ASME SMASIS 2025

ASME's Premier Conference on Smart Materials, Adaptive Structures, and Intelligent Systems

From Scientific Exploration to Industrial Application

Program

CONFERENCE
September 8–10, 2025

LOCATION
Sheraton Westport Chalet
St. Louis, Missouri

https://event.asme.org/SMASIS

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Contents

Dear SMASIS Attendee

Dear SMASIS Community,

Welcome to the 18th annual Conference on Smart Materials, Adaptive Structures, and intelligent Systems (SMASIS) in St. Louis, Missouri! It was our privilege to organize this edition of SMASIS and add our unique perspectives.

This year's scientific presentations are subdivided into 8 symposia, which are:

- **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**

In order to get more focused sessions and its communities into SMASIS, we sent out a call for **"special sessions,"** which is a first for this conference. In 2025 we start with those special sessions, which are established and chaired by their initiators:

- **Active Hybrid Composites**
- **Deployable and Adaptive Space Structures**
- **Multifunctional Energy Storage Systems**
- **Multifunctional Yarns, Textiles, and Systems**
- **Toyota / Univ of Michigan Tech Incubator**

Thanks to the extra effort of these initiators, SMASIS continued its growth in terms of the number of contributions and reached the level of pre-covid times.

For the past 17 years we have seen high quality research from universities, research institutions, industry, and government labs. Such research enhances knowledge and leads to innovation, which includes the transfer of the new knowledge from academia into industry. Therefore, we have started an initiative to strengthen the involvement of industry in the conference and given it a new dedicated home in the “industry forum”. As in 2024, it consists of two components: an industry forum session, where contributing companies are presenting. The second component is the exhibition tables where innovative products (that came from research in our community) are on display and can be checked out hands-on. The goal of this special emphasis is to encourage scientists to think boldly about where their research could lead and to promote collaborations and conversations with innovators about translating research into products.

One of the conference’s big industrial contributors has been Boeing - presenting multiple applications of shape memory alloys and demonstrating their capability in flight tests, inspiring researchers from around the world. This year’s conference is taking place at the home of the Boeing Smart Materials Lab in St. Louis and our Monday keynote by Dr. Steven Griffin (Senior Technical Fellow at Boeing) will highlight Boeing’s innovations.

We will also have keynotes given by Katia Bertoldi (Harvard John A. Paulson School of Engineering and Applied Sciences Cambridge, MA) as well as this year’s ASME Adaptive Structures Prize winner, Dr. George A. Lesieutre (Professor Emeritus of Aerospace Engineering at Penn State University), along with numerous invited talks.

An important “SMASIS-in-Action” event to strengthen the discussions around hardware and demonstrators is the hardware showcase, which we are conducting for the third time this year, with its awards for best hardware. Please take your time on Monday afternoon to check out some really amazing hardware by companies and students and be inspired by these creative contributions. Furthermore, a dedicated SMASIS-in-Action event for our students will also include 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. Please take advantage of these events to meet our emerging stars and future colleagues and leaders! Last by not least, another SMASIS-in-Action activity is the Student Paper Competition, which is taking place this year again. The finalists will hold presentations at the conference and the awards will be given at the banquet on Tuesday.

This conference would not be possible without volunteers. We are really grateful for all the dedicated colleagues who have worked so hard over weeks and months to make this conference possible. One example are the symposia chairs, who organize and chair the symposia. All these chairs are rooted in Technical Committees (TC). If you are interested in actively supporting this conference, or just observing how this conference is run, please join a TC meeting during lunch on Monday. Choose the one that is closest to the symposium of your highest interest:

- **Symposium 1: Development & Characterization of Multi-Functional Materials - > Active and Multifunctional Materials TC**
- **Symposium 2: Mechanics and Behavior of Active Materials Adaptive Systems Dynamics and Controls - > Active and Multifunctional Materials TC**
- **Symposium 3: Modeling Simulation and Control of Adaptive Systems - > Active Systems Dynamics and Controls TC**
- **Symposium 4: Integrated System Design and Implementation - > Active Materials Technology and Integrated Systems TC**
- **Symposium 5: Structural Health and Performance Monitoring - > Structural Health Monitoring TC**
- **Symposium 6: Bioinspired Smart Materials and Systems - > Bioinspired Smart Materials and Systems TC**
- **Symposium 7: Energy Harvesting - > Energy Harvesting TC**

This year's Pioneers Awards Banquet will be held in the Missouri History Museum, which is located in one of the buildings of the 1904 World's Fair. This event will be a wonderful opportunity to network and broaden your horizons, both intellectually and socially, and to enjoy amazing exhibits.

As mentioned before, 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, ASME team, SMASIS in action organizers, 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 Fort Wayne Metals, General Motors, Toyota, Ingpuls Dynamics GmbH, mateligent GmbH, and EOS North America.

Finally, we appreciate your participation in this event and commitment to submit your best work. To those of you we know personally, we eagerly anticipate catching up with you at this meeting. We also look forward to introducing ourselves to those of you we have not yet met and participating in thoughtful scientific discussions.

After months of planning: let us begin this fine conference!

General Chair:
Johannes Riemenschneider
(German Aerospace Center – DLR)

Technical Chair:
Brent Utter
(Lafayette College)

Technical Co-Chair:
Nathan Salowitz
(University of Wisconsin – Milwaukee)

Schedule At-A-Glance

Schedule-At-A-Glance

	Symposium 1: Development & Characterization of Multi-Functional Materials	Symposium 2: Mechanics and Behavior of Active Materials	Symposium 4: Integrated System Design and Implementation		Symposium 5: Structural Health and Performance Monitoring	Symposium 6: Bioinspired Smart Materials and Systems	Special Symposium: Embodying Physical Computing and Mechano-Intelligence			
		Symposium 3: Modeling Simulation and Control of Adaptive Systems			Symposium 7: Energy Harvesting					
Sunday, September 7										
1:00 PM - 6:00 PM										Leadership Summit Matterhorn
6:30 pm - 9:30 pm									Student Networking Event/ Game Night Zurich	
Monday, September 8										
	Bern	**Zermatt**	**St. Moritz**	**Lugano**	**Davos**	**Alpine 1**	**Alpine 2**	**Versailles Ballroom 1**	**Versailles Foyer / Versailles Ballroom 2**	
7:00 AM - 8:00 AM									**Breakfast**	
8:00 AM - 9:00 AM								**Keynote:** Steve Griffin		
9:10 AM - 10:30 AM	**1-1 Shape Memory Alloys 1** (Constantin Ciocanel (Northern Arizona University), Peter Caltagirone (NASA)	**2-1 Electro- and Magnetoactive Materials** (Zhangxian Deng, Robin Collet)	**4-1 SS: Deployable Space Structures** (Maria Sakovsky, Xin Ning)		**5-1 Smart Sensors for SHM** (Haifeng Zhang, Zhenhua Tian)	**6-1 Bioinspired Materials** (Vanessa Restrepo, Sumit Das Lala)	**S-1 Living and Bio-Inspired Systems** (Suyi Li, Jovana Jovanova)			
10:30 AM - 10:50 AM									**Coffee Break**	
10:50 AM - 12:10 PM	**1-2 Sensor and Actuator Materials 1** (Monday only) (Amir Ameli (UML), Brittany Newell (Purdue)	**3-1 Mission-Adaptive Morphing UAVs** (Darren Hartl (TAMU), Jay Kudva (Nextgenaero)	**4-2 SMA Application in Mechanical Engineering** (Kenny Pagel (FhG), Martin Radestock (DLR))	**Best Student Paper Finals**	**7-1 Thermal and Biomechanical Energy Harvesting** (Feng Qian (PSU Behrend), Lihua Tang (U of Auckland))	**6-2 Biomolecular Networks and Synthetic Tissues** (Eric Freeman (U Georgia), Andy Sarles (UT Knoxville))	**S-2 Physical Intelligence in Robots I** (Suyi Li, Patrick Musgrave)			
12:10 PM -1:40 PM	**TC: Active Material Technologies and/or Multifunctional Materials**	**TC: Adaptive Systems Dynamics and Controls**	**TC: Active Material Technologies and Integrated Systems**	**TC: Structural Health Monitoring**	**TC: Energy Harvesting**	**TC: Bioinspired Structures and Systems**			**Lunch**	
1:40 PM - 3:00 PM									**Hardware Showcase until 3:30**	
3:00 PM - 3:30 PM									**Coffee Break**	
3:30 PM - 4:50 PM	**1-3 Shape Memory Alloys 2** (Glen Bigelow (NASA), Constantin Ciocanel (Northern Arizona University)	**3-2 Wave Propagation, Buckling, and Dynamic Response** (Michael Philen)	**4-3 Special Session: Toyota/University of Michigan Technology Incubator** (Diann Brei (University of Michigan), Umesh Gandhi (Toyota Research))	**4-4: SS: Multifunctional Energy Storage Systems** (Sebastian Geier (DLR), Cody Gonzalez (UTSA)	**5-2 Smart Materials and Sensors for SHM** (Kim (Georgia Southern)	**6-3 Soft Robotic Swimmers for Aquatic Applications** (Salvador Rojas (CSULA), Ophelia Bolmin (Carnegie Mellon)	**S-3 Novel Structural Concepts** (Patrick Musgrave, Maria Sakovsky)			
5:30 PM - 7:00 PM									**Reception**	
7:00 PM- 9:00 PM								**SMASIS Division**		
6:30 PM- 9:30 PM										**Student Outing**

Schedule-At-A-Glance

Tuesday, September 9

	Bern	Zermatt	St. Moritz	Lugano	Davos	Alpine 1	Alpine 2	Versailles Ballroom 1	Versailles Foyer / Versailles Ballroom 2	
7:00 AM - 8:00 AM									**Breakfast**	
8:00 AM - 9:00 AM								**Keynote:** George A Lesieutre		
9:10 AM - 10:30 AM	**1-4 Multifunctional Composites/ Nanocomposites** (Leily Majidi (California Poly), Amir Ameli (UML)	**2-2 Shape Memory Alloy and Polymer Applications** (Othmane Benafan, Koray Benli)	**4-5 Morphing Aerospace Systems** (Farhan Gandhi (NCSU), Brent Bielefeld (AFRL)	**4-6 SS: Yarns and Textiles** (Julianna Abel (UMN), Paul Alexander (GM)	**5-3 Wave Physics-based SHM** (Zhenhua Tian (VT), Haifeng Zhang (UNT))	**6-4 Neuromorphic Computing** (Andy Sarles (UT Knoxville), Reza Montazami (Iowa State)	**S-4 Computing with Acoustic Wave** (Andres Arrieta, Patrick Dorin)			
10:30 AM - 10:50 AM									**Coffee Break**	
10:50 AM - 12:10 PM	**1-5 Sensor and Actuator Materials 2** (Amin Joodaky (MSU), Glen Bigelow (NASA)	**3-3 Morphing Airfoils and Biomedical Systems** (Sevki Cesmeci)	**4-7 Application of Advanced Computational Methods** (Brent Bielefeld (AFRL), Darren Hartl (TAMU)	**4-8 SS: Smart Textiles** (Paul Alexander (GM), Julianna Abel (UMN)	**7-2 Auxetic & Multistable Structures** (Wei-Che Tai (MSU), Feng Qian (PSU Behrend)	**6-5 Implants and Biomedicine** (Cody Gonzalez (UTSA), Muibar Kahn (Georgia Southern))	**S-5 Intelligence Embodied in Fluid-Structure Interactions** (Suyi Li, Noel Naughton)			
12:10 PM -1:40 PM									**Lunch** (Including Student Trivia)	**JIMSS Editorial Board Meeting** Geneva
1:40 PM - 3:00 PM	**1-6 3D Printing/AM** (Brittany Newell (Purdu), Zhenhua Tian (Virginia Poly)	**3-4 Tensegrity and Adaptive Stiffness Mechanisms** (Jeff Hill (BYU), Tiatian Li)	**4-9 SS: Adaptive and Multi-functional Space Structures** (Maria Sakovsky (Stanford), Giada Risso (Harvard)	**4-10 Wave Propagation, Acoustics, and Thermoelectrics** (Martin Radestock (DLR), Sebastian Geier (DLR)	**7-3 Metamaterials & Data-driven Identification** (Wei-Che Tai (MSU), Lihua Tang (U of Auckland)	**6-6 Bioinspired Design** (Ophelia Bolmin (Carnegie Mellon), Caterina Lamuta (Ulowa)	**S-6 Physical Intelligence in Robots II** (Suyi Li, Mahdi Haghshenas-Jaryani)			
3:00 PM - 3:30 PM									**Coffee Break**	
3:30 PM - 4:50 PM		**3-5 Nonlinear and Acoustic Metamaterials** (Suyi Li, Chris Sugino)	**4-11 Aerospace Applications of SMAs** (Hans Peter Monner (DLR), Salvatore Ameduri (CIRA)	**Students Career Panel**			**Industry Forum**			
5:20 PM - 6:00 PM	**Bus loading and Travel to Banquet**									
6:30 PM- 8:45 PM	**Pioneer Awards Banquet**									

Wednesday, September 10

	Bern	Zermatt	St. Moritz	Lugano	Davos	Alpine 1	Alpine 2	Versailles Ballroom 1	Versailles Foyer / Versailles Ballroom 2	
7:00 AM - 8:00 AM									**Breakfast**	
8:00 AM - 9:00 AM								**Keynote:** Katia Bertoldi		
9:10 AM - 10:30 AM	**1-7 AI/ML for materials** (Amin Joodaky (MSU), Donghyeon Ryu (New Mexico Tech)	**2-3 Smart composites, Structures, and Metamaterials** (Darren Hartl, Mustafa Alshaqaq)	**4-12 Tailored Structures and Robots** (Patrick Musgrave (UFL), Wonhee Kim (GM)		**5-4 Fusion of Computation and Sensing for SHM** (Bo Mi Lee (Missouri S&T), Hossain Ahmed (Georiga Southern))	**6-7 Adaptive Systems in Robotics and Control** (Aimy Wissa (Princeton), Cody Gonzalez (UTSA))	**S-7 Computing Metamaterials** (Andres Arrieta)			
10:30 AM - 10:50 AM									**Coffee Break**	
10:50 AM - 12:10 PM	**1-8 Metamaterials** (Amir Ameli (UML), Leily Majidi (Cal Poly)	**3-6 Vibration Mitigation and Energy Harvesting** (Abdu Abdelkefi)	**4-13 SS: Active Hybrid Composites** (Martin Gurka (IVW), Kenny Pagel (FhG-IWU)		**5-5 SHM for Additive Manufacturing** (Jinki Kim (Georgia Southern), Xinchang Zhang (INL))	**6-8 Systems and Structures for Extreme Environments** (Jovana Jovanova (TU Delft), Salvador Rojas (CSULA))	**S-8 Physical Reservoir Computing: Fundamental Design and Analysis** (Patrick Musgrave, Steven Kiyabu)			
Boeing's James S. McDonnell Prologue Room private tour (Pre-registration required) One hour tour: 2PM or 3PM (two options for the one hour tour: 2 pm or 3 pm (Attendees will need to arrange their own transportation)										

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.

HOTEL

Sheraton Westport Chalet Hotel St. Louis
191 Westport Plaza
Maryland Heights, MO 63146 USA

Sheraton Westport Lakeside Chalet features a seasonal outdoor swimming pool, fitness center, a garden, and restaurant in Maryland Heights. This hotel offers free shuttle service and room service. The property provides a 24-hour front desk, an ATM and luggage storage for guests. A buffet, à la carte, or American breakfast is served at the property. Guests can use the business center or relax in the bar. Hollywood Casino St. Louis is 5.6 miles from the hotel, while St. Louis Gateway Arch is 20 miles away. St. Louis Lambert International Airport is 10 miles from the property.

REGISTRATION INFORMATION

Registration will be located each day in the Lobby Foyer.

The hours are as follows:

Sunday, September 7	**1:00PM – 6:00PM**
Monday, September 8	**7:00AM – 5:00PM**
Tuesday, September 9	**7:00AM – 5:00PM**
Wednesday, September 10	**7:00AM – 12:30PM**

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 Missouri History Museum on Tuesday, 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 Sheraton Westport Chalet, and in the hotel's public space and meeting space provided by ASME. For access when onsite, please follow these steps: Sheraton Meeting Wi-Fi is open. You will get a splash page and then enter the access code "800". If you or anyone have any issues connecting, please reach out to the hotel for assistance.

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.

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 hotel operator so that the hotel can be on the alert for the emergency response team. The hotel management is available until 1:00AM, and Hotel security is available overnight after that time. There is information in the rooms on emergency exits, and automatic loudspeaker instructions are broadcast in case of fire or any emergency that would require evacuation

REGISTRANTS WITH DISABILITIES

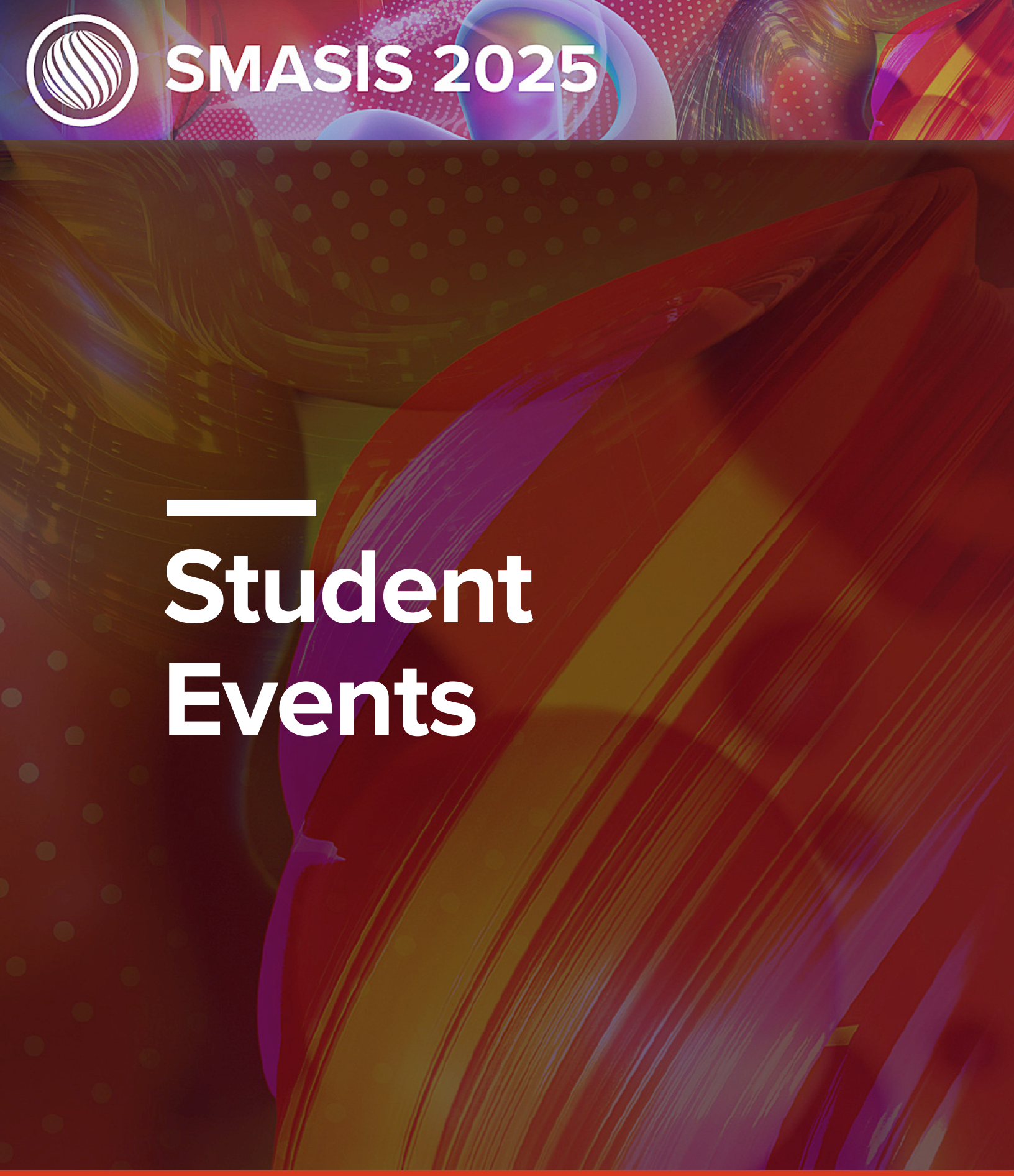
Whenever possible, we are pleased to plan for handicapped registrants. Advance notice may be required for certain requests. For on-site assistance, please visit the registration area and ask to speak with a conference representative.

HOTEL PARKING

Parking is complimentary for both the garage and surface lots. Valet is not available.

HAVE QUESTIONS ABOUT THE MEETING?

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



Student Events

STUDENT GAME NIGHT

Sunday, September 7
6:30AM - 9:30PM
Zurich, Lower Level

Co-Chairs: Peter Caltagirone, Trent White

Not ready to call it a night? Look no further. Everyone's welcome to join the game night at TBD. Bring friends, challenge them on board and card games, and keep the fun alive!

BEST STUDENT PAPER COMPETITION

Monday, September 8
10:50AM-12:10PM
Lugano, Lobby Level

Chair: Cody Gonzalez, Ophelia Bolmin

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 8
1:40PM-3:30PM
Versailles Ballroom Foyer, Lower Level

Co-Chairs: Paul Gilmore, Cody Gonzalez, Paul Alexander

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 OUTING

Monday September 8
6:30PM - 9:30PM
Meet in the hotel lobby

Co-Chairs: Peter Caltagirone, Trent White

Let`s spend the evening together with fellow students from around the country and beyond. Building up relationships that can even be helpful in the professional sphere has never been easier.

STUDENT TRIVIA LUNCH

Tuesday, September 9
12:10PM-1:40PM
Versailles Ballroom 2, Lower Level

Co-Chairs: Peter Caltagirone, Trent White

Are your trivia skills sharper than those of your SMA- SIS 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 CAREER PANEL

Tuesday, September 9
3:30PM-4:50PM
Lugano, Lobby Level

Co-Chairs: Peter Caltagirone, Trent White

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.

SMASIS 2025

Committee Meeting Schedule

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Committee Meeting Schedule

SUNDAY, SEPTEMBER 7		
MEETING	**TIME**	**ROOM**
Division Leadership Summit (By Invitation Only)	1:00PM–6:00PM	Matterhorn
MONDAY, SEPTEMBER 8		
COMMITTEE MEETINGS	**TIME**	**ROOM**
Bio-inspired Structures and Systems Technical Committee Meeting	12:10PM–1:40PM	Alpine 1
Active Materials and/or Multi-functional Materials Technical Committee Meeting	12:10PM–1:40PM	Bern
Active Material Technologies and Integrated Systems Technical Committee Meeting	12:10PM–1:40PM	St. Moritz
Energy Harvesting Technical Committee Meeting	12:10PM–1:40PM	Davos
Adaptive Systems Dynamics and Controls Technical Committee Meeting	12:10PM–1:40PM	Zermatt
Structural Health Monitoring Technical Committee Meeting	12:10PM–1:40PM	Lugano
SMASIS Division Meeting	7:00PM–9:00PM	Matterhorn
TUESDAY, SEPTEMBER 9		
TECHNICAL COMMITTEE MEETINGS	**TIME**	**ROOM**
JIMSS Editorial Meeting	12:10PM–1:40PM	Geneva

Conference Events

BREAKFAST

Monday, September 8 – Wednesday, September 10
7:00AM–8:00AM
Versailles II, Lower Level

Starting 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 8 – Wednesday – September 10
10:30AM–10:50AM and 3:00PM–3:30PM
Versailles Foyer, Lower Level

LUNCHES

Monday, September 8 and Tuesday, September 9
(Lunch on Own, Wednesday, September 10)
12:10PM–1:40PM
Versailles II, Lower Level

NETWORKING RECEPTION

Monday, September 8
5:30PM–7:00PM
Versailles Foyer, Lower Level

EXHIBITS

Monday, September 9 – Wednesday, September 10
10:00AM–5:00PM
Versailles Foyer, Lower Level

Please take advantage of the opportunity to visit General Motors Fort Wayne Metals, EOS, 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

Tuesday, September 9
7:00PM–9:30PM
Meet in Lobby

Missouri History Museum
The Missouri History Museum in Forest Park, St. Louis, Missouri, showcases Missouri history. It is operated by the Missouri Historical Society, which was founded in 1866.
Please note: Buses will leave hotel at 5:30pm sharp arriving back approximately 10:00PM. Times are approximate.

INDUSTRY FORUM

Tuesday, September 9
3:30PM–4:50PM
Room - Alpine 2

The 2025 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.

SMASIS 2025

Keynote Speakers

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Keynote Speakers

Monday, September 8

8:00AM–9:00AM
Versailles I, Lower Level

Steven Griffin, Ph.D.
Georgia Institute of Technology
Atlanta, GA

Keynote Title: Smart Structure Technology Push -vs- Pull

Abstract: Smart structures are often pushed as an alternative to a working solution to an engineering problem based on increased efficiency or performance. This is often a hard sell because the risk associated with a new approach may not outweigh the benefit. A much more compelling case is where a smart structure appears to be the only way of meeting a requirement. Some of these cases will be discussed and an explanation given of why smart structures were the clear technology winner in these applications.

Biography: Steven Griffin has more than 30 years of experience in vibration management applied and basic research. Primary areas of expertise include optical/structural LOS modeling for surveillance and directed energy systems, integrated structural acoustic modeling, vibration management, smart structures, optical space structures, composite structures, and structural health monitoring. As an Air Force officer assigned to AFRL, he was charged with spacecraft related composite structural research. This included design, construction, and research leadership of in-house smart structures and nondestructive evaluation laboratories along with program management responsibility of the world's largest smart structure, ASTREX, SDI-funded structural dynamics testbed for space-based laser dynamics research. Following military assignment, he was selected by the Air Force Palace Knight Program for Ph.D. research at Georgia Institute of Technology. As an engineer at Boeing-SVS, he served as Enabling Technologies Enterprise Lead in charge of multiple technical efforts related to pointing and tracking. Technical tasks focused on structural acoustic modeling for launch vehicles and integrated optical/structural modeling for directed energy and imaging systems. As Chief Engineer at Boeing MSSS Maui, tasks focused on systems engineering and technical problem solving. He was the author on more than 20 journal or book publications and more than 50 conference publications in the fields of acoustics, spacecraft structures and vibration management with 61 awarded patents and at least nine patents pending in the fields of vibration, acoustics, optics, and controls. He was selected as Strategic Missile and Defense Systems and Network and Space Systems 2013 Engineer of the Year and was Keynote Speaker at the 2014 Structural Health Monitoring and Composites Structures Conference in South Korea. He was the Invited Plenary Speaker at the 2022 and 2025 SPIE Smart Structures and NDE Conference, and the 2024 SPIE Lifetime Achievement Award winner. He served as ABET (Accreditation Board for Engineering and Technology) Program Evaluator setting global standard for programs in engineering and applied sciences and also serves as instructor for two classes in Ed Wells Partnership. Steven Griffin was recognized as Boeing Designated Expert, Technical Lead Engineer, Senior Technical Fellow, AIAA Fellow, and Directed Energy Professional Society Fellow. He also authored a book on Dynamic Vibration Absorbers, published in 2024.

Tuesday, September 9

8:00AM–9:00AM
Versailles I, Lower Level

George A. Lesieutre

Professor Emeritus of Aerospace Engineering
Penn State University

Keynote Title: Adaptive Structures: Making a Difference Together

Abstract: Adaptive structures systems have evolved tremendously in the last 45 years, enabled by advances in constituent and integrative science and technology. Every significant advance was made by a talented individual who benefited from collaborations with others offering complementary perspectives. Such interdisciplinary explorations illuminated potential disruptive functionality and exposed issues related to the realization of complicated systems. All aimed at a goal of societal impact: applications and technologies that improve people's lives while creating businesses and jobs. This talk will address questions like: How does the evolution and growth of a field (e.g., piezo*) depend on individual innovations? What limits growth? What is the role of a technological community (social network) like SMASIS?

Biography: George A. Lesieutre is Professor Emeritus of Aerospace Engineering at Penn State. He earned a B.S. in AeroAstro from MIT and a Ph.D. in Aerospace Engineering from UCLA. His research focuses on structural dynamics of aerospace systems, including passive damping and active structures. He is the author of a graduate-level textbook on structural dynamics. Prior to joining Penn State, he held positions at several companies and a national lab. At Penn State, he previously served as Associate Dean for Research and Graduate Programs, Department Head of Aerospace Engineering, and Director of the Center for Acoustics and Vibration. Lesieutre is a Fellow of the American Institute of Aeronautics and Astronautics and previously served on the AIAA Board of Directors, as General Chair for the 2015 AIAA SciTech Forum, and on several NASEM study panels. He presented the SDM Lecture at SciTech 2014. Lesieutre has received several awards, including five annual best paper awards and the SPIE Lifetime Achievement Award in Smart Structures and Materials. He has advised more than 60 graduate students and published more than 300 technical articles. He once paddled a canoe from Montreal to the Gulf of Mexico as part of a historical reenactment and ran a 50-mile ultramarathon. He is an instrument-rated private pilot.

Wednesday, September 10, 2025

8:00AM–9:00AM
Versailles I, Lower Level

Katia Bertoldi
Harvard John A. Paulson School of Engineering and Applied Sciences
Cambridge, MA

Keynote Title: Robotic Mechanical Metamaterials

Abstract: Flexible mechanical metamaterials are a class of structures with unique geometric features engineered to exhibit extraordinary properties in the nonlinear regime. These systems have the potential to drive the next generation of smart materials and devices, enabling functionalities such as shape morphing, programmable nonlinear mechanical behaviors, and energy manipulation.

Recently, a groundbreaking concept has emerged: embedding computational capabilities directly into these metamaterials. The integration of programmable mechanical responses, shape-shifting capabilities, and computation within a single synthetic structure paves the way for a new class of machines that are monolithic, require minimal electronic inputs, and possess advanced functionalities inherently embedded in their architecture.

In this talk, I will present our recent progress on integrating shape morphing, sensing, and intelligence into a single synthetic structure to realize such machines.

Biography: Katia Bertoldi is the William and Ami Kuan Danoff Professor of Applied Mechanics at the Harvard John A. Paulson School of Engineering and Applied Sciences. She earned master degrees from Trento University (Italy) in 2002 and from Chalmers University of Technology (Sweden) in 2003, majoring in Structural Engineering Mechanics. Upon earning a Ph.D. degree in Mechanics of Materials and Structures from Trento University, in 2006, Katia joined as a PostDoc in the group of Mary Boyce at MIT. In 2008, she moved to the University of Twente (the Netherlands) where she was an Assistant Professor in the faculty of Engineering Technology. In January 2010, Katia joined the School of Engineering and Applied Sciences at Harvard University and established a group studying the mechanics of materials and structures. She is the recipient of the NSF Career Award 2011 and of the ASME's 2014 Hughes Young Investigator Award. She published over 150 peer-reviewed papers and several patents. View a complete list of publication and research information here.

Invited Speakers

Symposium 1 Invited Speaker

Dr. Sameh Tawfick

Associate Professor of Mechanical Science and Engineering,
University of Illinois Urbana-Champaign

Presentation Title: Design Principles for the Use of Artificial Muscles in Soft and Miniature Robotics

Abstract: In this talk I will describe the design motif known as “antagonistic pairs,” commonly observed in skeletal muscles. This arrangement enables the reversible, cyclic, contractions necessary for motion. Antagonistic arrangement may initially appear inefficient, since the contraction of a muscle group stretches the antagonist one at each cycle, increasing resistance and energy consumption. We show that the nonlinear muscle mechanics is critical to the high efficiency of natural antagonistic muscle pairs, and we aim to mimic this nonlinearity via hierarchical muscle microstructure.

This talk will focus on twisted and coiled polymer actuators (TCPA). First, I will describe intriguing hierarchical super-, and hyper-coiled artificial muscles which, inspired by natural muscles, result in nonlinear J-shaped force-displacement behavior. Next, I will describe design rules to systematically select muscles for robotic mechanisms. Finally, I will describe their use to build work accumulating mechanics, such as vertical rope-climbing robots.

Biography: Sameh Tawfick is a Ralph A. Andersen Scholar and Associate Professor of Mechanical Science and Engineering at the University of Illinois. He studies advanced materials, nonlinear mechanics, and manufacturing processes. Sam obtained his Ph.D. from the University of Michigan, was a Postdoctoral Associate at the Massachusetts Institute of Technology, and a Beaufort Visiting Fellow in St. John’s College at the University of Cambridge in 2023. He is the recipient of young investigator awards from the U.S. Air Force, ASME, SME, and The Dean’s Award for Excellence in Research at Illinois. His teaching awards at the University of Illinois include The Everitt Award for Teaching Excellence, The Two-year Alumni Teaching Award, and The Engineering Council Stanley H. Pierce Award for Empathetic Student-faculty Cooperation.

Symposium 1 Invited Speaker

Martin L. Dunn

Professor and Dean of the College of Engineering, Design and Computing
University of Colorado, Denver

Presentation Title: Tailored Actuation in 4D Printed LCE Composites via Advanced Materials and Embedded Fiber Reinforcement

Abstract: 4D printing enables the fabrication of structures with spatially programmable, stimulus responsive material properties that can be engineered to actuate or morph in response to environmental cues. This presentation will highlight our recent work advancing 4D printing materials, manufacturing methods, and functional applications across three key areas. First, we introduce a novel two-step UV curable liquid crystal elastomer (LCE) system. Initially shaped via high-resolution vat photopolymerization techniques like digital light processing (DLP), these materials undergo a secondary thermomechanical curing

step that forms an interpenetrating epoxy network, locking in mesogen alignment. By tuning the epoxy content, we can precisely adjust mechanical and actuation characteristics, enabling thermally reversible deformation for uses in active metamaterials, morphing structures, and soft robotics.

Second, we present a direct ink write (DIW) method for printing LCE composites reinforced with continuous fibers. A custom-designed print head co-deposits LCE resin and fibers, leveraging shear forces during extrusion to align mesogens within the matrix. These fiber reinforcements significantly enhance actuation force and energy absorption, while the use of conductive fibers facilitates electrothermal activation and control of composite components.

Third, we describe an embedded continuous fiber printing strategy that enhances composite quality. Fibers are printed into a vat of resin, with localized UV curing providing superior resin infiltration and geometric precision. For each advancement, we showcase fabricated prototypes, supported by computational models that predict their responsive behaviors. Demonstrations include thermally and electrothermally actuated components for applications such as programmable metamaterials, adaptable architectures, artificial muscles, and soft robotic systems.

Biography: Martin L. Dunn is a professor and dean of the College of Engineering, Design and Computing at the University of Colorado Denver. He joined CU Denver in 2018 after serving as the founding associate provost for research at the Singapore University of Technology and Design (SUTD) where he oversaw the design and operation of the research and innovation enterprise. He was also a professor at SUTD and the founding director of the National Research Foundation-supported Digital Manufacturing and Design Center. Prior to joining SUTD, he served as a program director (mechanics of materials) in the Civil, Mechanical and Manufacturing Innovation Division at the U.S. National Science Foundation (NSF), where he was also the founding program director for the Design of Engineering Materials Systems program. He served the NSF while on leave from the University of Colorado Boulder where he was the associate dean of research in the College of Engineering, Design and Computing, chair of the Department of Mechanical Engineering, and a professor of mechanical engineering, holding the Victor Schelke Endowed Chair. Dunn's research has focused on understanding the mechanics and physics of complex heterogeneous materials through a combination of theory and experiment and using this understanding to create methods and tools to design and manufacture new materials and components. This includes constitutive modeling of the nonlinear multiphysics response (thermal, optical, mechanical) of active polymers and polymer composites, computational design automation approaches based on shape and topology optimization and additive manufacturing based on SLA, DLP, and FDM technologies. Most recently, this has involved the development of computational design and manufacturing methodologies for multimaterial additive manufacturing, including the creation of a technology called 4D printing—an approach that integrates new computational design, manufacturing process, and materials technologies to create environmentally responsive printed components.

Symposium 4 Invited Speaker

Prof. Dr. Hans Peter Monner

German Aerospace Center (DLR) &
Otto-von-Guericke University of Magdeburg

Presentation Title: Demonstration and Testing of Rotating Morphing Systems at DLR

Abstract: In this presentation, we explore some advancements in rotation morphing systems, focusing on their application in various engineering domains. We will demonstrate the active twisting mechanisms of helicopter rotor blades, highlighting how these systems enhance performance and reduce noise through adaptive aerodynamics. Additionally, we will examine the morphing trailing edge of wind turbine rotor blades, showcasing its potential to optimize energy capture and enhance

fatigue life. Finally, we will delve into the design and testing of morphing fan blades in jet engines, emphasizing their role in improving fuel efficiency and reducing emissions. Through a series of experimental results and simulations, this presentation aims to illustrate the potential and challenges of rotation morphing systems on the advancement in aviation and renewable energy.

Biography: Prof. Dr. Hans Peter Monner is the head of the Department Adaptronics at the Institute of Lightweight Systems of the German Aerospace Center (DLR). Additionally, he has a professorship at the Otto-von-Guericke University of Magdeburg and gives lectures within the field of smart structures technologies, vibroacoustics, and experimental mechanics. On the European level, his department is strongly involved in many European projects, e.g., MANTA – "Movables for Next generaTion Aircraft, " SABRE – "Shape Adaptive Blades for Rotorcraft Efficiency," GRETEL – "GREen Turboprop Experimental Laminar Flow Wind Tunnel Testing," or SADE – "Smart High Lift Devices for Next Generation Wings." Moreover, he is involved in different international networking activities, e.g., as part of the SciTech ASTC – "Adaptive Structures Technical Committee," or the ICAST – IOC "International Organizing Committee."

Symposium 5 Invited Speaker

Dr. Xinchang Zhang

Idaho National Laboratory

Presentation Title: Refractory Compact Heat Exchangers with Embedded Sensors Enabled by Hybrid Advanced Sintering and Additive Approach

Abstract: Structural health monitoring (SHM) of compact heat exchangers (CHXs) operating in extreme environments is essential for ensuring system reliability, safety, and longevity. This study presents the development of high-temperature sensors fabricated via aerosol jet printing (AJP) using platinum ink, selected for its exceptional thermal stability, oxidation resistance, and electrical conductivity. AJP enables precise deposition of fine-feature sensor patterns onto complex geometries, making it well-suited for integration within CHX architectures. To enhance sensor durability, an alumina-based ceramic protective layer was printed over the platinum sensing elements. The sensors demonstrated stable, repeatable performance up to 900°C during extended thermal cycling. A custom test setup was developed to evaluate sensor accuracy and robustness under steady-state and transient conditions. Substrate screening identified HG-1 ceramic-coated stainless steel as the most effective platform, offering strong adhesion and low resistance. Furthermore, electric field-assisted sintering (EFAS) was employed to embed the sensors into stainless steel 316L matrices without degrading their functionality. Post-embedding electrical tests confirmed sensor integrity, and initial characterization suggests strong potential for in-situ monitoring. EFAS was also employed to embed fiber Bragg grating sensors in structural materials for structural health monitoring. This work provides a scalable strategy for integrating high-performance temperature sensors directly into structural components, advancing embedded SHM technologies for harsh operating environments.

Biography: Dr. Xinchang Zhang is a Staff Engineer/Scientist in the Energy and Environmental Science and Technology (EES&T) directorate at Idaho National Laboratory. He is a principal investigator for multiple projects including those funded by the Department of Energy, Department of Defense, and INL Laboratory Directed Research and Development (LDRD). Zhang received his Ph.D. in mechanical engineering from Missouri University of Science and Technology in 2019. His primary focus includes advanced manufacturing (electric field-assisted sintering and additive manufacturing), advanced materials, sensors and smart structures, material characterization, and mechanical testing. Zhang authored/co-authored over 60 peer-reviewed publications and a book chapter. His current research interests include the design and fabrication of advanced materials, advanced manufacturing of compact heat exchangers, hybrid manufacturing processes for

sensor embedding for structural health monitoring, processing-microstructure-property relationships, and repair and remanufacturing. He has received several awards including the Exceptional Innovation Contribution Award and Recognition Award from INL, Dean's Ph.D. Scholar Award, Best Paper Award, NSF Travel Award, and Outstanding Reviewer for the journal Additive Manufacturing. He also serves as the reviewer for the leading journals in the area of advanced manufacturing and material science, including Nature Communications, Additive Manufacturing, Journal of Materials Science & Technology, Virtual and Physical Prototyping, Materials Science and Engineering: A, etc.

Symposium 5 Invited Speaker

Dr. Zilong Hua

Idaho National Laboratory

Presentation Title: Laser-Based Non-destructive Evaluation Techniques and Their Applications in Nuclear Energy Research

Abstract: Laser metrology employs lasers to generate and detect thermal or mechanical waves in materials. By analyzing the wave propagation in materials across time, frequency, and spatial domains, thermal properties such thermal conductivity, diffusivity, and heat capacity, as well as elastic properties such as Young's modulus and shear modulus, can be measured with high accuracy and resolution. Most laser-based measurements are remote, non-contact, and non-destructive. Therefore, with proper design and optimization, laser metrology systems can be powerful tools for non-destructive evaluation (NDE).

This talk will present the laser-based NDE systems and their applications at Idaho National Laboratory (INL). INL, under the DOE-NE, is the leading R&D national laboratory focused on the nuclear reactor design, construction, operation, and maintenance. Working within the Condensed Matter and Materials Physics group, our primary work involves fundamental research of the physical properties of nuclear fuels. Our laser metrology lab houses several thermal wave measurement systems (time-domain/frequency-domain/spatial-domain thermoreflectance, or TDTR/FDTR/SDTR, and photothermal radiometry/infrared thermography, or PTR/IRT), and laser ultrasound testing (LUT) systems (resonant ultrasound spectroscopy, or RUS, and time-domain Brillouin Scattering, or TDBS). These laser metrology NDE measurements cover spatial resolutions ranging from sub-micrometer to millimeter, and temperature from cryogenic to 1000°C. Using these systems, we investigate the thermal and elastic properties of nuclear fuels and structural materials, as well as the property change post-irradiation. These post-irradiation-examination (PIE) measurements play a crucial role in understanding the nuclear fuel performance within reactors. By collaborating with computational scientists and microstructure characterization researchers, we provide detailed insights into the performance of fuel and structural materials throughout their lifetime in reactor.

Additionally, we design and develop customized in-situ/in-operando laser metrology systems capable of collecting and analyzing data in a real-time manner, with the focus of system portability, survivability in extreme environment (such as in hot cells and reactors), and rapid screening capability. Since thermal and elastic properties are tightly tied to the microstructure defects, the real-time measurements can shed lights into the dynamic microstructure evolution. Examples include, 1) a fiber-based PTR system is used to measure real-time thermal conductivity change of nuclear fuels in MIT research reactor, 2) a lock-in IRT system is used as the real-time feedback loop to examine the manufactured part porosity in the Continuous Electric Field Assisted Sintering (CEFAS) system, and 3) an LUT system is used to monitor the annealing process of U-Zr alloys. Additional systems under development and their potential applications will also be presented.

Biography: Dr. Hua is a staff scientist at Idaho National Laboratory with research interests in the investigation of multi-scale thermal and acoustic transport phenomena of materials in extreme environment using laser-based characterization techniques. He also contributes to the development, deployment, and maintenance of state-of-art characterization techniques and INL-developed instruments, such as Thermal Conductivity Microscope (TCM) and Material Properties Microscope (MPM), for real-time, in situ measurements in reactors and hot cells, and as non-destructive evaluation tools. Dr. Hua received his doctorate in mechanical engineering at the Utah State University in 2013, and a bachelor's in materials science and engineering at the Tsinghua University (China) in 2007.

Symposium 5 Invited Speaker

Dr. Bo Mi Lee

Assistant Professor
Department of Mechanical and Aerospace Engineering
Missouri University of Science and Technology

Presentation Title: Additively Manufactured Stimuli-Responsive Materials for Wearable Sensing

Abstract: Wearable sensors are transforming healthcare, robotics, and human-machine interfaces. However, conventional sensors often suffer from rigidity, fragility, and poor conformity to dynamic surfaces such as human skin. In contrast, flexible, stimuli-responsive materials offer improved mechanical compliance, stretchability, and ability to respond to external stimuli, positioning them as viable materials for wearable sensors. Despite these advances, challenges remain in tailoring their sensing performance and scaling up fabrication. To address these challenges, additive manufacturing (AM) has emerged as a versatile approach for fabricating complex, customizable sensor architectures with minimal material waste and rapid production. Most importantly, AM enables precise control over 3D sensor geometry, porosity, and material composition, providing new opportunities to optimize sensor performance by design. In this talk, I will present our recent progress leveraging AM to assemble flexible, stimuli-responsive material-based sensors for wearable applications. The first part will focus on wireless hydrogel-based sensors for temperature and pressure monitoring. Then, I will introduce PEDOT:PSS-based flexible sensors capable of simultaneous strain and temperature sensing through piezoresistive and thermoelectric mechanisms.

Biography: Dr. Bo Mi Lee is an Assistant Professor in the Department of Mechanical and Aerospace Engineering at Missouri University of Science and Technology (Missouri S&T). Dr. Lee earned her Ph.D. in Structural Engineering from the University of California, San Diego in 2019. Following her Ph.D., she was a postdoctoral associate at the University of California, Davis (2019–2021), and the University of Central Florida (2021–2024). Dr. Lee's research interests include multifunctional materials, stimuli-responsive nanocomposites, and data-driven approaches for advanced sensor technologies, structural health monitoring, and energy solutions.

Symposium 6 Invited Speaker

Dr. Marianne Alleyne

Assistant Professor
Department of Entomology & Department of Mechanical Science and Engineering
University of Illinois at Urbana-Champaign

Presentation Title: Keeping Biologists in the Room: Addressing the Disciplinary Imbalance in Bioinspired Design

Abstract: Nature offers a vast repertoire of solutions refined through evolution, providing inspiration for novel technologies to address complex technological challenges. This bioinspired design (BID) method integrates biological insights and engineering principles. It is less common to take an opposite approach that we termed engineering-informed biology (EIB). For EIB we use engineering tools—many developed through BID—to better understand natural phenomena that motivates biological research. The work in the Alleyne Bioinspiration Collaborative (ABCLab) focuses on the diverse movement systems and surface functionalities of insects, including dragonflies, grasshoppers, flies, cicadas, leafhoppers, and beetles. Insects have evolved in a wide range of ecological contexts, offering an array of adaptive strategies to environmental challenges. These strategies, particularly in surface properties and biomechanics, provide rich opportunities for BID. Our investigations explore phenomena such as super-hydrophobicity, antimicrobial activity, ultra-reflectivity, and latch-mediated spring actuation. These natural functionalities not only inspire engineering applications but also help us understand the evolutionary pressures that shape them, exemplifying the two-way exchange between BID and EIB.

To illustrate our approach, two case studies will be presented. The first explores the anti-microbial and hydrophobic properties of insect surfaces and their potential for technological application, such as in medical or industrial materials. These findings and fabricated surfaces can then be used to answer, for instance, mechanistic and evolutionary questions for why different insects might use different approaches for achieving multifunctionality. The second case study examines the click beetle's jumping mechanism, driven by a latch-mediated spring actuation system, and its implications for designing compact, power-amplified mechanical systems. These mechanical system prototypes can be used to help explain the evolution for such mechanisms, which may not have been for the purpose of jumping. These examples highlight how a BID framework, informed by both biological complexity and engineering needs, can foster more effective interdisciplinary collaboration and innovation.

To effectively harness biological inspiration, especially across a broad array of systems, a structured BID framework is essential. This framework should facilitate the construction of meaningful analogies between biological functions and engineering challenges, ensuring that the most suitable biological strategies are identified and applied. BID studies remain isolated within disciplinary silos, limiting their potential impact. Interdisciplinary teams—especially those truly integrating biology and engineering—are rare but have shown greater potential for innovation. For such teams to succeed, collaboration must begin early and be sustained throughout the research process and must integrate biologists in a meaningful way. This often requires an upfront investment of time but pays dividends by aligning biological insight with engineering objectives and diverse team motivations.

Biography: Dr. Marianne Alleyne is an Assistant Professor in the Department of Entomology at the University of Illinois Urbana-Champaign. She earned her B.A. in Biology from the University of California, Berkeley (advisor: Dr. Bob Full), her M.S. in Entomology from the University of California, Riverside (advisor: Dr. Nancy Beckage), and her Ph.D. in Entomology from UIUC (advisor: Dr. Rob Wiedenmann). Her laboratory, the Alleyne Bioinspiration Collaborative (ABCLab) is particularly interested in bioinspired design (BID)—applying biological principles to solve engineering challenges, but also on engineering-informed biology (EIB), which uses engineering tools to gain insights into biological systems. Her current research focuses

the development of bioinspired materials and robotics that have multi-functionality, and to use prototypes and engineering tools to help explain why certain materials and movement systems have evolved in nature. The ABCLab fosters interdisciplinary collaboration across entomology, engineering, and design, with a strong emphasis on training undergraduate and graduate researchers. In order for both biologists and engineers to mutually benefit from BID and EID they need to know how to build, manage, and sustain collaborations that integrate diverse perspectives, methods, and goals. Only then can interdisciplinary research be innovative and lead to novel designs, while also advancing the field of biology. Dr. Alleyne has been an active member of the Entomological Society of America (ESA) for over 25 years, serving in various leadership roles, including as ESA President in 2023. Her broader professional interests include science communication, science policy, and advancing diversity and inclusion in science.

Symposium 6 Invited Speaker

Mihai "Mishu" Duduta

Assistant Professor
School of Mechanical, Aerospace and Manufacturing Engineering
University of Connecticut

Presentation Title: Soft Machines in Extreme Environments

Abstract: Soft machines—systems composed of compliant materials that mimic the adaptability and resilience of biological organisms—are redefining what is possible in environments where traditional rigid machines fail. This presentation explores the design, fabrication, and deployment of soft robotic systems engineered to operate in extreme environments, including deep underwater, outer space, and hazardous terrestrial zones. We highlight recent advances in materials science, actuation strategies, and sensing modalities that enable these machines to navigate high pressures, wide temperature ranges, corrosive conditions, and low-visibility scenarios. Through case studies, we demonstrate how softness can be a strategic advantage, enabling machines to conform, survive, and function where others cannot. This work lays the foundation for a new class of adaptive, robust, and multifunctional robots capable of thriving in the planet's—and universe's—most unforgiving environments.

Biography: Mihai "Mishu" Duduta is an assistant professor in the School of Mechanical, Aerospace and Manufacturing Engineering at UConn. He completed a B.S. in Materials Science and Engineering at MIT, then became the first employee of 24M Technologies, a start-up spun out to commercialize a battery technology he co-invented. His Ph.D. thesis in soft robotics, completed at Harvard University, under the guidance of Profs. Robert Wood and David Clarke, included work which won a Gold Award at the Materials Research Society Fall Meeting 2018, and was nominated for Best Paper at ICRA 2018. Before UConn, he was a Medical Devices Innovation Fellow at the University of Minnesota, then an assistant professor at the University of Toronto in Mechanical & Industrial Engineering. His research group focuses on materials and manufacturing innovations to enable soft machines to operate in extreme environments. Prof. Duduta has authored a book entitled, Soft Robotics: Building Machines from Soft Matter, to be published by DeGruyter in summer 2025.

Symposium 7 Invited Speaker

Dr. Andres F. Arrieta

Full Professor of Mechanical Engineering, Aeronautics, and Astronautics Engineering (by courtesy)
Purdue University

Presentation Title: Nonlinear Metamaterials for Low-Frequency and Broadband Energy Harvesting

Authors: Myungwon Hwang, Sneha Srikanth, Yeongeun Ki, and Andres F. Arrieta

Abstract: Conventional resonant-based energy harvesters suffer from performance degradation when operated away from the resonant frequencies of the vibrating structures. Nonlinear and metamaterial-based harvesting strategies have been proposed to broaden the operating bandwidths of the energy harvesters. However, the attainable bandwidth enhancements are still constrained by device or unit-cell resonances. Therefore, the resulting operational frequency bandwidth in such strategies is constrained by the fundamental resonant or scattering relationships, which are inversely proportional to the building block's size, rendering low-frequency applications particularly challenging. A new class of strongly nonlinear interactions in metamaterials that sustain soliton propagation can provide a route to address this bandwidth limitation. The particle-like nature of solitons offers a fundamentally different mechanism to achieve effective dynamics that break the strong link between unit cell size and operating frequency. We present a class of multistable metastructures displaying strong nonlinear interactions from propagating topological solitons or transition waves enabling low-frequency and broadband energy harvesting. We show how transition waves excite the same type of response in the metastructure's units regardless of the input excitation. The invariance of these dynamics allows for achieving robust impedance matching between the mechanical and electrical responses, thereby resulting in efficient electromechanical energy transduction. We also present a new dynamic phenomenon referred to as solitonic resonance, in which soliton-structural mode interactions enable multistable metastructures to exhibit extreme input-output energy exchange. By tuning the topology of our multistable metastructures, we can convert the input's frequencies into output responses that are orders of magnitude apart. These soliton-driven nonlinear interactions break the dependence of the attainable unconventional dynamical properties on the unit cell's size in resonance- or scattering-based metamaterials. The investigated multistable metastructures' dynamics provide a route to accelerating metamaterials adoption for energy harvesting in structural applications by enabling low-frequency operation.

Acknowledgment: We gratefully acknowledge the support of the National Science Foundation (Grant No. CMMI-1935137) funding this research.

Biography: Dr. Andres F. Arrieta is a Full Professor of Mechanical Engineering and Aeronautics and Astronautics Engineering (by courtesy) at Purdue University, where he leads the Programmable Structures Lab. Previously, he worked as a Group Leader at ETH Zurich's CMAS Lab and as a Research Associate at the Dynamics and Oscillations Group at TU Darmstadt. He received his Ph.D. in Mechanical Engineering from the University of Bristol and his BEng from the Los Andes University, Bogota, Colombia. Dr. Arrieta's research in structural mechanics investigates the fundamental interaction between geometry, hierarchy, and nonlinearity and their role in designing systems with intrinsic properties enabling adaptation, autonomy, and environmental responsiveness. Current efforts concentrate on the modeling and designing of morphing structures, soft robotics, embodied intelligence in structures, nonlinear metamaterials, energy harvesting, and bioinspired design. The Programmable Structures Lab's work has been highlighted by several media outlets, including National Geographic and Nature's News and Views.

His research has been recognized with several research awards, including the 2021 inaugural Early Career Award in Smart Materials and Structures (IOP Science); NSF CAREER Award (2020); the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Innovation Research Grant; the ASME Gary Anderson Award (2018) for "outstanding contributions to the field of Adaptive Structures;" and the ETH Postdoctoral Fellowship (2012).

Symposium 7 Invited Speaker

Dr. Mohammad H. Malakooti

Assistant Professor of Mechanical Engineering
University of Washington – Seattle

Presentation Title: Stretchable Thermoelectric Wearables with 3D Soft Architectures and Electrical Self-Healing

Abstract: Designing thermoelectric generators that are simultaneously stretchable, efficient, and durable remains a major challenge for energy-harvesting wearables. In this talk, I will present a new class of stretchable thermoelectric devices built using 3D soft architectures that integrate multifunctional elastomer composites, rigid semiconductors, and electrically self-healing liquid metal conductors. These devices operate reliably under extreme mechanical deformation up to 230% strain and exhibit high power density at low temperature gradients. I will describe how 3D printing is used to fabricate the thermoelectric modules and enhance thermal management through engineered infill patterns. This approach helps maintain the temperature gradient across the semiconductors, increasing energy conversion without compromising mechanical flexibility or resilience. The devices demonstrate high damage tolerance, continuing to function after multiple punctures and thousands of stretching cycles. They also provide effective active heating and cooling through the Peltier effect, enabling on-demand thermoregulation. When integrated with 3D-printed heatsinks, they can power LEDs and sensors by harvesting body heat, which highlights their potential for self-powered, skin-conformable electronics. I will conclude by discussing how machine learning can accelerate the design of soft multifunctional composites, particularly for flexible thermoelectric devices.

Biography: Dr. Mohammad H. Malakooti is an Assistant Professor of Mechanical Engineering at the University of Washington – Seattle. He leads the iMatter Lab, a research group dedicated to creating materials that match the extraordinary adaptability, rich multifunctionality, and embodied intelligence of natural material systems. He received his Ph.D. from the University of Florida in 2015, completed a Postdoctoral Fellowship at the University of Michigan (2015–2017), and was a Research Scientist at Carnegie Mellon University (2017–2019). Dr. Malakooti has published over 45 peer-reviewed articles in leading scientific journals. His contributions have been recognized with several honors, including ASME Best Paper Awards (2016, 2022) and the Outstanding Postdoctoral Fellow Award from the University of Michigan.

Special Symposium Invited Speaker

Dr. Mattia Gazzola

Charles Conrad Kritzer Associate Professor
University of Illinois Urbana-Champaign

Presentation Title: Modeling, Realization and Control of Living Creatures, Machines, and Materials

Abstract: Fiber-based organization of matter is pervasive in nature and engineering, in active and passive settings, and across scales, from muscles, tendons, and bones that make up full organisms to polymers, composite materials, and soft robots. Here, a modeling approach based on assemblies of Cosserat rods is presented to tackle fibrous systems that are distributed, heterogeneous, and hierarchically organized. Scalability, robustness, and utility of our simulation methods are then demonstrated for the design, realization and control of soft living creatures, bio-hybrid machines, and metamaterials.

Biography: Mattia Gazzola is the Charles Conrad Kritzer Associate Professor in the Mechanical Science and Engineering Department at the University of Illinois Urbana-Champaign. He joined UIUC in Fall 2016 after a postdoc at Harvard and a Ph.D. at ETH Zurich. His work lies at the interface between mechanics, biology, robotics, and computing. His studies were awarded with the ETH Medal, Early and Advanced Swiss National Science Foundation Fellowships, NSF CAREER, and featured on the cover of several scientific journals including, Science, Nature, PNAS, and PRL. He is the Lead PI and co-director of the center-scale NSF Expedition "Mind in Vitro–Computing with Living Neurons."

Special Symposium Invited Speaker

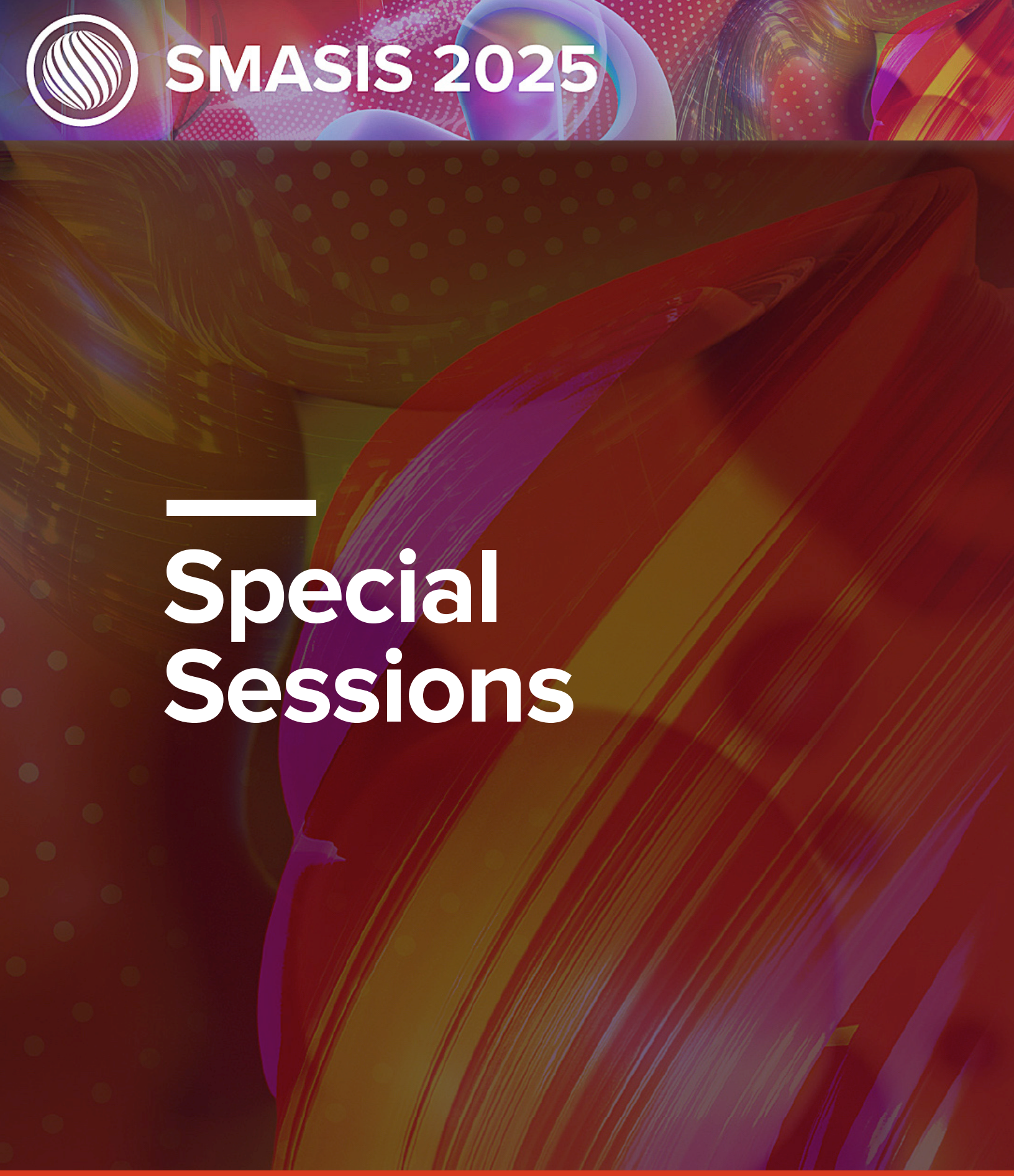
Marc Serra-Garcia

Tenure Track Group Leader
AMOLF, 1086VA Amsterdam, the Netherlands

Presentation Title: Physical Computing with Metamaterials

Abstract: There is a significant range of physical phenomena—from nonlinear elasticity, to symmetry, noise, topology, and disorder—that are rarely utilized in traditional computing paradigms. Yet these phenomena can unlock new efficiencies, by directly processing signals in their natural domain, and by bypassing the traditional abstraction stack associated with digital CMOS technology. However, building physical computers is challenging. Information processing tasks generally involve complex input-output relations, thus requiring designs that are highly expressive; and for these designs, the relation between function and structure is nontrivial, complicating the simulation, design, and fabrication of devices. In my talk, I will illustrate our journey toward using metamaterials for physical computing, with two recent examples. First, I will talk about our results in passive speech recognition, where we leverage a phononic metamaterial to implement wake-up-word detection with zero standby power consumption. Second, I will discuss our ongoing work in self-learning materials, that autonomously adapt to improve their performance—driven by their ability to form long-term memories in response to examples and external feedback.

Biography: Marc Serra-Garcia (Manresa, 1987) is a tenure-track group leader at the AMOLF research institute in Amsterdam. After a B.Sc. in Physics at Universitat Autònoma de Barcelona, he did a M.Sc. degree at Caltech, and a Ph.D. at ETH Zurich. His research is currently focused on novel (beyond-CMOS) approaches to information processing, with the goal of using a richer and more diverse set of physical phenomena to implement relevant information-processing tasks with low power. The research has been recognized by an ERC Starting grant and various other grants from the Dutch Research Council and Swiss National Science Foundation.



Special Sessions

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Deployable and Adaptive Space Structures

- Host of special session: Maria Sakovsky
- Part of Symposium 4
- **Session Description:** This session focuses on advancements in the design, analysis, and implementation of deployable and adaptive spacecraft structures. Topics include but are not limited to innovative deployment mechanisms, lightweight materials, adaptation of shape and other mechanical properties in structures, and multifunctional materials and structures with special consideration for structures operating in the space environment. This session invites discussions on experimental validation, computational modeling, and emerging technologies that enable next-generation capabilities for solar arrays, optical and radio frequency apertures, and other space applications.

Active Hybrid Composites

- Host of special session: Martin Gurka
- Part of Symposium 4
- **Session Description:** The combination of active smart materials (such as shape memory alloys, piezoelectrics or active polymers) and a structural load bearing material (e.g fibre reinforced composite) leads to so- called active hybrid composites with sensing or actuation capabilities.

  This considerably broadens possibilities for new applications, but poses new questions. On the practical side, new ways must be found to exchange energy and mechanical loads with the surrounding structure; theoretically, the question arises how to describe these multifunctional composites efficiently.
  This Active Hybrid Composites session will focus on both aspects.

Multifunctional Energy Storage Systems

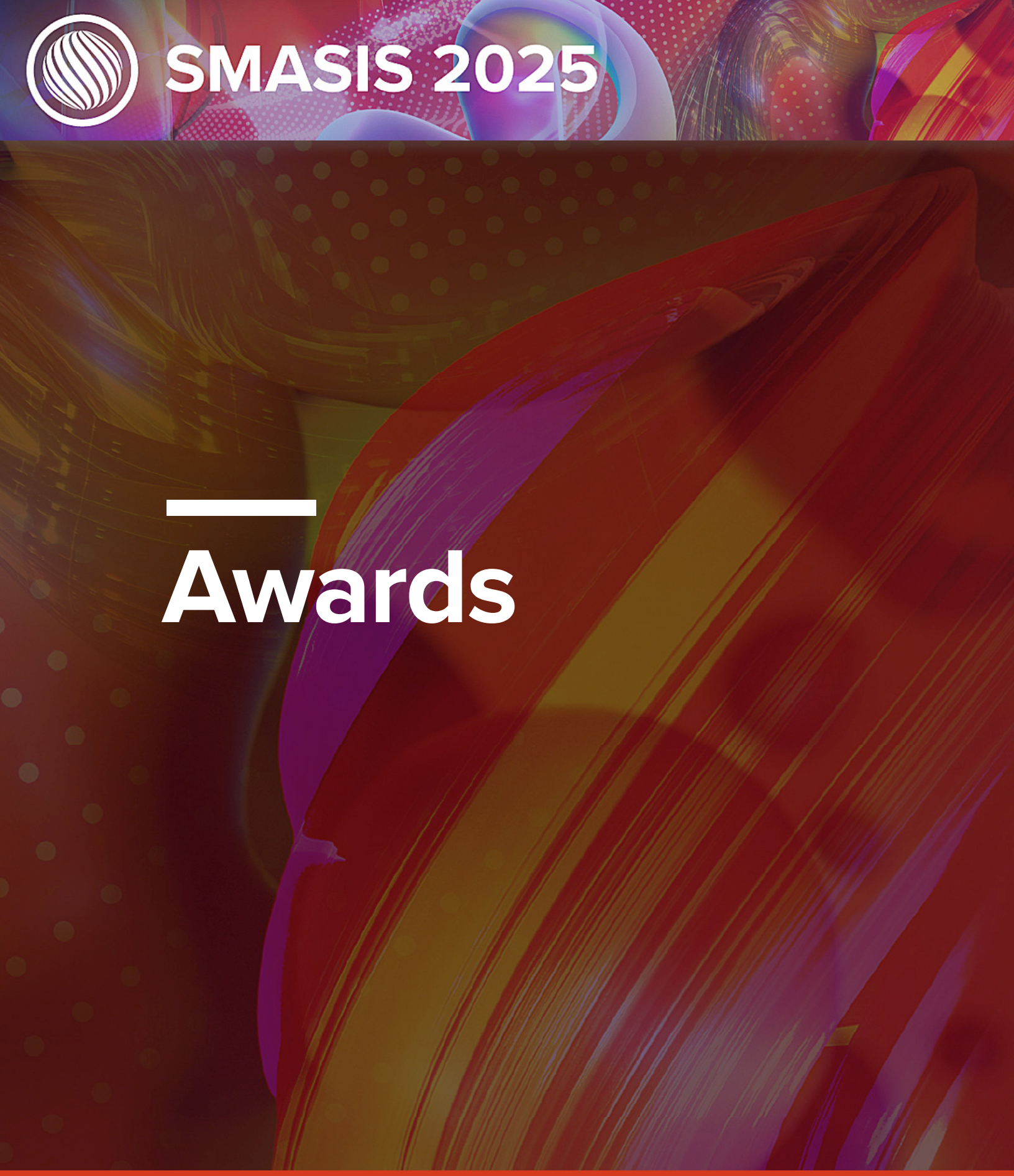
- Hosts of special session: Sebastian Geier, Cody Gonzalez
- Part of Symposium 4
- **Session Description:** The use of multifunctional energy storage systems (such as batteries, supercapacitors, and others) for additional purposes such as composites, structures, and actuators is an emerging topic. Such technology could lead to dual purpose energy storage for reduced volume and/or weight, or additional system capabilities such as structural reinforcement, actuation, and sensing.
  This special session gives a platform for research presentations highlighting this topic.

Multifunctional Yarns, Textiles, and Systems

- Host of special session: Paul W. Alexander - General Motors R&D & Julianna Abel - University of Minnesota
- Part of Symposium 4
- **Session description:** Customer-facing interactive technologies not only have to be functionally capable, but they also must be inviting and comfortable for users to engage with. Multifunctional textile technology offers 'soft' devices and systems that integrate functionality into materials familiar to users and can operate and articulate around and with them in an inherently safer and more ingratiating manner. This session explores performance enhancement by introducing multifunctionality at all levels of the textile hierarchy: novel constituent yarns and fibers with capabilities beyond the conventional, textile architectures that add functionality through their construction and architecture, and adaptive and reconfigurable components and systems that use textiles and yarns in clever ways to create impactful customer experiences. This session is open to researchers and designers who work in this space and are making discoveries and contributions that advance the burgeoning field of multifunctional textiles.

Toyota / Univ of Michigan Tech Incubator Session

- Host of special session: Diann Brei, University of Michigan and Umesh Gandhi, Toyota Research
- Part of Symposium 4
- **Session Description:** The Toyota Research Institute of North America (TRINA) and the Smart Materials and Structures Design Lab at the University of Michigan are partnering to address the challenges of using smart materials and adaptive structures for real-world applications. This session will highlight a unique university–industry collaboration that combines complementary strengths to develop innovative solutions while preparing students for future careers. The Technology Incubator model enables short-term, low-investment projects to quickly assess high-risk, high-reward ideas. U-M's Mechanical Engineering Department supports this approach through its Research, Innovation, Service, and Entrepreneurship (RISE) program, a sequence of undergraduate and master's independent project courses where students apply engineering principles to real-world projects. We will share an overview of our novel partnership framework and showcase student project examples.



Awards

The American Society of Mechanical Engineers®
ASME®

ASME
SETTING THE STANDARD

ASME DEDICATED SERVICE AWARD

"In 1983, the ASME Board of Governors approved the establishment of the ASME Dedicated Service Award (DSA). It honors unusual dedicated voluntary service to the Society marked by outstanding performance, demonstrated effective leadership, prolonged and committed service, devotion, enthusiasm and faithfulness."

Chris Lynch, University of California Riverside
Chris Lynch is a transformative leader with over two decades of impactful service and leadership to ASME and the SMASIS community. Most notably Chris in 2005 he co-founded the ASME Smart Materials, Structures and Intelligent Systems (SMASIS) Conference and served many years on the conference Executive Advisory Board. He has steadily built and supported the SMASIS community serving on TC/Branch leadership, Aerospace division leadership and current member of the SMASIS division steering committee.

Mary Frecker, Penn State University
In recognition of Mary Frecker's continuous and dedicated service to ASME through the Design Engineering Division and the newly formed SMASIS Division. Mary is the role-model of making significant contributions to our scientific community through leadership, mentorship, and research innovation.

ASME HONORARY MEMBER

Honorary Membership is one of the most prestigious ASME awards. It is awarded for a lifetime of service to engineering or related fields--e.g. science, research, public service. This achievement is described as "distinguished service that contributes significantly to the attainment of the goals of the engineering profession." Ranking closely with Honorary Membership is the ASME Medal which is awarded for "eminently distinguished engineering achievement."

Honorary Membership was first awarded in 1880, the founding year of the Society.

Kon-Well Wang, University of Michigan

Kon-Well Wang Elected Honorary Member of ASME

Kon-Well Wang, the A. Galip Ulsoy Distinguished University Professor of Engineering and the Stephen P. Timoshenko Professor of Mechanical Engineering at the University of Michigan, has been elected Honorary Member of the American Society of Mechanical Engineers (ASME) - one of the society's highest honors. Professor Wang was recognized for his "lifelong distinguished contributions in achieving transformative research in structural dynamics with practical importance and establishing new fields, leading the community to advance the engineering profession, and providing leadership that shaped the nation's research and education."

Throughout his career, Professor Wang has distinguished himself as an eminent scholar for his groundbreaking research, including the creation of multifunctional adaptive structures, nature-inspired metastructures, and embodying mechano-intelligence in structural dynamics. His achievements have significant contributions to the basic scientific knowledge, as well as to technologies that have greatly benefited industry, from automotive drivetrains to rotorcraft airframes and space reflectors.

With over 400 publications, leadership roles at the University of Michigan and the National Science Foundation, and numerous prestigious awards, Professor Wang has advanced the engineering profession as a researcher and educator, a dedicated mentor to more than 90 graduate students and postdocs, and a community leader. His visionary and strategic leadership have elevated engineering education, shaped national research directions, and enhanced the profession's impact. Professor Wang will be formally recognized at the ASME International Mechanical Engineering Congress & Exposition in November 2025.

GARY ANDERSON EARLY ACHIEVEMENT AWARD

Austin Downey, Ph.D.,
Associate Professor of Mechanical Engineering, Aerospace Engineering,
Civil Engineering at the University of South Carolina

Biography: Austin R.J. Downey, is an Associate Professor of Mechanical Engineering, Aerospace Engineering, Civil Engineering at the University of South Carolina. His work is pioneering ultra-low-latency machine-learning and embedded control solutions for structures operating in extreme dynamic environments. His NSF CAREER, AFOSR Young Investigator, and Fulbright awards share a single focus: developing ultra-low-latency state-estimation and control strategies for structures in extreme dynamic environments, optimized for execution on heterogeneous computing architectures. Applications span hypersonic flight control and real-time blast mitigation. His broader smart-structure portfolio features smart concrete systems, meter-scale sensing skins, self-sensing composite laminates, and UAV-deployable sensor packages for structural health monitoring.

Since earning dual doctoral degrees in Engineering Mechanics and Wind Energy Science Engineering & Policy from Iowa State University in 2018 as an NSF-IGERT Fellow, he has published more than 80 peer-reviewed papers. Austin mentors a diverse team of 10 Ph.D. candidates, 5 M.S. students, and over 25 undergraduates, and has graduated 3 Ph.D. and 10 M.S. students. Moreover, he has mentored more than 80 past undergraduate researchers whose collective accomplishments include three NSF GRFP and two DoD SMART fellowships. A committed advocate of open science, he maintains more than 100 public GitHub repositories, sharing code, data, and hardware designs.

BEST PAPER IN STRUCTURES, STRUCTURAL DYNAMICS, AND CONTROL AWARD

Awardees:

Mohamed Mousa: PhD Candidate,
Department of Mechanical and Aerospace Engineering,
University at Buffalo (SUNY)

Mostafa Nouh, Professor, ASME Fellow,
Department of Mechanical and Aerospace Engineering,
University at Buffalo (SUNY)

Manuscript: Parallel Mechanical Computing: Metamaterials that can Multitask

Analogue mechanical computing is the process of executing complex mathematical operations by manipulating incident waves through guided scattering. In off-grid and extreme environments, they provide a capacity to process signals which solely exist in mechanical form, such as vibroacoustic loads. They are largely hindered by their inability to perform parallel computations, i.e., different concurrent operations on the same input. Here, we realize the ability to conduct distinct tasks on monochromatic incident pressure fields within a single system of multilayered, resonant metasurfaces via smart frequency multiplexing. The study paves the way for rationally designed metamaterials with a self-embedded ability to multitask, a development which has been elusive in nondigital computing platforms.

Mohamed Mousa: PhD Candidate,
Department of Mechanical and Aerospace Engineering,
University at Buffalo (SUNY)

Biography: Mohamed is a PhD candidate at the University at Buffalo (SUNY), currently conducting research in the Sound and Vibrations Laboratory. His research centers around elasto-acoustic metamaterials, exploring their unique properties, for applications in smart materials, artificial mechanical intelligence, and mechanical computing. He holds BS and MS degrees from Cairo University in Mechanical Engineering and has over 5 years of experience as a teaching and research assistant, and a Turbomachinery Control engineer at Schneider Electric.

Mostafa Nouh, Professor in the Department of Mechanical and Aerospace Engineering at the University at Buffalo (SUNY).

Biography: Mostafa Nouh: Mostafa Nouh is a Professor in the Department of Mechanical and Aerospace Engineering at the University at Buffalo (SUNY). He received his PhD degree from the University of Maryland. His research focuses on structural dynamics and acoustics with applications in metamaterials, smart structures, and intelligent mechanical systems. He is a fellow of the American Society of Mechanical Engineers, a recipient of the NSF CAREER award, the Gary Anderson award, and the University at Buffalo's Young Investigator award. He has published over 60 journal papers and currently serves as an Associate Editor of the Journal of Vibration and Acoustics.

BEST PAPER IN MECHANICS AND MATERIAL SYSTEMS AWARD AND ENERGY HARVESTING BEST PAPER AWARD

Awardees:

Youngshang Han – Ph.D. Student – Department of Mechanical Engineering,
University of Washington, Seattle, WA 98195, USA

Halil Tetik – Postdoctoral Scholar – Department of Mechanical Engineering,
University of Washington, Seattle, WA 98195, USA

Mohammad H. Malakooti – Assistant Professor – Department of Mechanical Engineering,
University of Washington, Seattle, WA 98195, USA

Manuscript: 3D Soft Architectures for Stretchable Thermoelectric Wearables with Electrical Self-Healing and Damage Tolerance

Flexible thermoelectric devices (TEDs) exhibit adaptability to curved surfaces, holding significant potential for small-scale power generation and thermal management. However, they often compromise stretchability, energy conversion, or robustness, thus limiting their applications. Here, we introduce the implementation of 3D soft architectures, multifunctional composites, self-healing liquid metal conductors, and rigid semiconductors to overcome these challenges. These TEDs are extremely stretchable, functioning at strain levels as high as 230%. Their unique design, verified through multiphysics simulations, results in a considerably high power density at low temperature gradients. This is achieved through 3D printing multifunctional elastomers and examining the effects of three distinct thermal insulation infill ratios (0%, 12%, and 100%) on thermoelectric energy conversion and structural integrity. The engineered structure is lighter and effectively maintains the temperature gradient across the thermoelectric semiconductors, thereby resulting in higher output voltage and improved heating and cooling performance. Furthermore, these thermoelectric generators show remarkable damage tolerance, remaining fully functional even after multiple punctures and 2,000 stretching cycles at 50% strain. When integrated with a 3D-printed heatsink, they can power wearable sensors, charge batteries, and illuminate LEDs by scavenging body heat at room temperature, demonstrating their application as self-sustainable electronics.

Youngshang Han – Ph.D. Student – Department of Mechanical Engineering,
University of Washington, Seattle, WA

Biography: Youngshang Han received his B.Sc. in Mechanical Engineering from Chung-Ang University and earned his M.S. from the University of Washington, where he is now pursuing a Ph.D. in Mechanical Engineering in the iMatter Lab under the supervision of Prof. Mohammad H. Malakooti. His research focuses on additive manufacturing of stretchable composites and soft electronic devices. Youngshang has contributed to more than five high-impact journal articles and three patents. He has also received honors including the 2023 NanoES Student Scientific Achievement Award and the 2024 Clean Energy Institute Graduate Fellowship at the University of Washington.

Halil Tetik – Postdoctoral Scholar – Department of Mechanical Engineering, University of Washington, Seattle, WA

Biography: Dr. Halil Tetik received his B.Sc. and M.Sc. in Mechanical Engineering from Izmir Institute of Technology, Turkey, and his Ph.D. in Industrial Engineering from Kansas State University, where he worked with Prof. Dong Lin on 3D printing of functional aerogels. Upon graduation, he joined the University of Washington as a postdoctoral scholar, studying additive manufacturing of soft multifunctional composites and wearable electronics under the supervision of Prof. Mohammad H. Malakooti. He has published over 10 journal articles and received the Outstanding Paper Award at the 2021 North American Manufacturing Research Conference.

Mohammad H. Malakooti – Assistant Professor – Department of Mechanical Engineering, University of Washington, Seattle, WA

Biography: Dr. Mohammad H. Malakooti is an Assistant Professor of Mechanical Engineering at the University of Washington. He leads the iMatter Lab, a research group dedicated to creating materials that match the extraordinary adaptability, rich multifunctionality, and embodied intelligence of natural material systems. He received his Ph.D. from the University of Florida, completed a Postdoctoral Fellowship at the University of Michigan, and was a Research Scientist at Carnegie Mellon University. Dr. Malakooti has published over 45 peer-reviewed articles and received several honors, including ASME Best Paper Awards (2016, 2022) and the Outstanding Postdoctoral Fellow Award from the University of Michigan.

EPHRAHIM GARCIA BEST PAPER AWARD AND BIO INSPIRED SMART MATERIALS AND SYSTEMS BEST PAPER AWARD

Awardees:

Ruowen Tu, Postdoctoral researcher,
Istituto Italiano di Tecnologia (current);
University of Michigan (related to the paper)

Rémy A. Delplanche, Ph.D. candidate,
The University of Montana

Daniel J. Inman, Professor,
University of Michigan, Aerospace Engineering

Bret Tobalske, Professor,
The University of Montana

Henry A. Sodano, Professor,
University of Michigan

Manuscript: 3D Printed Feathers with Embedded Aerodynamic Sensing

Abstract: Bird flight is often characterized by outstanding aerodynamic efficiency, agility and adaptivity in dynamic conditions. Feathers play an integral role in facilitating these aspects of performance, and the benefits feathers provide largely derive from their intricate and hierarchical structures. Although research has been attempted on developing membrane-type artificial feathers for bio-inspired aircraft and micro air vehicles (MAVs), fabricating anatomically accurate artificial feathers to fully exploit the advantages of feathers has not been achieved. Here, we present our 3D printed artificial feathers consisting of hierarchical vane structures with feature dimensions spanning from 10−2 to 102 mm, which have remarkable structural, mechanical and aerodynamic resemblance to natural feathers. The multi-step, multi-scale 3D printing process used in this work can provide scalability for the fabrication of artificial feathers tailored to the specific size requirements of aircraft wings. Moreover, we provide the printed feathers with embedded aerodynamic sensing ability through the integration of customized piezoresistive and piezoelectric transducers for strain and vibration measurements, respectively. Hence, the 3D printed feather transducers combine the aerodynamic advantages from the hierarchical feather structure design with additional aerodynamic sensing capabilities, which can be utilized in future biomechanical studies on birds and can contribute to advancements in high-performance adaptive MAVs.

Biography: Ruowen Tu is a postdoctoral researcher at Istituto Italiano di Tecnologia in Italy. He completed dual bachelor's degrees in both mechanical engineering from Shanghai Jiao Tong University, and Aerospace Engineering from University of Michigan. He also received his Ph.D. in Aerospace Engineering from University of Michigan in 2024. His research interest include additive manufacturing of multifunctional materials, bioinspired design, and robotic systems with mechanical and material intelligence.

Biography: Rémy Delplanche is a Ph.D. candidate in the Ecology and Evolution program at the University of Montana. He earned a B.S. in Biology from Gonzaga University. His research interests broadly include the biomechanics and aerodynamics of vertebrate flight, the comparative anatomy of vertebrate wings, and the biomechanics of nonsteady locomotion. His Ph.D. work tests the effects of turbulence on flight in doves, with emphases on wing and feather kinematics, neuromuscular control, and metabolic and stability costs.

Biography: Daniel J. Inman received his Ph.D. from Michigan State University (1980) and is the Harm Buning Collegiate Professor and former Chair of Aerospace Engineering at the University of Michigan. Since 1980, he has published eight books eight software manuals, 20 book chapters, over 410 journal papers and 674 proceedings papers, given 78 keynote/plenary lectures, graduated 71 Ph.D. and 75 MS students. He works in the areas of applying smart materials and structures to solve aerospace engineering problems including energy harvesting, structural health monitoring, vibration suppression and morphing aircraft. He is a Fellow of AIAA, IIAV, ASME, SEM and AAM.

Biography: Bret Tobalske is a professor of biology in the Division of Biological Sciences and Director of the Field Research Station at Fort Missoula at the University of Montana. He received a BS from Southern Illinois University at Carbondale and an MS and PhD from the University of Montana. His research interests are in comparative biomechanics, the effects of body size on the ecological and evolutionary interactions between animals and the physical world. His specific interests include muscle contractile behavior, wing and body kinematics, material properties and aerodynamics.

Henry A. Sodano, Professor, University of Michigan

Biography: Dr. Sodano is a Professor in the Aerospace Engineering Department at the University of Michigan with an appointment in the Macromolecular Science and Engineering Program. 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 over 290 technical articles with his work being cited over 23,000 times. He currently serves as an associate editor of four journals and was awarded the NSF CAREER award in 2009, the American Society of Composites Young Researcher Award in 2012, the ASME Gary Anderson Award for Early Career Achievement in 2009, Virginia Tech's 2010 Outstanding Recent Alumni Award, Arizona State University's 2009 Faculty Achievement Award in Research Excellence, NASA Tech Brief Awards in 2010 and 2014, 7 best paper awards and was inducted into Virginia Tech's Academy of Engineering Excellence in 2010. He is a Fellow of ASME and SPIE and an Associate Fellow of AIAA.

ACTIVE MATERIAL TECHNOLOGY AND INTEGRATED SYSTEMS OUTSTANDING CONTRIBUTION AWARD

Martin Pohl, Dr.-Ing, German Aerospace Center (DLR)
Institute of Lightweight Systems, Department of Adaptive Systems

Manuscript: Wind tunnel and flight testing of a lamb wave-based ice accretion sensor

Severe icing conditions are still a risk in aviation, therefore detecting these conditions is crucial. This can be provided by an icing sensor. Using lamb waves which are guided by the aircraft structure, an ice detection is possible on aerodynamic surfaces. If an ice accretion happens, the wave guide behavior is affected changing amplitude and lag time of the lamb wave pulses. If the sensor is mounted to e.g. the leading edge of the wing, ice can be detected where it is relevant for the aerodynamic performance.

Within the project, the sensor hard- and software have been developed to create and measure lamb wave pulses in a wide frequency range. To investigate the influence of ice accretion on the lamb waves, wind tunnel tests were undertaken. Finally, the sensor was investigated in a flight test. In this paper, an overview about the function of the sensor as well as the general signal behavior are given. The results of the wind tunnel test and some preliminary results from the flight tests will be shown. In both tests, the sensor was able to detect even very thin ice layers with minimum delay from the beginning of the ice accretion.

Biography: Martin Pohl studies mechanical and aerospace engineering at Technical University of Dresden 2002-2008. He has been a scientific employee at DLR since 2008, and obtained his Ph.D. in 2015 in the field of noise and vibration reduction. His research fields encompasses a wide range of topics, including structural morphing, noise and vibration reduction, ultrasonics and ice detection, and electronics and control.

ACTIVE AND MULTIFUNCTIONAL MATERIALS OUTSTANDING CONTRIBUTION AWARD

Awardees:

M. Sc. Fabian Sordon, Mechatronic Systems Lab,
Technische Universität Berlin, Hardenbergstraße 36, 10623 Berlin, Germany

Dr.-Ing. Omar El Khatib, Institute of Mechanics and Fluid Dynamics,
Technische Universität Bergakademie Freiberg, Lampadiusstr. 4, 09599 Freiberg, Germany

M. Sc. Robert Courant, Mechatronic Systems Lab,
Technische Universität Berlin, Hardenbergstraße 36, 10623 Berlin, Germany

M. Sc. Akshay Balachandran Jeeja, Institute of Mechanics and Fluid Dynamics,
Technische Universität Bergakademie Freiberg, Lampadiusstr. 4, 09599 Freiberg, Germany

Prof. Dr.-Ing. Jürgen Maas, Mechatronic Systems Lab,
Technische Universität Berlin, Hardenbergstraße 36, 10623 Berlin, Germany

Prof. Bjoern Kiefer, Ph.D., Institute of Mechanics and Fluid Dynamics,
Technische Universität Bergakademie Freiberg, Lampadiusstr. 4, 09599 Freiberg, Germany

Manuscript: A novel scale-bridging method for MSMA linking continuum thermodynamics constitutive formulations to lumped system-level models

This work introduces a novel scale-bridging method between a continuum thermodynamics constitutive model and a lumped system-level model for magnetic shape memory alloys (MSMA). With this method, system models for real-time operations are generated based on virtual experiments using the constitutive model. The proposed method addresses the fact that, while constitutive models for MSMA typically only require small sets of parameters as input, their evaluation is still computationally expensive. System models for control engineering, however, require extensive experimental parameterization, while their evaluation is highly time-efficient. The proposed scale-bridging method has the potential to combine a small parameterization effort and a low computational cost of the real-time system model. Additionally, the constitutive model is utilized to investigate whether it can determine the individual behavior of MSMA samples. This is important since the inherent model parameters, while valid for ideal single crystals, deviate for non-ideal MSMA sample behavior. To this end, the MSMA constitutive model, based on a global variational principle originally proposed by Kiefer et al is supplemented by various extensions, including a more robust algorithmic treatment. A parameter identification procedure is introduced to optimize the constitutive model parameters based on an outer hysteresis curve for a particular load case. By conducting virtual experiments with the constitutive model, data sets are generated to parameterize Preisach hysteresis models as numerical approximations of the constitutive models. The resulting hysteresis models are compared with physical experiments using an MSMA test bench for different load cases.

It is shown that the proposed scale-bridging method successfully generates hysteresis models derived from constitutive models. While maintaining accuracy comparable to strictly phenomenological models across various load cases (as validated through physical MSMA test bench experiments), these models require significantly less parameterization effort than classical system models. This translates to faster model creation and broader applicability.

Biography: Fabian Sordon is a dedicated research engineer at the Technical University of Berlin, specializing in smart materials — particularly magnetic shape memory alloys and magnetorheological fluids. He brings expertise in multiscale modeling of magnetic materials using multiphysical simulations, as well as the design of magnetic excitation circuits. After earning his bachelor's degree from the Karlsruhe Institute of Technology and his master's in mechanical engineering from the Technical University of Berlin, he is now making significant strides in his field at the Mechatronic Systems Lab.

Biography: Omar El Khatib is a postdoctoral researcher at TU Bergakademie Freiberg, specializing in multiscale modeling of multifunctional materials and fracture mechanics. His work integrates advanced numerical methods with material modeling, focusing on smart materials such as ferromagnetic shape memory alloys and ferroelectric ceramics. He holds a doctorate in mechanical engineering and has contributed to diverse areas, including fracture and damage analysis, coupled multiphysics problems, and computational materials science. His research bridges mechanics and materials science to investigate the complex behavior of functional materials.

Biography: Robert Courant received his bachelor's and master's degrees in mechanical engineering from the Technical University of Berlin, where he currently serves as a research assistant at the Mechatronic Systems Laboratory. His research focuses on magnetic shape memory alloys, particularly developing a novel excitation concept for multistable actuators. He investigates these multiphysical systems using analytical, numerical, and experimental methods at various scales. Continuum-scale models characterized by digital image correlation serve as the basis for developing scale-bridging lumped-element models, which enable efficient actuator control.

Biography: Akshay Balachandran Jeeja is a doctoral researcher at TU Bergakademie Freiberg, working in collaboration with both the Institute of Mechanics and Fluid Dynamics and the Institute of Numerical Mathematics and Optimization. He earned his Master's degree in Computational Materials Science from the same university, where his thesis focused on finite element modeling of magnetic shape memory alloys. His current research centers on developing variational formulations for thermo-chemo-mechanical behavior in nonlinear materials, along with designing parallel solvers to tackle these coupled problems efficiently on high-performance computing clusters.

Biography: Jürgen Maas received his Dipl.-Ing. and PhD in Electrical Engineering from the University of Paderborn in 1993 and 1998 respectively. After working as a research assistant, he was team leader for Mechatronics, DaimlerChrysler Research from 1998 to 2004. In 2004, he became Professor of Control Engineering and Mechatronics at the Ostwestfalen-Lippe University of Applied Sciences in Lemgo, Germany. Since 2016, he has been a full professor of electromechanical systems at the Technical University of Berlin, Germany. He is author/co-author of more than 200 publications. Research interests include modelling, design and control of mechatronic systems, especially transducers based on smart materials."

Bjoern Kiefer is a Full Professor at the Institute of Mechanics and Fluid Dynamics of TU Bergakademie Freiberg, Germany. His education included a five-year Mechanical Engineering degree at Ruhr-University Bochum and a Ph.D. in Aerospace Engineering at Texas A&M University. He then worked as a Postdoctoral Researcher at the University of Stuttgart and as Junior Professor for the Mechanics of Functional Materials at TU Dortmund. Dr. Kiefer served as Chair of the ASME SMASIS Division and was elected Fellow of the Society. He is currently a Visiting Professor in the Engineering Science Department at the University of Oxford.

ADAPTIVE SYSTEMS DYNAMICS AND CONTROLS BEST JOURNAL PAPER AWARD

Awardees:

Sebastian Gratz-Kelly, Department of Systems Engineering,
Saarland University, Saarbrücken 66123 Germany

Tim Felix Krüger, Department of Systems Engineering,
Saarland University, Saarbrücken 66123 Germany

Stefan Seelecke, Department of Systems Engineering,
Saarland University, Saarbrücken 66123 Germany

Gianluca Rizzello, Department of Systems Engineering,
Saarland University, Saarbrücken 66123 Germany

Giacomo Moretti, Department of Industrial Engineering,
University of Trento, Trento 38123, Italy

Manuscript: A tri-modal dielectric elastomer actuator integrating linear actuation, sound generation, and self-sensing capabilities

This paper presents a concept of multi-modal dielectric elastomer actuator (DEA) that leverages a single voltage input to concurrently work as linear actuator and loudspeaker, while also integrating self-sensing capabilities. Low-frequency linear actuation is obtained by inducing tangential stretching of the DEA membrane surface, whereas high-frequency sound generation is concurrently achieved through transverse structural vibrations of the DEA membrane surface. Multi-mode actuation is combined with a new self-sensing paradigm: measuring the current signal arising from the dynamic acoustic excitation and processing it in real-time with capacitance estimation algorithms, the actuator low-frequency displacement can be reconstructed with no need for additional transducers or dedicated probing signals. The performance of the proposed self-sensing approach is evaluated using complex multi-harmonic driving signals, with a focus on analyzing the correlation between capacitance estimates and the low-frequency stroke of the device. Concurrent self-sensing and multi-mode actuation are finally demonstrated in a number of application scenarios, in which the intensity/frequency of the DEA acoustic output is adjusted in closed-loop as a function of externally induced deformations, such as impacts with obstacles, or interactions with a user. The multi-modality paradigm pursued in this work paves the way to new application opportunities, such as multi-sensory user interfaces (e.g. audio-tactile buttons), or highly integrated sensor-actuator units able to sense their state during operation and provide feedback (e.g., acoustic signaling) accordingly.

Biography: Sebastian Gratz-Kelly received his PhD in Systems Engineering from the Saarland University, Germany, 2025 and is Group leader for Smart Textiles at the intelligent Material Systems Lab of the Saarland University. He received his B.Sc. in 2014 and M.Sc. in 2017 from the Saarland University, department of Systems Engineering. His research topics are sensor and actuator systems based on dielectric elastomers, smart textiles and textile integration, as well as user interaction.

Biography: Tim Krüger is a Bachelor student at Saarland University in the field of Systems Engineering. He works as a student assistant for the Smart Textiles group, at the Intelligent Material Systems Lab. His tasks include design and maintenance of testbenches and demonstrators for dielectric elastomer sensors and actuators, experimental data acquisition and management.

Biography: Stefan Seelecke received his Ph.D. degree in Engineering Science from Technical University Berlin, Berlin, Germany in 1995. After his habilitation in 1999, he joined the Department of Mechanical and Aerospace Engineering at North Carolina State University, Raleigh, USA, in 2001. He is currently a Full Professor of Systems Engineering and Materials Science & Engineering at Saarland University, Saarbrücken, Germany, where he directs the Intelligent Material Systems Lab. His research interests include the development of smart materials-based actuator and sensor systems, in particular (magnetic) shape memory alloys, piezoelectrics and electroactive polymers.

Biography: Gianluca Rizzello received the master's (Hons.) degree in control engineering from the Polytechnic University of Bari, Bari, Italy, in 2012. He received his Ph.D. in Information and Communication Technologies from Scuola Interpolitecnica di Dottorato, a joint program between Polytechnic Universities of Torino, Bari, and Milano, Italy, in 2016. After his doctoral studies, he joined the Saarland University, Saarbrücken, Germany, first with the role of a postdoc researcher and Group Leader Smart Material Modeling and Control (2016–2019), and subsequently as Assistant Professor in Adaptive Polymer Systems (2020 - present). His research interests involve modeling, control, and self-sensing of innovative mechatronic and robotic systems based on unconventional drive technologies, such as smart materials.

Biography: Giacomo Moretti holds a MSc degree in Energy Engineering (University of Pisa - 2013) and a PhD in Mechanical Engineering (Scuola Sant'Anna - 2017). He has been a visiting scholar at the University of Edinburgh, UK (2016), and a research fellow at Scuola Sant'Anna, Italy (2017–2020) and Saarland University, Germany (2020–2022), which he joined with a Marie-Curie fellowship. Since 2022, he has been assistant professor (tenure track) at the University of Trento (IT). He is the recipient of a 2024 starting grant from the European Research Council. His research covers the fields of multifunctional transducers and energy harvesting. His main contributions regard the development and validation of ocean wave energy harvesting concepts based on electroactive-polymers; smart-material-based electrostatic loudspeakers and user interfaces; thermo- and electro-active robotic artificial muscles.

STRUCTURAL HEALTH MONITORING BEST PAPER AWARD

Awardees:

Ying Zhang, Dr., Xi'an
Jiaotong University, School of Mechanical Engineering

Xin Wu, Mr., Xi'an
Jiaotong University, School of Mechanical Engineering

Yaguo Lei, Professor, Xi'an
Jiaotong University, School of Mechanical Engineering

Junyi Cao, Professor, Xi'an
Jiaotong University, School of Mechanical Engineering

Wei-Hsin Liao, Professor,
The Chinese University of Hong Kong,
Department of Mechanical and Automation Engineering

Manuscript: Self-Powered Wireless Condition Monitoring for Rotating Machinery

Condition monitoring has played a significant role in reducing downtime and maintenance costs for key rotating machinery. However, traditional methods to power wireless sensor nodes depend highly on capacity-limited batteries or wiring from external source. Although the rotational energy harvesting technologies have been widely considered as a promising self-powered method, the output power under low-frequency occasions fails to supply the usable energy to wireless sensor nodes for condition monitoring. Therefore, a self-powered wireless condition monitoring system for rotating machinery in low-frequency occasions is presented in this article. A variable reluctance energy harvester is designed to convert rotational motion into electrical power. The ring-shaped stator contains magnets and tile silicon steel, while the rotor is composed of teethed silicon steel and coils. Besides, a ring-shaped circuit for low-speed occasions is designed to achieve power management and storage, signal detection and wireless transmission. In addition, an experimental test is carried out to verify the performance of the proposed self-powered wireless condition monitoring system. The results show that the output power of the proposed harvester reaches 336.7–851.8 mW at 200–328 rpm, while the average power after rectification and filtering is 203.3–602.5 mW. Moreover, the power test results show that the broadcasting, connecting, collecting and transmitting, and sleep modes of WiFi consume around 450, 206, 313, and 46 mW, respectively. By properly prolonging sleep mode, the average power consumption of wireless sensor networks can be significantly reduced. Furthermore, the condition monitoring performance of the proposed self-powered system is verified by acceleration detection.

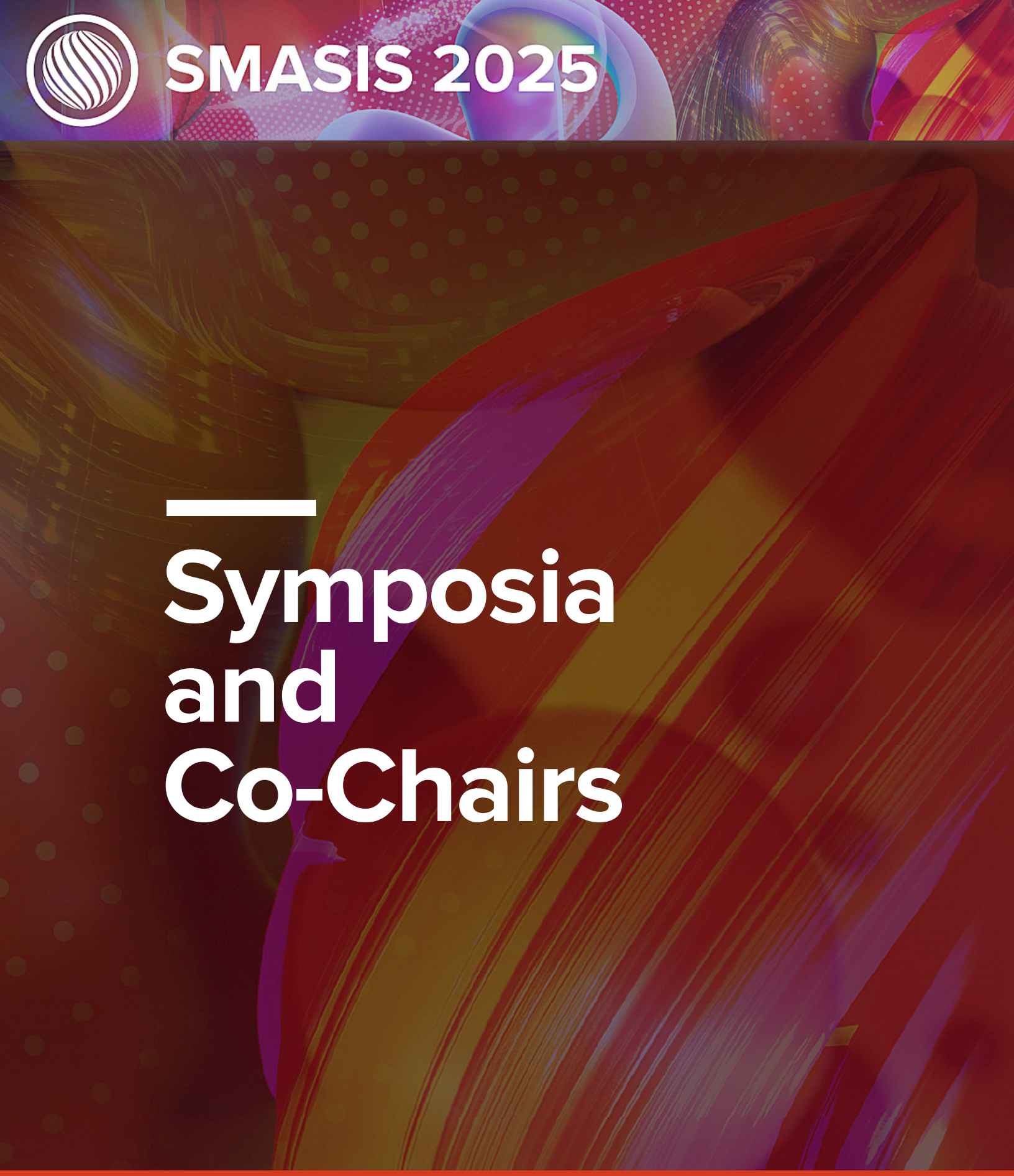
Biography: Ying Zhang received B.S. degree in Mechanical Engineering from Chongqing University in 2016, followed by M.S. degree in 2019 and Ph.D. degree in 2023, both from the School of Mechanical Engineering at Xi'an Jiaotong University. Currently, he is an Assistant Professor at the School of Mechanical Engineering at Xi'an Jiaotong University, and his research interests mainly include self-powered condition monitoring, smart materials and structures.

Biography: Xin Wu received the B.S. degree in mechanical engineering from Chongqing University, Chongqing, China, in 2021. He is currently pursuing the M.S. degree with the School of Mechanical Engineering, Xi'an Jiaotong University, Xi'an, China. His research interests include energy harvesting and self-powered sensors.

Biography: Yaguo Lei received the B.S. and Ph.D. degrees in mechanical engineering from Xi'an Jiaotong University in 2002 and 2007, respectively. In 2010, he joined the University of Alberta, Edmonton, Canada, as a Postdoctoral Research Fellow. He was an Alexander von Humboldt Fellow with the University of Duisburg-Essen, Duisburg, Germany, and also the Faculty of Engineering. He is currently a Full Professor of Mechanical Engineering with Xi'an Jiaotong University. His research interests include machinery condition monitoring and intelligent maintenance. Dr. Lei is a Fellow of ASME, IET, and ISEAM.

Biography: Junyi Cao received the Ph.D. degree in mechanical engineering from Xi'an Jiaotong University, Xi'an, China, in 2006. From September 2013 to September 2014, he was a Visiting Scholar with the Department of Aerospace Engineering, University of Michigan, Ann Arbor, MI, USA. He is currently a Full Professor with the School of Mechanical Engineering, Xi'an Jiaotong University. His main research interests include vibration energy harvesting, intelligent health monitoring, and smart materials and structures.

Biography: Wei-Hsin Liao received the Ph.D. degree in mechanical engineering from The Pennsylvania State University, State College, PA, USA, in 1997. He is Choh-Ming Li Professor of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Hong Kong. His research interests include smart materials and structures, energy harvesting, vibration control, mechatronics, exoskeleton, and prosthesis. Dr. Liao currently serves as an Associate Editor for Journal of Intelligent Material Systems and Structures, and on the Executive Editorial Board of Smart Materials and Structures. Dr. Liao is the recipient of 2020 ASME Adaptive Structures and Material Systems Award and 2018 SPIE SSM Lifetime Achievement Award, to recognize his outstanding contributions to the advancement of smart structures and materials. He is a Fellow of ASME, HKIE, and IOP.



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TALKS WITHIN THE INDUSTRY FORUM:

Fort Wayne Metals: 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 efective implementation of these wires in various applications. This discussion explores the challenges and ofers potential solutions in bridging this gap, focusing on how the unique properties of actuator wire can be best utilized to be most efective 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 efective 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 eforts by Fort Wayne Metals and industry partners toovercome these challenges. By identifying and tackling these issues, we aim to accelerate market adoption and enhance the performance of actuator wire technologies.

GM (Wonhee M. Kim, PhD)

Model year 2018 XXXX and YYYY programs experienced charge air cooler (CAC) over-cooling during cold ambient conditions, particularly in northern North America during winter. Installing a CAC shutter to block airflow has been identified as the most effective mitigation strategy. However, a motor-driven shutter system requires a wire harness to control the actuator—an impractical solution for vehicles already on the market. This constraint makes a shape memory alloy (SMA) actuator the only viable alternative, as its temperature-stress-strain behavior enables both ambient temperature sensing and shutter vane actuation. An SMA spring actuator was developed to close the shutter at 0 °C, allow partial airflow above 10 °C, and fully open at 25 °C. The characterization of the SMA spring and the actuator design process were established for this passive system, along with a formal validation procedure and pass/fail criteria. The passive SMA actuator has since been implemented as both a warranty fix and a component of the Winter Package.

Toyota - Smart materials solutions by mateligent – from compliant sensor systems to efficient industrial grippers and automotive actuators

Mateligent holding as the spin-off out of Saarland University and the ZeMA research institute in the field of smart material systems research has grown to a total of 5 companies commercializing smart material-based sensor and actuator solutions. Dielectric elastomer (DE) sensors are soft, thin, conformable devices that can take accurate measurements and readings while being strained up to 100% for millions of cycles. These sensors are used today for 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 newest founded company in the holding structure focuses on the series production of shape memory alloy (SMA) wire-based industrial grippers. Fully electrical vacuum grippers and mechanical grippers without the need for compressed air supply decrease energy consumption of production sites and allow for implementation of smart factory aspects. The presentation will introduce the base technologies of the mentioned commercial products and dive into market- and business-case relevant aspects.

EOS: Bridging the Gap to Adaptive Structures with Additive Manufacturing *(Yash Parikh, PhD and Dave Krzeminski, PhD)*

The development of smart materials, adaptive structures, and intelligent systems critically depends on the ability to innovate and produce complex, functional components. Additive Manufacturing (AM), specifically Laser Powder Bed Fusion (PBF-L) for metals and polymers, is now a proven method for reliable serial production, offering unparalleled design freedom. This enables intricate geometries, multi-material integration, and embedded functionalities essential for creating next-generation adaptive structures that can

sense and respond in real-time. While PBF-L demands precise control for consistent quality, yielding exceptional geometric accuracy and mechanical properties, fully harnessing its potential for these advanced applications requires specialized expertise. EOS, a global leader in PBF technology, empowers organizations through our Additive Minds consulting unit and the AM Ignite academy. We provide the deep expertise and structured support needed to navigate AM complexities, ensuring successful implementation from design to serial production. Join us to explore how EOS helps industries like aerospace, medicine, tooling, and automotive bridge the gap between innovative concepts and the tangible realization of highperformance adaptive structures, accelerating innovation with additive solutions.

INGPULS: On the similarities and differences in the development, qualification and product phase between a passive SMA high temperature safety valve and an electrically activated SMA release actuator *(Dr. Christian Grossmann, Dr. Harald Buchalla, Dr. André Kortmann, Dr. Burkhard Maaß)*

In the constant search for optimization, the limits of conventional actuator technologies have been gradually pushed to the physical boundaries in recent decades. It is therefore not surprising that actuators based on shape memory alloys are now attracting a great attention from many different industries. In the case of feasibility, technologies of previous product generations almost always achieve significant added value in comparison. Although there is still a great need for information in the industries about what SMA are and what advantages SMA actuators can achieve with optimal development, demand is rising continuously and strongly with the growing number of successful products on the market.

In the current presentation, we would therefore like to present two successful actuator projects that have recently achieved TRL 10 and are in industrial use today. Despite the different alloys, the two projects share some similarities in terms of metallurgical and microstructural manufacturing concepts. However, they could not be more different in terms of project planning, project duration and development costs. We would like to present these relationships using the example of a NiTiHf high-temperature safety valve, initially developed but not limited for the use in nuclear power plants, as well as a binary NiTi release actuator, now integrated in an E-pouch systems that are usually applied in modern and automated warehouses in intralogistics.

Mateligent: Smart materials solutions by mateligent – from compliant sensor systems to efficient industrial grippers and automotive actuators

Mateligent holding as the spin-off out of Saarland University and the ZeMA research institute in the field of smart material systems research has grown to a total of 5 companies commercializing smart material-based sensor and actuator solutions. Dielectric elastomer (DE) sensors are soft, thin, conformable devices that can take accurate measurements and readings while being strained up to 100% for millions of cycles. These sensors are used today for 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 newest founded company in the holding structure focuses on the series production of shape memory alloy (SMA) wire-based industrial grippers. Fully electrical vacuum grippers and mechanical grippers without the need for compressed air supply decrease energy consumption of production sites and allow for implementation of smart factory aspects. The presentation will introduce the base technologies of the mentioned commercial products and dive into market- and business-case relevant aspects.

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mateligent iDEAS GmbH is a spin of 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.

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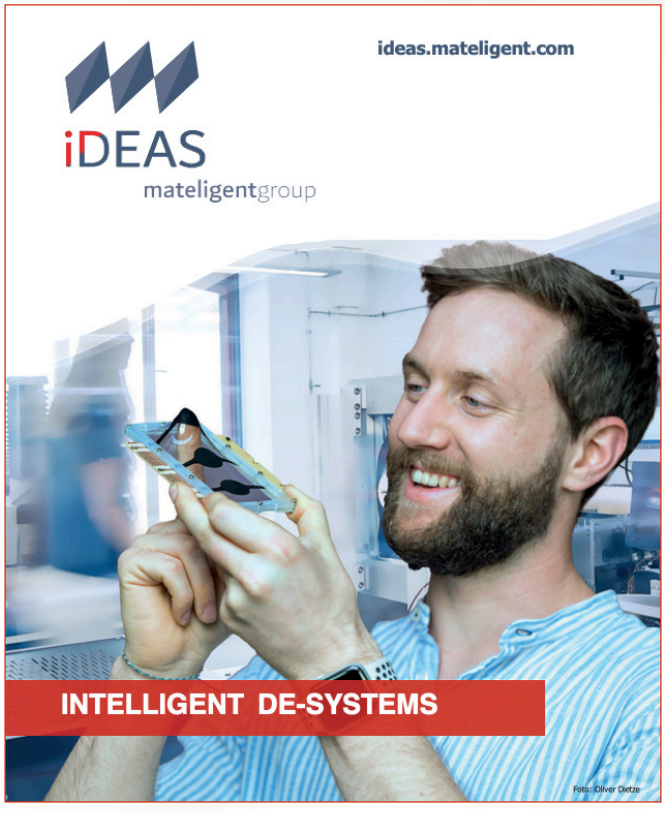

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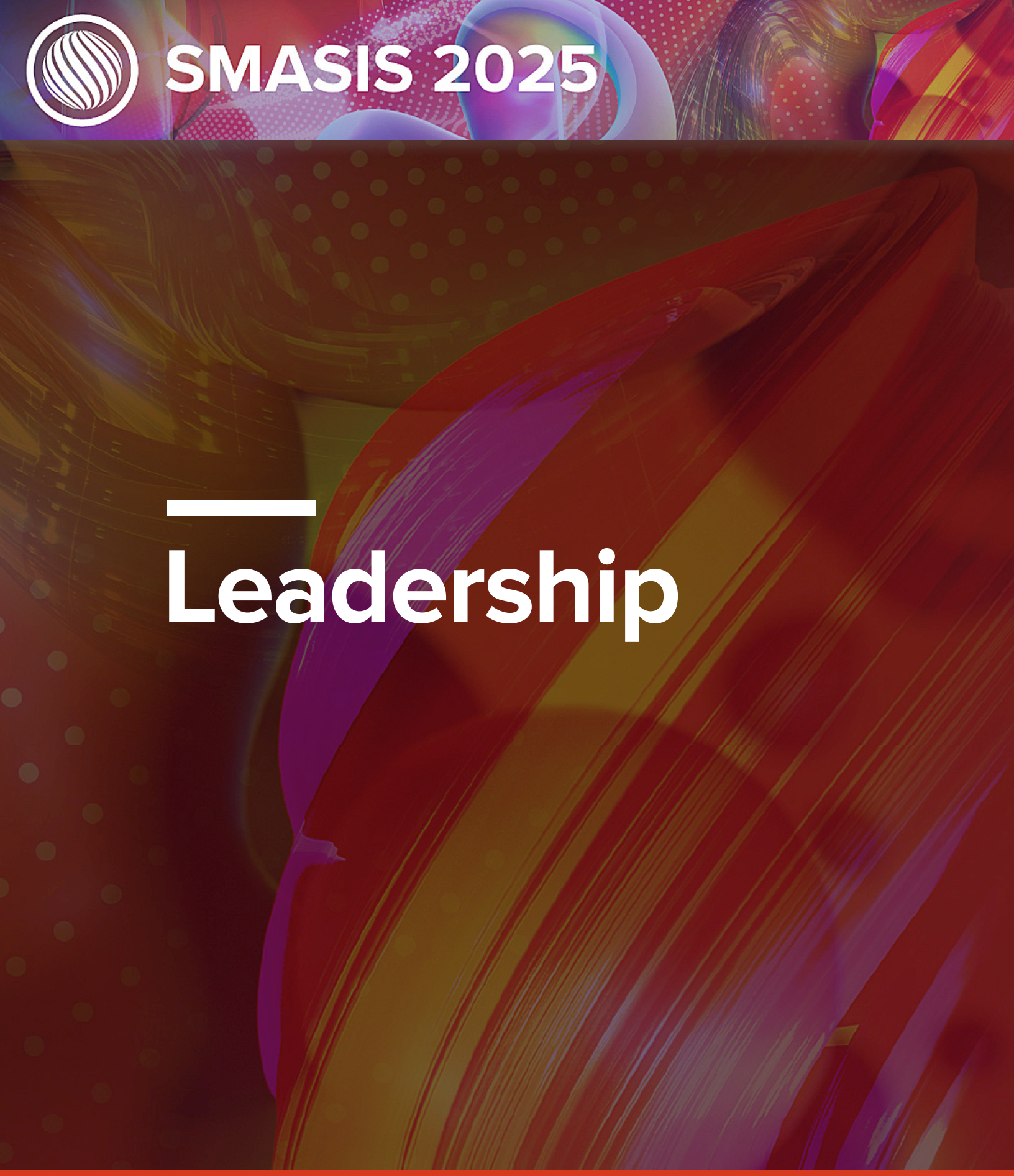

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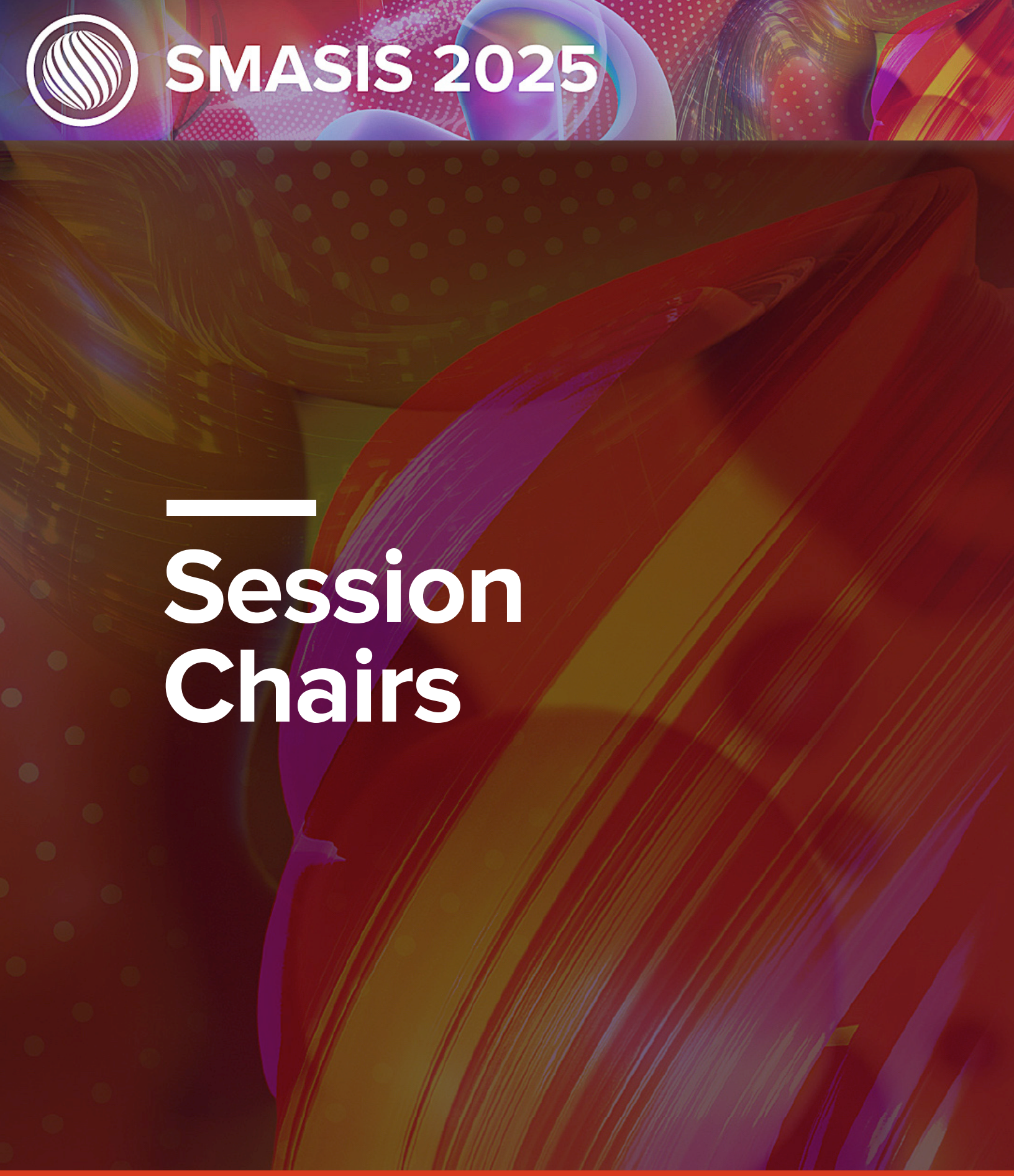

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Belle	Adelynn	167991	Computational Modeling of Additively Manufactured Shape Memory Alloy Lattices Considering Performance Under Dynamic Loading	02-03 Smart Composites, Structures, and Metamaterials	9/10/2025, 09:10 AM - 10:30 AM	Zermatt
Benafan	Othmane	170081	Shape Memory Alloy Actuated Vortex Generators for Aircraft Quiet High-Lift System: Alloy Design	02-02 Shape Memory Alloy and Polymer Applications	9/9/2025, 09:10 AM - 10:30 AM	Zermatt
Benli	Koray	171959	Multilayered Shape Memory Polymer / Inflatable Morphing Headrest	04-03 SS: Toyota/University of Michigan Technology Incubator	9/8/2025, 03:30 PM - 04:50 PM	St. Moritz
Benli	Koray	171974	Towards Moldable Applications Using Shape Memory Polymer-Based Auxetic Structures	02-02 Shape Memory Alloy and Polymer Applications	9/9/2025, 09:10 AM - 10:30 AM	Zermatt
Bergen	Christian	171968	A Framework for Designing Magnetoactive Elastomer Actuators: Topology Optimization, Fabrication, and Actuation	03-03 Morphing Airfoils and Biomedical Systems	9/9/2025, 10:50 AM - 12:10 PM	Zermatt

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Bipin	Haryshwa	168611	Nitinol-Driven Morphing Airfoil for Uavs and Small-Scale Aircraft	03-03 Morphing Airfoils and Biomedical Systems	9/9/2025, 10:50 AM - 12:10 PM	Zermatt
Bo	Luyu	167971	Wireless Ultrasonic Phased Array Systems for Structural Health Monitoring: Enabling On-Demand Wall Thickness Measurement and Damage Detection	05-03 Wave Physics-based SHM	9/9/2025, 09:10 AM - 10:30 AM	Davos
Borden	Yan	171475	A Quick Aeroelastic Module for a Multidisciplinary Morphing Aircraft Design Software Package Multidisciplinary Morphing Aircraft Design Software Package	03-01 Mission-Adaptive Morphing UAVs	9/8/2025, 10:50 AM - 12:10 PM	Zermatt
Boston	D. Matthew	171912	Exploring the Design Space of a Reduced-Order Fluid-Structure Interaction Airfoil Model for Physical Reservoir Computing	S-05 Intelligence Embodied in Fluid-Structure Interactions	9/9/2025, 10:50 AM - 12:10 PM	Alpine 2
Bothra	Sanaya	168492	Measuring Traumatic Brain Injury Impacts in a Piezoelectric and Anatomically Accurate Rat Brain Phantom	06-05 Implants and Biomedicine	9/9/2025, 10:50 AM - 12:10 PM	Alpine 1
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Caltagirone	Peter	165314	Thermally Activated Emergency Venting System Based on Novel Shape Memory Alloy Ring Device	01-01 Shape Memory Alloys 1	9/8/2025, 09:10 AM - 10:30 AM	Bern
Carvajal	Mario	167869	An Information Theoretic Analysis of Nonlinear Mechanical Physical Reservoir Computers	S-08 - Physical Reservoir Computing: Fundamental Design and Analysis	9/10/2025, 10:50 AM - 12:10 PM	Alpine 2
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Cheng	Liuyang	171489	Soft Robotic Octopus Tentacles Actuated by Scalable Coiled Artificial Muscles	04-13 SS: Active Hybrid Composites	9/10/2025, 10:50 AM - 12:10 PM	St. Moritz
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Chikhareva	Maria	164764	Optimization of a Shape Memory Alloy Engine for Heat Recovery	02-02 Shape Memory Alloy and Polymer Applications	9/9/2025, 09:10 AM - 10:30 AM	Zermatt
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Ciocanel	Constantin	171893	Strain Field in Ni2mnga Magnetic Shape Memory Alloys Under Combined Tensile and Magnetic Loading	01-01 Shape Memory Alloys 1	9/8/2025, 09:10 AM - 10:30 AM	Bern
Collet	Robin	166254	A Thermodynamics Based Model of Energy Conversion through a Ferroelectric to Antiferroelectric Phase Transformation in 95/5 PZT	02-01 Electro- and Magnetoactive Materials	9/8/2025, 09:10 AM - 10:30 AM	Zermatt
Dai	Miaomiao	171524	Inverse Design of Viscoelastic Metamaterials for Rate-Dependent Energy Absorption	01-08 Metamaterials	9/10/2025, 10:50 AM - 12:10 PM	Bern
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Dunn	Martin	172382	Tailored Actuation in 4D Printed LCE Composites via Advanced Materials and Embedded Fiber Reinforcement	01-05 Sensor and Actuator Materials 2	9/9/2025, 10:50 AM - 12:10 PM	Bern
Earnhardt	Allison	172064	Bio-Inspired Design of an Origami Enabled Crawling Robot for Three-Dimensional Navigation	06-08 Systems and Structures for Extreme Environments	9/10/2025, 10:50 AM - 12:10 PM	Alpine 1
El Khatib	Omar	172730	Finite Element Framework for a Magneto-Mechanically Coupled Micromagnetics-Inspired Model of Ferromagnetic Shape Memory Alloys	02-01 Electro- and Magnetoactive Materials	9/8/2025, 09:10 AM - 10:30 AM	Zermatt
Farahani	Mohammad Reza	171817	Multi-Objective Optimization of Superelastic Niti Microfilament Yarns for Energy Absorbing Textile Applications	04-06 SS: Yarns and Textiles	9/9/2025, 09:10 AM - 10:30 AM	Lugano
Fick	Allison	171839	Modeling of Pressure and Length for Fast-Growing Vine Robots for Crash Safety Applications	04-12 Tailored Structures and Robots	9/10/2025, 09:10 AM - 10:30 AM	St. Moritz
File	Allison	171929	A Review of Bio-Inspired Design in Wave Energy Converters: Current Advancements, Limitations, and Opportunities for Innovation	06-08 Systems and Structures for Extreme Environments	9/10/2025, 10:50 AM - 12:10 PM	Alpine 1
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Gazzola	Mattia	172342	Modeling, Realization and Control of Living Creatures, Machines, and Materials	S-01 Living and Bio-Inspired Systems	9/8/2025, 09:10 AM - 10:30 AM	Alpine 2
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Geier	Sebastian	171904	Production and Characterization of Electrically Conductive Adhesives Based on Carbon-Based Fillers for Use in the Wind Energy Sector	01-04 Multifunctional Composites/ Nanocomposites	9/9/2025, 09:10 AM - 10:30 AM	Bern
Ghoshal	Pritam	167775	Fpga Based Structural Health Monitoring Using Reservoir Computing	05-04 Fusion of Computation and Sensing for SHM	9/10/2025, 09:10 AM - 10:30 AM	Davos
Gilmore	Paul	162537	Challenges and Progress in Using Carbon Fiber as Active Materials in Structural Batteries	04-04 SS Multifunctional Energy Storage Systems	9/8/2025, 03:30 PM - 04:50 PM	Lugano
Gleason	Matthew	167950	Solid-State Joining of Shape Memory Alloys Using Cold Spray Deposition	01-03 Shape Memory Alloys 2	9/8/2025, 03:30 PM - 04:50 PM	Bern
Göddel	Philipp	167646	Compact Rotary Actuator Based on Shape Memory Alloy Wire Bundles and Textile-Based Deflection Mechanism	04-02 SMA Application in Mechanical Engineering	9/8/2025, 1 0:50 AM - 12:10 PM	St. Moritz
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Hartl	Darren	167918	Aerodynamic and Aeroacoustic Experimental Analysis of Sma Slat Gap Filler for Airframe Noise Reduction	04-11 Aerospace Applications of SMAs	9/9/2025, 03:30 PM - 04:50 PM	St. Moritz
Hartl	Darren	167923	Evaluating Morphing Wing Penalties Using Aeroelastic Fea: A Computational Framework for Comparing Adaptive and Fixed-Wing Uav Designs Across Multiple Mission Phases	03-01 Mission-Adaptive Morphing UAVs	9/8/2025, 10:50 AM - 12:10 PM	Zermatt
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He	Shan	171887	Role of Sensor Selection in a Metamaterial Physical Reservoir Computer	S-08 - Physical Reservoir Computing: Fundamental Design and Analysis	9/10/2025, 10:50 AM - 12:10 PM	Alpine 2
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Jin	Liuchao	165228	Machine Learning-Enabled Inverse Design for Hierarchical Architectures	01-07 AI/ML for Materials	9/10/2025, 09:10 AM - 10:30 AM	Bern
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Joodaky	Amin	171892	Developing Cushion Curves of Foams Using Physics-Informed Machine Learning	01-07 AI/ML for Materials	9/10/2025, 09:10 AM - 10:30 AM	Bern
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Jovanova	Jovana	167744	Ice Sticks – Ice Adhesion for Locomotion on Icy Surfaces	06-08 Systems and Structures for Extreme Environments	9/10/2025, 10:50 AM - 12:10 PM	Alpine 1
Kaiser	Max	167830	Fundamental Characteristics and Adjustment Parameters of Shape Adaptive Shape Memory Alloy Hybrid Composites	04-13 SS: Active Hybrid Composites	9/10/2025, 10:50 AM - 12:10 PM	St. Moritz

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Khan	Md Asif Hasan	167672	In-Situ Condition Monitoring of Extrusion-Based 3d Bio-Printing Using Phase-Based Motion Estimation	05-05 SHM for Additive Manufacturing	9/10/2025, 10:50 AM - 12:10 PM	Davos
Khazaaleh	Shadi	167803	Origami-Inspired Energy Harvesting Tile	07-02 Auxetic & Multistable Structures	9/9/2025, 10:50 AM - 12:10 PM	Davos
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Lee	Yi-Chin	167949	Prioritizing Tactility in 3d Machine-Knitted Material Behavior	04-06 SS: Yarns and Textiles	9/9/2025, 09:10 AM - 10:30 AM	Lugano
Lee	Bo Mi	171936	Additively Manufactured Stimuli-Responsive Materials for Wearable Sensing	05-02 Smart Materials and Sensors for SHM	9/8/2025, 03:30 PM - 04:50 PM	Davos
Lee	Marianne	171958	Moldable Cargo Blanket Using Inflatable Tiles	04-03 SS: Toyota/University of Michigan Technology Incubator	9/8/2025, 03:30 PM - 04:50 PM	St. Moritz
Lehenbauer	Isabel	171847	Energy Harvesting With Hasel Transducers in a Robotic Trout	06-03 Soft Robotic Swimmers for Aquatic Applications	9/8/2025, 03:30 PM - 04:50 PM	Alpine 1
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Lie	Darren	167951	Swimming Characterization of a Bioinspired Robotic Fish With Hybrid Piezoelectric-Servomotor Actuation	04-13 SS: Active Hybrid Composites	9/10/2025, 10:50 AM - 12:10 PM	St. Moritz
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Mailen	Russell	172120	Mechanics of Bistable Kresling Structures as Deployable Towers	04-01 SS: Deployable Space Structures	9/8/2025, 09:10 AM - 10:30 AM	St. Moritz

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Malakooti	Mohammad	172374	Stretchable Thermoelectric Wearables with 3D Soft Architectures and Electrical Self-Healing	07-01 Thermal and Biomechanical Energy Harvesting	9/8/2025, 10:50 AM - 12:10 PM	Davos
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Monner	Hans Peter	171602	Demonstration and Testing of Rotating Morphing Systems at Dlr	04-05 Morphing Aerospace Systems	9/9/2025, 09:10 AM - 10:30 AM	St. Moritz
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Morell	Maxime	167960	Mechano luminescent Zns:pdms Composites	03-05 Nonlinear and Acoustic Metamaterials	9/9/2025, 03:30 PM - 04:50 PM	Zermatt
Mousa	Mohamed	171992	Elastoacoustic Mechanical Intelligence: The Pursuit of Smart, Multi-Tasking Waves	S-07 Computing Metamaterials	9/10/2025, 09:10 AM - 10:30 AM	Alpine 2
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Nguyen	Minh	171432	On the Mechanical Design of Physical Reservoir Computing in Multistable Origami Metastructure	S-03 Novel Structural Concepts	9/8/2025, 03:30 PM - 04:50 PM	Alpine 2
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Ogun	Emmanuella	166103	Advanced Crack Detection in Building Structures Using Pix2pix and U-Net Architectures	05-04 Fusion of Computation and Sensing for SHM	9/10/2025, 09:10 AM - 10:30 AM	Davos
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Pagel	Kenny	171914	Integration of Shape Memory Alloy Wires in Polymer Structures and Their Applications as Strain Sensors and Actuators	04-13 SS: Active Hybrid Composites	9/10/2025, 10:50 AM - 12:10 PM	St. Moritz
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Perri	Carmen	167819	Textile Integrated Dielectric Elastomer Based Sensor Array Combined With Tactile Feedback Element	04-08 SS: Smart Textiles	9/9/2025, 10:50 AM - 12:10 PM	Lugano
Philen	Michael	172111	Atomization of Supercooled Water Droplets Using High Frequency Structural Excitations via Piezoceramic Transducers	03-02 Wave Propagation, Buckling, and Dynamic Response	9/8/2025, 03:30 PM - 04:50 PM	Zermatt
Pohl	Martin	167537	Lamb Wave Based Ice Sensing by Neuronal Network Analysis of Icing Wind Tunnel Data	04-10 Wave Propagation, Acoustics, and Thermoelectrics	9/9/2025, 01:40 PM - 03:00 PM	Lugano
Qian	Feng	172105	Vortex Induced Vibration Control of Wind Turbine Towers Using Tuned Mass Damper Inerter	03-06 Vibration Mitigation and Energy Harvesting	9/10/2025, 10:50 AM - 12:10 PM	Zermatt
Radestock	Martin	167609	Comparison of Wings With Conventional Flaps and Morphing Moveables in Scaled Flight Test Experiment	04-05 Morphing Aerospace Systems	9/9/2025, 09:10 AM - 10:30 AM	St. Moritz
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Rincon	Jhonatan	171868	Curvature Adaptable Robotic End-Effectors	04-12 Tailored Structures and Robots	9/10/2025, 09:10 AM - 10:30 AM	St. Moritz
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Salim	Nusrat Jahan	167578	Coupled Magneto-Mechanics of Single and Dual-Anisotropic Magnetoactive Elastomers	02-01 Electro- and Magnetoactive Materials	9/8/2025, 09:10 AM - 10:30 AM	Zermatt
Salowitz	Nathan	168473	Initial Integration of Ultrasonic Structural Health Monitoring in Self-Healing Metal-Metal Composites	05-03 Wave Physics-based SHM	9/9/2025, 09:10 AM - 10:30 AM	Davos
Sarles	Stephen	171945	Ion-Selective Gating and Synaptic Memory Emulation in Bio-Membrane/oect Hybrid Interfaces	06-04 Neuromorphic Computing	9/9/2025, 09:10 AM - 10:30 AM	Alpine 1

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Schrader	Brandon	171860	Control of a Soft Robotic Swimmer Using Physical Reservoir Computing	S-02 Physical Intelligence in Robots I	9/8/2025, 10:50 AM - 12:10 PM	Alpine 2
Schrader	Brandon	171961	Underwater Acoustic Generation Using Hasel Artificial Muscles	04-10 Wave Propagation, Acoustics, and Thermoelectrics	9/9/2025, 01:40 PM - 03:00 PM	Lugano
Serra-Garcia	Marc	172343	Physical Computing with Metamaterials	S-07 Computing Metamaterials	9/10/2025, 09:10 AM - 10:30 AM	Alpine 2
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Shrestha	Sarita	171846	Synaptic Rewiring in Biomolecular Brain-Inspired Materials	06-02 Biomolecular Networks and Synthetic Tissues	9/8/2025, 10:50 AM - 12:10 PM	Alpine 1
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Soreca	Emanuele	168319	Cfd Analyses and Performance Evaluation of a Morphing Wing Trailing Edge and Adaptive Synthetic Jets	04-07 Application of Advanced Computational Methods	9/9/2025, 10:50 AM - 12:10 PM	St. Moritz
Stephens	Maggie	171841	Active Inflatable Stabilization Spoilers for Toyota Mothership Kite	04-03 SS: Toyota/University of Michigan Technology Incubator	9/8/2025, 03:30 PM - 04:50 PM	St. Moritz

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Sugino	Christopher	171947	Optimal Distributed Control of Piezoelectric Metamaterials	03-05 Nonlinear and Acoustic Metamaterials	9/9/2025, 03:30 PM - 04:50 PM	Zermatt
Sukhnandan	Ravesh	172072	A Bioinspired Soft Grasper for Human-in-the Loop Manipulation	S-01 Living and Bio-Inspired Systems	9/8/2025, 09:10 AM - 10:30 AM	Alpine 2
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Tawfick	Sameh	172377	Design Principles for the Use of Artificial Muscles in Soft and Miniature Robotics	01-02 Sensor and Actuator Materials 1	9/8/2025, 10:50 AM - 12:10 PM	Bern
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Vanaei	Saeedeh	167866	Additive Manufacturing of Niti Self-Expanding Stents: Design Optimization for Improved Biomechanics and Hemodynamics Performance	01-01 Shape Memory Alloys 1	9/8/2025, 09:10 AM - 10:30 AM	Bern
Veloso	Eugene	167927	Characterization of Bio-Inspired Covert Flaps for Stability Control in Airborne Wind Energy Harvesting Kite	06-08 Systems and Structures for Extreme Environments	9/10/2025, 10:50 AM - 12:10 PM	Alpine 1

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Vlieghe	Sevan	170594	A Novel Technique for Full-Field Digital Image Correlation Measurement of Dual-Layer Tensioned Membrane Systems in Deployable Antennas	04-01 SS: Deployable Space Structures	9/8/2025, 09:10 AM - 10:30 AM	St. Moritz
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Wissa	Aimy	167839	Bio-Inspired Flaps for Flight Control During Dynamic Pitch Maneuvers	06-07 Adaptive Systems in Robotics and Control	9/10/2025, 09:10 AM - 10:30 AM	Alpine 1
Yang	Xinyi	171563	Bioinspired, Wind-Triggered, Biodegradable Seed Carrier for Electronic-Free Precision Deployment	06-01 Bioinspired Materials	9/8/2025, 09:10 AM - 10:30 AM	Alpine 1
Yates	Trevor	167814	Physical Reservoir Computing on a Robotic Swimmer With Soft Hydraulic Actuators	S-06 Physical Intelligence in Robots II	9/9/2025, 01:40 PM - 03:00 PM	Alpine 2
Zamani	Mohammad Hossein	171940	Quantitative Assessment of Print Quality in Direct Ink Writing of Magnetoactive Elastomers Using Image Processing: Effects of Rheology and Processing Parameters	01-06 3D Printing/AM	9/9/2025, 01:40 PM - 03:00 PM	Bern
Zhang	Xinchang	163432	Refractory Compact Heat Exchangers With Embedded Sensors Enabled by Hybrid Advanced Sintering and Additive Approach - Invited Speaker	05-01 Smart Sensors for SHM	9/8/2025, 09:10 AM - 10:30 AM	Davos
Zhang	Liyuan	167658	Click and Run: Investigation of Click Beetles' Ultrafast Clicking Behavior as a Mechanism for Escape From Constraints	06-06 Bioinspired Design	9/9/2025, 01:40 PM - 03:00 PM	Alpine 1

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Zhang	Yuning	171939	Embodying Mechano-Intelligence in Reconfigurable Metastructures for In-Memory Phononic Learning	S-04 Computing with Acoustic Wave	9/9/2025, 09:10 AM - 10:30 AM	Alpine 2
Zhao	Ping	171913	Natural Frequency Prediction of a Piezoelectric Energy Harvester Using Neural Networks and Singular Value Decomposition	07-03 Metamaterials & Data-driven Identification	9/9/2025, 01:40 PM - 03:00 PM	Davos
Zhou	Lijun	164704	Mechanical and Thermal Properties of Liquid Metal Elastomer Composites With Hybrid Fillers: Modeling and Experiment	01-04 Multifunctional Composites/ Nanocomposites	9/9/2025, 09:10 AM - 10:30 AM	Bern
Zhou	Lijun	171946	Artificial Intelligence for Inverse Design of Multifunctional Elastomer Composites With Solid and Liquid Particles	01-07 AI/ML for Materials	9/10/2025, 09:10 AM - 10:30 AM	Bern
Zrostlik	Rick	168583	Processing of Shape Memory Alloy Torque Tubes for Continuous Energy Harvesting	07-01 Thermal and Biomechanical Energy Harvesting	9/8/2025, 10:50 AM - 12:10 PM	Davos

Hotel Floor Plan

SHERATON
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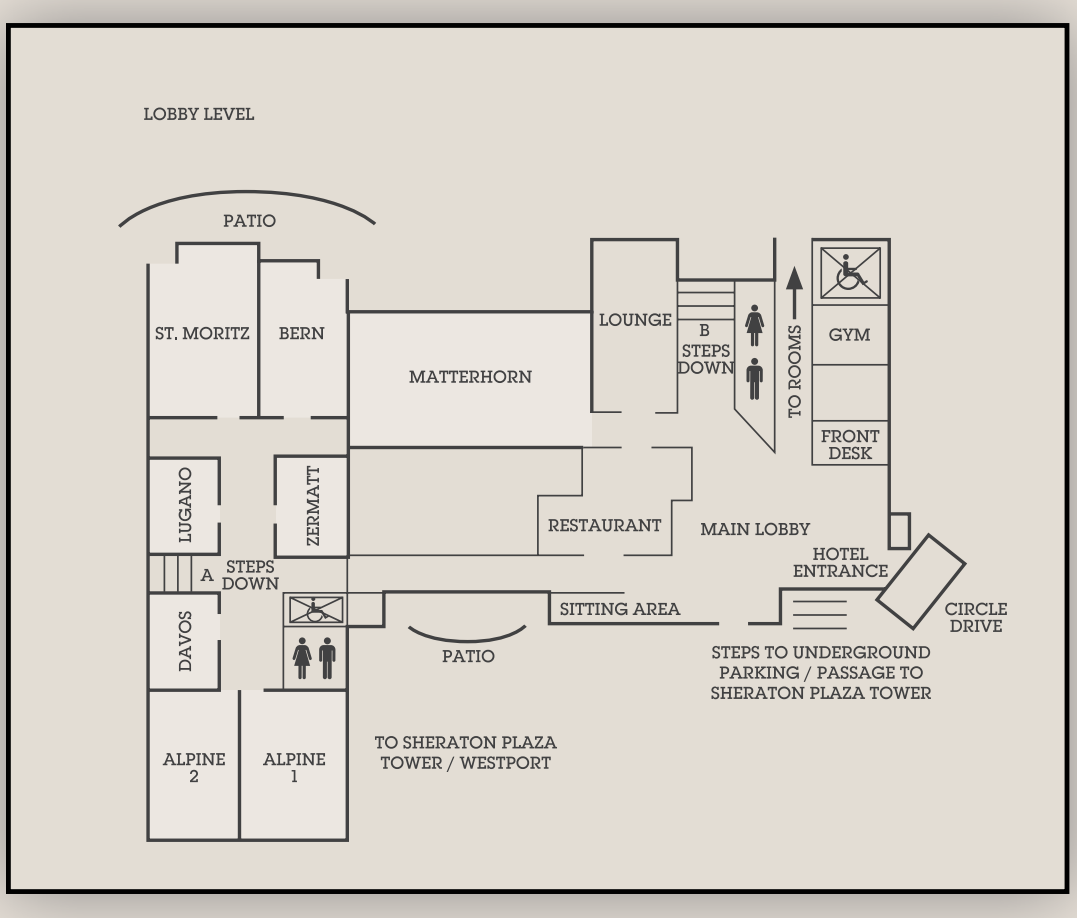
LOBBY LEVEL



SHERATON
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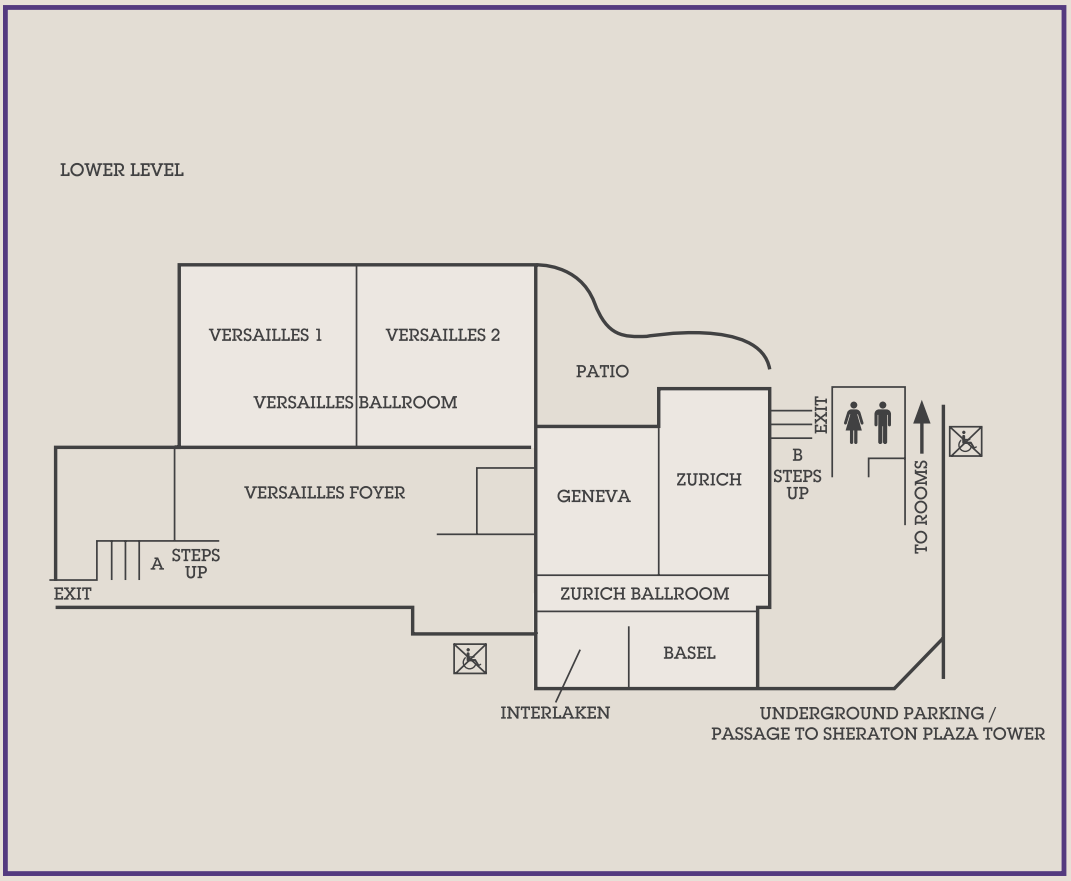
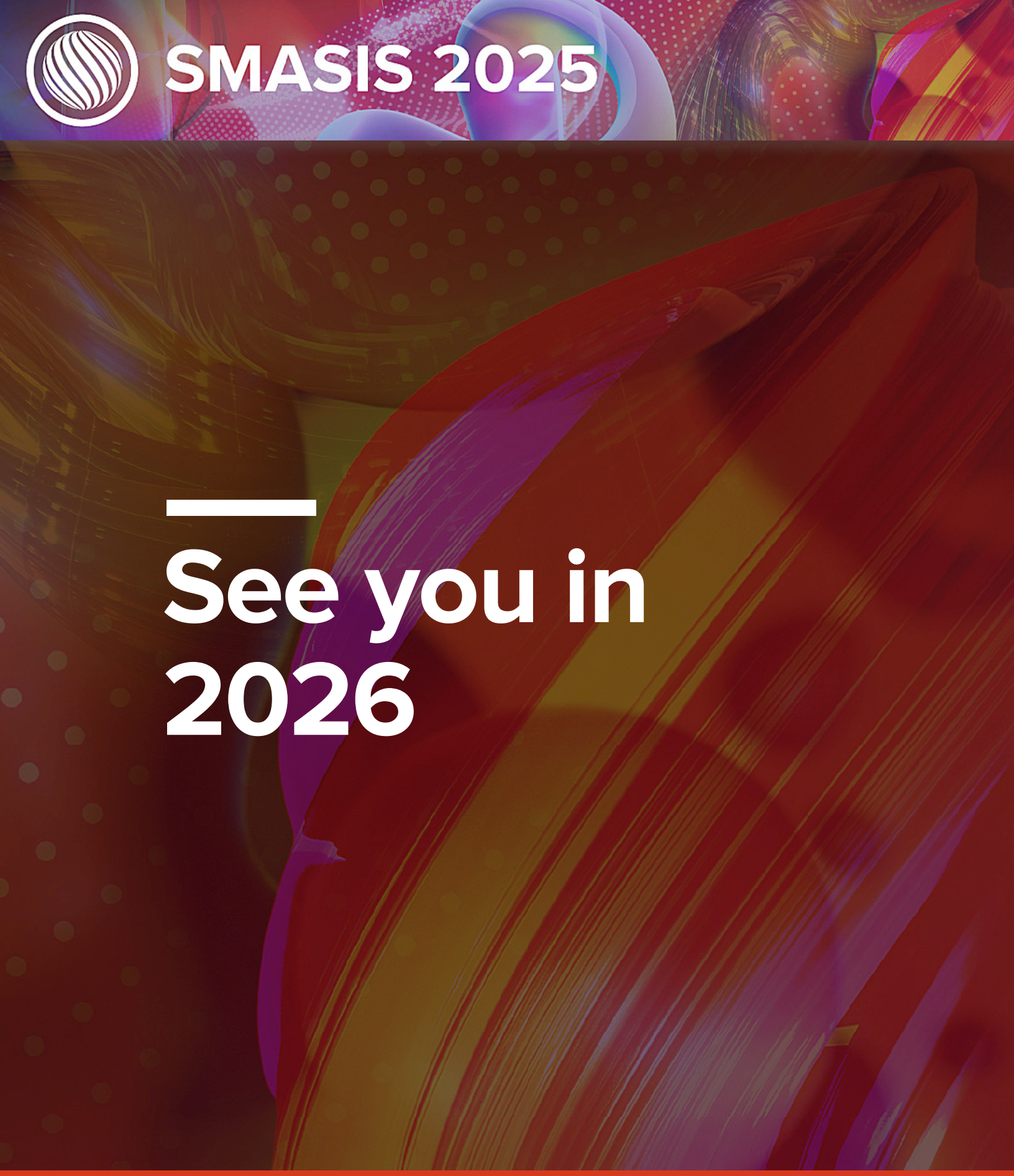
LOWER LEVEL





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