. CONFERENCE CENTER LEVEL

Donald Leo

Executive Vice President and Provost

Ohio University
Athens, OH

Don Leo is currently the Executive Vice President and Provost at Ohio University, an R1 public university in Athens, OH, that enrolls over 28,000 students in over 250 degree programs. Prior to his appointment at Ohio University, Don served as the Dean of the College of Engineering at the University of Georgia, where he worked with faculty, staff, and students to grow the enrollment, research, and service of the college over an eleven-year period. From 1998-2013 he was a faculty member at Virginia Tech, where he did a majority of his research in the field of smart materials, focusing primarily on the integration of control theory, material science, and vibrations to understand how smart material systems could improve engineered systems. He received his Bachelor of Science in Aeronautics and Astronautics Engineering from the University of Illinois, Urbana-Champaign, and his Master of Science and Doctor of Philosophy degrees in Mechanical and Aerospace Engineering from the University at Buffalo under the director of Dr. Daniel Inman. He authored the textbook *Engineering Analysis of Smart Materials* Systems (for which he still receives a small royalty check twice a year), is a Fellow of ASME, and has been awarded the Alumni of the Year Award and Young Alumnus Award from UIUC Department of Aerospace Engineering.

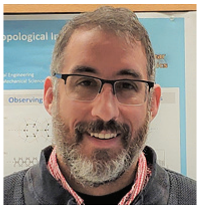
PRESENTATION TITLE: Smart Materials and Adaptive Systems: How Far Have We Come, and How Far Do We Have to Go?

Abstract:

The field of smart materials has been a sustained field of scholarship for over forty years. The roots of the field lie in the desire to make engineered systems sense and react to environmental stimuli in a manner that mimics the abilities of natural systems. The field has made significant advances over these 40+ years, for example, in the development of a variety of stimuli-responsive materials; advancing the integration of control systems with engineered systems, and the use of advanced computing architectures to create 'intelligent' engineered systems that respond to external stimuli. This talk will explore the early motivations for the field and relate these advances to the ways in which our field has influenced society. It will also highlight ways in which the field of smart materials and adaptive systems may influence society in the future.

WEDNESDAY, SEPTEMBER 11

8:00AM–9:00AM BUCKHEAD BALLROOM. CONFERENCE CENTER LEVEL



Michael J. Leamy
George W. Woodruff School of Mechanical Engineering
Atlanta, Georgia, USA

Michael J. Leamy joined the George Woodruff School of Mechanical Engineering, Georgia Tech, as an Assistant Professor In August 2007. He then served as an Associate Professor (2012-2018), Professor (2018-Present), and Director of Graduate Studies (2023-Present). Dr. Leamy received his B.S. (1993) from Clarkson University, and his M.S. (1995) and Ph.D. (1998) from The University of Michigan, Ann Arbor, all in Mechanical Engineering. Prior to his position at Georgia Tech, Professor Leamy worked as an Assistant Professor at the United States Military Academy (West Point, NY), a Research Scientist at the MITRE Corporation (McLean, VA), a Research Associate at the NASA Langley Research Center (Hampton, VA), and a Postdoctoral Fellow at Israel's Institute of Technology (Technion). Dr. Leamy's research interests are in emerging and multidisciplinary areas of engineering science, with an emphasis on nonlinear dynamical behavior in structures, materials, and complex systems. Emerging engineering systems of particular interest include acoustic metastructures, topological insulators, and electric vehicle powertrains. He has received the Distinguished Achievement Award (1998) from the University of Michigan, a Koret Foundation Fellowship (1998) from Technion, the Army's Superior Civilian Service Award (2003), the Lockheed Dean's Excellence in Teaching Award (2010), and the Lloyd Hamilton Donnell Best Paper Award from Applied Mechanics Reviews (co-recipient, 2016). In addition, he was named a Fellow by ASME (2014) and a Woodruff Faculty Fellow (2017) by the George Woodruff School of Mechanical Engineering. His past and current editorial positions include serving as an Associate Editor for the *Journal of Vibration and Acoustics* (2011-2017), *Nonlinear Dynamics* (2019-2023), *Wave Motion* (2017-Present), and *Applied Mechanics Reviews* (2018-Present). He is presently the Specialty Chief Editor, Acoustic Metamaterials, for *Frontiers in Acoustics*. Dr. Leamy's research program has been supported by the Ford Motor Corporation, General Motors, Honeywell Inc., Ferrari S.p.A., ThyssenKrupp Elevator America, the National Science Foundation, the Department of Energy, the Defense Threat Reduction Agency, the Army Research Office, and the Office of Naval Research. He has authored or co-authored over 250 peer-reviewed publications.

PRESENTATION TITLE: Reconfigurable Topological Insulators and Experimentally-Demonstrated Applications Using an Electroacoustic Material Platform

ABSTRACT:

Topological insulators (TIs), exhibiting topologically-protected edge and interface waves, have recently emerged in phononic systems. Reconfigurabilty is essential for enabling TI-based applications. One potential means for achieving reconfigurability employs shunted piezoelectric (PZT) disks in which a unit cell's mechanical impedance is altered using negative capacitance circuits. Dynamic reconfigurability and programmability of such material platforms can then be obtained through simple on/off switching. In this vein, we propose and experimentally verify an electroacoustic TI which exhibits programmable topologically protected edge states useful for acoustic multiplexers, demultiplexers, and transistors. This reconfigurable structure is composed of an elastic hexagonal lattice whose unit cell contains two shunted PZT disks, each connected to a negative capacitance circuit by an on/off switch. Closing one or the other circuit results in the breaking of mirror symmetry and yields mechanical behavior analogous to the quantum valley Hall effect. By interfacing two topologically-distinct materials, a domain wall is introduced exhibiting a localized interface state topologically-protected from backscattering at defects and sharp edges. Through the use of programmable time-division, in which domain walls appear and disappear in time, we demonstrate multiplexing and demultiplexing. We also demonstrate an acoustic transistor using the same programmable platform, before closing with a discussion on future research directions.

Symposia Invited Speakers

MONDAY, SEPTEMBER 9 **9:10AM-9:50AM**
SESSION 4-1 **PONCE DE LEON, TERRACE LEVEL**

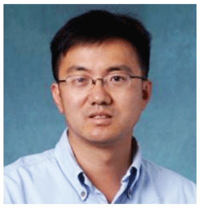
Dr. Salvatore Ameduri
Senior Researcher
Italian Aerospace Research Centre (CIRA)
Capua, Italy

Presentation Title: Morphing in Aerospace: How are we doing?

Abstract: Morphing in aerospace is today under the spotlight for its potential benefits within a complex scenario. In synergy with other technologies, morphing seems in fact to offer real opportunities within a growing market facing, from one side, problems in terms of environmental warming and safety and, from the other side, on extreme economic competition. Speaking of breakthrough approaches and also of the often-relevant upheaval of the basic flight conception, it is reasonable to wonder how morphing technology can frame itself within this new scenario. The level of maturity of the subsystems involved in a morphing device, the transportability of the technology on different classes of aircraft, the demonstration and certification are just some sizzling topics. In this sense, an overview of the achievements of some Projects the authors were involved in or they are aware of, is discussed highlighting strength and weakness points of the technology and its maturity level. The challenges faced, the issues still open, and the lesson learned are presented, outlining possible effective strategies to make steps forward.

Biography: Salvatore Ameduri graduated in Aeronautic Engineering at the Univ. of Naples "Federico II" in 1998. In 2002, he defended a Ph.D. thesis in Aerospace Engineering, funded by EREA Organization, on developing a smart system for normal shock wave mitigation in transonic. Hired in 2002 at CIRA, he is now a senior researcher responsible for the "Sensors and Actuators for Adaptive Structures" research unit. He is author and co-author of 2 patents at European and worldwide level and of more than 100 indexed publications on scientific journals edited by AIAA, ASME, Elsevier, MDPI, SAGE, SPIE, Techno-Press. He is also a reviewer for these associations, winner of awards for project competitions, as invited speaker and best presentations, scientific reviewer for financing proposals. S. Ameduri has an H-index of 15 and plays the role of manager, technical coordinator, and concept developer in National and International programs focusing on morphing, noise and vibration control, and structural health monitoring.

MONDAY, SEPTEMBER 9 **9:50AM – 10:30AM**
SESSION 1-1 **SUWANEE, CONFERENCE CENTER LEVEL**



Dr. H. Jerry Qi
The George W. Woodruff School of Mechanical Engineering
Georgia Institute of Technology

Presentation Title: Multimaterial Additive Manufacturing for Shape Morphing Structures

Abstract: 3D printing (additive manufacturing, AM) a process by which materials are deposited in a layer-by-layer manner to form a 3D solid, has seen significant advances in the recent decades. 3D printing has the advantage in creating a part with complex geometry from a digital file, making them an idea candidate for making architected materials. Multimaterial 3D printing is an emerging field in recent years in additive manufacturing. It offers the advantage of placement of materials with different properties in the 3D space with high resolution. In this talk, we present our recent progress in developing multimaterial additive manufacturing methods. In the first approach, we present a new development in which we integrate two AM methods, direct-ink-write (DIW) and digit light processing (DLP), into one system. In this system, the DLP can be used to print complex bulk parts, while DIW can be used to print functional inks. In the second approach, we recently developed a grayscale DLP (g-DLP) 3D printing method by which we can print a part with gradient material properties. Finally, we further explore on how to use a machine learning approach to design shape morphing structures utilizing the capability of multimaterial additive manufacturing.

Biography: Dr. H. Jerry Qi is a professor in the School of Mechanical Engineering at Georgia Institute of Technology and is the site director of NSF IUCRC on Science of Heterogeneous Additive Printing of 3D Materials (SHAP3D). He received his undergraduate and graduate degrees from Tsinghua University and a ScD degree from MIT. After a one-year postdoc at MIT, he joined the University of Colorado Boulder as an assistant professor and moved to Georgia Tech in 2014. Prof. Qi's research is in the broad field of nonlinear mechanics of polymeric materials and focuses on developing fundamental understanding of multi-field properties of soft active materials through experimentation and constitutive modeling, then applying these understandings to application designs. He and his collaborators have been working on a range of soft active materials, including shape memory polymers, and light activated polymers, covalent adaptable network polymers. In recent years, he has been working on integrating active materials with 3D printing, or 4D printing.

MONDAY, SEPTEMBER 9 **10:50AM-11:30AM**
SESSION 5-2 **CHASTIAN B, TERRACE LEVEL**

Dr. Wen Shen
Assistant Professor
University of
Central Florida (UCF)

Presentation Title: Additive Manufactured Smart Materials for Structural Health Monitoring

Abstract: Additive manufacturing, also known as 3D printing, has a wide range of applications in the automotive, aerospace, energy, and defense sectors. For example, additive manufacturing has been increasingly used to fabricate complex, lightweight composite materials. However, the design and additive manufacturing of smart composite materials or structures that excel in both mechanical performance and the capability to monitor structural health in response to external simulations remains a challenge. In this talk, we will present additively manufactured smart polymer composites with high mechanical strength and the ability to measure local stress within the material wirelessly. Both static and cyclic mechanical test results will be presented to demonstrate the effectiveness of the additively manufactured smart composites in monitoring structural health.

Biography: Dr. Wen Shen is an Assistant Professor in the Department of Mechanical and Aerospace Engineering and the Nanoscience and Technology Center at the University of Central Florida (UCF). She received a B.S. in Materials Science and Engineering and a B.S. in Biological Engineering from Shanghai Jiao Tong University. She earned her Ph.D. degree in Materials Engineering from Auburn University. She was a postdoctoral fellow in the School of Electrical and Computer Engineering at the Georgia Institute of Technology and the Department of Electrical and Systems Engineering at the University of Pennsylvania. Prior to joining UCF, she was an Assistant Professor at the University of Texas at Arlington. Dr. Shen's research is focused on the development of functional materials-based microelectronics.

MONDAY, SEPTEMBER 9 **3:30PM –4:10PM**
SESSION 1-4 **SUWANEE, CONFERENCE LEVEL**

Dr. Babak Anasori
School of Materials Engineering and
School of Mechanical Engineering

Presentation Title: 2D MXenes, Their Assemblies, and Interface Engineering for Multifunctional Structures and Composites

Abstract: Two-dimensional (2D) transition metal carbides, nitrides, and carbonitrides, known as MXenes, have grown in the past decade from a newly discovered material to a large family of 2D materials. MXenes have a wide array of material properties, including solution-processability and hydrophilicity (surfactant-free nanoinks), high electrical conductivity, high 2D stiffness, functionalized surfaces, and chemical and structural tunability. MXenes have been extensively investigated for applications such as energy storage, catalysis, sensing, environmental, biomedical, electromagnetic interference shielding, and wireless communication.

In this talk, I will focus on the recent compositional and structural developments, as well as the tunability of MXenes. Next, I will discuss how MXenes can be assembled with other nanomaterials, as well as integrated into the matrices of bulk metals and ceramics. While the integration of MXenes can improve mechanical properties and electrical conductivity, it can also add more functionalities to the final products. Lastly, I will present our recent findings on the interface engineering of MXenes, focusing on controlling defects and understanding their high-temperature phase stability and transformation.

Biography: Dr. Babak Anasori is a Reilly Rising Star Associate Professor at the Schools of Materials and Mechanical Engineering at Purdue University and the Editor-in-Chief of Graphene and 2D Materials, a Springer-Nature journal. Dr. Babak Anasori received his PhD at Drexel University in 2014 in the Materials Science and Engineering Department, the birthplace of MXenes. Dr. Anasori has more than 170 refereed publications on MXenes and their precursors, and he is among the Web of Science Highly Cited Researchers from 2019 to 2023. He is also 4th on the 2023 list of Rising Stars of Science in the USA by Research.com. In 2023, he was identified by ScholarGPS as the number #1 in Mechanical Engineering among all scholars in the USA in the past five years. He has received several international awards, including the 2016 Materials Research Society (MRS) Postdoctoral Award, the 2021 Drexel University 40-under-40, the 2021 Waterloo Institute for Nanotechnology (WIN) Rising Star Award in Nanoscience and Nanotechnology, and the 2024 Abraham Max Distinguished Professor Award at Purdue School of Engineering. Dr. Anasori's research lab works on developing novel 2D carbide and carbonitride MXenes for various applications, including energy generation, electromagnetic interference shielding, and ultra-high temperature ceramics.

TUESDAY, SEPTEMBER 11 **9:10AM - 9:50AM**
SESSION S-4 **AUGUSTA, CONFERENCE LEVEL**

Michael Dickey
North Carolina State University
Raleigh, NC

Presentation Title: Tactile Logic Using Soft Elastomers and Liquid Metals

Abstract: Most machines rely on a ”sense-compute-respond” model. That is, sensors send information to a centralized processor (compute) that determines how to respond (output) appropriately to the given information (inputs). Such machines use rigid, centralized electronic components to make these ”intelligent” decisions. Here, we show a way to perform simple logical functions on the ”material-level” in soft materials based on the way the material is touched without relying on semiconductor-based transistors. We were inspired, in part, by an octopus, which is capable of locally processing tactile information through the use of neurons distributed in the appendages. To this end, we present a completely soft, stretchable silicone composite innervated with liquid metal as a conceptual demonstrator. When touched, the liquid metal circuits change their local resistance, thereby changing the way electrical energy distributes in the embedded circuit. That electrical energy can be used to cause Joule heating (for thermochromic responses), for powering circuit components such as LEDs, or to power electromechanical motors. The response of the material converts analog tactile ”inputs” into digital “outputs“, such as the ”on/off” state of a motor. This concept can be implemented to perform simple logic that breaks the typical “sense-compute-respond” paradigm used in both natural and synthetic control systems by removing the need for a centralized processor. Using the material itself as the active player in the decision-making process offers possibilities for creating entirely soft devices that respond locally to environmental (here, mechanical) interactions. This talk will discuss the use of liquid metals for such “intelligent materials” in addition to giving background for their use as conductors for soft and stretchable electronics and devices. Alloys of gallium are noted for their low viscosity, low toxicity, and near-zero vapor pressure. Despite the large surface tension of the metal, it can be patterned into non-spherical 2D and 3D shapes due to the presence of an ultra-thin oxide skin that forms on its surface. Because it is a liquid, it can be patterned in ways that are truly unique for metals, such as printing, injection, and selective wetting. The metal is extremely soft and flows in response to stress to retain electrical continuity under extreme deformation. By embedding the metal into elastomeric or gel substrates, it is possible to form soft, flexible, and conformal electrical components, stretchable antennas, and ultra-stretchable wires that maintain metallic conductivity up to ~800% strain. In addition to discussing the advantages of liquid metals for intelligent materials, this talk will focus on recent work to utilize liquid metal for tactile sensors. The sensors detect touch from changes in capacitance. By using soft composites consisting of liquid metal particles dispersed in elastomer, it is possible to increase the dielectric properties while using ultra-soft materials. Thus, the sensors are very sensitive to touch.

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 and EPFL in 2023. Michael's research interests include soft matter (liquid metals, gels, polymers) for soft and stretchable devices (electronics, energy harvesters, textiles, and soft robotics).

TUESDAY, SEPTEMBER 10 **9:50AM-10:30AM**
SESSION 4-4 **PONCE DE LEON, TERRACE LEVEL**

Dr. Parikshith Kumar
Metallurgical Associate
W L Gore & Associates
Flagstaff, AZ

Presentation Title: Existing Challenges and Factors to Consider in the Development of SMA Implantable Medical Devices

Abstract: Shape memory alloy-implantable medical devices have significantly changed the landscape of medical treatment by enabling minimally invasive surgery to treat various disease states. The quest to reach a broader patient population or use these devices in complex disease states/procedures has brought about new technical challenges that need to be addressed. Within the realm of material properties, device design and boundary conditions, we will discuss current challenges the industry faces and how experimental modeling and imaging tools are utilized to address these challenges. We will then explore opportunities available for next generation SMA implantable devices.

Biography: Parikshith Kumar got his Ph.D. from Texas A&M University in 2009 and has worked extensively with shape memory alloys for the actuator industry from 2001-2012. Since 2012 he transitioned to the medical products division at W. L Gore and Associates as a Metallurgical associate on the Metals platform. His work involves front end research to develop new material and processes and has been recognized by new product development teams for his effort in the launch of several life saving devices in the company's portfolio. His areas of focus include microstructure-mechanical property relationship, fatigue and corrosion behavior of SMAs. He has also been serving as an SMST board member for the past 7 years and is the conference chair for SMST 2024.

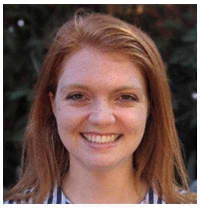
TUESDAY, SEPTEMBER 10 **10:50AM - 11:30AM**
SESSION 5-4 **CHASTAIN B, TERRACE LEVEL**

Yang Wang
Georgia Institute of Technology
Department of Civil and Environmental Engineering
Atlanta, GA

Presentation Title: Structures, Sensing, and Computing – the Pursuit of Digital Twins through Model Updating

Abstract: Computer modeling and numerical simulation have become common practice in most engineering disciplines, including structural engineering. Despite the success of computer simulation, in-situ sensor measurements from an as-built structure often differ considerably from the behavior simulated by a computer model. This discrepancy between model and reality poses substantial difficulty for the development of digital twins, which refer to computer models that rely on real-time sensor measurements to constantly update themselves in order to mirror the changes in an as-built structure. To this end, recent advances in sensor technologies have enabled significant field measurements from as-built structures, providing us highly detailed and quantified recording of in-situ structural behaviors. To ensure the fidelity of a digital twin to the as-built structure, model updating is usually performed based on dynamic properties that are experimentally observed in-situ and considered the ground truth. Mathematical optimization problems are solved with the objective of minimizing the difference between the in-situ measured dynamic properties and those provided by the computer simulation model. This talk will discuss a few of the latest developments in exploiting global optimization algorithms that can either guarantee global optimality or provide a solution certificate on how optimal the final results are.

TUESDAY, SEPTEMBER 10 **11:30AM - 12:10PM**
SESSION 6-6 **CHASTAIN A, TERRACE LEVEL**



Dr. Christina Harvey
Assistant Professor in Mechanical and Aerospace Engineering
UC Davis
Davis, CA

Presentation Title: Avian Morphing for Flight Stability and Control

Abstract: Birds regularly accomplish an impressive array of in-flight transitions, from maneuvering through cities, evading predators, or gliding in gusty conditions. The ability to adapt and maneuver in these variable flight conditions is allowed by in-flight active and passive wing and tail shape adjustments, known as morphing. In this talk, I will discuss how avian wing morphing enhances maneuverability and adaptability through a perspective of flight dynamics, control, and aerodynamics. These results will shed light on which biological characteristics may be specifically useful for incorporation into novel designs. Furthermore, I will highlight how a fundamental understanding of biological principles supports the expansion of UAV concepts' operational capabilities.

Biography: Dr. Christina Harvey is an Assistant Professor in Mechanical and Aerospace Engineering at UC Davis, where she leads the Biologically Informed Research and Design (BIRD) lab. She holds a PhD in Aerospace Engineering from the University of Michigan, a M.Sc. in Zoology from the University of British Columbia, and a B.Eng. in Mechanical Engineering from McGill University. She is a 2023 Packard Fellow and 2021 Amelia Earhart Fellow.

WEDNESDAY, SEPTEMBER 11 9:50AM – 10:30AM
SESSION 6-8 CHASTAIN A, TERRACE LEVEL

Saad Bhamla
Associate Professor of Biomolecular Engineering
Georgia Tech
Atlanta, GA

Presentation Title: The Blob: Topologically Entangled Living Matter

Abstract: Tangled active filaments are ubiquitous in nature, from chromosomal DNA and cilia carpets to root networks and worm collectives. How activity and elasticity facilitate collective topological transformations in living tangled matter is not well understood. In this talk, I will share our discoveries on why aquatic worms braid, tangle, and knot with their neighbors to form extraordinary mechano-functional living blobs - the stuff of science fiction. I will discuss how these soft, squishy, 3-D blobs rapidly morph their shape, crawl, float, climb, self-assemble, and disassemble topological tangles. Using both mathematical models and robotic analogs, I will discuss how these "living polymers" solve Gordian knot problems using clever biophysics mechanisms that open a path to new classes of active, topologically tunable robotic swarms.

Biography: Saad Bhamla studies biomechanics across species to engineer knowledge and tools that inspire curiosity.

A self-proclaimed "tinkerer," his lab is a trove of discoveries and inventions that span biology, physics, and engineering. His current projects include studying the hydrodynamics of insect urine, worm blob locomotion, and ultra-low-cost devices for global health. His work has appeared in *The New York Times*, *The Economist*, CNN, *Wired*, NPR, *The Wall Street Journal*, and more. Saad is an associate professor of biomolecular engineering at Georgia Tech.

Saad is also a prolific inventor. His most notable inventions include a 20-cent paper centrifuge, a 23-cent electroporator, and the $1 hearing aid. Saad's work is recognized by numerous awards including a Moore Inventor Fellowship, a NIH R35 Outstanding Investigator Award, NSF CAREER Award, Junior Faculty Teaching Excellence Award, and INDEX: Design to Improve Life Award. Saad is a National Geographic Explorer and TED speaker. His dedication to making science accessible has been honored with the National Academies' Eric and Wendy Schmidt Award for Excellence in Science Communication. In 2023, *Newsweek* recognized Saad as 1 of 10 Innovators disrupting healthcare. Saad is a co-founder of Piezo Therapeutics.

MONDAY, SEPTEMBER 9 4:10PM - 4:50PM
SESSION 7-1 CHASTAIN B, TERRACELEVEL

Alper Erturk
Carl Ring Family Chair and Professor of Mechanical Engineering
Georgia Institute of Technology

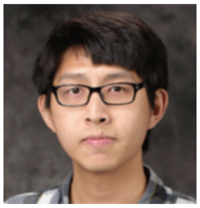
Alper Erturk is the Carl Ring Family Chair & Professor in the Woodruff School of Mechanical Engineering at Georgia Tech. He began at Georgia Tech in 2011 as an Assistant Professor; he was promoted to Associate Professor with tenure in 2016 (and was named Woodruff Faculty Fellow in 2017), and then became a full Professor (and was named Woodruff Professor) in 2019. Most recently he was awarded his current chaired professorship in 2022. His theoretical and experimental research interests are in dynamics, vibration, and acoustics of passive and active structures for a broad range of engineering problems. His publication/presentation record includes more than 130 journal papers, 220 conference papers/abstracts, 5 book chapters, and 2 books (total citations > 20,000 and h-index: 64). He is a recipient of many awards including an NSF CAREER Award (in dynamical systems), ASME C.D. Mote Jr. Early Career Award (in vibration & acoustics), ASME Gary Anderson Early Achievement Award (in adaptive structures & material systems), SEM James Dally Young Investigator Award (in experimental mechanics), and numerous journal/conference best paper awards including the Philip E. Doak Award of the Journal of Sound and Vibration. He served as an Associate Editor for various journals and was recently named the Editor-in-Chief of Smart Materials & Structures. He holds Invited/Adjunct Professor positions at Politecnico di Milano (POLIMI) and at Korea Advanced Institute of Science & Technology (KAIST). He is a Fellow of ASME and SPIE.

Presentation Title: Leveraging Metamaterials and Phononic Crystals in Energy Harvesting

Abstract: Metamaterials (MMs) and phononic crystals (PCs) offer unique opportunities to manipulate elastic and acoustic waves in unprecedented ways, stimulating the research for new avenues in energy harvesting. Following a brief account of some of our early work, first, gradient-index (GRIN) lens concepts are covered to demonstrate performance enhancement in energy harvesting from structure-borne flexural waves (the lowest anti-symmetric Lamb wave mode). GRIN PC lens-based enhanced energy harvesting is shown for unidirectional wave focusing, and then extended to the omnidirectional counterpart via the Luneburg lens refractive index profile. More than an order of magnitude enhancement is observed in the harvested power in CNC-machined lens domains in aluminum plates. The harvested power enhancement is also shown via additive manufacturing-based counterpart in a composite domain involving a 3D-printed, polyamide PC lens bonded to an aluminum plate. In the second part of the talk, GRIN PC lens design is extended to bulk pressure waves in fluids, namely for underwater ultrasonic wave focusing and audio-frequency sound wave focusing in air, leading to a substantial enhancement of the acoustic energy via focusing. For instance, audio-frequency acoustic wave harvesting with a simple piezoelectric element is enhanced by an order of magnitude in the presence of a 3D-printed polylactide-based, 3D GRIN PC lens. The underwater counterpart also is shown for enhanced ultrasonic power transfer in a double-lens setting. In the third part of the talk, the focus is placed on resonant MM concepts, starting from the multifunctional implementation to combine locally resonant bandgap formation with harvesting energy from the resonators. Graded MMs involving gradual property variation also are discussed and shown to enhance the harvested power compared to uniform resonators case. Finally, a double-negative locally resonant approach is taken in a hybrid setting on a negative group velocity branch, demonstrating further opportunities to leverage in energy harvesting.

WEDNESDAY, SEPTEMBER 11 — **10:30AM - 12:10PM**

SESSION 7-4 — **CHASTAIN B, TERRACE LEVEL**



Hongcheng Tao
Postdoctoral Research Associate
Purdue University

Presentation Title: Measuring Triboelectric Gas Breakdown

Abstract: Mechanical impacts represent one of the strongest nonlinear interactions and are therefore introduced in designing energy harvesting systems. Vibro-impact energy harvesters may naturally employ the intrinsic electromechanical coupling method of contact electrification, comprising, namely, triboelectric generators. Triboelectric energy harvesters enjoy high open-circuit output voltages, which on the other hand may exceed the threshold of triggering dielectric breakdown of the surrounding gas. Such electrostatic gas discharge has been assumed to obey the classical Paschen's law, which yet has insufficient experimental validation. The present work uses Coulomb force to monitor surface charge variations and thus reconstruct Paschen curves that govern gas breakdown in insulator contact electrification. It offers an alternative approach for characterizing either the ionization energies of gases or the secondary-electron-emission properties of surfaces without the requirement of a power supply, which can potentially benefit applications ranging from the design of insulative materials to the development of triboelectric devices.

Biography: Hongcheng Tao received a B.S. in Mechanical Engineering from Shanghai Jiao Tong University (2016) and a Ph.D. from Purdue University (2022) under the guidance of Professor James Gibert. He is currently a postdoctoral fellow in the School of Mechanical Engineering at Purdue University.

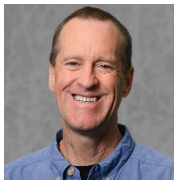
Awards

2024 GARY ANDERSON EARLY ACHIEVEMENT AWARD

Caterina Lamuta
Assistant Professor Mechanical Engineering (ME), University of Iowa

Biography: Caterina Lamuta received her PhD in Mechanical Engineering in 2017 at the University of Calabria, Italy. In 2016 she was a visiting scholar at UIUC, and in 2017 she was selected as a Postdoctoral Fellow at the Beckman Institute, at UIUC. She joined the Department of Mechanical Engineering at the University of Iowa (UIowa) in 2018 where she is currently an Associate Professor and director of the Smart Multifunctional Material Systems (SMMS) Lab. Dr. Lamuta is the recipient of the 2021 DARPA Young Faculty Award (including the DARPA Director's Fellowship), the 2023 ONR Young Investigator Program (YIP) Award, 2022 Early Career Scholar of the Year award from Office of the Vice President for Research at UIowa, and 2022 Early Career Faculty Excellence Award from the College of Engineering at UIowa. Her research is also funded by AFOSR, NSF, and NASA, and focuses on smart and bioinspired materials, and soft robotics.

ASME DEDICATED SERVICE AWARD



Ralph Smith
Distinguished University Professor
North Carolina State University

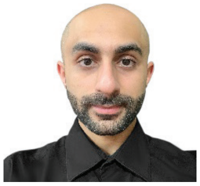
Biography: Ralph Smith is a Distinguished University Professor of Mathematics at North Carolina State University. He is the author of "Smart Material Systems: Model Development" (SIAM, 2005) and "Uncertainty Quantification: Theory, Implementation, and Applications" (SIAM 2014 1st ed., 2024 2nd ed.). He is also a co-author of "Smart Material Structures: Modeling, Estimation and Control" (Masson/Wiley 1996). He serves on the editorial boards of the Journal of Intelligent Material Systems and Structures, the SIAM/ASA Journal on Uncertainty Quantification, and the International Journal for Uncertainty Quantification. Ralph is the recipient of the 2016 ASME Adaptive Structures and Material Systems Award and the SPIE 2017 Smart Structures and Materials Lifetime Achievement Award. Additionally, he is a SIAM and ASME Fellow. He has a sustained record of service and leadership to the SMASIS community. He has enthusiastically served in multiple roles including serving as the General Chair of the premier SMASIS conference and leading the community as Chair of the Aerospace Division Executive Committee. Further, he has ensured that our community acknowledged and recognized the best while serving as the Adaptive Structures and Material Systems Award Chair. His dedicated efforts have supported the development of a solid foundation for the new SMASIS division.

2024 BEST PAPER IN STRUCTURES, STRUCTURAL DYNAMICS, AND CONTROLS AWARD

Authors: Mustafa Alshaqaq, Christopher Sugino, and Alper Erturk

Paper title: "Digital programming of reciprocity breaking in resonant piezoelectric metamaterials."

Abstract: We demonstrate a digitally controlled piezoelectric metamaterial waveguide leveraging resonant, spatiotemporally modulated synthetic impedance circuits for programmable reciprocity breaking. Piezoelectric metamaterials have effective stiffness that depends on the shunt circuitry connected to each unit cell, offering greatly increased design freedom over their purely mechanical counterparts. By connecting a digitally controlled synthetic impedance shunt circuit to each unit cell of the metamaterial domain, the effective stiffness is externally programmed according to a desired profile in space and time. Specifically, we present threefold capabilities in this electromechanical system: (1) smooth parameter modulation (no abrupt switching) through synthetic impedance circuits that eliminate cumbersome analog electrical components, (2) resonant electromechanical modulation in space and time so that one does not have to operate near the Bragg band gap, and (3) precise digital programming by numerically entering the space and time properties of the domain. We also demonstrate the frequency conversion in narrow-band excitation centered at a directional band gap. The experimental results are compared against high-fidelity multiphysics finite-element simulations, yielding excellent agreement for this class of digitally programmable nonreciprocal elastic metamaterials.



Mustafa Alshaqaq
Assistant Professor
King Fahd University of Petroleum and Minerals
Dhahran, Saudi Arabia

Biography: Mustafa Alshaqaq received his PhD in Mechanical Engineering at Georgia Institute of Technology in 2023 and is currently an Assistant Professor of Mechanical Engineering at King Fahd University of Petroleum and Minerals.

Christopher Sugino
Assistant Professor
Stevens Institute of Technology
Hoboken, NJ

Biography: Christopher Sugino received his PhD in Mechanical Engineering at Georgia Institute of Technology in 2019 and is currently an Assistant Professor of Mechanical Engineering at Stevens Institute of Technology where he started in 2022.

Alper Erturk
Professor
Georgia Institute of Technology
Atlanta, GA

Biography: Alper Erturk is currently the Carl Ring Family Chair and Professor of Mechanical Engineering at Georgia Tech where he began in 2011.

2024 BEST PAPER IN MECHANICS AND MATERIAL SYSTEMS AWARD

Authors: Sumit Gupta, Tanvir Sohail, Marti Checa, Sargun S. Rohewal, Michael D. Toomey, Nihal Kanbargi, Joshua T. Damron, Liam Collins, Logan T. Kearney, Amit K. Naskar, and Christopher C. Bowland

Paper Title: "Enhancing composite toughness through hierarchical interphase formation."

Abstract: High strength and ductility are highly desired in fiber-reinforced composites, yet achieving both simultaneously remains elusive. A hierarchical architecture is developed utilizing high aspect ratio chemically transformable thermoplastic nanofibers that form covalent bonding with the matrix to toughen the fiber-matrix interphase. The nanoscale fibers are electrospun on the micrometer-scale reinforcing carbon fiber, creating a physically intertwined, randomly oriented scaffold. Unlike conventional covalent bonding of matrix molecules with reinforcing fibers, here, the nanofiber scaffold is utilized interacting non-covalently with core fiber but bridging covalently with polymer matrix to create a high volume fraction of immobilized matrix or interphase around core reinforcing elements. This mechanism enables efficient fiber-matrix stress transfer and enhances composite toughness. Molecular dynamics simulation reveals enhancement of the fiber-matrix adhesion facilitated by nanofiber-aided hierarchical bonding with the matrix. The elastic modulus contours of interphase regions obtained from atomic force microscopy clearly indicate the formation of stiffer interphase. These nanoengineered composites exhibit a ≈60% and ≈100% improved in-plane shear strength and toughness, respectively. This approach opens a new avenue for manufacturing toughened high-performance composites.

Sumit Gupta

Biography: Sumit Gupta works as a R&D Associate in Oak Ridge National Laboratory's (ORNL) Carbon and Composites Group (Chemical Sciences Division). Prior to joining ORNL, he received his Ph.D. in Structural Engineering from the University of California, San Diego's Structural Engineering Department (2020). He obtained an M.S. in Civil Engineering from the University of California, Davis, in 2015 and a B.S. degree in Construction Engineering from Jadavpur University, India, in 2014. He was the recipient of the 2019 dissertation fellowship (UC San Diego) and the 2019 SPIE education fellowship, among others. His current research interests include multifunctional materials, multiscale modeling, and tomographic imaging for resilient structural systems.

Tanvir Sohail

Biography: Tanvir Sohail is a Postdoctoral Research Associate at Oak Ridge National Laboratory's Advanced Computing for Chemistry and Materials Group within the National Center for Computational Sciences. His work is dedicated to advancing computational methodologies for the characterization and development of novel materials. Tanvir holds a Ph.D. in Aerospace Engineering and Mechanics (2023) and an M.S. in Aerospace Engineering and Mechanics (2021) from The University of Alabama, AL, U.S. He also earned a B.E. in Construction Engineering from Jadavpur University, Kolkata, India, in 2018. Building on this strong academic foundation, Tanvir specializes in refining multiscale models for high entropy alloys and polymer composites. He employs a sophisticated blend of ab initio calculations, molecular dynamics, and finite element analysis, which helps unravel the complex behaviors of advanced materials. His innovative approach significantly contributes to the field and has broad implications for various industrial applications.

Marti Checa

Biography: Dr. Marti Checa is an R&D staff scientist at the Center for Nanophase Materials Sciences (CNMS), a Department of Energy Nanoscale Science Research Center. He holds a PhD in Nanoscience from University of Barcelona (UB) and has extensive experience in development of novel atomic force microscopy (AFM) methods and their use in material science characterization of structure-function properties at the nanoscale. His specialization is in electrical and electromechanical surface property mapping as well as automatizing measurements using artificial intelligence (AI) and machine learning (ML) approaches in the field of autonomous microscopy.

Sargun S. Rohewal

Biography: Sargun Singh Rohewal is a Ph.D. student in Energy Science and Engineering at the University of Tennessee, Knoxville. He is conducting his research under the supervision of Dr. Amit Naskar in the Carbon and Composite Group (Chemical Sciences Division) at Oak Ridge National Laboratory. His work focuses on the design, synthesis, and characterization of bio-derived multifunctional polymer systems and composites. Currently, he is developing a novel class of polymeric materials specifically tailored for rapid manufacturing techniques like injection molding and extrusion. This research necessitates a deep understanding of polymer architecture, intermolecular interactions, and flow behavior. Sargun earned his M.S. in Chemistry from the University of Alabama at Birmingham (UAB) in 2020 and his B.S. (Honors School) in Chemistry from Panjab University, India. He is a recipient of the 2024 Graduate Advancement and Training Education (GATE) fellowship awarded by University of Tennessee-Oak Ridge Innovation Institute (UT-ORII).

Michael D. Toomey

Biography: Michael Toomey has worked as an R&D Associate in Oak Ridge National Laboratory's (ORNL) Carbon and Composites Group (Chemical Sciences Division) as a materials scientist since May 2024, after having had worked as a Postdoctoral researcher, also at ORNL. He received his Ph.D. in Materials Science and Engineering from Purdue University in West Lafayette, Indiana (2020). His current work focuses on the development and optimization of high-performance composites through precursor and process design for both functional and structural applications. To ensure a sustainable future, much of the work focuses on delivering required performance for various applications through approaches that promote materials circularity.

Nihal Kanbargi

Biography: Nihal Kanbargi is a Materials Scientist at Oak Ridge National Laboratory (ORNL), specializing in the design and structure-process-property relationships of multiphasic polymeric systems. He has a keen interest in upcycling of underutilized biogenic resources into sustainable composites and possesses extensive experience in polymer physics, advanced materials characterization, mechanics of materials, adhesion, and failure in composites. Currently, he focuses on developing and optimizing the chemistry and physics of diverse polymeric materials for advanced manufacturing applications. Previously, he held post-doctoral positions at ORNL and the University of Tennessee, Knoxville, where he developed multifunctional sustainable elastomers and characterized their dynamics and mechanical properties. Kanbargi holds a Ph.D. from the University of Massachusetts, Amherst, where he worked on anisotropic materials and composites, and an undergraduate degree from the Indian Institute of Technology, Roorkee. His work has led to numerous publications in high-impact journals as well as patents.

Joshua T. Damron

Biography: Joshua Damron did his bachelor's in chemistry at Oklahoma State University, where he studied polymer dynamics and solid state NMR under Dr. Jeffery White. He then spent a year at the Martin-Luther Universität Halle-Wittenberg in Germany in the NMR Group under Dr. Kay Saalwächter as a Fulbright Student before he received his PhD from the University of Michigan in 2018. His dissertation focused on advanced solid-state NMR methodology and applications under Dr. Ayyalusamy Ramamoorthy. He completed a postdoctoral fellowship under Dr. Victor Acosta at the University of New Mexico, developing an optically detected NMR microscope, before moving to Oak Ridge National Laboratory as an NMR R&D associate in the Carbon and Composites group within the Chemical Sciences Division.

Liam Collins

Biography: Liam Collins is an R&D staff scientist at the Center for Nanophase Materials Sciences (CNMS), a Department of Energy Nanoscale Science Research Center. He earned his Ph.D. in Physics from University College Dublin, Ireland, in 2015. With over a decade of experience in materials science, Liam specializes in developing atomic force microscopy (AFM) techniques for characterizing structure-function properties on the nanoscale. He is the co-inventor of several AFM methods for nanoscale characterization of electrostatic, electrochemical, and electromechanical properties. These methods are utilized to investigate diverse functional materials, including ferroelectric, bio-, and energy materials. Liam has published over 100 journal articles, and his work has been recognized with several prestigious awards, including R&D 100 Award (2016), Microscopy Today Innovation Award (2016) and the MRS Graduate Student Gold Award (2014).

Logan T. Kearney

Biography: Logan Kearney is a R&D Associate in Oak Ridge National Laboratory's (ORNL) Carbon and Composites Group (Chemical Sciences Division). Prior to joining ORNL, he received his Ph.D. in Materials Science at Purdue University (2017). He is the PI of ORNL's x-ray facility used to establish structure property relationships in materials for energy applications. His research topics include polymers and carbon materials for structural and functional applications.

Amit K. Naskar

Biography: Amit Naskar is a Distinguished Research Staff and leader of the Carbon and Composites Group in the Oak Ridge National Laboratory's Chemical Sciences Division. His areas of research include carbon fibers, carbon precursors, sustainable polymers, composites, and characterization of polymer structure and dynamics. Amit earned his Ph.D. in Rubber Technology from the Indian Institute of Technology, Kharagpur, India and conducted post-doctoral research at Clemson University, SC before joining ORNL in 2006. He has published more than 100 journal articles and 1 edited book, and has 35 issued US patents. He is the lead inventor of ORNL's technology for conversion of polyolefin fibers into carbon fibers, sustainable polymer formulations for composites, and tailored carbon morphology for energy storage applications. He is the recipient of the 2017 Inventor of the Year award at ORNL.

Christopher C. Bowland

Biography: Christopher Bowland is a R&D Staff Scientist in the Carbon and Composites Group within the Chemical Sciences Division at Oak Ridge National Laboratory (ORNL). Chris joined ORNL in 2016 as a Wigner Fellow in the Carbon and Composites Group. He received his PhD in 2016 in Materials Science and Engineering from the University of Florida where he worked on synthesizing ferroelectric films on carbon fiber for electromechanical functionalities. His current research focuses on multifunctional composites and developing scalable routes to integrate nanomaterials into fiber-reinforced composites for embedded sensing applications. He also has been involved at ORNL with developing sustainable, 3D-printable polymers utilizing lignin and investigating the molecular structure of those polymers in different environments using neutron scattering.

ENERGY HARVESTING TECHNICAL COMMITTEE 2024 BEST PAPER AWARD

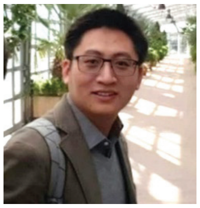
Authors: Peilun Yin, Lihua Tang, Zhongjie Li, Hengyu Guo, and Kean Chin Aw

Paper Title: "Circuit representation, experiment and analysis of parallel-cell triboelectric nanogenerator."

Abstract: Typical simulation using finite element for designing triboelectric nanogenerator (TENG) needs high computational resources. Equivalent circuit modeling as a less computationally intensive method has great potential for TENG simulation but it is only used for simple structures in the literature. In this work, taking parallel-cell triboelectric nanogenerator (PC-TENG) as an example, we establish an equivalent circuit representation for TENG with complex structures. The boundary effect and the parasitic capacitance, which are normally ignored in the existing simple circuit models in the literature, are considered in the equivalent circuit modeling by comparison with finite element simulation and experiment. With the validated equivalent circuit model of the PC-TENG, a parametric study demonstrates the influence of various critical parameters (separation angle α from 0° to 90°, excitation frequency from 1 Hz to 10 Hz, and excitation amplitude truncation percentage from 0 % to 100 %) on the electrical outputs of the PC-TENG, showing that PC-TENG can obtain the optimal outputs at α > 15°, 10 Hz and a truncation percentage of 50 %. The methodology based on the proposed circuit representation paves the way for holistic modeling, evaluation and optimization for complex TENG design.

Peilun Yin
PhD student
The University of Auckland
Auckland, New Zealand

Biography: Peilun Yin received the B.S. and M.S. degrees in Electrical Engineering and Automation from Shanghai University in 2018 and 2021, respectively. Currently, he is a PhD student in the Department of Mechanical and Mechatronics Engineering, the University of Auckland, New Zealand. His research interests include vibration and dynamics, triboelectric nanogenerators, and electromagnetic / piezoelectric energy harvester. Mr. Yin has authored and co-authored 11 research articles in influential international journals. His work has attracted more than 300 citations with an h-index 7 and i10-index 6 according to Google Scholar. He was the conference secretary and session chair of the 5th International Conference on Vibration and Energy Harvesting Applications (VEH 2024).



Lihua Tang
Associate Professor
The University of Auckland
Auckland, New Zealand

Biography: Lihua Tang is currently an Associate Professor in the Department of Mechanical and Mechatronics Engineering, the University of Auckland, New Zealand. He received his BEng in engineering mechanics and MEng in solid mechanics from Shanghai Jiao Tong University, China, in 2005 and 2008, respectively, and PhD in structures and mechanics from Nanyang Technological University, Singapore, in 2012. His main research interests include smart materials and structures, energy harvesting, vibration control, mechanical / acoustic metamaterials, origami dynamics, and thermoacoustics. He has authored / co-authored over 250 journal articles and conference papers with over 10,000 citations and an h-index 56 (Google Scholar). His research has been supported by various funds including prestigious Marsden grants from the Royal Society of New Zealand. He is currently an Associate Editor of Journal of Intelligent Material Systems and Structures.

Zhongjie Li
Associate Professor
Shanghai University
Shanghai, China

Biography: Zhongjie Li received the bachelor's and master's degrees in engineering at Harbin Institute of Technology, China in 2013 and 2015, respectively. He obtained his Ph.D. at the University of Toronto, Toronto, Canada, concentrating on vibration energy harvesting using piezoelectric materials. He is now an associate professor at Shanghai University with research focuses on self-powered systems for wearable electronics, energy harvesting techniques, soft robotics and smart functional materials. He was the session chair of the 3rd and 4th International Conferences on Vibration and Energy Harvesting Applications (VEH 2021 and VEH 2022+1). He is currently a Guest Editor of Micromachines.

Hengyu Guo
Professor
Chongqing University
Chongqing, China

Biography: Hengyu Guo received his B.S. and Ph.D. degrees in Applied Physics from Chongqing University, China. Then he worked as a postdoctoral fellow in Zhong Lin Wang's group, Georgia Institute of Technology, US. Now he is a professor in Department of Physics, Chongqing University, China. His current research interest is triboelectric nanogenerator based energy and sensor systems.

Kean Chin Aw
Associate Professor
The University of Auckland
Auckland, New Zealand

Biography: Kean Chin Aw received Engineering Council (UK) in electrical and electronics engineering from Tunku Abdul Rahman College, Kuala Lumpur, Malaysia, in 1986, the M.Sc. degree in advanced manufacturing systems from Brunel University, London, U.K., in 1998, and the Ph.D. degree in applied physics from the University of Science, Penang, Malaysia, in 2002. He has been a Professor at the Department of Mechanical and Mechatronics Engineering, the University of Auckland, New Zealand, since 2023. Prior to his academic position, he was at Intel, Altera, and Navman for a total of 11 years. His main interests are in micro systems and deployment of smart/functional materials and structures such as conducting polymers, metallic oxides, etc., as sensors and actuators in various applications such as biosensors, medical/rehabilitation robots, micropumps, micromanipulators, MEMS, energy harvester, etc. He has more than 250 refereed publications.

STRUCTURAL HEALTH MONITORING TECHNICAL COMMITTEE 2024 BEST PAPER AWARD

Authors: Augustine E. Loshelder, Jiaze He, Md Aktharuzzaman, Mohammad S. Harb, and Jing Rao

Paper Title: "Apex-shifted Radon transform for baseline-subtraction-free (BSF) damage scattered wave extraction."

Abstract: The total focusing method (TFM) is a widely used ultrasonic imaging algorithm that achieves a highly focused image of the entire scanning region using a delay-and-sum principle. One major challenge to TFM images is the existence of a "dead zone" region near the array that is induced by the source(s) of the array. Specifically, the direct P-waves and surface waves (collectively referred to as direct arrivals) can cause strong near-surface artifacts due to their high amplitude and may overlap with scattered signals from regions of interest near the array. The induced artifacts can obscure damage sites and lower the quality of TFM images. In this paper, we propose an apex-shifted Radon transform (ASRT)-based ultrasonic signal processing technique to mitigate near-array artifacts as a more selective filtering alternative to conventional time-gating strategies for TFM. The ASRT-based image processing algorithm described here is used to mute the direct arrivals in the time-space domain of full matrix capture data before performing TFM. The ASRT is a mathematical transform that targets specific geometry from time-space domain full matrix capture (FMC) data and compresses wave packets into point-like regions in the Radon domain. In this new domain, overlapping events in the original domain are represented as sparse discrete regions where undesirable information can be muted without destroying nearby data. By this process, we can heavily attenuate the undesirable wave groups polluting the ultrasonic signals. First, a mathematical formulation and intuitive explanation of the ASRT is provided. Then, the algorithm's capability to enable near-array imaging is demonstrated on a synthetic model of a steel region with two small inclusions near the array.

In the synthetic case, a significant reduction of the "dead-zone" artifacts is seen. Then, the algorithm's performance is shown to be comparable to experimental data obtained from an inconel block with holes. From this investigation, we can conclude that the ASRT is an effective tool for enabling ultrasonic imaging within a wavelength of the array.

Augustine E. Loshelder
Ph.D. Student
The University of Alabama
Tuscaloosa, Alabama

Biography: Augustine Loshelder, a Ph.D. student at The University of Alabama from Madison, Mississippi, is a National Merit Finalist majoring in Aerospace Engineering and Mechanics. He has consistently made the president's list and is an avid musician.

Jiaze He
Assistant Professor
The University of Alabama
Tuscaloosa, Alabama

Biography: Dr. Jiaze He, a tenured professor at Harbin Institute of Technology, previously served at the University of Alabama and Princeton University. He has led five NSF/NASA projects and chairs the ASME Symposium on NDE & SHM. His research focuses on ultrasound imaging, nondestructive evaluation, and machine learning.

Md Aktharuzzaman
Ph.D. Student
The University of Alabama
Tuscaloosa, Alabama

Biography: Md Aktharuzzaman, a Ph.D. student at The University of Alabama, earned his BSc from MIST, Bangladesh, and interned at Biman Bangladesh Airlines. His research focuses on nondestructive evaluation and structural health monitoring.

Mohammad S. Harb
Assistant Professor
American University of Beirut
Beirut, Lebanon

Biography: Dr. Mohammad Harb, an assistant professor at American University of Beirut, specializes in Structural Health Monitoring. He previously worked at NASA Langley and Mooney Aircraft.

Jing Rao
Assistant Professor
The University of New South Wales
Canberra, Australia

Biography: Dr. Jing Rao, a professor at Beihang University, focuses on non-destructive testing and structural health monitoring. She has held positions at UNSW, Australia, and the Technical University of Munich.

2024 EPHRAHIM GARCIA BEST PAPER AWARD

Authors: Yupei Jian, Guobiao Hu, Lihua Tang, Yincheng Shen, Yulin Zhan, and Kean Chin Aw

Paper Title: Adaptive Piezoelectric Metamaterial Beam: Autonomous Attenuation Zone Adjustment in Complex Vibration Environments

Abstract: Programmable metamaterials for broadband vibration control draw growing interest due to their abilities to tailor dynamic responses. However, the deterministic dynamic behavior of any traditional metamaterial is a challenge to cope with the complex and variable vibration conditions in real environments. This work proposes an adaptive piezoelectric metamaterial beam (piezo-meta-beam) that consists of bimorph piezoelectric arrays. The shunt circuits are designed with self-tuning abilities by integrating microcontroller-driven digital potentiometers into synthetic inductive circuits. Two typical scenarios are considered, i.e., harmonic and white noise excitations with different spectra. Different self-tuning strategies based on bandgap prediction are contrapuntally developed. However, a flaw in the analytical bandgap expression widely appearing in the literature is noted through a verification study. A modified bandgap expression based on

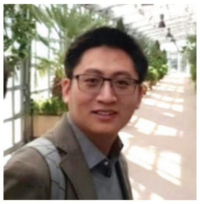
the 3D finite element model is proposed for correction. This modified bandgap expression is adopted in formulating the control strategy of the microcontroller. A series of experiments are conducted to investigate the adaptive behavior of the piezo-meta-beam. In the harmonic sweep excitation test, the adaptive piezo-meta-beam shows an ultra-broad attenuation zone (220–720 Hz), while the traditional counterpart only has a bandgap width of less than 20 Hz. In the case of noise excitation, autonomous adjustment of the center frequency and attenuation zone is achieved for noises over different spectra. In general, this work presents a methodology for designing intelligent metamaterials that can adapt to environmental vibrations with vast potential for real applications.

Yupei Jian
Assistant Professor
Southwest Jiaotong University
Chengdu, Sichuan Province, China

Biography: Yupei Jian is currently a tenure-track assistant professor with the School of Electrical Engineering, Southwest Jiaotong University. He received his Ph.D. degree in Mechanical Engineering from the University of Auckland. Before joining SWJTU, he worked as a Research Assistant at Hong Kong University of Science and Technology (Guangzhou). His research interests include elastic-acoustic metamaterials, dynamics of smart structures, and vibration control. He has authored/co-authored over 10 journal articles and conference papers with over 300 citations and an h-index 7, including one ESI highly cited paper (first author). He received the Best Doctoral Thesis Award 2024 from the New Zealand Chinese Scientists Association. His paper published in Smart Materials and Structures as first author was selected as Highlight of 2023. He serves as reviewer for more than 10 SCI journals and guest editor for two SCI journals.

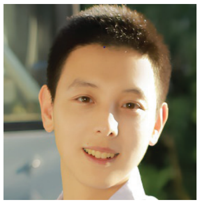
Guobiao Hu
Assistant Professor
The Hong Kong University of Science and Technology (Guangzhou)
Guangzhou, Guangdong Province, China

Biography: Dr. Guobiao Hu is currently a tenure-track assistant professor with the Internet of Things (IoT) Thrust, Hong Kong University of Science and Technology (Guangzhou). He received his Ph.D. degree in Mechanical Engineering from the University of Auckland. Before joining HKUST(GZ), he worked as a Research Fellow at Nanyang Technological University. His research interests include energy harvesting, acoustic-elastic metamaterials, and intelligent material structures & systems. Dr. Hu has published over 100 peer-reviewed technical papers in prestigious journals and international conferences. He received the Best Paper Finalist Award at the SPIE Conference on Smart Structures/NDE 2018. He has filed four patents, including one Singapore and three Chinese patents. According to Google Scholar statistics, his publications have received over 2800 citations with an H-index of 30. He serves as reviewer for more than 60 SCI journals and guest editor for 5 SCI journals.



Lihua Tang
Assistant Professor
The University of Auckland
Auckland, Auckland, New Zealand

Biography: Lihua Tang is currently an Associate Professor in the Department of Mechanical and Mechatronics Engineering, the University of Auckland, New Zealand. He received his BEng in engineering mechanics and MEng in solid mechanics from Shanghai Jiao Tong University, China, in 2005 and 2008, respectively, and Ph.D. in structures and mechanics from Nanyang Technological University, Singapore, in 2012. His main research interests include smart materials and structures, energy harvesting, vibration control, mechanical/acoustic metamaterials, origami dynamics and thermoacoustics. He has authored/co-authored over 250 journal articles and conference papers with over 10,000 citations and an h-index 56 (Google Scholar). His research has been supported by various funds including prestigious Marsden grants from the Royal Society of New Zealand. He is currently an Associate Editor of *Journal of Intelligent Material Systems and Structures*.



Yincheng Shen
The University of Auckland
Auckland, Auckland, New Zealand

Biography: Yincheng Shen is a Master's graduate in Mechatronics Engineering from the University of Auckland, New Zealand, where he also earned his Bachelor's Honours degree in the same field. His studies spanned mechanical design, electronics, and software, with a strong focus on embedded systems. Yincheng is committed to integrating hardware and software to create innovative engineering solutions.

Yulin Zhan
Professor
Southwest Jiaotong University
Chengdu, Sichuan Province, China

Biography: Yulin Zhan is currently a professor at the School of Civil Engineering, Southwest Jiaotong University, China. He obtained his Bachelor's degree in Civil Engineering and Ph.D. in Bridge and Tunnel Engineering from Southwest Jiaotong University in 2002 and 2007, respectively. His main research interests include concrete and steel-concrete composite bridges, high-performance composite materials, sustainable construction materials, and seismic disaster prevention in mountainous area bridges. He has authored/co-authored over 100 journal articles and conference papers and published 4 monographs. His research is supported by various funds, including the National Natural Science Foundation of China. He currently serves as a young editor for journals such as *Journal of Transportation Engineering* and *Railway Science and Engineering Journal*, and is a reviewer for journals such as *Journal of Bridge Engineering*, *Engineering Structures*, *Structures*, *China Journal of Highway and Transport*, *Journal of Southwest Jiaotong University*, and *Journal of Chang'an University*, and *Building Structure*.

Kean Chin Aw
Professor
The University of Auckland
Auckland, Auckland, New Zealand

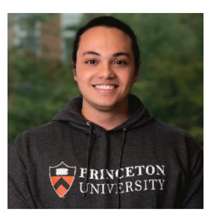
Biography: Kean Chin Aw received Engineering Council (UK) in electrical and electronics engineering from Tunku Abdul Rahman College, Kuala Lumpur, Malaysia, in 1986; the M.Sc. degree in advanced manufacturing systems from Brunel University, London, U.K., in 1998; and the Ph.D. degree in applied physics from the University of Science, Penang, Malaysia, in 2002. He has been a Professor at the Department of Mechanical and Mechatronics Engineering, the University of Auckland, New Zealand, since 2023. Prior to his academic position, he was at Intel, Altera, and Navman for a total of 11 years. His main interests are in microsystems and deployment of smart/functional materials and structures such as conducting polymers, metallic oxides, etc., as sensors and actuators in various applications such as biosensors, medical/rehabilitation robots, micropumps, micromanipulators, MEMS, energy harvester, etc. He has more than 250 refereed publications.

BIOINSPIRED SMART MATERIALS AND SYSTEMS TECHNICAL COMMITTEE 2024 BEST PAPER AWARD

Authors: Diaa Zekry, Taewoo Nam, Rikin Gupta, Yufei Zhu, and Aimy Wissa

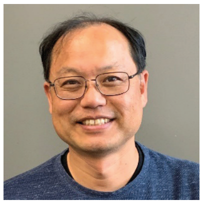
Paper Title: *Covert-Inspired Flaps: An Experimental Study to Understand the Interactions Between Upperwing and Underwing Covert Feathers*

Abstract: Birds are agile flyers that can maintain flight at high angles of attack (AoA). Such maneuverability is partially enabled by the articulation of wing feathers. Coverts are one of the feather systems that has been observed to deploy simultaneously on both the upper and lower wing sides during flight. This study uses a feather-inspired flap system to investigate the effect of upper and lower side coverts on the aerodynamic forces and moments, as well as to examine the interactions between both types of flaps. Results from wind tunnel experiments show that the covert-inspired flaps can modulate lift, drag, and pitching moment. Moreover, simultaneously deflecting covert-inspired flaps on the upper and lower sides of the airfoil exhibit larger force and moment modulation ranges compared to a single-sided flap alone. Data-driven models indicate significant interactions between the upper and lower side flaps, especially during the pre-stall regime for the lift and drag response. The findings from this study also are biologically relevant to the observations of covert feathers deployment during bird flight. Thus, the methods and results summarized here can be used to formulate new hypotheses about the coverts role in bird flight and to develop a framework to design covert-inspired flow and flight control devices for engineered vehicles.



Diaa Zekry
Ph.D. Candidate in Mechanical and Aerospace Engineering
Princeton University
Princeton, NJ

Biography: Diaa Zekry is a Ph.D. candidate in Mechanical and Aerospace Engineering at Princeton University. With a distinguished academic background, he holds an M.A. from Princeton and a B.S. in Aerospace Engineering from Zewail City University of Science and Technology, graduating summa cum laude. His research focuses on bio-inspired flight control aerodynamics, particularly studying covert flaps for flight control. As a Graduate Research Assistant at Princeton's BAM Lab, Diaa has made significant contributions to aerodynamics research, mentored students, and published in top-tier journals. Diaa's practical experience includes an internship at Toyota Research Institute of North America, where he developed aerodynamic models for an energy-harvesting kite.

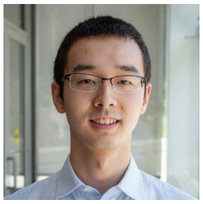


Taewoo Nam
Senior Research Manager
Toyota Research Institute of North America
Ann Arbor, MI

Biography: Taewoo Nam is a senior research manager at the Toyota Research Institute of North America, leading the High-Altitude Aerial Platform study. Previously, he worked at Georgia Tech's Aerospace Systems Design Laboratory, focusing on multi-disciplinary design optimization and probabilistic design for advanced aircraft, including Boeing's SUGAR and NASA's Truss-braced wing concept. Nam also contributed to the ICAO CO2 emissions standard with CAEP Working Group 3. He spent seven years at Korea Aerospace Industries working on the T-50 supersonic trainer and Korean Next Generation Fighter (KFX) programs. Nam holds a Bachelor's and Master's in Aerospace Engineering from Seoul National University and a Doctorate from Georgia Tech.

Rikin Gupta
Sr. Engineer
Supernal
Irvine, CA

Biography: Dr. Rikin Gupta holds a Ph.D. in Aerospace Engineering from Virginia Tech and currently serves as an Aeroelastics and Loads Sr. Engineer at Supernal in Irvine, CA. Prior to this, he led the loads and aeroelastic team at Aurora Flight Sciences, where he played a pivotal role in the DARPA X-65 and DARPA Liberty Lifter programs, focusing on tool development, analysis, and airworthiness criteria. At the Toyota Research Institute of North America in Ann Arbor, Michigan, he contributed to the development of flight dynamics, control models, aeroelastic analysis, and wind tunnel flutter testing of inflatable wings for the high-altitude aerial platform project.



Yufei Zhu
Research Engineer
Toyota Research Institute of North America
Ann Arbor, MI

Biography: Yufei Zhu is a member of the Mothership development group at the Toyota Research Institute of North America based in Ann Arbor, Michigan. Yufei is experienced in the fields of autonomous robots and vehicles operating in space, air, and ground domains, including dynamics, control, planning, navigation, and optimization. Yufei has been focused on developing the flight control system of mothership for autonomous airborne wind energy harvesting since he joined Toyota in June 2020. Yufei is also experienced in the development of innovative sensors and actuators using smart materials such as Shape Memory Alloy (SMA), Dielectric Elastomer (DE), etc.

Aimy Wissa
Assistant Professor
Princeton University
Princeton, NJ

Biography: Professor Aimy Wissa joined the Mechanical and Aerospace Engineering Department at Princeton University as an Assistant Professor in January 2022. She is the director of the Bio-inspired Adaptive Morphology (BAM) Lab. Wissa was a post-doctoral fellow at Stanford University, and she earned her doctoral degree in Aerospace Engineering from the University of Maryland in 2014. Wissa's work focuses on the modeling and experimental evaluation of dynamic and adaptive bioinspired structures and systems, such as avian-inspired and insect-inspired wings and robotic systems with multiple modes of locomotion. Wissa is a McNair Scholar. She has received numerous awards, including the Air Force Office of Scientific Research Young Investigator and NSF's CAREER awards.

ACTIVE MATERIAL TECHNOLOGIES AND INTEGRATED SYSTEMS TECHNICAL COMMITTEE 2024 OUTSTANDING CONTRIBUTION AWARD

Awarded to: Maria Sakovsky

Authors: Rosette Maria Bichara, Joseph Costantine, Youssef Tawk, and Maria Sakovsky

Paper Title: *A Multi-Stable Deployable Quadrifilar Helix Antenna with Radiation Reconfigurability for Disaster-Prone Areas*

Abstract:
In disaster-prone areas, damaged infrastructure requires impromptu communications leveraging lightweight and adaptive antennas. Accordingly, we introduce a bi-stable deployable quadrifilar helix antenna that passively reconfigures its radiation characteristics in terms of pattern and polarization. The proposed structure is composed of counter-rotating helical strips, connected by rotational joints to allow a simultaneous change in the helix height and radius. Each helical strip is composed of a fiber-reinforced composite material to achieve two stable deployed states that are self-locking. The reconfiguration between an almost omnidirectional pattern and a circularly polarized directive pattern enables the antenna to be suitable for both terrestrial and satellite communication within the L-band. More specifically, the presented design in infrastructure-less areas achieves satellite localization with directive circularly polarized waves and point-to-point terrestrial connectivity with an almost omnidirectional state. Hence, we present a portable, agile, and passively reconfigured antenna solution for low-infrastructure areas.

Rosette Maria Bichara
Ph.D. Candidate
American University of Beirut
Beirut, Lebanon

Biography: Rosette Maria Bichara is a Ph.D. candidate at the Electrical and Computer Engineering Department of the American University of Beirut (AUB) and a recipient of the IEEE Antennas and Propagation Doctoral Fellowship award. She is an active doctoral student researcher in the EMpact lab, which is a lab specializing in Electromagnetics, Antennas, and RF Circuits. Her research interests include miniaturized antenna design, deployable antenna design, and bi-stable structures. Her master's degree also was completed in the EMpact lab where she worked on using machine learning algorithms for the generation and optimization of miniature antennas for IoT devices. She was a teaching assistant for multiple undergraduate and graduate RF courses. She has eight published conference and journal papers.

Joseph Costantine
Professor
American University of Beirut
Beirut, Lebanon

Biography: Joseph Costantine is a Professor and the Associate Chairperson of the Electrical and Computer Engineering Department as well as the director of the Qatar Scholarship-Education Above All program at the American University of Beirut. Dr. Costantine is also a World Economic Forum young scientist since 2020. He received his doctorate from the University of New Mexico in 2009, his master's (M.E.) degree from the American University of Beirut, and his bachelor's degree from the second branch of the faculty of engineering at the Lebanese University. He has 13 Provisional and Full U.S. patents. He has published so far two books, two book chapters, and more than 180 Journal and conference papers. His research interests reside in reconfigurable antennas, cognitive radio, RF energy harvesting systems, antennas and rectennas for IoT devices, RF systems for biomedical devices, wireless characterization of dielectric material, and deployable antennas for small satellites.

Youssef Tawk
Associate Professor
American University of Beirut
Beirut, Lebanon

Biography: Youssef Tawk is an Associate Professor in the electrical and computer engineering department at the American University of Beirut, Lebanon. Dr. Tawk received a Ph.D. degree from the University of New Mexico, Albuquerque, NM, USA, in 2011, a master's degree in electrical and computer engineering from the American University of Beirut in 2007, and a Bachelor of Engineering degree with the highest distinction from Notre Dame University, Lebanon in 2006. He has more than 180 IEEE journals and conference papers. He is the co-author of two books and two book chapters, and coinventor of 10 provisional and full U.S. patents. His research interests include antennas and modern communication systems for IoT, 5G and beyond, reconfigurable antennas and RF systems for microwave and millimeter-wave applications, cognitive radio, optically controlled antennas and RF components, phased antennas arrays, and reconfigurable phase shifters based on advanced additive manufacturing techniques.

Maria Sakovsky
Assistant Professor
Stanford University
Stanford, CA

Biography: Maria Sakovsky is an Assistant Professor in the department of Aeronautics and Astronautics at Stanford University. She received her B.S.c in Aerospace Engineering from the University of Toronto. Following this, she completed her M.Sc. and Ph.D. 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 Ph.D., she was awarded the ETH Zürich postdoctoral fellowship to investigate reconfigurable antennas based on mechanical metamaterials. Her work focuses on the use of shape adaptation to realize space structures with reconfigurable geometry, stiffness, and even non-mechanical performance. Particular focus is on the mechanics of thin fiber reinforced composite structures, the interplay between composite material properties and structural geometry, and embedded functionality and actuation of lightweight structures.

ACTIVE AND MULTIFUNCTIONAL MATERIALS TECHNICAL COMMITTEE 2024 OUTSTANDING CONTRIBUTION AWARD

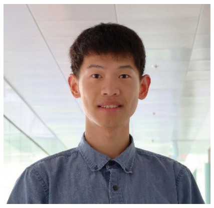
Authors: Ruowen Tu and Henry A. Sodano

Paper Title: *Highly Stretchable Printed Poly (Vinylidene Fluoride) Sensors Through the Formation of a Continuous Elastomer Phase*

Abstract: Stretchable piezoelectric stress/strain sensing materials have attracted substantial research interest in the fields of wearable health monitoring, motion capturing, and soft robotics. These sensors require operation under dynamic loading conditions with high strain range, changing strain/loading rates, and varying pre-stretch states, which are challenging conditions for existing sensors to produce reliable measurements. To overcome these challenges, an intrinsically stretchable poly(vinylidene fluoride) (PVDF) sensor is developed through the polymer blending of PVDF and acrylonitrile butadiene rubber (NBR). Through precipitation printing and vulcanization, the resulting PVDF/NBR blends exhibit strong β phase PVDF and a blend morphology with submicron-level phase separation, but also strains up to 544%. Both the blend morphology and the mechanical properties indicate that this PVDF/NBR blend can be considered as a continuous elastomer phase above micron scale. After electric poling and adding electrodes, the PVDF/NBR blends have excellent piezoelectric properties to be used as both stretching mode strain sensors and compression mode stress/force sensors. The stretching mode sensors can measure strain up to 70% without strain rate and pre-stretch dependence, while the compression mode sensors have a loading-rate-independent linear voltage–stress relationship up to 4.8 MPa stress and a negligible pre-stretch dependence. Therefore, the PVDF/NBR sensors can provide accurate and reliable stress/strain measurements when attached to soft structures, which paves the way for sensing and calibration of soft robots under dynamic loading conditions.

Henry A. Sodano
Professor Aerospace Engineering Department
Macromolecular Science and Engineering
University of Michigan
Ann Arbor, MI

Biography: Dr. Sodano is a Professor in the Aerospace Engineering Department at the University of Michigan with an appointment in Macromolecular Science and Engineering and the CEO of Trimer Technologies. His research lies in advanced materials with focus on composite materials, multifunctional materials, additive manufacturing, ceramics and nanotechnology. He received his Ph.D. in Mechanical Engineering from Virginia Tech in 2005, his M.S. in 2003, and his B.S in 2002 also from Virginia Tech. He has published 300 technical articles receiving over 21,500 citation and five best paper awards. He was received the NSF CAREER award, the ASC Young Researcher Award, the ASME Gary Anderson Award, Virginia Tech's Outstanding Recent Alumni Award, ASU's Faculty Achievement Award in Research Excellence, two NASA Tech Brief Awards, and was inducted into Virginia Tech's Academy of Engineering Excellence. He is a Fellow of ASME and SPIE and an Associate Fellow of AIAA.



Ruowen Tu
University of Michigan
Ann Arbor, MI

Biography: Ruowen Tu received his Ph.D. in aerospace engineering from the University of Michigan, USA, in 2024. He earned dual B.S. degrees in mechanical engineering from Shanghai Jiao Tong University, China, and aerospace engineering from the University of Michigan, USA, both in 2019. His research focuses on additive manufacturing and 3D printing of advanced polymers and piezoelectric materials. He aso has contributed to the biomechanical study of birds by developing multifunctional artificial feathers. For the next step, he will be joining the Istituto Italiano di Tecnologia as a postdoctoral researcher.

ADAPTIVE SYSTEMS, DYNAMICS, AND CONTROLS TECHNICAL COMMITTEE 2024 BEST PAPER AWARD

Authors: Rachael Granberry, Megan Clarke, Robert Pettys-Baker, Heidi Woelfle, Crystal Compton, Amy Ross, Kirstyn Johnson, Santo Padula II, Surbhi Shah, Julianna Abel, and Brad Holschuh

Paper Title: *Dynamic, Tunable, and Conformal Wearable Compression Using Active Textiles*

Abstract: New medical compression technologies that are simultaneously low-profile, facile to don, and dynamic—applying medical compression only when needed—can expand the use of wearable compression, increase patient compliance, and lead to better medical outcomes. Dynamic and conformal wearable compression devices are presented that can be donned in a low-stiffness state and transition into a high-stiffness and, consequently, high-compression state, on-demand. These devices are enabled by active textiles developed from custom NiTi filaments that remain inactive at room temperature and accomplish actuation proximal to the human body surface. Further, these compression devices exploit NiTi material hysteresis to sustain a high-compression state post-heating and upon equilibrium with the body surface temperature for thermally-comfortable, on-body performance. Two case study examples—1) a consumer medical compression device and 2) a custom astronaut compression device—demonstrate the generalizability and flexibility of the engineering and design methods to develop a range of dynamic, tunable, and conformal compression devices with different goals and requirements. Further, this work demonstrates a roadmap for developing wearable systems that can accommodate a range of users without sacrificing system performance. This research opens doors for new NiTi-based medical and consumer applications that interface with the body surface.

Rachael Granberry
NASA Space Technology Research Fellow
University of Minnesota
St Paul, MS

Biography: Rachael has a Ph.D. in Design with a minor in Mechanical Engineering from the University of Minnesota, specializing in the mechanical design of shape-changing textiles and garments and their relationship with the human body. Her

Ph.D. research focused on developing dynamic compression garments for astronautic and consumer medical applications through a NASA Space Technology Research Fellowship. Before graduate school, she worked at the Wyss Institute at Harvard University in a wearable robotics lab, developing textile-based physical interfaces for passive and active wearable assistive and rehabilitative devices. Currently, Rachael is a Research Scientist at Meta's Reality Labs Research, contributing to the development of haptic gloves and EMG wrist-based wearables for the future of interaction in augmented and virtual reality.

Megan Clarke
Graduate Student Researcher
University of Minnesota
St. Paul, MN

Biography: Megan Carke is a design researcher situated at the intersections of wearable technology and functional apparel design. They hold a Bachelor's of Science in apparel design and Master's of Science in apparel studies from the University of Minnesota - Twin Cities where they were a member of the Wearable Technology Lab. Megan's research interests are centered in textile and garment-based sensing grounded in human-centered design principles, wearability, and interdisciplinary research. Their thesis work explored the feasibility of stitched respiration sensors and chest-mounted pulse oximetry sensing for garment-based respiratory health monitoring supported by the National Science Foundation as a Graduate Research Fellowship Program recipient (2021). Previous work includes soft robotic medical device design, soft goods development for wearable technology studies, and design for wearability. Megan currently works as a product design consultant based out of Minneapolis, MN.

Robert Pettys-Baker
Graduate Student Researcher
University of Minnesota
St. Paul, M

Biography: Dr. Robert Pettys-Baker is a recent Ph.D. graduate from the University of Minnesota's Human Factors and Ergonomics program. He previously received a B.S. in Apparel Design and M.S. in Apparel Studies from the University of Minnesota. His research focuses on the intersection of fashion, technology, and user experience, with an emphasis on creating devices that consider both the functional and psychological/emotional impact on users. Robert is joining Kent State University in Fall 2024 as an assistant professor in the Fashion Design and Merchandising program. Before this Robert was a long-time member of the University of Minnesota's Wearable Technology lab working on novel soft robotic technologies ranging from wearable haptics to medical devices. He is also a recipient of the University of Minnesota's Doctoral Dissertation Fellowship (2023–2024).

Heidi Woelfle
Lab Manager
University of Minnesota
St. Paul, MN

Biography: Heidi Woelfle is a researcher in the Wearable Technology Lab at the University of Minnesota—Twin Cities. She has a Bachelor of Science degree in Apparel Design with minors in Environmental Science and Product Design. Her research interests include garment-based wearable technologies and sustainable fashion. She has worked on projects relating to the design of exoskeletons, active heating wearables, and active compression garments.

Crystal Compton
Graduate Student Researcher
University of Minnesota
St. Paul, MN

Biography: Crystal has a Ph.D. and M.S. in Design – Product Development with a minor in Human Factors and Ergonomics from the University of Minnesota, where she also worked in the Wearable Technology Lab. Her Ph.D. research focused on the development and characterization of wearable textile-based sensing to better understand the relationship between the human body and an enclosed wearable system (space suit), supported by NASA's Anthropometry and Biomechanics Facility. Previously, she has worked at Tactile Medical developing at-home therapy garments for patients with lymphedema and Microsoft Research and Xbox Devices Team on the advancement of e-textile and wearable technology products. Currently, she is a Sr. Mechanical (Soft Systems/Textile) Engineer at Flex's Austin Innovation Center (AIC) working on research and development of wearable technology, e-textiles, and soft robotics.

Amy Ross
Space Suite Pressure Garment Technology Development Lead
NASA
Houston, TX

Biography: Amy Ross graduated in 2006 from the University of North Dakota with a Masters in Space Studies, 1996 from Purdue University with a Masters in Mechanical Engineering, and 1994 from Purdue University with a Bachelor's in Mechanical Engineering. She works at Johnson Space Center on a NASA HQ team in the Exploration Systems Development Mission Directorate in the Strategy and Architecture Office where she is the Mars Architecture Team surface systems lead. Amy has served as a space suit engineer and Space Suit Pressure Garment Technical Discipline Lead in the previous 28 years. Other interesting job-related experiences include suit qualification in the Neutral Buoyancy Laboratory; flying on the KC-135/DC-9 Reduced Gravity Aircraft ('Vomit Comet') where she experienced zero, Lunar, and Mars gravities; Space Shuttle Launch pad emergency egress training; experience in 12 different space suit configurations; and suited subject for the first simulated lunar gravity run in the NBL.

Kirstyn Johnson
Deputy Team Lead and Project Engineer
NASA
Houston, TX

Biography: I'm highly motivated to help push towards a future manned mission to Mars and beyond! My interests lie in Systems Engineering and Project Management, helping set a project vision and providing drive to a team to meet milestones and reduce project risk through task and schedule management.

Santo Padula II
Materials Research Engineer
NASA Glenn Research Center
Cleveland, OH

Biography: Dr. Santo Padula II received his Ph.D. in Materials Science and Engineering from Michigan Technological University and has worked full-time at the NASA Glenn Research Center for over 24 years. Dr. Padula has focused his career on developing new materials and test techniques to support advanced material development and has conducted research activities in a broad range of areas including fatigue of superalloys, impact behavior of lattice block structures and metallic foam concepts, and mechanical response of high temperature shape memory alloys and devices. His forte has been on incorporating novel measurement techniques to permit the determination of data under complicated thermomechanical loading conditions. His advancements in this area have contributed to the development of one-of-a-kind constitutive models for new materials with unusual behaviors.

Surbhi Shah
Consultant & Assistant Professor
Mayo Clinic Cancer Center
Phoenix, AZ

Biography: Dr. Shah is a clinician, researcher, and educator with a focus on classical hematological disorders. She treats a broad variety of non-malignant hematological conditions, with special interest in rare diseases and inherited/acquired thrombotic disorders. She is actively engaged in implementation health research with a focus on quality and minimizing clinical practice variability, particularly for thrombotic complications in high-risk patient populations such as cancer, organ transplant, antiphospholipid antibody syndrome, etc. She also is very engaged in teaching and mentoring medical students, residents, and fellows on day-to-day basis.

Julianna Abel
Associate Professor
University of Minnesota
Minneapolis, MN

Biography: Dr. Julianna Abel is a Benjamin Mayhugh Associate Professor in the Department of Mechanical Engineering at the University of Minnesota. Dr. Abel earned her Ph.D. and M.S. in Mechanical Engineering from the University of Michigan and her B.S. from the University of Cincinnati. She is an NSF CAREER Award recipient, McKnight Land Grant Professor, Toyota Programmable Systems Innovation Fellow, Glenn Research Center Faculty Fellow, and the Charles E. Bowers Faculty Teaching Award Recipient. Her research combines innovative design processes and advanced manufacturing techniques with material and structural modeling to lay the scientific foundation necessary for the design of multifunctional yarns and textiles.

Brad Holschuh
Associate Professor
University of Minnesota
St. Paul, MN

Biography: Dr. Brad Holschuh is an Associate Professor of UX Design at the University of Minnesota, where he serves as Co-Director of the Wearable Technology Laboratory (WTL) and Director of Graduate Studies for the Human Factors and Ergonomics (HFE) graduate program. Since 2022, Dr. Holschuh also holds the title of UMN Distinguished University Teaching Professor and is a member of the UMN Academy of Distinguished Teachers. He earned his B.S. ('07), dual M.S. ('10), and Ph.D. ('14) degrees from MIT, where as a NASA Space Technology Research Fellow (NSTRF) in the Man-Vehicle Laboratory (MVL) he researched advanced materials for next generation space suits. At UMN, Dr. Holschuh's research focuses on the use of wearable technology to improve human performance both in space and on Earth, with a specific focus on integrating active materials technology into wearable systems.

All Technical Presentations Can Be Found in the Conference Application (App).

Authors Index

Author Last Name	Authors First Name	"Submission Code"	Submission Name	Assigned to Session	Scheduled
Aamir	Muhammad Fasih	139926	Frequency Dependent Dielectric Properties of Mn-Co Co-Doped Nio and Modulus Study of (Zn)x/CuTl-1223 Nanoparticles Composites	SYMP 1-6: Multifunctional Composites	Tuesday, September 10
Abdalla	Osama	141025	Biocompatible Energy Harvester for Smart Knee Implants	SYMP 6-2: Energy Harvesting and Wave Dynamics	Monday, September 9
Albakri	Mohammad	140436	Electromechanical Impedance-Based Defect Detection in Additively Manufactured Metal Parts in the Green State	SYMP 5-6: SHM for Additive Manufacturing	Wednesday, September 11
Ali	Fawad	140347	Smart Material Optimization: Exploring the Influence of Experimental Parameters on PVDF Crystalline Structure	SYMP 1-5: Piezoelectric Materials	Tuesday, September 10
Ameduri	Salvatore	140207	Piezoelectric Transducers, Coating and Ice Accretion Geometry: A Study on Their Influence on the Effectiveness of an Ultrasonic Ice Protection System	SYMP 4-3: Adaptive Aerospace Systems	Monday, September 9
Ameduri	Salvatore	138288	Morphing in Aerospace: How Are We Doing?	SYMP 4-1: Morphing Aerospace	Monday, September 9
Anasori	Babak	148764	2D MXenes, Their Assemblies, and Interface Engineering for Multifunctional Structures and Composites	SYMP 1-4: Functional Nanomaterials	Monday, September 9
Andrews	Michaela	140374	Impact of Yarn Geometry and Programming on Thermo-Mechanical Performance of Shape Memory Polymer Yarns	SYMP 2-4: Structure and Performance of Shape Memory Polymer Actuators	Tuesday, September 10
Anekal	Pranay	141231	Computational Investigation of Strain and Damage Sensing of CNT-Based Polymer Bonded Energetics Using a Hierarchical Multiscale Approach	SYMP 5-4: Fusion of Computation and Sensing for SHM	Tuesday, September 10
Armendarez	Nicholas	140361	Brain Inspired Heterogeneous Reservoir Computing With Ion Channel-Based Memristors	SYMP 6-10: Reservoir Computing and Control	Wednesday, September 11
Arrieta	Andres	141250	Embodied Tactile Sensing and Object Classification From Mechanics	SYMP S-1: Integrated Systems	Monday, September 9
Arrieta	Andres	141077	Augmenting Mechanical Storage and Computing via Viscoelastic Multistable Structures	SYMP S-2: Computing Meta-Materials I	Monday, September 9
Bailey	Abigail	140316	Flexible Matrix Composite Wafers in Smart Prosthetic Sockets for Improved Socket Comfort and Fit	SYMP 6-5: Prosthetics and Implants	Tuesday, September 10
Baltes	Matthias	140153	A Novel Tactile Feedback Wristband Based on a Dielectric Elastomer	SYMP 4-5: Dielectric Elastomer Technologies	Tuesday, September 10
Baltes	Matthias	140331	Resonance-Optimized Dielectric Pump Demonstrator With Self-Sensed Based Pressure Feedback	SYMP 4-5: Dielectric Elastomer Technologies	Tuesday, September 10
Beals	Matthew David	140421	Data Driven 1D – Dispersion Estimation in Hydraulic Fluid Media	SYMP 2-4: Structure and Performance of Shape Memory Polymer Actuators	Tuesday, September 10
Bell	Marquise D.	141123	Thermal Energy Harvesting of Body Heat to Power Pneumatic Wearables	SYMP 7-2: Heat and Triboelectric Energy Harvesting	Tuesday, September 10
Belsher	Aidan	140156	Temperature-Dependent Acoustic Properties of Magnetostrictive Iron-Gallium Alloys	SYMP 2-5: Performance of Magneto- and Electro-Responsive Energetic, Alloy, and Composite Materials	Tuesday, September 10
Bergen	Christian	140391	Comparison of Coupled and Nonlinear Magnetoactive Elastomer Topology Optimization Formulations	SYMP 2-1: Magneto-Responsive Materials Modeling, Optimization, and Performance	Monday, September 9
Bevilacqua	Domenico	139592	Neural Network-Based Sensorless Control of a Shape Memory Alloy Actuator	SYMP 3-5: Actuator Systems	Tuesday, September 10

Bevilacqua	Domenico	140296	Aerodynamics Experimental Results of a Bio-Inspired Flapping Wing With Sma Micro-Wire Muscles and Resonant Compliant Joints	SYMP 6-6: Morphing Wings	Tuesday, September 10
Bhamia	Saad	149997	The Blob: Topologically Entangled Living Matter	SYMP 6-8: Biomimetic Materials and Living Systems	Wednesday, September 11
Bielefeldt	Brent	140159	Toward 3-D Offline Multiscale Topology Optimization Using Radial Basis Interpolation Constraint Functions	SYMP 4-2: Design of Adaptive Structures	Monday, September 9
Bielefeldt	Brent	140164	Enabling Adaptive Skin Design Using Infilled Compliant Arrays	SYMP 4-2: Design of Adaptive Structures	Monday, September 9
Bordiga	Giovanni	140025	Mechanical Metamaterial "Brain" for Fully Analog Control of a Mobile Robot	SYMP S-5: Mechano-Intelligent Robots	Tuesday, September 10
Boren	Blake	141430	Smart Adaptive Structures for Wave Energy Conversion	SYMP 7-3: Hydrokinetic Energy Harvesting	Tuesday, September 10
Brown	Austin	140185	Development of a Continuous Cable Tensegrity	SYMP 3-3: Advancements in Tensegrity	Monday, September 9
Burger	Anna	140438	Morphing Structures for Supersonic Acoustic Mitigation	SYMP 3-1: Morphing and Dynamic Structures	Monday, September 9
Buskohl	Philip	141014	Spectral Analysis of Mechanical Reservoir Computing With ReLU Spring Networks	SYMP S-6: Reservoir Computing & Nonlinear Dynamics	Tuesday, September 10
Cai	Bowen	139559	Wavenumber Analysis-Based Mechanical Property Characterization for Additively Manufactured Thermoset Composites	SYMP 5-6: SHM for Additive Manufacturing	Wednesday, September 11
Caltagirone	Peter	139843	Shape Memory Materials Handbook: A Guide for Developing and Designing With Shape Memory Alloys, Superelastic Alloys, Magnetic Alloys, Ceramics, and Polymers	SYMP 1-10: Shape Memory Alloys	Wednesday, September 11
Carvajal	Mario	140473	Multifractal Analysis of Physical Reservoir Computer Structures	SYMP S-6: Reservoir Computing & Nonlinear Dynamics	Tuesday, September 10
Cassagne	Adrien	141028	In-Phase/Out-of-Phase Thermomechanical Loading in High Temperature Shape Memory Alloys	SYMP 2-3: Investigations of Shape Memory Alloy Performance	Monday, September 9
Chahari	Mahmood	140990	Towards Load Imbalance Detection for Instrumented Knee Implants Using Quadrant Triboelectric Harvesters	SYMP 6-5: Prosthetics and Implants	Tuesday, September 10
Chawla Khiani	Rashmi	140660	Damage Prediction of Highly Porous Ultra-High Temperature Ceramics for Hypersonic Applications Using Material Point Method	SYMP 1-6: Multifunctional Composites	Tuesday, September 10
Chen	Kai Jun	140104	A Physical Learning Algorithm for Stiffness Adaptation Control in Lattice Structures	SYMP S-3: Computing Meta-Materials II	Monday, September 9
Chew	Enquan	139978	Shape Reconstruction of Highly Multi-Stable Structures From In Situ State Sensing	SYMP 4-7: Multi-Stable Smart Systems	Wednesday, September 11
Collet	Manuel	140546	Towards the Programming of Nonlinear Actuators: The Example of the Nonlinear Electroacoustic Resonator	SYMP 3-4: Programming and Modeling	Tuesday, September 10
Cooper	Sophia	148117	A Microstructural and Phase Evolution Study on Niti-Based High Temperature Shape Memory Alloys	SYMP 1-9: Functional Structures	Wednesday, September 11
De Silva	W. Ushara	140255	Experimental Investigation Into Particle Dynamics Induced by Steady-State Structure-Borne Traveling Waves	SYMP 6-2: Energy Harvesting and Wave Dynamics	Monday, September 9
Deng	Bolei	140641	Next-Generation Exploratory Robots Through Physical Intelligence	SYMP S-5: Mechano-Intelligent Robots	Tuesday, September 10
Denning	Harrison	140381	Tuning Tensegrity: Simplified Construction and Cable Tension Interactions	SYMP 3-3: Advancements in Tensegrity	Monday, September 9
Desai	Shubham	140211	Experimental Studies on Enhancing Piezoelectric Coupling Using Nonlocal Interactions	SYMP 7-1: Energy Harvesting With Metamaterials	Monday, September 9

Dickey	Michael	137649	Tactile Logic Using Soft Elastomers and Liquid Metals	SYMP S-4: Soft & Intelligent Matter	Tuesday, September 10
Dong	Lin	148306	Design of Textured Piezoelectric Nanofibers With a Balanced Performance	SYMP 1-5: Piezoelectric Materials	Tuesday, September 10
Dong	Lin	148442	Smart Human-Machine Interface for Prosthetic Control	SYMP 6-5: Prosthetics and Implants	Tuesday, September 10
Dorin	Patrick	139219	Wave-Based Mechanical Computing Utilizing Multimodal Topological Corner States	SYMP S-3: Computing Meta-Materials II	Monday, September 9
Dupont	Joshua	139348	Bandwidth Enhancement Leveraging a Programmable Time Modulated Piezoelectric Metasurface	SYMP 3-4: Programming and Modeling	Tuesday, September 10
Dura	Hari Bahadur	140096	Exploring the Tunability of Flexural Properties in a Composite Beam, Inspired by the Biomechanics of Fish Scales	SYMP 6-7: Bioinspired Morphing Structures	Tuesday, September 10
Dutta	Ankan	140233	Swept Volume Performance Optimization of 3D-Printed Micrometer-Scale Magnetic Artificial Cilia	SYMP 2-1: Magneto-Responsive Materials Modeling, Optimization, and Performance	Monday, September 9
Dutta	Shammo	148720	Bioinspired Design Optimization for Mechanical Metamaterials	SYMP 6-9: Bioinspired Design	Wednesday, September 11
Earnhardt	Allison	148470	Effect of Actuator Stroke and Dynamics on the Bioinspired Locomotion of a Single and Multi-Robot System	SYMP 6-9: Bioinspired Design	Wednesday, September 11
El Khatib	Omar	140214	A Phase-Field Framework Capturing Rate-Independent Dissipation in the Hysteretic Behavior of Shape Memory Alloys	SYMP 2-2: Modeling and Experimental Investigations of Shape Memory Alloy Performance	Monday, September 9
Elahinia	Mohammad	147860	Exploring Elastocaloric Effect in Additively Manufactured NiTi Shape Memory Alloys	SYMP 1-10: Shape Memory Alloys	Wednesday, September 11
Erturk	Alper	140479	Piezoelectric Structures With Nonlinear Synthetic Impedance Shunts, Machine Learning-Based Simulations, and Experimental Validations	SYMP 3-4: Programming and Modeling	Tuesday, September 10
Erturk	Alper	140505	Leveraging Rainbow and Acoustic Black Hole Concepts in Piezoelectric Energy Harvesting From Metamaterials	SYMP 7-4: Energy Harvesting - Invited Talk	Wednesday, September 11
Farahani	Mohammad Reza	140501	Optimization of NiTi Microfilament Yarns	SYMP 3-5: Actuator Systems	Tuesday, September 10
Fontana	Marco	141359	Dynamic Response of Zipping Gap Electrostatic Actuators	SYMP 3-5: Actuator Systems	Tuesday, September 10
Gao	Yicong	138584	Effect of Structure Parameters of 4D-Printed Actuators on Time-Depend Behavior: Experiment, Modeling, and Design	SYMP 2-4: Structure and Performance of Shape Memory Polymer Actuators	Tuesday, September 10
Geier	Sebastian	140468	Realization and Space-Qualification of a Solar Composite Panel With Integrated Supercapacitors	SYMP 4-6: Vehicle Technologies	Tuesday, September 10
Gosavi	Hrishikesh	140422	Sensitivity Analysis of Tire Modal Characteristics in Unloaded Conditions Relative to Inflation Pressure	SYMP 5-3: SHM for Extreme Load Applications	Monday, September 9
Gosavi	Hrishikesh	139941	Kalimba Inspired Metastructure for Frequency Selectivity	SYMP 6-1: Bioelectronics	Monday, September 9
Gratz-Kelly	Sebastian	139090	A Novel Approach for Optimizing Muscle Activation Level and Localization With Multi-Mode Dea Feedback Capability	SYMP 4-5: Dielectric Elastomer Technologies	Tuesday, September 10
Gupta	Samikhshak	140461	Utilizing Steady-State Traveling Waves in a Quiescent Water Environment for Particle Manipulation	SYMP 3-6: Structural Dynamics	Tuesday, September 10
Hajyalikhani	Poorya	140408	Application of Embedded FBG Sensors for Monitoring the Structural Stability of Residential Timber Buildings Under Hurricane	SYMP 5-1: Optical SHM Technologies	Monday, September 9
Hartl	Darren	140459	Immersive Flight Dynamics Model for Morphing Vehicles	SYMP 3-1: Morphing and Dynamic Structures	Monday, September 9

Hartl	Darren	140402	Shape Memory Alloy Torque Tube Based Thermosyphon for Passive Thermal Control	SYMP 4-8: Shape Memory Alloy Applications	Wednesday, September 11
Harvey	Christina	149923	Avian Morphing for Flight Stability and Control	SYMP 6-6: Morphing Wings	Tuesday, September 10
He	Shan	139435	Nonlinear Effect in Physical Reservoir Computing Using a Mechanical Oscillator	SYMP S-6: Reservoir Computing & Nonlinear Dynamics	Tuesday, September 10
Hess	Isabel	140091	Investigating Hasel Transducers for Underwater Energy Generation	SYMP 7-3: Hydrokinetic Energy Harvesting	Tuesday, September 10
Hill	Jeff	140430	Optimizing Tensegrity Structures for Variable Shock Environments	SYMP 3-3: Advancements in Tensegrity	Monday, September 9
Hofer	Andreas	140040	Systematic Design of Adaptive Connectors Based on Shape Memory Alloys for Electrical Vehicles	SYMP 4-6: Vehicle Technologies	Tuesday, September 10
Hofer	Andreas	140067	Optimizing Force Distribution in Deep Drawing Tools Using SMA High Load Actuators	SYMP 4-8: Shape Memory Alloy Applications	Wednesday, September 11
Johnson	Aliesha	147850	High Performance Triboelectric Nanogenerator With Polyethylene Oxide/Mica Tribo-Positive Composite Material	SYMP 7-2: Heat and Triboelectric Energy Harvesting	Tuesday, September 10
Jumet	Barclay	141322	A Programmable Textile Platform for Haptic Wearables	SYMP S-4: Soft & Intelligent Matter	Tuesday, September 10
Katibeh	Mohammad	139126	Experimental Identification and Validation of Fully Coupled State Space Model for Induced-Strain Actuated Mechanism-Free Ornithopters	SYMP 4-2: Design of Adaptive Structures	Monday, September 9
Khan	Mujibur	139438	Effect of Surface Plasma on Nanofiber and Nanocomposite Membranes	SYMP 1-4: Functional Nanomaterials	Monday, September 9
Kim	Ellen	140057	Experimental Characterization of Deployable Energy Absorbing Smart Wall Based on Tendon Constrained Inflatables	SYMP 4-6: Vehicle Technologies	Tuesday, September 10
Kleinwechter	Felix	139802	Structural Design and Optimization of Piezo-Activated Morphing CFRP Fan Blades	SYMP 4-1: Morphing Aerospace	Monday, September 9
Koohbor	Behrad	139489	3D Printable TPU-MWCNT Composite Filaments With Tunable Electro-Mechanical Properties	SYMP 2-5: Performance of Magneto- and Electro-Responsive Energetic, Alloy, and Composite Materials	Tuesday, September 10
Kriegl	Raphael	139154	Characterization of Tunable Rebound Properties of Micro-Structured Magnetoactive Elastomers	SYMP 2-1: Magneto-Responsive Materials Modeling, Optimization, and Performance	Monday, September 9
Kumar	Parikshith	149922	Existing Challenges and Factors to Consider in the Development of SMA Implantable Medical Devices	SYMP 4-4: Human Integrated Smart Systems	Tuesday, September 10
Künnecke	Sven Christian	139102	Adaptive Shock Control Bump With Shape Memory Alloy Wires on a Morphing Spoiler	SYMP 4-6: Vehicle Technologies	Tuesday, September 10
Leblanc	Bryan	141354	Analytical Modeling and Shape Matching Design Optimization of an N-Cap Lithium-Ion Battery Actuator	SYMP 3-5: Actuator Systems	Tuesday, September 10
Lee	Bo Mi	147950	Enhancing Sensitivity of Hydrogel-Based Resonant Sensors Through Additively Manufactured Porous Structures	SYMP 1-8: Wearables	Wednesday, September 11
Lee	Kyung Jun Paul	140308	Towards Insect-Scale Multi-Modal Robots: The Gliding Aerodynamics and Wing Deployment Kinematics of Schistocerca Americana Grasshoppers	SYMP 6-7: Bioinspired Morphing Structures	Tuesday, September 10
Li	Suyi	139036	Correlating Mechanical Design to Physical Reservoir Computing Performance	SYMP S-6: Reservoir Computing & Nonlinear Dynamics	Tuesday, September 10
Lin	Daphne	140702	A Machine Learning Framework for the Formulation of Magnetoactive-Filled Shape Memory Polymers	SYMP 1-3: Machine Learning for Materials	Monday, September 9
Looper	Keaton	148274	Effects of Process Parameters on the Porosity and Crack Formation of Additively Manufactured Ni-Lean NiTiHf	SYMP 1-9: Functional Structures	Wednesday, September 11

Löps	Paul	147991	A Novel Implicit Integration Scheme for the Thermomechanically Coupled Modeling of Single-Crystalline Shape Memory Alloys Based on an Augmented Lagrangian Formulation	SYMP 2-2: Modeling and Experimental Investigations of Shape Memory Alloy Performance	Monday, September 9
Mabe	Olivia	139877	Variable-Stiffness Power Take-Off System for Broadband Ocean Wave Energy Point Absorbers	SYMP 6-2: Energy Harvesting and Wave Dynamics	Monday, September 9
Mabe	James	148300	Shape Memory Alloys for Variable Frequency Wind Chimes	SYMP 4-8: Shape Memory Alloy Applications	Wednesday, September 11
Mailen	Russell	140423	Mechanical Properties of Self-Folding Polymer Miura Ori	SYMP 1-2: Shape Memory Polymers	Monday, September 9
Mailen	Russell	140416	Self-Folding Shape Memory Polymer Origami Activated by Joule Heating of Embedded Conductive Filaments	SYMP 1-7: Functional Printing	Tuesday, September 10
Malladi	Vijaya V. N. Sriram	140453	Exploring the Relationship Between Cost Function of Hybrid Traveling Waves and Structural Absorption Coefficient Adapted From Acoustics	SYMP 3-6: Structural Dynamics	Tuesday, September 10
Mamman	Rabiu	140165	A Physics-Based Model for the Detachment of Biofilms From a Bioinspired Smart Skin	SYMP 6-8: Biomimetic Materials and Living Systems	Wednesday, September 11
Maraj	Joshua	140161	Interfacing High Resistance Self-Sealing Biomembranes With Organic Transistors for Stimuli Responsive Hybrid Synapses	SYMP 6-1: Bioelectronics	Monday, September 9
Marschner	Uwe	140344	Modelling of Dielectric Elastomer Multiactuator Networks as Cooperative Systems	SYMP 3-2: Advanced Material Systems	Monday, September 9
Marschner	Uwe	140444	Multiphysical Design of a Chaos Generator	SYMP 3-2: Advanced Material Systems	Monday, September 9
Masmeijer	Thijs	148444	The Directional DIC Method With Automatic Feature Selection	SYMP 5-1: Optical SHM Technologies	Monday, September 9
Mathur	Teagan	140150	A Click Beetle Inspired Robotic Model Organism: Exploring the Physics of Line of Action and Spring Design	SYMP 6-3: Adaptive Structures in Robotics	Monday, September 9
Maxson	Sean	140166	Design of a Low-Cost Continuum Soft Robotic Tentacle With Self-Locking Capabilities	SYMP 6-3: Adaptive Structures in Robotics	Monday, September 9
Mazzeschi	Mattia	140338	Guided-Wave Structural Health Monitoring for Assessing the Bond Strength of Induction-Welded Thermoplastic Composite Joints	SYMP 5-5: Wave Physics-based SHM	Wednesday, September 11
Mccue	Liam	140934	Design and Fluid-Structural Analysis of a Shape Memory Alloy-Based Model-Scale Slat Gap Filler for Airframe Noise Reduction	SYMP 4-3: Adaptive Aerospace Systems	Monday, September 9
Mohamed	Ahmed Salah	140364	A Physical Memcapacitive Reservoir Computing System for Energy-Efficient Temporal Data Processing	SYMP 6-10: Reservoir Computing and Control	Wednesday, September 11
Molitor	Philipp	140140	Systematic Scalable Manufacturing Process for Rolled Dielectric Elastomer Actuators	SYMP 1-7: Functional Printing	Tuesday, September 10
Molitor	Philipp	140329	Eccube – Small Scale Elastocaloric Cooling Demonstrator	SYMP 4-8: Shape Memory Alloy Applications	Wednesday, September 11
Moore	Joseph	140106	Investigating the Feasibility of Focused Ultrasound Actuation of Shape Memory Alloy	SYMP 6-4: Smart Materials and Actuators	Monday, September 9
Muliana	Anastasia	140187	Multi-Dimensional and Multi-Scale Shape Configurations Using Chiral Kerf Structures	SYMP 2-4: Structure and Performance of Shape Memory Polymer Actuators	Tuesday, September 10
Musgrave	Patrick	148101	Active Stiffness Variation in Bio-Inspired Swimmers Using In-Plane Muscle Forcing	SYMP 6-3: Adaptive Structures in Robotics	Monday, September 9
Newell	Brittany	140173	Production and Validation of Non-Planar Electroplated 3D Printed Circuit Boards	SYMP 1-7: Functional Printing	Tuesday, September 10
Newell	Brittany	140240	3d Printed Flexible Tactile Sensor for Rehabilitation	SYMP 1-8: Wearables	Wednesday, September 11

Nieduzak	Tymon B.	140078	Machine Learning Predictive Algorithm for Self-Sensing Electric Vehicle Battery Enclosure	SYMP 5-4: Fusion of Computation and Sensing for SHM	Tuesday, September 10
Owens	Charles	140224	Thermal Properties of 4D-Printed Shape Memory Polymer Structures	SYMP 1-2: Shape Memory Polymers	Monday, September 9
Oyekola	Peter	140268	Enhancing Indirect Electromechanical Impedance Nde Sensitivity Using Elastic Metamaterial	SYMP 5-5: Wave Physics-based SHM	Wednesday, September 11
Pagel	Kenny	140337	New Concept of a Bidirectional SMA-Actuated Stepper Drive for a Hand Exoskeleton	SYMP 4-4: Human Integrated Smart Systems	Tuesday, September 10
Pagel	Kenny	140373	Development of a Bistable Fluid Valve Based on Shape Memory Alloys, Considering Production Using 3D Printing Processes	SYMP 4-7: Multi-stable Smart Systems	Wednesday, September 11
Pan	Tan	139320	Design of Magneto-Active Elastomer Unimorph Using Clustering Algorithm and Dimensionality Reduction	SYMP 6-3: Adaptive Structures in Robotics	Monday, September 9
Pankonien	Alexander	141256	Cavity Flow Dynamics as a Source of Information Processing	SYMP S-1: Integrated Systems	Monday, September 9
Petlenkov	Eduard	137019	Damping Optimization in Locally Resonant Metastructures via Hybrid GA-PSO Algorithms and Modal Analysis	SYMP 7-1: Energy Harvesting With Metamaterials	Monday, September 9
Pottackal	Neethu	141337	Food Mechanics: Smart Food Design via Additive Manufacturing	SYMP 1-7: Functional Printing	Tuesday, September 10
Pourahmadian	Fatemeh	140608	Intelligent Laser Ultrasonic Imaging	SYMP 5-1: Optical SHM Technologies	Monday, September 9
Preston	Daniel	141360	Embedded Fluidic Control in Compliant 2-D Architectures	SYMP S-1: Integrated Systems	Monday, September 9
Qi	Jerry	148703	Multimaterial Additive Manufacturing for Shape Morphing Structures	SYMP 1-1: Shape Morphing	Monday, September 9
Radestock	Martin	140352	Digitalization of DLR Unmanned Aerial System Platform Proteus for Simulation of Morphing and Flight Mechanics	SYMP 4-3: Adaptive Aerospace Systems	Monday, September 9
Rahman	Md Anisur	140392	Nozzle Pressure Defect Detection in Extrusion-Based Bio 3d Printing Using Video-Based Motion Estimation.	SYMP 5-6: SHM for Additive Manufacturing	Wednesday, September 11
Rennich	Emj	147921	Environmental Testing of Gecko-Inspired Directional Dry Adhesives for Space Applications	SYMP 6-9: Bioinspired Design	Wednesday, September 11
Riley	Katherine S.	148150	Compliant Building Blocks of Mechanical Computing	SYMP 4-7: Multi-stable Smart Systems	Wednesday, September 11
Rincon	Jhonatan	141843	Modeling of Origami Curved Surfaces With Stiffened Membranes for Deployable Robot Wings	SYMP 6-6: Morphing Wings	Tuesday, September 10
Rincon	Jhonatan	141765	Multistable Morphing Surface for Interactive Reconfiguration	SYMP 4-7: Multi-stable Smart Systems	Wednesday, September 11
Risso	Giada	140004	Re-Programmable Morphing Through Tunable Poisson's Ratio	SYMP 1-1: Shape Morphing	Monday, September 9
Rivas-Padilla	Jose	141251	Design and Experimental Validation of an Embeddable Multi-Stable Joint in a Morphing Rib Topology	SYMP 3-1: Morphing and Dynamic Structures	Monday, September 9
Roach	Devin	149042	Digital Light Process 3D Printing of Freeform Voxelated Liquid Crystal Elastomers	SYMP 1-1: Shape Morphing	Monday, September 9
Rose	Chad	140504	Non-Woven Conducting Polymer Electrodes for Wearable Sensors	SYMP 1-8: Wearables	Wednesday, September 11
Ryu	Donghyeon	140580	Highly Flexible and Distributed Strain Sensing Strip for Health Monitoring Wearables	SYMP 5-2: Smart Materials and Sensors for SHM	Monday, September 9
Ryu	Donghyeon	148240	Design of Wavelength Tunable Mechano-Luminescent Micro-Composites	SYMP 1-6: Multifunctional Composites	Tuesday, September 10
Salowitz	Nathan	140454	Microstructural Design and Analysis of Nickel Titanium Reinforced Self-Healing Metal-Metal Composites	SYMP 1-10: Shape Memory Alloys	Wednesday, September 11

Satme	Joud N.	139950	Online Health Monitoring of Electronic Components Subjected to Repeated High-Energy Shock	SYMP 5-3: SHM for Extreme Load Applications	Monday, September 9
Satme	Joud N.	140435	UAV Assisted Sensor Deployment for Infrastructure Monitoring Using Video Streaming	SYMP 4-3: Adaptive Aerospace Systems	Monday, September 9
Schmelter	Tobias	139998	Investigation of Different Activation Profiles During Electrical Activation of Shape Memory Wires Regarding the Wire Temperature	SYMP 2-3: Investigations of Shape Memory Alloy Performance	Monday, September 9
Schmelter	Tobias	140251	Long-Term Reliability of Shape Memory Wires: Analysis of the Influence of Different Activation Profiles on the Degradation Behavior and Lifetime	SYMP 2-3: Investigations of Shape Memory Alloy Performance	Monday, September 9
Seidel	Gary	141409	Piezoresistive Deformation and Damage Sensing in Energetic Materials Under Vibration and Impact Loads via Peridynamics	SYMP 2-5: Performance of Magneto- and Electro-Responsive Energetic, Alloy, and Composite Materials	Tuesday, September 10
Shakib	Mahmudul Alam	140267	Geopolymers for Neuromorphic and Piezoelectric Applications	SYMP 6-1: Bioelectronics	Monday, September 9
Shamonin	Mikhail	140384	Transient Magnetostriction of Magneto-Active Elastomeric Cylinders	SYMP 2-1: Magneto-Responsive Materials Modeling, Optimization, and Performance	Monday, September 9
Shan	Xin	138083	Design Optimization of Induced-Strain Actuated Mechanism-Free Ornithopters Based on Coupled State Space Model	SYMP 4-2: Design of Adaptive Structures	Monday, September 9
Shanmugam	Bala Priya	141081	Peridynamic Approach to Hypervelocity Impact Detection on Lunar Structures	SYMP 5-3: SHM for Extreme Load Applications	Monday, September 9
Shen	Wen	150003	Additive Manufactured Smart Materials for Structural Health Monitoring	SYMP 5-2: Smart Materials and Sensors for SHM	Monday, September 9
Shrestha	Sarita	140163	Electrical Reconfiguration of a Droplet-Based Tissue	SYMP 6-1: Bioelectronics	Monday, September 9
Sohail	Tanvir	148025	Atomistic Modeling-Enabled Interface Design for Tougher Composites	SYMP 1-6: Multifunctional Composites	Tuesday, September 10
Soltane	Meryem	140180	A Conceptual Development of an Active Camber Morphing Airfoil for an Improved Aerodynamic Performance With Flexible Cellular Skin	SYMP 6-7: Bioinspired Morphing Structures	Tuesday, September 10
Song	Kenan	142061	Bioinspired Nanolayers via Manufacturing Innovations	SYMP 6-9: Bioinspired Design	Wednesday, September 11
Song	Yuyang	141441	Lightweight Fabric-Based Inflatable Hand With Strong Load Capacity Enabled by Shape Memory Polymers	SYMP 6-4: Smart Materials and Actuators	Monday, September 9
Sparenberg	Marc	140332	Optimal Curvature Properties of Piezoelectric Step Actuators	SYMP 1-5: Piezoelectric Materials	Tuesday, September 10
Srikanth	Sneha	147923	Bistable Metamaterials for Impact Mitigation	SYMP 7-1: Energy Harvesting With Metamaterials	Monday, September 9
Sugino	Christopher	140491	Passive Band Gap Enhancement in Piezoelectric Metamaterials via Non-Local Resonance	SYMP 3-2: Advanced Material Systems	Monday, September 9
Talluru	Viswajit	141241	Thermal Strain Sensing in MWCNT's Based Polymer Bonded Energetic Materials With Aluminum Grains as Fuel	SYMP 5-2: Smart Materials and Sensors for SHM	Monday, September 9
Tao	Hongcheng	141439	An Experimental Dataset for Neural Network Aided Modeling of Programmable Mechanical Metamaterials	SYMP 1-3: Machine Learning for Materials	Monday, September 9
Tao	Hongcheng	141589	Measuring Triboelectric Gas Breakdown	SYMP 7-4: Energy Harvesting - Invited Talk	Wednesday, September 11
Tholen	Haley	140090	Optomechanical Logic Operations in Photo-Responsive Liquid Crystal Elastomers	SYMP S-4: Soft & Intelligent Matter	Tuesday, September 10
Thompson	Zhymir	141124	Real-Time Shock Event Classification From Univariate Structural Response Measurements	SYMP 3-6: Structural Dynamics	Tuesday, September 10

Tian	Haoyi	141293	Modeling of Shape Memory Alloys With Data-Driven Transformation Correction	SYMP 2-2: Modeling and Experimental Investigations of Shape Memory Alloy Performance	Monday, September 9
Tian	Zhenhua	140365	Development of an Acoustics-Based Gas Leakage Sensing Approach	SYMP 5-5: Wave Physics-Based SHM	Wednesday, September 11
Tian	Zhenhua	141274	Physics-Informed Neural Networks (PINNs)-Based Solution of the Lamb Wave Dispersion Equation for Isotropic Plate	SYMP 5-5: Wave Physics-Based SHM	Wednesday, September 11
Tikalsky	Jan	140049	Hytem Demonstrator: Design and Analysis of a Morphing Trailing Edge Demonstrator Using Hyperelastic Adhesive	SYMP 4-1: Morphing Aerospace	Monday, September 9
Tillinger	Dor	140410	Modelling the Electrical Performance of Droplet-Based Soft Power Sources	SYMP 6-2: Energy Harvesting and Wave Dynamics	Monday, September 9
Torbett	McKayla	139948	Emulsification and Centrifugation for Scalable Fabrication of Biomimetic Tissue-Like Materials	SYMP 6-8: Biomimetic Materials and Living Systems	Wednesday, September 11
Tournat	Vincent	140378	Automated Design of Flexible Mechanical Metamaterials With Reprogrammable Wave Functionalities	SYMP S-3: Computing Meta-Materials II	Monday, September 9
Urbina	Sofia	141345	Electropneumatic Sleeve for Rapid and Precise Electrical Muscle Stimulation	SYMP 4-4: Human Integrated Smart Systems	Tuesday, September 10
Vallejo Ciro	Maria Isabel	139277	Impact of Fabrication Process Variations on Epoxy Shape Memory Polymer Mechanical Properties Across Temperature Gradients	SYMP 6-4: Smart Materials and Actuators	Monday, September 9
Venkatachalam	Vignesh	139481	Design and Demonstration of a 3d Soft-Robotics Module Based on Rolled Dielectric Elastomer Actuators (RDEAs)	SYMP 6-4: Smart Materials and Actuators	Monday, September 9
Venkatachalam	Vignesh	140131	Energy-Efficient Multi Smart Materials Based Actuator Demonstrator Combining Shape Memory Alloy Wires With Electrostatic Clutches	SYMP 4-5: Dielectric Elastomer Technologies	Tuesday, September 10
Wang	Jun	147900	Information Perception in a Fabric-Based Soft Robotic Arm via Physical Reservoir Computing	SYMP S-5: Mechano-Intelligent Robots	Tuesday, September 10
Wang	Yang	144249	Structures, Sensing, and Computing – the Pursuit of Digital Twins Through Model Updating	SYMP 5-4: Fusion of Computation and Sensing for SHM	Tuesday, September 10
Watkins	Audrey	139603	Nonlinear Waves in Multistable Metamaterials for Mechanical Computing	SYMP S-2: Computing Meta-Materials I	Monday, September 9
Weaver	Robin	140484	Dynamic Response of Tessellated Bistable Structures Subjected to Impact Loads	SYMP 1-9: Functional Structures	Wednesday, September 11
Wheatcroft	Ed	135650	A Passively Actuated Spoiler Using Sequential, Interacting Instabilities	SYMP S-1: Integrated Systems	Monday, September 9
Williams	Brandon	139955	Bi-Axial Field Structured Magnetoelastomer Coupons for Magcfrp Delamination Density Detection	SYMP 1-9: Functional Structures	Wednesday, September 11
Worrell	Dominique	148596	Shape Memory Alloy Reflector for an Expandable Solar Concentrator	SYMP 1-10: Shape Memory Alloys	Wednesday, September 11
Xie	Yuanhang	139336	Enhancing Vortex Energy Harvesting Efficiency: Evaluating Predictive Algorithms	SYMP 7-3: Hydrokinetic Energy Harvesting	Tuesday, September 10
Xue	Yuliang	140125	Axial Flux Permanent Magnet Generator for Effectively Harvesting Low-Grade Heat Energy Driven by the Shape Memory Alloy	SYMP 7-2: Heat and Triboelectric Energy Harvesting	Tuesday, September 10
Yang	Rundong	140469	Mechanical Intelligence for Coordination and and Control of Wingbeats in Bioinspired Flapping Wing Robots	SYMP S-5: Mechano-Intelligent Robots	Tuesday, September 10
Yates	Trevor	140394	A Modular Soft Swimming Robot to Teach the Concepts of Bio-Inspired Propulsion	SYMP 6-7: Bioinspired Morphing Structures	Tuesday, September 10

Yu	Lingyu	148500	Ultrasonic Nondestructive Inspection on Stainless Steel Canister Structures With Laser Based Method	SYMP 5-1: Optical SHM Technologies	Monday, September 9
Zabihollah	Abolghassem	140064	Utilizing Fbg for Stability and Failure Monitoring of Power Line Transmission Towers Subjected to Hurricane Loads.	SYMP 5-3: SHM for Extreme Load Applications	Monday, September 9
Zabihollah	Abolghassem	140418	Dynamic and Twisting Control of Small UAV Blades Using Integrated FBG Sensors and Shape Memory Alloy Actuators	SYMP 3-1: Morphing and Dynamic Structures	Monday, September 9
Zamani	Mohammad Hossein	140167	Towards Complex Shape Actuation: An Investigation of Local and Global Magnetoactive Gradients in 3D-Printed Multi-Stimuli Responsive Shape Memory Polymer Composites	SYMP 1-2: Shape Memory Polymers	Monday, September 9
Zekry	Diaa	139944	The Physics of Bio-inspired Covert Flaps as Flight Control Devices	SYMP 6-10: Reservoir Computing and Control	Wednesday, September 11
Zhang	Xuewei	140490	Stimuli-Responsive Material Systems for Enhanced High-Voltage Insulation	SYMP 3-2: Advanced Material Systems	Monday, September 9
Zhang	Yuning	140160	Harnessing Wave Physics in Phononic Metamaterials for In-Memory Mechanical Learning	SYMP S-2: Computing Meta-Materials I	Monday, September 9
Zhao	Qianyu	141593	Programming of Nonlinear Heterogeneous Metamaterial for Shock and Vibration	SYMP 3-4: Programming and Modeling	Tuesday, September 10
Zhou	Lijun	140189	Data-Driven Design of Functional Elastomer Composites With Dissimilar Inclusions	SYMP 1-3: Machine Learning for Materials	Monday, September 9
Zhou	Lijun	140275	Accurate Sweat Sensing With Multifunctional Wearable Patch and Machine Learning	SYMP 1-8: Wearables	Wednesday, September 11

Exhibitors & Sponsors

PLATINUM SPONSOR

FORT WAYNE METALS

Turning knowledge into solutions.

Fort Wayne Metals is a manufacturer of precision wire-based products used in critical applications around the world. Founded in 1970, we're driven by a spirit of innovation, quality, and continual improvement that has pioneered the development of new alloys and revolutionary materials to accommodate a range of applications.

As the world's leading melt-to-finish source for Nitinol to the medical device industry, Fort Wayne Metals processes Nitinol in multiple forms and finishes, including shape set parts and actuators. Powered by a spirit of innovation and a mission to make lives better, we enable solutions for complex design requirements. Our customers are the focus of everything we do. That's why we are FDA registered and ISO 9001, AS 9100C, and ISO 13485 certified. We constantly expand upon a wide breadth of materials, capabilities, and technical expertise, offering a range of alloys – including Nitinol, titanium, and stainless steel – for a wide spectrum of materials, including round wire, shaped wire, rod, strands, cables, and more. We'll continue to push boundaries because we love advancing our knowledge, enabling us to find better solutions for our customers. Visit us at: www.fwmetals.com

GOLD & PIONEER BANQUET SPONSOR

gm RESEARCH & DEVELOPMENT

GM's goal is to deliver world-class customer experiences at every touchpoint and do so on a foundation of trust and transparency. Our vision is a world with zero crashes, zero emissions and zero congestion. Our diverse team of global employees brings their collective passion for engineering, technology and design to deliver on this ambitious future. And the bold commitments we've made are moving us closer to realizing this vision. Visit us at: https://www.gm.com

SILVER SPONSOR

BOEING

As a leading global aerospace company, Boeing develops, manufactures, and services commercial airplanes, defense products and space systems for customers in more than 150 countries. As a top U.S. exporter, our company leverages the talents of a global supplier base to advance economic opportunity, sustainability, and community impact. Our diverse team is committed to innovating for the future, leading with sustainability, and cultivating a culture based on our company's core values of safety, quality, and integrity. Visit us at: boeing.com/careers

TOYOTA

Founded in 2008, the Toyota Research Institute of North America (TRINA) is exploring next-generation core technologies via fundamental research to build the foundation for Toyota's advanced product development. TRINA's strong in-house research capabilities coupled with strategic collaborative work with researchers across North America has resulted in more than 1200 patents and numerous high impact publications.

BRONZE SPONSORS

mateligent group

mateligent iDEAS GmbH is a spin-off from Saarland University with a focus on the development of novel actuator and sensor systems based on dielectric elastomers. In this field, mateligent holds more than 200 patents and started a sensor series production based in Minnesota in 2024. Their spectrum ranges from proof-of-concept studies and feasibility analyses to series solutions and series production with and for their customers.

THANK YOU TO OUR SPONSORS!

MEDIA SPONSOR

MECHANICAL ENGINEERING

ARTIMUS ROBOTICS

Artimus Robotics Inc is a deep tech startup commercializing a revolutionary soft actuator technology. Our Hydraulically Amplified Self-healing ELectrostatic (HASEL) actuator technology combines thin film polymers, liquid dielectrics, and flexible conductors to achieve muscle-like performance. HASELs offer many benefits over existing electromechanical actuators including wide frequency bandwidth (DC to several 100 Hz), high force-to-weight (>1,000 N/kg), high power-to-weight (>300 W/kg), high actuation strain (>50%), and self-sensing. Artimus offers standard HASEL actuators for evaluation and also develops application-specific solutions. In addition to HASEL actuators, Artimus sells multi-channel high voltage amplifiers for electrostatic technologies. We serve customers in a range of industries including research, defense, medical, and automotive.

ingpuls dynamics
a member of brandgroup

Ingpuls is a materials company, which produces elements based on shape memory alloys. As your partner, we design shape memory alloys / Nitinol with the properties you need for your innovative products using state-of-the-art manufacturing and characterization methods. We then produce these materials and develop the products with the functions you require. This is how high-tech products are created, with the SMA component at the center – everything from a single mold.

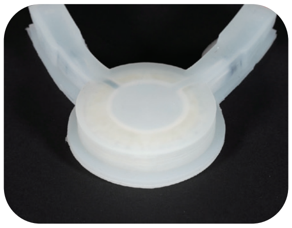
Sponsors Advertisements

ARTIMUS ROBOTICS

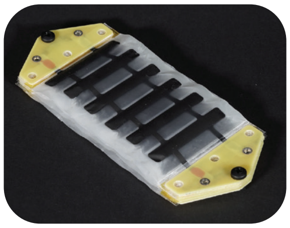
video

Flexible Electrohydraulic Transducers
Actuation, Sensing, and Energy Harvesting

Power Amplifiers for Electrostatics



Expanding E-Series
Pushing force with large strain (>30%)



Contracting C-Series
Muscle-like contraction with high blocked stress (200 kPa)

Multichannel HV Electronics
For HASEL actuators + **other technologies**

info@artimusrobotics.com • Artimus Robotics © 2024

Leadership

SMASIS 2024 Conference Leadership

General Chair
Shahrzad Towfighian
Binghamton University

Technical Chair
Johannes Riemenschneider
German Aerospace Center (DLR)

Technical Co-chair
Brent Utter
Lafayette College

International Co-chairs
Wei-Hsin Liao,
Chinese University of Hong Kong

Uwe Marschner
University of Dresden

Advisory Board
Executive Advisory Board
Diann Brei, University of Michigan
Greg Carman, University of California, Los Angeles
Inderjit Chopra, University of Maryland
Marcelo Dapino, The Ohio State University
Alison Flatau, University of Maryland
Dan Inman, University of Michigan
Nancy Johnson, General Motors
Jay Kudva, Next Generation Aeronautics
Dimitris Lagoudas, Texas A&M
Kenneth Loh, University of California, San Diego
Sergio Lucato, Teledyne Scientific Company
Chris Lynch, University of California, Riverside
Anna McGowan, NASA
Roger Ohayon, Conservatoire Nacional des Arts et Metiers (CNAM)
Michael Philen, Virginia Tech
Janet Sater, Institute for Defense Analyse (IDA)
Stefan Seelecke, Universitat des Saarlandes
Ralph Smith, North Carolina State University
Kon-Well Wang, University of Michigan

SMASIS Division Officers
Bjoern Kiefer, Chair
TU Bergakademie Freiberg, Germany

Onur Bilgen, Vice Chair
Rutgers University

Eric Freeman, Secretary and Webmaster
University of Georgia

Janet Sater, Treasurer
Institute for Defense Analysis

Cornel Ciocanel, Vice Treasurer
Northern Arizona University

2024-2025 ASME Officers
President
Susan Ipri-Brown

Executive Director/CEO
Thomas Costabile, P.E.

ASME Staff
Mary D. Jakubowski, CMP
Manager, Events Management

Josalind Mercado
Meetings Coordinator, Events Management

Chelsa Cheyenne Lewis-Bevel
Specialist, Conference E-Tools

Barbara Zlatnik, Sr. Manager,
Tech & Engineering Communities

Mary Grace Stefanchik
Director, Publishing Development

Mary Rose MacDonald
Publishing Coordinator, Conf. Publication

Session Chairs

Session Name	Chair First Name	Chair Last Name	Company	Co-Author First Name	Co-Author Last Name	Company
SYMP 1-1: Shape Morphing	Mohammad	Malakooti	University of Washington	Amir	Ameli	University of Massachusetts Lowell
SYMP 1-10: Shape Memory Alloys	Nathan	Salowitz	University of Wisconsin - Milwaukee	Mohammad	Elahinia	University of Toledo
SYMP 1-2: Shape Memory Polymers	Russell	Mailen	Auburn University	Devin	Roach	Oregon State University
SYMP 1-3: Machine Learning for Materials	Mohammad	Malakooti	University of Washington	Lijun	Zhou	University of Washington
SYMP 1-4: Functional Nanomaterials	Christopher	Bowland	Oakridge National Laboratory	Sumit	Gupta	ORNL
SYMP 1-5: Piezoelectric Materials	Christopher	Bowland	Oakridge National Laboratory	Lin	Dong	New Jersey Institute of Technology
SYMP 1-6: Multifunctional Composites	Amir	Ameli	University of Massachusetts Lowell			
SYMP 1-7: Functional Printing	Mohammad	Malakooti	University of Washington	Devin	Roach	Oregon State University
SYMP 1-8: Wearables	Russell	Mailen	Auburn University	Brittany	Newell	Purdue University
SYMP 1-9: Functional Structures	Russell	Mailen	Auburn University	Oliver	Myers	Clemson
SYMP 2-1: Magneto-Responsive Materials Modeling, Optimization, and Performance	Zhangxian	Deng	Boise State University	Behrad	Koohbor	Rowan University
SYMP 2-2: Modeling and Experimental Investigations of Shape Memory Alloy Performance	Dimitris	Lagoudas	Texas A&M	Douglas	Nicholson	Boeing
SYMP 2-3: Investigations of Shape Memory Alloy Performance	Douglas	Nicholson	Boeing	Omar	El Khatib	University of Freiburg
SYMP 2-4: Structure and Performance of Shape Memory Polymer Actuators	Julianna	Abel	University of Minnesota	Paris	von Lockette	University of Maryland Baltimore County
SYMP 2-5: Performance of Magneto- and Electro-Responsive Energetic, Alloy, and Composite Materials	Mikhail	Shamonin	OTH	Raphael	Kriegl	University of Regensburg
SYMP 3-1: Morphing and Dynamic Structures	Darren	Hartl	Texas A&M Univ.	Jose	Rivas-Padilla	Purdue University
SYMP 3-2: Advanced Material Systems	Uwe	Marschner	Technische UniversitÃ¤t Dresden	Xuewei	Zhang	Texas A&M University-Kingsville
SYMP 3-3: Advancements in Tensegrity	Jeffrey	Hill	Brigham Young University	Austin	Brown	Brigham Young University
SYMP 3-4: Programming and Modeling	James	Gibert	Purdue University	Joshua	Dupont	Uconn
SYMP 3-5: Actuator Systems	Marco	Fontana	University of Pis	Bryan	Leblanc	The University of Texas at San Antonio
SYMP 3-6: Structural Dynamics	Vijaya v. N. Sriram	Malladi	Michigan Tech Univ.	Jeffrey	Hill	Brigham Young University
SYMP 4-1: Morphing Aerospace	Farhan	Gandhi	North Carolina State University	Brent	Bielefeldt	Booz Allen Hamilton
SYMP 4-2: Design of Adaptive Structures	Salvatore	Ameduri	Italian Aerospace Research Centre	Alexander	Pankonien	US Air Force Research Laboratory
SYMP 4-3: Adaptive Aerospace Systems	Martin	Radestock	German Aerospace Center	Salvatore	Ameduri	Italian Aerospace Research Centre
SYMP 4-4: Human Integrated Smart Systems	Patrick	Musgrave	University of Florida	Farhan	Gandhi	North Carolina State University
SYMP 4-5: Dielectric Elastomer Technologies	Sebastian	Geier	German Aerospace Center	Alexander	Pankonien	US Air Force Research Laboratory
SYMP 4-6: Vehicle Technologies	Wonhee	Kim	General Motors	Sebastian	Geier	German Aerospace Center
SYMP 4-7: Multi-stable Smart Systems	Brent	Bielefeldt	Booz Allen Hamilton	Patrick	Musgrave	University of Florida
SYMP 4-8: Shape Memory Alloy Applications	Kenny	Pagel	Fraunhofer Institute for Machine Tools and Forming Technology	Wonhee	Kim	General Motors
SYMP 5-1: Optical SHM Technologies	Jinki	Kim	Georgia Southern University	Tanvir	Sohail	ORNL
SYMP 5-2: Smart Materials and Sensors for SHM	Zhenhua	Tian	Virginia Tech	Bo Mi	Lee	Missouri S&T
SYMP 5-3: SHM for Extreme Load Applications	Zhenhua	Tian	Virginia Tech	Wen	Shen	University of Central Florida

SYMP 5-4: Fusion of Computation and Sensing for SHM	Sumit	Gupta	ORNL	Jinki	Kim	Georgia Southern University
SYMP 5-5: Wave Physics-based SHM	Zhenhua	Tian	Virginia Tech	Bowen	Cai	Mississippi State University
SYMP 5-6: SHM for Additive Manufacturing	Sumit	Gupta	ORNL	Bowen	Cai	Mississippi State University
SYMP 6-1: Bioelectronics	Vanessa	Restrepo Perez	Texas A&M University	Maria Isabel	Vallejo Ciro	Texas A&M University
SYMP 6-10: Reservoir Computing and Control	Cody	Gonzalez	University of Texas at San Antonio	Andy	Sarles	University of Tennessee
SYMP 6-2: Energy Harvesting and Wave Dynamics	Matthew	Bryant	North Carolina State University	Caterina	Lamuta	University of Iowa
SYMP 6-3: Adaptive Structures in Robotics	Andy	Sarles	University of Tennessee	Matthew	Bryant	North Carolina State University
SYMP 6-4: Smart Materials and Actuators	Vanessa	Restrepo Perez	Texas A&M University	Manuel Jose	Carvajal Loaiza	Texas A&M University
SYMP 6-5: Prosthetics and Implants	Matthew	Bryant	North Carolina State University	Cody	Gonzalez	University of Texas at San Antonio
SYMP 6-6: Morphing Wings	Cody	Gonzalez	University of Texas at San Antonio	Vanessa	Restrepo Perez	Texas A&M University
SYMP 6-7: Bioinspired Morphing Structures	Caterina	Lamuta	University of Iowa	Cody	Gonzalez	University of Texas at San Antonio
SYMP 6-8: Biomimetic Materials and Living Systems	Ophelia	Bolmin	Carnegie Mellon University	Matthew	Bryant	North Carolina State University
SYMP 6-9: Bioinspired Design	Ophelia	Bolmin	Carnegie Mellon University	Vanessa	Restrepo Perez	Texas A&M University
SYMP 7-1: Energy Harvesting with Metamaterials	Serife	Tol	University of Michigan	Lihua	Tang	University of Auckland.
SYMP 7-2: Heat and Triboelectric Energy Harvesting	Wei Che	Tai	Michigan State Univ	Serife	Tol	University of Michigan
SYMP 7-3: Hydrokinetic Energy Harvesting	Lihua	Tang	University of Auckland	Serife	Tol	University of Michigan
SYMP 7-4: Energy Harvesting - Invited Talk	Serife	Tol	Univeristy of Michigan	Wei Che	Tai	Michigan State Univ
SYMP S-1: Integrated Systems	Alexander	Pankonien	US Air Force Research Laboratory	Bolei	Deng	Georgia Institute of Technology
SYMP S-2: Computing Meta-Materials I	Andres	Arrieta	Purdue University	Giovanni	Bordiga	Harvard University
SYMP S-3: Computing Meta-Materials II	Patrick	Dorin	Univeristy of Michigan	Maria	Sakovsky	Stanford University
SYMP S-4: Soft & Intelligent Matter	Kon-Well	Wang	Univeristy of Michigan	Daniel	Preston	Rice University
SYMP S-5: Mechano-Intelligent Robots	Suyi	Li	Virginia Tech	Nick	Gravish	University of California, San Diego
SYMP S-6: Reservoir Computing & Nonlinear Dynamics	Philip	Buskohl	Air Force Research Laboratory	Patrick	Musgrave	University of Florida

Symposia Chairs

#	SYMPOSIUM NAME	ROLE	NAME	AFFILIATION
1	Development and Characterization of Multifunctional Materials	Chair Co-Chair Co-Chair	Mohammad Malakooti Amir Ameli Christopher Bowland	University of Washington UMass Lowell Oak Ridge National Laboratory
2	Mechanics & Behavior Active Materials	Chair Co-Chair Co-Chair	Paris Von Lockette Zhangxian (Dan) Deng John Gallagher	University of Maryland, Baltimore County (UMBC) Boise State Merrimack College
3	Modeling, Simulation and Control of Adaptive Systems – Chairs need to be confirmed	Chair Co-Chair Co-Chair	Giovanni Berselli Abdessattar Abdelkefi Jeff Hill	University of Genoa New Mexico State University Brigham Young University
4	Integrated System Design and Implementation	Chair Co-Chair Co-Chair	Patrick Musgrave Farhan Gandhi Brent Bielefeld	University of Florida Rennselaer Polytechnic University Booz Allen Hamilton
5	Structural Health Monitoring	Chair Co-Chair Co-Chair	Zhenhua Tian Sumit Gupta Jinki Kim	Virginia Tech Oak Ridge National Labs Georgia Southern University
6	Bioinspired Smart Materials and Systems	Chair Co-Chair Co-Chair	Vanessa Restrepo Cody Gonzales Matthew Bryant	Texas A&M University University of Texas at San Antonio North Carolina State University
7	Energy Harvesting	Chair Co-Chair Co-Chair	Serife Tol Wei-Che Tai Lihua Tang	University of Michigan Michigan State University University of Auckland
	Embodying Physical Computing and Mechano-Intelligence	Chair Co-Chair Co-Chair	Kon-Well Wang Suyi Li Andres F. Arrieta	University of Michigan Virginia Tech Purdue University
	Hardware Competitions	Chair Co-Chair	Maria Sakovsky Paul Gilmore Cody Gonzales	Stanford University Toyota University of Texas at San Antonio
	Industry forum	Chair	Paul Motzki	Saarland University
	Student events	Chair Co-Chair	Patrick Walgren Rishi	AFRL Embry-Riddle Aeronautical University
	Outreach / High Schools students	Chair Co-Chair	Patrick Walgren Rishi	AFRL Embry-Riddle Aeronautical University
	Student Best Paper Competition	Chair Co-Chair	Vanessa Restrepo Ophelia Bolmin	Texas A&M University Carnegie Mellon University

Symposia Chairs

Symposium 1: Development and Characterization of Multifunctional Materials

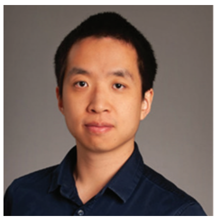
Mohammad Malakooti
Chair

Ameli Amir
Co-chair

Christopher Bowland
Co-chair

Symposium 2: Mechanics & Behavior Active Materials

Paris Von Lockette
Chair



Zhangxian Deng
Co-chair

Jon Gallagher
Co-chair

Symposium 3: Modeling, Simulation and Control of Adaptive Systems

Giovanni Berselli
Chair

Abdu Abdelkefi
Co-chair

Jeff Hill
Co-chair

Symposium 4: Integrated System Design and Implementation

Patrick Musgrave
Chair

Farhan Gandhi
Co-chair

Brent Bielefeldt
Co-chair

Symposia Chairs

Symposium 5: Structural Health Monitoring

Zhenhua Tian
Chair

Sumit Gupta
Co-chair

Jinki Kim
Co-chair

Symposium 6: Bioinspired Smart Materials and Systems

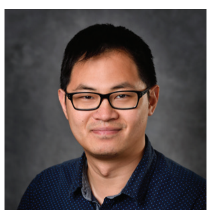
Vanessa Restrepo
Chair

Cody Gonzalez
Co-chair

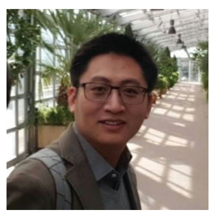
Matthew Bryant
Co-chair

Symposium 7: Energy Harvesting

Serife Tol
Chair

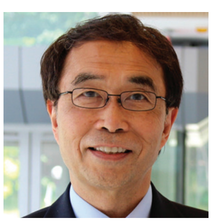


Wei Che Tai
Co-chair



Lihua Tang
Co-chair

Special Symposium: Embodying Physical Computing and Mechano-Intelligence



Kon-Well Wang
Chair

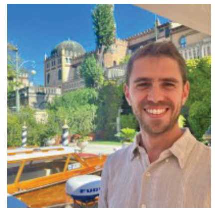
Suyi Li
Co-chair

Andres Arrieta
Co-chair

Hardware Competition

Maria Sakovsky
Chair

Cody Gonzalez
Co-chair



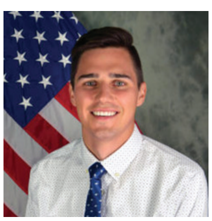
Paul Gilmore
Co-chair

Student Best Paper Competition

Vanessa Restrepo
Chair

Ophelia Bolmin
Co-chair

Student Events and Outreach



Patrick Walgren
Chair

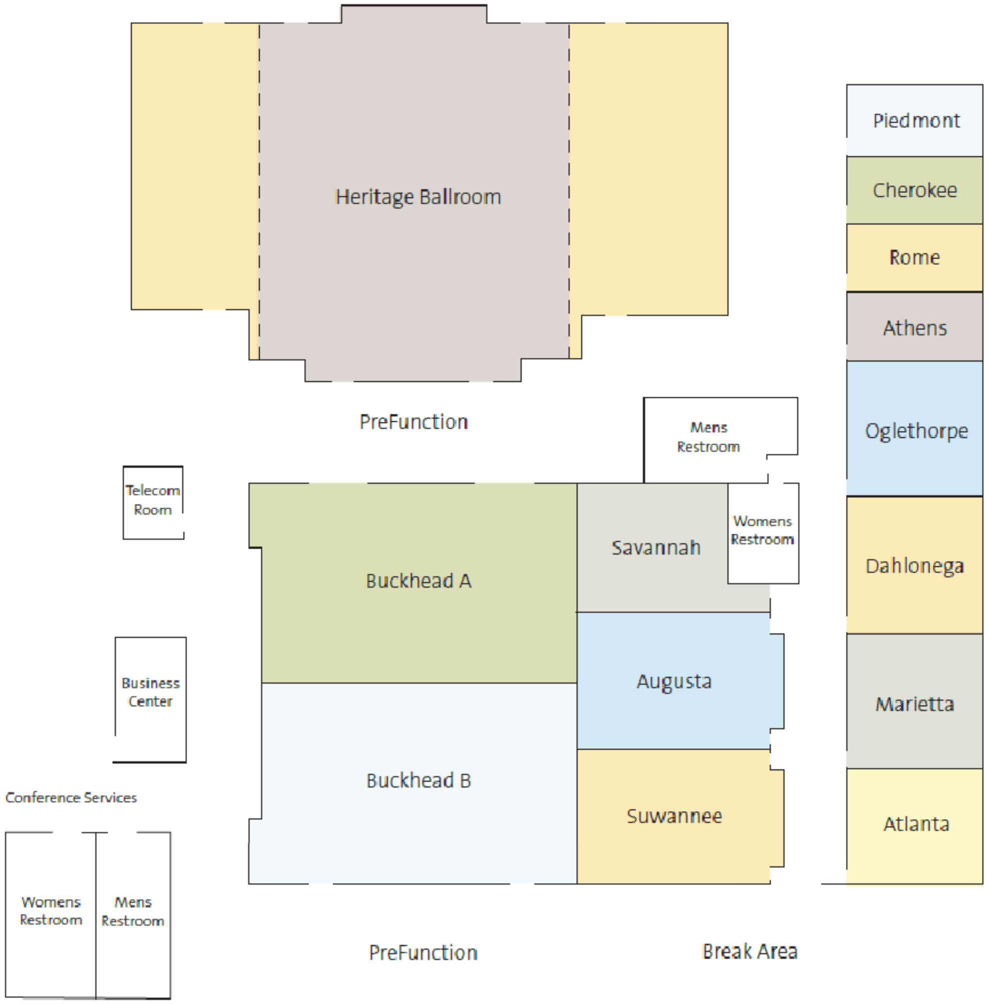
Rishikesh Srinivasaraghavan Govindarajan
Co-chair

Industry Forum

Paul Motzki
Chair

Hotel Floor Plans

CONFERENCE LEVEL



TERRACE LEVEL