ASME® 2020 IMECE®

International Mechanical Engineering Congress & Exposition®

CONFERENCE
Nov 16–19, 2020

Virtual, Online

Program

https://event.asme.org/IMECE

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Welcome From The Chairs

Dear Distinguished Attendees:

Welcome to the ASME 2020 International Mechanical Engineering Congress and Exposition (IMECE)! This year, we have transitioned from the on-site IMECE in Portland, OR, due to the novel Coronavirus (COVID-19), to a virtual meeting space that provides us a unique opportunity to highlight more of the innovative work by our International Mechanical Engineering community. We appreciate your support and patience during this transition and expect to have a dynamic, interactive, and inclusive virtual conference.

This virtual conference will feature both synchronous and asynchronous events, exhibits, poster sessions, and discussion forums via an online platform, all of which will be broadcast to ensure as wide participation as possible, given the international nature of the conference participants within different time zones. We are excited to bring together academia, industry, and the government to share developments in fundamental and applied research, as well as advances in education and technology. Prerecorded presentations with live Question & Answer periods will ensure that you are able to capture all facets of the conference you find illuminating. We sincerely hope that a robust scholarly conversation will occur during and after the conference with an exchange of ideas and connections.

The 2020 conference includes 17 Technical Tracks with over 1,000 virtual presentations and posters spanning a wide range of global mechanical engineering interests, from essential research to applied science, with a goal of inspiring the next generation of mechanical engineers and scientists to contribute to our society. The IMECE technical program is a grassroots effort forged by remarkable volunteer contributions and supported by a formidable ASME staff. This conference is also the convergence point for our mechanical engineering community, where together, we celebrate our accomplishments, recognize our achievements, and strategically plan for our future.

The IMECE 2020 technical program will start on Monday, November 16 at 11:00AM ET with a welcome by our ASME CEO, Tom Costabile, followed by the first of our three Keynote Lectures given by Dr. Emily A. Carter, the Executive Vice Chancellor and Provost at the University of California, Los Angeles. Her talk will provide Insights into Sustainable Energy Materials Optimization from First Principles. Other Keynotes will follow on Tuesday (11/17) and Thursday (11/19) at 11:00AM ET to open our technical program on these days. Dr. Dragos Maciuca, the Executive Technical Director of Ford's Research and Innovative Center will speak on Tuesday about Opportunities & Challenges for Mechanical Engineering in Autonomy and Artificial Intelligence. On Thursday, Dr. James Truchard, the Former CEO of National Instruments and the ASME 2020 Richard J. Goldstein Energy Lecture Award Recipient, will discuss A Future for Energy. The Track Plenary Series will follow each of the Keynote Lectures while additionally starting our day on Wednesday (11/18) at 11:00AM ET. Every day will include invited and contributed presentations in parallel Technical Sessions after the Plenaries conclude, delivering a full day of exciting advances in mechanical engineering.

The National Science Foundation continues to have a presence at IMECE. Ten program directors from different areas of CMMI and CBET will be available for one-on-one sessions with faculty from U.S. educational institutions on Tuesday (11/17). Then on Wednesday (11/18). Speakers from CBET and CMMI will each present a 45-minute info session followed by a 45-minute proposal development discussion. The NSF provided a travel grant award for the NSF student poster competition, with more than 50 posters from NSF-funded graduate and undergraduate students. In addition to the NSF poster competition, there will be the Undergraduate Research and Design Expo and the "virtual podium" technical poster show. All these posters will be showcased virtually through the Poster Exhibit Hall. IMECE also provides the home for many events by ASME divisions and committees, including the ME Department Heads Forum, Congress-Wide Symposium, and many special awards and lectures among other honors.

On behalf of the entire Conference Steering Committee, we thank our mechanical engineering community for the exemplary dedication, passion, and effort to make IMECE an open forum for discussion, learning, and professional growth and development. A special thank you for the volunteer organizers, including track chairs, topic and symposium organizers, session chairs, reviewers, and judges. Furthermore, we thank the IMECE participants whom have made the preparations necessary for online participation. We also extend our gratitude to the ASME staff for coordinating, supporting, and running this extensive and multifaceted event, especially during this challenging time.

We are looking forward to seeing you all at the 2020 IMECE!

Sincerely,

IMECE Conference Steering Committee

GENERAL INFORMATION

MEMBERSHIP TO ASME (One Year Free)

Registrants who paid the non-member conference registration fees will receive a one-year 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.

POSTER PRESENTATIONS

Poster presentations will be available throughout the entire conference. Be sure to visit the Undergraduate Research and Design Expo Student Poster Competition, NSF Student Competition and the Research Posters.

NAVIGATING SHOWCARE CONFERENCE SOFTWARE

1. For the best experience and to avoid connection issues, it is best to be hardwired or at least have a strong reliable internet connection to view a conference with live streaming and mp4's full animation.
2. The system works best in Firefox, Safari, or Chrome.
3. There are many ways to get to the different sections of the website. Hover over and click the icons on the left navigation to maneuver around the site. There are also hyperlinks at the top or middle of the webpage.
4. Time Zone: Times listed in the Schedule At A Glance, Technical Program listed on the website and session times are in Eastern Time (ET). The time that shows on the Full Schedule in the left navigation will be in the time zone where you are located. Please take the time difference into consideration when managing the schedule.
5. Make sure you update your profile to assist in networking with other attendees.

6. Networking:
    a. There are opportunities to create discussion groups in the Community–Question and Answer section of the website.
    b. Roundtables–This is a great way to start a conversation on a particular subject matter or continue a conversation from a technical session. A capacity of 16 people allows for an exchange of ideas that is not overwhelming.
    c. Follow attendees and connect with them.
7. Be sure to visit our exhibitors in the Exhibit Hall. Chat with exhibitors, jump on one-on-one video calls and review their materials.
8. Poster sessions are a great component of IMECE. Be sure to view the abstract and one-minute videos in the Poster Hall. Submit questions to the authors about their submissions.
9. Gamification–As you navigate the website, you will collect reputation points and may win an Amazon gift card.
10. To view Technical Sessions, click on the Technical Session tile and search for the session that you want to participate in.
11. On-Demand content will become available once a session has ended. Keynote sessions will be available 24 hours after they are presented.

PUBLICATIONS: IMECE2020 CONFERENCE PAPERS AND PROCEEDINGS

Technical papers accepted for publication for IMECE2020 will be available through a dedicated Online Papers site available to all fully paid attendees beginning a week before the conference.

- Post-conference, an ISO batch file and two zip files will be made available on the Online Papers site so that users can download them to their personal computer systems.
- Post-conference, papers presented at the conference will be published as the official Proceedings of the conference on The ASME Digital Collection (asmedigitalcollection.asme.org).

Authors may refer to The Collection for DOI links and citation information for their papers. All ASME conference Proceedings are disseminated worldwide and submitted for indexing to SCOPUS, COMPENDEX, the ISI Conference Proceedings Citation Index, Web of Science (Clarivate), and Google Scholar. For further information about ASME Publications, please contact conferencepubs@asme.org.

EVENT APP INFORMATION

IMECE 2020 Committee Meetings, Lectures, and Special Events will be hosted in the app. Don't miss the opportunity to log-on and engage with your ASME colleagues as they discuss the latest business and plans for the future as well as honor those in the field.

Accessing the Desktop Version of the app (recommended for Virtual Conferencing):

1. Visit this link: **https://crowd.cc/imece2020**
2. In the Event Password field, **enter imece2020**. Note: The password is not case-sensitive.
3. On the next screen, click "Login".
4. Enter your name and email address.
5. Enter the six-digit verification code that will be sent to your email.

Downloading the Mobile version to a Smart Phone or Tablet:

1. Go to your app store. Search for **CrowdCompass AttendeeHub** and install it. Note: If you are using a Blackberry, Windows phone, an Android version older than 7.0, or iOS older than version 11, you will need to use the desktop version of the app found here: **https://crowd.cc/imece2020**
2. After installing, the AttendeeHub icon will appear on your home screen.
3. Search the AttendeeHub for **imece2020** and download it.
4. Tap the name of the event to open it.

Logging In

1. Enter your first and last name where prompted, then tap Next. Enter an email address where you'd like your verification email sent, then tap Next one more time.
2. Retrieve your six-digit verification code from your email.
3. Enter the code in the app.

KEYNOTE SPEAKERS

Monday, November 16, 11:00AM – 12:00PM ET

Emily A. Carter, Ph.D.
Executive Vice Chancellor and Provost Distinguished Professor of Chemical and Biomolecular Engineering UCLA

Title: Insights into Sustainable Energy Materials Optimization from First Principles

Abstract: I believe that scientists and engineers have a responsibility to improve life for all Earth's inhabitants. To this end, for more than a dozen years, I have used my skills—in developing and applying quantum mechanics methods aimed at complex phenomena difficult to probe experimentally—to accelerate discovery, understanding, and optimization of materials for sustainable energy. These range from materials for converting sunlight and other renewable energy sources to fuels and electricity; to clean, efficient biodiesel combustion; to clean electricity production from solid oxide fuel cells and nuclear fusion reactors; and to lightweight metal alloys for fuel-efficient vehicles. During this lecture, I will begin with an overview and then focus on insights into (photo)electrocatalysis that could someday create a virtuous cycle of artificial photosynthesis, exploiting energy from sunlight or other renewable sources, water, air, and carbon dioxide to synthesize the fuels and chemicals needed to sustain future generations.

Biography: Emily A. Carter is the Executive Vice Chancellor and Provost (EVCP) and Distinguished Professor of Chemical and Biomolecular Engineering at UCLA. Carter began her independent academic career at UCLA in 1988, rising through the chemistry and biochemistry faculty ranks before moving to Princeton University in 2004, where she spent the next 15 years jointly appointed in mechanical and aerospace engineering and in applied and computational mathematics. During her first stint at UCLA, she helped launch two institutes that still exist today, the Institute for Pure and Applied Mathematics and the California NanoSystems Institute. While at Princeton, she held the Arthur W. Marks '19 and the Gerhard R. Andlinger Professorships. After an international search, she was selected to be the Founding Director of Princeton's Andlinger Center for Energy and the Environment. From 2010 to 2016, she oversaw the construction of its award-winning building and state-of-the-art facilities, the development of novel educational and research programs, and the hiring of its faculty and staff. After a national search, she served from 2016 to 2019 as Princeton's Dean of Engineering and Applied Science, where she spearheaded major research, education, outreach, and diversity initiatives, before returning to UCLA as EVCP in September 2019. Dr. Carter maintains a very active research presence, developing and applying quantum mechanical simulation techniques to enable discovery and design of molecules and materials for sustainable energy. Her research is supported by multiple grants from the U.S. Department of Defense and the Department of Energy. The author of over 400 publications,

Carter has delivered over 550 invited and plenary lectures worldwide and has served on advisory boards spanning a wide range of disciplines. She is the recipient of numerous honors, including election to the U.S. National Academy of Sciences, the American Academy of Arts and Sciences, U.S. National Academy of Inventors, and the U.S. National Academy of Engineering. Carter earned a B.S. in Chemistry from UC Berkeley in 1982 (graduating Phi Beta Kappa) and a Ph.D. in Chemistry from Caltech in 1987, followed by a brief postdoc at the University of Colorado, Boulder, before joining the UCLA faculty.

Tuesday, November 17, 11:00AM – 12:00PM ET

Dragos Maciuca, Ph.D.
Executive Technical Director
Ford's Research and Innovation Center

Title: Opportunities & Challenges for Mechanical Engineering in Autonomy and Artificial Intelligence

Abstract: When talking about Artificial Intelligence in automotive engineering, the first thought that comes to mind is autonomous vehicles. And indeed, AI has had an incredible impact on autonomous vehicles. In this talk we'll explore the application of AI for autonomous vehicles together with a brief history of how we got here. However, there are many other applications of AI in automotive engineering and in mechanical engineering, in particular.

This talk will explore the applications of AI in various parts of the industry and some of the challenges and opportunities facing mechanical engineers. We'll address applications including autonomous vehicles, generative design, robotics and image processing, and the role of mechanical engineering in these areas. We'll also briefly address some of the challenges occurring at the intersection of AI, autonomy, and mechanical engineering

Biography: Dragos Maciuca is the Executive Technical Director at Ford's Research and Innovation Center in Palo Alto, California. He is an experienced engineer and management professional, with more than 20 years of professional experience in Silicon Valley spanning a breadth of industries, including automotive (BMW and Nissan), consumer electronics (Apple), semiconductor manufacturing (KLA-Tencor), and aerospace (Lockheed Martin). He has extensive experience advising startups, developing and commercializing products, collaborating with universities, and leading cross-functional teams. Dragos holds a Ph.D. in Control Systems from University of California at Berkeley and an MBA from the UC Berkeley, Haas School of Business.

Thursday, November 19, 11:00AM–12:00PM ET

James J. Truchard, Ph.D.
Former CEO, NI
ASME 2020
Richard J. Goldstein Energy Lecture Award Recipient

Title: A Future for Energy

Abstract: Humans depend heavily on energy for survival. Humans get energy from the sun via food we eat through nature's elaborate means of conversion of that food by the electron transport chain into ATP, a form of energy the body's cells can consume. Humans also have created elaborate means of extracting energy for their use, with carbon being a major source of that energy. Today, wind and solar are used extensively to generate electricity. The intermittent nature of wind and solar create a demand for storage or an alternate source of energy to close the gap. Batteries are rapidly gaining adoption in vehicles but see limited use in grid storage. Once, nuclear power was seen as a key component of electricity generation. In reality, fission-based nuclear power has had only some success while fusion-based nuclear power has been 50 years away since the 1950s. Fission-based nuclear power has suffered political acceptance because of safety related fears. The National Academies are currently conducting a study on clean, safe and affordable nuclear power. Using good engineering practices, we can create a sustainable future for energy, perhaps even with nuclear power.

Biography: James Truchard completed his education at The University of Texas at Austin. He received his bachelor's and master's degrees in physics in 1964 and 1967, respectively, and his Ph.D. in electrical engineering in 1974. While pursuing his Ph.D., he worked full time as a research scientist at the Applied Research Laboratory at UT Austin, where he pioneered technologies for computer-based systems for testing the U.S. Navy's sonar transducers and sonar beamformers. Computer-based test measurement systems became Dr. Truchard's vision for National Instruments, a company he co-founded in 1976. Starting with computer interfaces for traditional instruments, he went on to create data acquisition products interfaced directly to computers. Dr. Truchard co-invented LabVIEW, a graphical programming language that revolutionized how tests and measurements are performed in engineering and science experiments for a wide range of industries. National Instruments went on to create a suite of products and now works with over 35,000 companies and 7,000 universities. On January 1, 2017, Dr. Truchard retired after 40 years as CEO of the company, now known as NI.

Dr. Truchard has actively supported the next generation of engineers through programs such as FIRST® and hands-on learning labs. Since retiring from NI in 2017, he has spent his time sponsoring a number of humanitarian causes, including working with top researchers to help find the cause of Alzheimer's Disease. Dr. Truchard set up the Oskar Fischer Prize in 2019 to incentivize Alzheimer's researchers to take an engineering approach to Alzheimer's Disease. He believes through out-of-the-box thinking and cross-referencing key factors the answer to this devastating affliction can be achieved. He is also currently sponsoring a study with the National Academies on clean, safe, and affordable nuclear power. Among his various honors, Dr. Truchard was inducted into the National Academy of Engineering in 2007, named an IEEE Fellow in 2015, and inducted into the National Inventors Hall of Fame in 2019.

Track Plenary Presentations

Track 1: Acoustics, Vibration, and Phonics

Tuesday, November 17, 2020, 12:15PM–1:00PM

Exotic Wave-Matter Interactions in Metamaterials Based on Broken Symmetries

Andrea Alù

Abstract: In this talk, I discuss our recent research activity in acoustics and mechanics exploring tailored meta-atoms and suitable arrangements of them forming metamaterials that provide exciting venues to realize new mechanical phenomena and devices. I discuss venues to largely break reciprocity and realize isolation based on broken time-reversal symmetry induced by mechanical motion, spatio-temporal modulation, and/or nonlinearities. Time modulation and/or mechanical motion offer an interesting opportunity to realize non-reciprocal devices for guided waves and free-space radiation in acoustics and mechanics, breaking the limitations of static, passive, linear metamaterials and opening tremendous opportunities for new frontiers of wave manipulation. Nonlinearities combined with geometrical asymmetries can also be used to break transmission symmetry and reciprocity, with interesting opportunities in acoustics and mechanics, both static and dynamic. Arrays of these elements also can enable topological order in metamaterials, with unusual sound and mechanical wave transport.

In addition to non-reciprocity, time modulation and mechanical motion open other opportunities for unusual wave interactions. An example is the possibility to pump energy in the system by extracting it from the modulation network. The most common way of achieving this parametric gain phenomenon is to modulate at twice the signal frequency, which may be used to amplify the signal traveling in the modulated system or broaden its bandwidth of operation. Another opportunity is provided by commutated switching networks, which can convert frequencies with large efficiency, a functionality that can be exploited to establish new regimes of wave propagation and overcome the trade-off between delay and bandwidth in delay elements. Another class of interesting metamaterials based on broken symmetries are parity-time symmetric metamaterials, which are asymmetric in space, but symmetric upon parity and time inversion. Combining these features provides intriguing phenomena for guided waves, radiation and scattering phenomena, which we will discuss in detail during the talk. These non-Hermitian systems have been drawing large interest in recent years, mostly in the context of quantum mechanics and optics. One particular feature that has been raising great interest is the emergence of exceptional point (EP) singularities in which the eigen-values and eigen-vectors coalesce and become degenerate. EP singularities are highly sensitive to small-scale perturbations; hence, such systems are being considered toward sensor applications.

However, superior sensitivity is anticipated within a narrow parameter space. Therefore, a careful balance of coupling, differential gain and phase-mismatch must be maintained among the system's degrees of freedom. In this talk, I will discuss the impact and opportunities of these concepts for mechanics and acoustics, and their relevance for unusual wave-matter interactions in scattering systems.

Generally, the opportunities brought by time modulation, mehcanical motion, parametric phenomena, gain, and nonlinearities in the context of mechanical metamaterials have been opening exciting directions from basic science to practical technology, which will be discussed in depth during the talk.

Biography: Andrea Alù is the Founding Director and Einstein Professor at the Photonics Initiative, CUNY Advanced Science Research Center. He received his Laurea (2001) and Ph.D. (2007) from the University of Roma Tre, Italy, and, after a postdoc at the University of Pennsylvania, he joined the faculty of the University of Texas at Austin in 2009, where he was the Temple Foundation Endowed Professor until January 2018. Dr. Alù is a Fellow of NAI, IEEE, AAAS, OSA, SPIE, and APS, and has received several scientific awards, including the IEEE Kiyo Tomiyasu Award, the Vannevar Bush Faculty Fellowship from DoD, the ICO Prize in Optics, the NSF Alan T. Waterman award, the OSA Adolph Lomb Medal, and the URSI Issac Koga Gold Medal.

Track 2: Advanced Manufacturing

Thursday, November 19, 12:15PM–1:00PM

Additive Manufacturing in Naval and Marine Applications: Lessons Learned and Future Trends

Cindy Waters

Abstract: Additive manufacturing (AM) is being employed in various naval facilities with many successes in a variety of thrust areas. The global advancements in AM are expansive, and the DoD continues to be dedicated to create AM implementation plans, and to fund a national network of manufacturing institutes with an increasing number of research programs. The department of the Navy continues to expand successful AM efforts, including repairs and parts production for noncritical and flight/submarine-critical parts. An update on the status of AM in the Navy will be presented. Though AM can claim many successes in naval applications, the technology of advanced manufacturing is a dynamic one. Additional new technique developments are critical as well as ensuring high quality in the production of metal parts in order to fully seize the manufacturing advantages for the warfighter. This talk will discuss the progress of the AM in Naval and Marine applications through the lens of a thought leader at a Naval Warfare Center and an ONR Manufacturing Program Manager. The emphasis will be on lessons learned to date, expected future directions for deployed use of AM technologies, and a vision for collaboration, as well as how AM will be used to promote fleet logistics, sustainment, and repair.

Biography: Dr. Cindy Waters is the Senior Science Technology Manager (SSTM), Principal for Advanced Materials and Manufacturing, at Naval Surface Warfare Center Carderock (NSWCCD). Dr. Waters joined Carderock in early 2019 in the Additive Manufacturing team as a Senior Research Engineer. She works closely with the branches supporting insertion of additive manufacturing technology into the fleet and serves as a leader and technical expert for the Division, Warfare Center, Naval Sea Systems Command, Naval Research and Development Establishment and Department of the Navy in additive manufacturing, materials, and manufacturing processes. She is also serving as the Lead Coordinator of the Manufacturing Engineering Education Program (MEEP) program for the Office Naval Research. She was a tenured Professor of Mechanical Engineering at North Carolina A&T State University before joining NSWCCD. Research projects studied aspects of qualification and characterization of Metal Additive Manufactured parts. Other facets of her research experience focused on the education of engineers and faculty and organizational resistant to change. Her career includes more than 25 years of achievements in a variety of research, classroom, institutional service, and collaborative environments. The diverse collaborations included partners at various government agencies, including Oak Ridge Manufacturing Demonstration Facility, ONR, Honeywell National Security Campus and Y 12 National Security Complex, and Savannah River National Laboratory. She and a partner at Oak Ridge MDF recently published an SAE Deep Dive Book titled, Additive Manufacturing for Designers: A Primer.

She continues to advise, counsel, and collaborate on research and development initiatives across the Naval Research and Development Establishment in addition to conducting research and development projects that advance the state-of-the-art for Naval applications. These are all collaborative efforts with DoD, industry, and academia to develop new materials and processes to solve specific naval needs.

Track 3: Advanced Materials: Design, Processing, Characterization and Applications

Wednesday, November 18, 11:00AM–11:45AM

3D Printing, Synchrotron X-Ray Experiments and Machine Learning

Anthony Rollett

Abstract: 3D printing of metals has advanced rapidly in the past decade and is used across a wide range of industry. Although laser powder bed fusion (LPBF) has matured the fastest for metals, other technologies, such as binder jet and (robotic) wire feed, are making substantial progress. Many aspects of the technology are considered to be well-understood in the sense that machines make parts and temperature histories with residual stress can be simulated. Nevertheless, key questions remain open as to how to qualify printers and certify parts, how to control defect structures, which includes surface condition, and how to implement more sophisticated control systems. At the microscopic scale, more work is required to quantify, understand, and predict defect- and micro-structures, which affect properties. Strength, for example, is often at least as good as conventionally processed material, whereas defect-sensitive properties such as fatigue are

more challenging. Synchrotron-based experiments have been particularly illuminating, e.g., dynamic X-ray radiography (DXR) which provides ultra-high-speed imaging of laser melting of metals and their powders. This has, e.g., enabled the keyhole phenomenon to be quantified, which in turn has demonstrated the importance of power density, as opposed to energy density. Under typical LPBF conditions, there is almost always a keyhole present. If the power density is too high, the keyhole is unstable and sheds pores that are trapped by solidification. Energy density, while informative, also fails to capture the crucial boundary between full density and lack-of fusion porosity because it does not take account of melt pool overlap. Synchrotron-based 3D X-ray computed microtomography (μXCT) showed that essentially all metal powders exhibit porosity that partially persists into the printed metal. This explanation is reinforced by evidence both DXR and simulation. The links between porosity and process conditions provide a physics-based approach to defining a process window a given machine which, in turn, suggests a route to qualification by measuring and tracking the location of the process window in power-speed-hatch space for any given powder bed printer. To illustrate the power of machine learning, computer vision (CV) has successfully classified different microstructures, including powders. The power of CV is further demonstrated by its ability to detect and classify defects in the spreading of powder. Machine learning provides new insights on correlations between welding parameters, microstructure and material properties in laser hot-wire weld deposits to Ti-6Al-4V. High-speed synchrotron X-ray diffraction is beginning to provide new information on solidification and phase transformation in, e.g., IN718, Ti-6Al-4V and stainless steel. High Energy (X-ray) Diffraction Microscopy (HEDM) experiments is also providing data on 3D microstructure and local elastic strain in 3D printed materials such as Ti-6Al-4V and stainless steel.

Biography: Anthony Rollett's research focuses on microstructural evolution and microstructure-property relationships in 3D. Interests include 3D printing of metals, materials for energy conversion systems, strength of materials, constitutive relations, microstructure, texture, anisotropy, grain growth, recrystallization, formability, extreme value statistics and stereology. Important recent results include high-speed x-ray visualization of laser-drilled keyholes during laser melting, development of a spectral approach to eigenstrain problems, validation of the 3D elasto-viscoplastic FFT code against synchrotron x-ray diffraction data, definition of process windows in 3D printing through characterization of porosity, prediction of solidification microstructure, the appearance of new grains during grain growth, and grain size stabilization. He has been a Professor of Materials Science & Engineering at Carnegie Mellon University since 1995 and before that was with the Los Alamos National Laboratory. He is a Fellow of several professional societies and a member of two federal advisory committees. He is the co-Director of CMU's NextManufacturing Center that is dedicated to advancing manufacturing especially through 3D printing. He has over 200 peer-reviewed publications.

Track 3: Advanced Materials: Design, Processing, Characterization and Applications

Tuesday, November 17, 12:15PM–1:00PM

Rate-Activated Tethers: Wearable Smart Materials to Reduce Mechanical Injuries to the Body and Brain

Eric Wetzel

Abstract: Injuries during work and play, for both civilians and military personnel, result in lost time, decreased productivity, increased health care costs, and reduced quality of life. A common theme in many of these injuries, from sprained ankles to brain injury, is an association between rapid dynamic mechanical input and injury likelihood. Existing wearable protective devices, including ankle and knee braces, helmets, and body pads, are typically constructed from materials whose low-speed and high-speed behaviors are very similar. In contrast, a dynamically responsive material that transforms into a more protective state during high rate mechanical impulses could improve the comfort and performance of wearable protection.

The U.S. Army Research Laboratory has invented a dynamic strapping material called a “rate-activated tether” (RAT). RATs exhibit elastic compliance at low speeds, similar to elastic straps, but resist extension with up to 100X more force when elongated at high speeds. The rate sensitivity of RATs is derived from an enclosed shear thickening fluid (STF), a colloidal material with speed-sensitive resistance to flow. This talk will describe the basic design and behavior of RATs, the influence of STF and component properties, and challenges with integration. A number of application examples will be presented, including goggle straps, ankle braces, and helmet suspensions. In addition, the unique challenges and opportunities associated with technology development and transition at a DoD laboratory will also be discussed.

Biography: Dr. Eric Wetzel is the Team Leader for Multifunctional Materials, and Research Area Leader for Soldier Materials, at the U.S. Army Research Laboratory (ARL) in Aberdeen, MD. His research interests span a range of topics, including ballistic textiles, multifunctional composite materials, additive manufacturing, and two-dimensional polymers. Dr. Wetzel has co-authored over 75 peer-reviewed journal publications and book chapters, and holds 20 patents. In 2014, he was awarded an NFL Head Health Challenge grant for the investigation of concussion-mitigation technologies, followed by selection in 2015 for a Head Health Challenge Final Award to prepare the technology for commercialization. Dr. Wetzel has also been selected for a 2018 Federal Laboratory Consortium Excellence in Technology Transfer Award, and in 2020 was appointed a Fellow in the National Academy of Inventors.

Track 4: Advances in Aerospace Technology

Thursday, November 19, 12:15PM–1:00PM

Physics-Guided Learning in Aerospace: From Material Fracture to System Operation

Yongming Liu

Abstract: Artificial Intelligence (AI) is being0 explored in almost every engineering discipline in recent years. As a purely data-driven approach, classical AI is known to have poor prediction capability since no physics knowledge is included. This talk presents the concept of Hybrid Intelligence, a physics-guided learning approach that integrates machine learning (artificial intelligence) and physics (human intelligence) for engineering analysis across very different scales in aerospace. The physics-guided learning methodology encodes the underlying physics of engineering problems into machine learning models and fuses information from abstracted knowledge and observed data together.

Three different physics-encoding methods are presented to cover most common engineering problems: encoding in network architecture, encoding in input features, and encoding in output functions. The first method is illustrated using the convolutional neural networks (CNNs)-based method for partial differential equations (PDEs) and recurrent neural networks (RNNs)-based method for ordinary differential equations (ODEs). The second method is illustrated encoding prior physics and knowledge in imaging quantifies to facilitate the learning process. The last method is illustrated using the Bayesian Entropy Network (BEN)-based method for constrained probabilistic inference and uncertainty quantification. These different methods are demonstrated with aerospace engineering applications at very different scales, including material fatigue and fracture, structural dynamics, and air traffic control and management. Several future research directions are discussed based on the findings from the current study.

Biography: Yongming Liu is a Professor in mechanical and aerospace engineering at Arizona State University and the founding director of the Center for Complex System Safety—a joint center of Arizona State University, University of Arizona, and Northern Arizona University. He completed his Ph.D. at Vanderbilt University in 2006 and obtained his Bachelor's and Master's degrees from Tongji University in China in 1999 and 2002, respectively. Dr. Liu's research interests include prognostics, probabilistic methods, fatigue and fracture, imaging-based experiments, and Bayesian methods. He is the recipient of the Air Force Young Investigator Award in 2011 and has worked with a wide variety of governmental agencies and industrial partners for his research, including NASA, NSF, DOE, DOT, and DOD. He is currently leading a NASA University Leadership Initiative project on information fusion for air traffic management, which focuses on the development of probabilistic learning methods with extensive data resources for air transportation safety assurance.

Track 4: Advances in Aerospace Technology

Wednesday, November 18, 11:00AM–11:45AM

Recent Advances in Optical-Based Non-Contact Full-Field Damage Visualization for Composite Structures

Fuk-Gwo Yuan

Abstract: Guided wave based nondestructive inspection (NDI)/structural health monitoring (SHM) aims at using ultrasonic guided waves excited within the structure in order to interrogate the structure. By investigating the scattered ultrasonic guided waves in the structure using appropriate signal/image processing algorithms, a wealth of information about the hidden details of the structure can be unearthed, including information about the location of the damage, if present, and its characteristics. Commonly used excitation sources include thermal load, mechanical vibration shaker, air-coupled transducer (ACT), piezoelectric transducer (PZT), pulse laser, etc., and the scattered waves can be sensed using ACT, PZT, optical fibers, EM transducer, photo detector (PD), camera (CCD or CMOS), etc. In the aerospace industry, several optical-based imaging modalities to assess the damage have been developed. This keynote will focus on two recently developed non-contact full-field optical-based techniques for visualizing the barely visibly impact damage (BVID) in composite structures.

The first is an integrated system comprised of an image acquisition device (high-speed camera), digital image correlation (DIC), and an image processing software system, which can be termed as GWSHM-IC (guided wave based SHM using digital image correlation). This study is viewed as the first attempt at using a high-speed camera together with DIC using white light to capture the scattered guided wavefield on the surface of a structure (caused by the wave-damage interactions from the damage underneath the surface) in the near ultrasonic frequency range. A phase-based damage imaging condition, wavenumber index (WI), is employed to image the BVID. Guided waves have the ability to interrogate the entire thickness of platelike structures over large areas, and the digital camera (camera sensor), where each pixel is considered to effectively act as a sensor, can provide extremely high spatial resolution by measuring these guided waves simultaneously at all the points within the field of view. As such, the use of high-speed digital cameras has promising potential to provide an effective and reliable means for non-contact, large area monitoring in order to identify hidden damage within the structure.

The second non-contact full-field damage image technique involves the use of coherent light to visualizing the BVID in composite structures through speckle interferometry using CCD or a high-speed camera. The system comprises two sub-systems: (1) laser speckle photometry (LSP) and (2) shearography. Both sub-systems rely on observing the variation of laser speckles in time series without reference arm and are very insensitive to ambient noise where traditional holography/ESPI suffers greatly. Other advantages of LSP/shearography include robust tolerance of laser coherence, larger illumination area, flexible choice of correlation functions, and that more advanced post-processing techniques, such as Bayesian updating and inference, can be readily applied which holography/ESPI do not possess. These two non-contact, full-field techniques for damage image are believed to be a significant first step toward that goal of using an integrated high-speed camera system to visualize hidden damage in structures via ultrasonic guided wavefields.

Biography: Dr. Fuk-Gwo Yuan has been with North Carolina State University since 1989. Currently, he is a professor at Mechanical and Aerospace Engineering, NC State. He also serves as a Samuel P. Langley Professor at the National Institute of Aerospace, Hampton, Virginia. His recent research includes structural health monitoring/management, machine learning, multi-functional materials, nano/meso scale sensors, advanced computing tools with smart sensors, damage prognosis, and energy harvesting.

Track 5: Biomedical and Biotechnology

Tuesday, November 17, 12:15PM–1:00PM

Forces, Fibers, Fractals, Fractional Calculus and Trans-Formations in Elastography

Thomas J. Royston

Abstract: Dynamic elastography imaging, whether based on magnetic resonance, ultrasound, or optical modalities, attempts to reconstruct quantitative maps of the viscoelastic properties of biological tissue, properties that are altered by disease and injury. Reconstruction often assumes isotropy and homogeneity and neglects boundary and pre-strain conditions. Many tissue types, such as skeletal muscle, violate most or all these assumptions, posing challenges and opportunities for developing better imaging biomarkers. These challenges are reviewed, and novel methods to address them are introduced.

Biography: Thomas J. Royston, Ph.D., Professor and Head of Bioengineering at the University of Illinois at Chicago (UIC), earned his Ph.D. in Mechanical Engineering from Ohio State University in 1995. He has been a faculty member at UIC since 1995, with appointments in Bioengineering and Mechanical Engineering, and head of Bioengineering since 2009. Dr. Royston's NIH and NSF-supported research in mechanical wave motion and imaging in porous and nonporous viscoelastic materials, and acoustics applied to medical diagnostics and therapy has been recognized with the NSF Career Award, the NIH NIBIB Nagy Award, and the Acoustical Society of America (ASA) Lindsay Award. He is a Fellow of the American Society of Mechanical Engineers (ASME) and the American Institute for Medical and Biological Engineering (AIMBE). He has served as associate editor for journals of the ASA and ASME, and has published over 88 peer-reviewed journal articles.

Track 5: Biomedical and Biotechnology
Wednesday, November 18, 11:00AM–11:45AM

A Contrast-Free Morphometric Microvessel Analysis for Cancer Detection
Azra Alizad

Abstract: As a focus of intense research, ultrasound as cancer imaging technology is evolving rapidly. Our group has developed several ultrasound technologies and demonstrated their clinical use by testing these techniques on patients. Recently, we have developed novel ultrasound-based imaging for microvasculature visualization and quantification. This method uses a contrast-free ultrasound microvasculature morphometric analysis consisting of a high definition microvasculature imaging for detection and visualization of small sub-millimeter vessels, as well as a method for quantification of vessel architecture to perform quantitative analysis of the microvasculature network in lesions to differentiate malignant from benign. This noninvasive ultrasound-based technology allows physicians to observe vascular changes in diseased tissues and detect abnormalities such as cancerous lesions. This talk encompasses the results of human studies on this newly developed ultrasound technology.

Biography: Azra Alizad, MD, received her medical degree and fellowship from Tehran University Medical Sciences. Currently, Dr. Alizad is a professor of Radiology, Department of Radiology and Professor of Biomedical Engineering as well as an associate professor of Medicine at the Mayo Clinic College of Medicine in Rochester, MN. In addition to her training in Medicine, she has a broad background and expertise in medical ultrasound research. She leads a translational research laboratory, involving development and application of novel ultrasound technologies such as microvasculature imaging, functional ultrasound, elastography, vibro-acoustic imaging for diagnosis of abnormalities in breast, thyroid, prostate, neck masses, and axillary lymph nodes, brain and bone. Dr. Alizad is the principal investigator of multiple major federal grants funded by the National Institute of Health (NIH) and recipient of a grant funded by Komen Breast Foundation for the Cure. She is an elected Fellow of the American Institute for Medical and Biological Engineering (AIMBE) and American Institute of Ultrasound in Medicine (AIUM). In addition to senior member of the Institute of Electrical and Electronics Engineers-UFFC, she also holds membership in several other professional societies, including the Radiological Society of North America (RSNA), American Medical Association, American Association for Cancer Research (AACR) and AACR-WICR (Women in Cancer Research), AACR-MICR (Minorities in Cancer Research), Acoustic Society of America, and American Society for Breast Diseases. At the Mayo Clinic, she is also an active member of the Mayo Clinic Cancer Center and the Center for Clinical and Translational Science.

Track 6:
Design, Systems and Complexity
Tuesday, November 17, 12:15PM–1:00PM

Smart Collaborative Robots for Manufacturing Applications

Satyandra Kumar Gupta

Abstract: Many emerging robotics applications require the use of multiple collaborating robots to operate under human supervision. To be useful in such applications, collaborative robots will need to (1) program themselves, (2) efficiently learn from the observed performance, (3) safely operate in the presence of uncertainty, (4) appropriately call for help during the execution of challenging tasks, and (5) effectively communicate with humans. This presentation will provide an overview of the advances in physics-aware artificial intelligence that are being used to enable robots to automatically make decisions to meet aforementioned requirements. First, we will present an approach for automatically generating near-optimal trajectories in real time to enable robots to program themselves from task descriptions. Second, we will describe self-directed learning methods to equip robots with the ability to learn from observing the performance of previously executed tasks and adapting their plans. Third, we will describe methods for robots to operate safely in the presence of uncertainty by generating contingency-aware plans. Fourth, we will discuss computational methods for endowing robots with introspective capabilities so that they can seek help from humans on challenging tasks. Finally, we will present augmented reality-based interfaces for enabling robots to elicit human guidance during the decision-making process. The use of collaborative robots can significantly improve human productivity and eliminate the need for human involvement in tasks that pose risks to human safety. Assembly, composite layup, machine tending, and sanding tasks will be used as illustrative examples to show how smart collaborative robots can be used in high mix manufacturing applications.

Biography: Dr. Satyandra K. Gupta is Smith International Professor in the Department of Aerospace and Mechanical Engineering and Department of Computer Science in Viterbi School of Engineering at the University of Southern California (USC). He served as a program director for the National Robotics Initiative at the National Science Foundation from September 2012 to September 2014. Dr. Gupta's interests are in the area of physics-aware decision-making to facilitate and advance the state of automation. He has published more than 350 technical articles. He is a fellow of the American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronics Engineers (IEEE), and Society of Manufacturing Engineers (SME). He serves as the editor of the ASME Journal of Computing and Information Science in Engineering. Dr. Gupta has received numerous honors and awards for his contributions to the scientific community. Representative examples include: the Young Investigator Award from the Office of Naval Research in 2000, Robert W. Galvin Outstanding Young Manufacturing Engineer Award from the Society of Manufacturing Engineers in 2001, CAREER Award from the National Science Foundation in 2001, Presidential Early Career Award for Scientists and Engineers (PECASE) in 2001, Invention of the Year Award at the University of Maryland in 2007, Kos Ishii-Toshiba Award from

ASME in 2011, Excellence in Research Award from ASME Computers and Information in Engineering Division in 2013, and Distinguished Alumnus Award from Indian Institute of Technology, Roorkee in 2014. He has also received ten best paper awards at international conferences.

Track 7: Dynamics, Vibration, and Control

Wednesday, November 19, 11:00AM–11:45AM

COVID-19: Data-Driven and Delay Dynamics

Bala Balachandran

Abstract: COVID-19 was declared as a pandemic by the WHO on March 11, 2020. Here, the dynamics of this epidemic is studied by using a generalized Logistic Function model and compartmental models with and without delays. It is shown as to how forecasting may be done on the spreading of the infection in a chosen population by using a generalized Logistic Function model. In the compartmental model, the population is divided into susceptible, exposed, infected, and recovered and deceased compartments, and a set of delay differential equations are used to describe the system. The critical role of data is elucidated, and it is discussed as to how the compartmental model can be used to capture various aspects including quarantining. The obtained results can be useful for furthering our understanding of disease dynamics as well as planning purposes.

Biography: Dr. Bala Balachandran received his B. Tech (Naval Architecture) from the Indian Institute of Technology, Madras, India, M.S. (Aerospace Engineering) from Virginia Tech, Blacksburg, VA, and Ph.D. (Engineering Mechanics) from Virginia Tech. Currently, he is a Minta Martin Professor of Engineering at the University of Maryland, where he has been since 1993. His research interests include nonlinear phenomena, dynamics and vibrations, and control. The publications that he has authored/co-authored include a Wiley textbook entitled, Applied Nonlinear Dynamics: Analytical, Computational, and Experimental Methods (1995, 2006); a Cambridge University Press textbook entitled, Vibrations (2019); and a co-edited Springer book entitled, Delay Differential Equations: Recent Advances and New Directions (2009). Currently, he serves as the Editor of the ASME Journal of Computational and Nonlinear Dynamics and a Contributing Editor of the International Journal of Non-Linear Mechanics. He is a Fellow of ASME and AIAA and a senior member of IEEE.

Track 7: Dynamics, Vibration, and Control
Thursday, November 19, 12:15PM–1:15PM

Design with Internal Resonances: From Macro to Micro Nonlinear Resonators
Anil Bajaj

Abstract: Most micro-electromechanical resonator designs are based on linear resonant operation of micro-structures vibrating in flexural or torsional modes. Novel microresonators that utilize "internal resonance" phenomena and nonlinear interactions in structural modes are described. The focus is on systems with 1:2 and 1:3 internal resonances between two structural modes and their nonlinear interactions in the presence of nonlinearities. A technique for design of such resonators is described and few specific cases, including the beam-type designs – the T-resonator, the pedal resonator, and plate-type designs, are described. Detailed analytical modeling includes inertial quadratic, and stretching and curvature cubic nonlinearities, electrostatic potential, and effects of thermal pre-stress. Lagrangian formulation and nonlinear two-mode reduced-order models are used to investigate possible static pull-in limits as well as nonlinear resonant dynamics with mass-sensing applications. Uncertainty Quantification and Sensitivity Analysis techniques are applied to understand the most significant geometric design parameters affecting the performance of the resonators.

Biography: Anil K. Bajaj is the Alpha P. Jamison Professor of Mechanical Engineering at Purdue University. He served as a Visiting Professor and Arcot Ramachandran Chair in the Department of Applied Mechanics at the Indian Institute of Technology Madras and Chennai, India, in 2019–2020. He was the William E. and Florence E. Perry Head of Mechanical Engineering (6/2011–6/2019) and Associate Head for Research and Graduate Education (1998–2010), all at Purdue. Dr. Bajaj completed his B.Tech. (1973) and M.Tech. (1976), both in Mechanical Engineering from the Indian Institute of Technology, Kharagpur and Kanpur, India, respectively, and Ph.D. in Mechanics (1981) from the University of Minnesota. Dr. Bajaj's research is in the areas of nonlinear dynamics of structural systems; linear stability and dynamics of systems and structures; brake squeal predication and sensitivity analysis; dynamics of seat-occupant systems; MEMS designs using nonlinear resonances; flow-induced dynamics of elastic bodies; and modeling of Viscoelastic Properties of Foam. He is a Fellow of the ASME and has received many Purdue University awards ("Provost's Award for Outstanding Graduate Mentors," Purdue Graduate School, 2006; College of Engineering "Mentorship" Award for Faculty Excellence, "Team" Award for Faculty Excellence, 2009). He has published more than 225 archival journal and conference proceedings papers and has advised (or co-advised) more than 45 M.S. and Ph.D. students. Dr. Bajaj served as a Contributing Editor of the journal Nonlinear Dynamics till 2015. He was awarded the 2019 Thomas K. Caughey Dynamics Award by the Applied Mechanics Division (AMD) of the ASME.

Track 8: Energy

Wednesday, November 18, 5:10PM–6:25PM

Grand Challenges in Energy Research

Panelists: Jayathi Murthy, Ajay Malshe, and Mark O'Malley

Moderators: Eric Loth and Partha P. Mukherjee

Abstract: This is an inaugural panel that brings world-class university thought leaders and National Academy of Engineering (NAE) members together, who will provide their perspectives on the frontiers of multi-faceted research and engagement needs and opportunities in the broader context of energy science and engineering.

Jayathi Murthy

Jayathi Murthy is the Ronald and Valerie Sugar Dean of Henry Samueli School of Engineering and Applied Science at the University of California, Los Angeles. Before joining UCLA as the first woman Dean of Engineering in January 2016, she was Chair of the Department of Mechanical Engineering at the University of Texas at Austin and held the Ernest Cockrell Jr. Memorial Chair in Engineering. Prior to joining the University of Texas at Austin, Murthy was the Robert V. Adams Professor of Mechanical Engineering at Purdue University from 2008 to 2011. Before joining Purdue, she was a professor of mechanical engineering at Carnegie Mellon University in Pittsburgh. Earlier, she worked for ten years at New Hampshire-based Fluent, Inc., a developer and vendor of the world's most widely used computational fluid dynamics software, where she led the development of algorithms that are widely used in the CFD world. She is a member of the National Academy of Engineering (NAE), foreign fellow of the Indian National Academy of Engineering (INAE), fellow of the American Society of Mechanical Engineers (ASME), and the recipient of many honors, including the ASME Heat Transfer Memorial Award in 2016. Murthy is the author of more than 330 technical publications.

Ajay Malshe

Ajay P. Malshe is currently R. Eugene and Susie E. Goodson Distinguished Professor of Mechanical Engineering at Purdue University. Before joining the Purdue faculty, he served as a Distinguished Professor and 21st Century Endowed Chair Professor in the Department of Mechanical Engineering at the University of Arkansas. He has gained a national and international reputation in advanced manufacturing, bio-inspired designing, multifunctional material surface engineering, and system integration and productization. Malshe has received numerous prestigious international honors, including fellowships to the American Society of Mechanical Engineering (ASME), American Society of Materials (ASM), International Academy of Production Engineering (CIRP), and the Institute of Physics (InstP). In 2018, he was elected to the National Academy of Engineering (NAE) "for innovations in nanomanufacturing with impact in multiple industry sectors." Malshe has trained more than 60 graduate and post-doctoral students, educated more than 1200 undergraduate students and mentored younger engineers in academia and business; published over 200 peer-reviewed manuscripts and received over 20 patents resulting in numerous award-winning engineered products applied by leading corporations in energy, aerospace, transportation and EV, high-performance racing, and other industrial sectors; and delivered over 100 keynote and invited presentations. He is also a founder and experienced business entrepreneur.

Mark O'Malley
Mark O'Malley is the Professor of Electrical Engineering at University College Dublin (UCD) and founding Director of the Electricity Research Centre, a multidisciplinary, multi-institutional, industry supported research activity. He is a foreign member of the U.S. National Academy of Engineering (NAE), a member of the Royal Irish Academy, and a Fellow of the Institute of Electrical and Electronic Engineers (IEEE) and has received two Fulbright Fellowships. O'Malley is recognized as a world authority on Energy Systems Integration and, in particular, Grid Integration of Renewable Energy. He was a visiting researcher on sabbatical at the U.S. National Renewable Energy Laboratory as Chief Scientist, Energy Systems Integration. He was the co-founder and Director of the International Institute of Energy Systems Integration, which in 2018 merged with the Utility Variable Integration Group to form the Energy Systems Integration Group (ESIG). He is now the Chair of the ESIG Research and Education Working Group.

Track 9: Engineering Education
Thursday, November 19, 12:15PM–1:00PM

Global Learning in Engineering Education: Five W's and one H
Kendra Sharp

Abstract: A need to better prepare graduates to work effectively in an increasingly globalized society combined with a desire to increase the reach and impact of our educational institutions themselves drives a growing demand for comprehensive internationalization in higher education. Arguably, the ability of workforce professionals (and our graduates) to operate in more diverse settings, with cross-cultural competence, is critical for maintaining economic competitiveness. Leaders of the engineering profession agree. The American Society of Engineering Education's Corporate Member Council indicated a need for engineers to develop cross-cultural competencies such as embracing diverse viewpoints, possessing a global and multidisciplinary perspective, and maintaining an awareness of ethical nuances across differences in cultural context. The new ABET accreditation criteria for engineering programs has further underscored the expectation that engineering programs must include curricular elements ensuring that students gain the ability to understand global, economic, environmental and societal context in engineering practice. In this presentation, Dr. Sharp will discuss the five W's (Who? What? Where? When? Why?) and one H (How?) for integrating global learning into our engineering education efforts. She will describe different approaches to integrating global learning, including efforts such as Oregon State University's (OSU's) Humanitarian Engineering Program. Lastly, she will provide some context around COVID-19's impact on institutional global learning efforts from her experience as OSU's Senior Advisor to the Provost for International Affairs in 2020. At the same time national borders were shutting down and global travel restrictions skyrocketing, COVID-19 shined a spotlight on our level of global interconnectedness and the importance of global research and science diplomacy to our shared future. She will discuss her institution's response relative to global learning opportunities, and initial thoughts regarding COVID-19's influence on her institution's future plans for global learning.

Biography: Dr. Kendra Sharp is the Senior Advisor to the Provost for International Affairs at Oregon State University (OSU) and Professor of Mechanical Engineering. In her administrative role, she provides leadership for the development and implementation of strategic initiatives in internationalization and global engagement at OSU. She also founded and directs OSU's Humanitarian Engineering Program. She believes deeply in the value of interdisciplinary education and research, and using engineering and technology for positive social impact. In collaboration with faculty, students, non-governmental organizations (NGOs), and social entrepreneurs, she works to address global issues in poverty, energy, and water through engineering design and international education. Recent awards include an Erskine Fellowship at the University of Canterbury (New Zealand), ASME's Edwin F. Church Medal, OSU's College of Engineering Faculty Mentoring Award, and OSU's International Service Award. Dr. Sharp received her Ph.D. and B.S. degrees from the University of Illinois at Urbana-Champaign, and Master's degrees from the University of Cambridge (UK), and the University of California-Berkeley.

Track 10: Fluids Engineering

Thursday, November 19, 12:15PM–1:00PM

Flow Control Applications

Dennis Bushnell

Abstract: Flow control, aka "Designer Fluid Mechanics," has a long history with many successes across a plethora of applications. This report addresses the characteristics of the approaches that are actually used, why they are used, the many approaches that are not used, and why. Analysis indicates ways forward to increase applicability/usefulness and efficiency of flow control research. Overall, greater and more effective progress in flow control requires utilization of far more detailed information early in the research process regarding application details and requirements.

Biography: Dennis M. Bushnell is currently Chief Scientist at NASA Langley Research Center in Hampton, Virginia. He is responsible for Technical Oversight and Advanced Program formulation for a major NASA Research Center with technical emphasis in the areas of atmospheric sciences and structures, materials, acoustics, flight electronics/control/software, instruments, aerodynamics, aerothermodynamics, hypersonic airbreathing propulsion, computational sciences and systems optimization for aeronautics, spacecraft, exploration and space access. He has had 52 years of experience as research

scientist, section head, branch head, associate division chief and chief scientist. His technical specialties include flow modeling and control across the speed range, advanced configuration aeronautics, aeronautical facilities, advanced power and energy, planetary exploration, and hypersonic airbreathing propulsion. Bushnell is Member of National Academy of Engineering, Fellow of ASME, Honorary Fellow of AIAA, and Fellow of the Royal Aeronautical Society. He authored 252 publications/major presentations and 350 invited lectures/seminars. He received B.S. in M.E. degree from University of Connecticut with Highest Honors, Distinction, and University Scholar in 1963, and M.S. degree in M.E. from University of Virginia in 1967.

Track 11: Heat Transfer and Thermal Engineering

Tuesday, November 17, 12:15PM–1:00PM

Engineering Materials for Thermal Challenges

Amy Marconnet

Abstract: Heat transfer is a limiting factor in reliability and performance of next-generation batteries, electronic devices, and electric vehicles. Mobile platforms with limited heat dissipation pathways are becoming ubiquitous while requiring integration of dissimilar materials and components with a high density of interfaces and placing additional constraints on device performance. Open challenges exist in optimizing and tuning the thermal transport within these heterogeneous systems, while meeting constraints on mechanical properties and device performance. Ultimately, efficient, thermally informed engineering is needed to translate research into technology and requires integrated modeling, experiments, and materials development. This talk describes several recent examples of engineering materials from the nano- and micro-structural level to achieve targeted performance objectives.

Biography: Amy Marconnet is an Associate Professor of Mechanical Engineering at Purdue University. She received a B.S. in Mechanical Engineering from the University of Wisconsin – Madison in 2007, and an M.S. and a Ph.D. in Mechanical Engineering at Stanford University in 2009 and 2012, respectively. She then worked briefly as a postdoctoral associate at the Massachusetts Institute of Technology, before joining the faculty at Purdue University in August 2013 as an Assistant Professor. She was promoted to Associate Professor in August 2019. At Purdue, Dr. Marconnet has made significant contributions to the field of heat transfer developing an interdisciplinary research program to evaluate, understand, and control the physical mechanisms governing the thermal transport properties of materials, machines, and systems. Her research group has made significant advances to the development of novel metrology tools for characterizing transport properties, enhanced understanding of fundamental transport and energy conversion mechanisms, and strategic, physics-based design and development of materials with multi-functional capabilities. In 2017, she won the Woman Engineer of the Year Award from the ASME Electronics & Photonics Packaging Division and, in 2020, was recognized as the Outstanding Graduate Student Mentor for Mechanical Engineering by the College of Engineering at Purdue and received the Bergles-Rohsenow Young Investigator Award in Heat Transfer from ASME.

Track 11: Heat Transfer and Thermal Engineering

Wednesday, November 18, 11:00AM–11:45AM

Delivering Transformational Solutions to Engineering Grand Challenges Using High Temperature Thermochemistry

James Klausner

Abstract: The field of thermochemistry has been delivering creative engineering solutions since the early glass foundries dating back several millennia. In recent years, there has been a resurgence of interest in high temperature thermochemistry, driven by concentrated solar power applications. Recent engineering advances in high temperature thermochemistry are characterized by extreme operating environments (1,500°C) and extreme energy fluxes (5 MW/m2). As such, challenges to robust engineering solutions include material stability, material failure, aggressive corrosion, thermal management, joining and sealing, process control with highly variable inputs, and high capital costs, among others. Despite the extreme engineering challenges, there has been a global effort to advance the state of the art and bring high temperature thermochemistry engineering systems to operational reality at scale. This talk will focus on several societal engineering grand challenges and explore some of the transformational thermochemistry solutions brought to bear. Some engineering grand challenges to be considered include the capture and utilization of solar energy to synthesize carbon neutral fuel, low-cost grid-scale renewable energy storage, low carbon and low energy production of metals, and thermal management of hypersonic vehicles.

Biography: Dr. James Klausner is an MSU Foundation Professor and Mechanical Engineering Department Chair at Michigan State University (2016–present). He formerly served as Chair of the ASME Heat Transfer Division (2011–2012). He serves on the board of directors for the American Society of Thermal Fluid Engineers and the International Titanium Association Foundation. For three and a half years, he served as a Program Director at the U.S. Department of Energy Advanced Research Projects Agency-Energy (ARPA-E). Prior to that he held the Newton C. Ebaugh Professorship in Mechanical and Aerospace Engineering at the University of Florida (1989–2015). He received his Ph.D. in 1989 from the University of Illinois, Urbana-Champaign. He has made substantial fundamental contributions to understanding the dynamics of boiling heat transfer systems. He has made many fundamental and applied research contributions in high temperature thermochemistry, waste heat and solar driven desalination, and high heat flux phase-change heat transfer. Dr. Klausner has authored more than 150 refereed publications, and his theoretical work on boiling dynamics is included in the Handbook of Heat Transfer. He is the author of ten patents and four provisional patents. He is a Fellow of the American Society of Mechanical Engineering and the American Society of Thermal Fluid Engineers. He is a recipient of the ASME Heat Transfer Division Memorial Award and the 75th Anniversary Award.

Track 12: Mechanics of Solids, Structures and Fluids

Tuesday, November 17, 12:15PM–1:00PM

Mechanics of 3D Mesostructures and Their Applications

John Rogers

Abstract: Complex, three-dimensional (3D) assemblies of micro-/nanomaterials form naturally in biological systems, where they provide sophisticated function in even the most basic forms of life. In spite of their broad potential utility in man-made devices, design options for analogous abiotic 3D mesostructures are severely constrained by the comparatively primitive capabilities that are available with established techniques for materials growth, assembly, and 3D printing. This talk summarizes progress on strategies that rely on geometric transformation of preformed 2D functional micro-/nanostructures into 3D architectures by controlled processes of actively induced compressive buckling. The emphasis is on the foundational materials and mechanics principles, computational approaches that enable inverse designs, and examples of applications in areas ranging from thermoelectrics to microelectromechanical systems to passive microfliers to biologically inspired open mesoscale microfluidic/electronic networks as functional interfaces to 3D cell cultures, including spheroids, organoids, assembloids, and mini-brains.

Biography: John A. Rogers obtained B.A. and B.S. degrees in chemistry and in physics from the University of Texas, Austin, in 1989. From MIT, he received S.M. degrees in physics and in chemistry in 1992 and the Ph.D. degree in physical chemistry in 1995. From 1995 to 1997, Dr. Rogers was a Junior Fellow in the Harvard University Society of Fellows. He joined Bell Laboratories as a Member of Technical Staff in the Condensed Matter Physics Research Department in 1997 and served as Director of this department from 2000 to 2002. He then spent 13 years on the faculty at University of Illinois, most recently as the Swanlund Chair Professor and Director of the Seitz Materials Research Laboratory. In the Fall of 2016, he joined Northwestern University as the Louis Simpson and Kimberly Querrey Professor of Materials Science and Engineering, Biomedical Engineering and Medicine, with affiliate appointments in Mechanical Engineering, Electrical and Computer Engineering and Chemistry, where he is also Director of the recently endowed Querrey Simpson Institute for Bioelectronics. He has published more than 750 papers, is a co-inventor on more than 100 patents, and has co-founded several successful technology companies. His research has been recognized by many awards, including a MacArthur Fellowship (2009), the Lemelson-MIT Prize (2011), and most recently the Benjamin Franklin Medal (2019). He is a member of the National Academy of Engineering, National Academy of Sciences, National Academy of Medicine, National Academy of Inventors, and American Academy of Arts and Sciences.

Track 12: Mechanics of Solids, Structures and Fluids

Wednesday, November 18, 11:00AM–11:45AM

Mosquito Bite Prevention through 2D Materials Thin Films

Huajian Gao

Abstract: The mosquito is the world's most important vector for transmission of infectious disease, and chemical agents now used for mosquito bite prevention have various environmental or human health side effects. Recently we have explored a nonchemical method for mosquito bite prevention based on graphene [1]. It was demonstrated that multilayer graphene films in the dry state completely inhibit biting by preventing mosquitos from sensing skin- or sweat-associated chemicals used to locate blood meals, and in some cases, the graphene films also act as mechanical barriers to the penetration of the mosquito fascicle, its feeding apparatus. This work suggests a nanotechnology-based approach to fighting against mosquito and associated disease transmission, as well as provides an initial set of guidelines for the development of 2D materials based protective technologies on skin or within smart fabrics.

Reference: [1] Castilho, C.J., Li, D., Liu, M., Liu, Y., Gao, H., and Hurt, R.H., Mosquito bite prevention through graphene barrier layers, Proc. Natl. Acad. Sci. USA, 116(37), pp. 18304–18309, 2019. DOI: 10.1073/pnas.1906612116

Biography: Huajian Gao received his B.S. from Xian Jiaotong University in 1982 and his M.S. and Ph.D. in Engineering Science from Harvard University in 1984 and 1988, respectively. He served on the faculty of Stanford University from 1988 to 2002, where he was promoted to Associate Professor with tenure in 1994 and to Full Professor in 2000. He served as Director at the Max Planck Institute for Metals Research from 2001 to 2006, and then as the Walter H. Annenberg Professor of Engineering at Brown University from 2006 to 2019. At present, he is one of the five Distinguished University Professors at Nanyang Technological University and Scientific Director of the Institute of High Performance Computing in Singapore.

Dr. Gao's research has been focused on the understanding of basic principles that control mechanical properties and behaviors of materials in both engineering and biological systems. He is the Editor-in-Chief of the Journal of the Mechanics and Physics of Solids, the leading journal of his field. He has been elected to memberships in U.S. National Academy of Sciences, U.S. National Academy of Engineering, American Academy of Arts and Sciences, German National Academy of Sciences, and Chinese Academy of Sciences. He has also received numerous awards and honors, including the John Simon Guggenheim Fellowship, the Rodney Hill Prize in Solid Mechanics from the International Union of Theoretical and Applied Mechanics, the William Prager Medal from Society

of Engineering Science, the Nadai Medal from American Society of Mechanical Engineers, and the Theodor von Karman Medal from American Society of Civil Engineers.

Track 13: Micro - and Nano-Systems Engineering and Packaging

Thursday, November 19, 12:15PM–1:00PM

Moving Drops on Micro-Structured Surfaces

Karl F. Böhringer

Abstract: The dynamic interaction between liquid drops and a solid surface is greatly influenced by its microscopic structure, including its topography and material composition. While phenomena such as capillarity and hydrophobicity have been studied for many years, recent research has produced remarkable new insights in this field. Here, we review the physical principles that produce movement of drops, develop models for their behavior, discuss the design and fabrication of micro-structured surfaces, and demonstrate several applications, including self-cleaning surfaces and a microfluidic platform for parallel processing of liquid samples.

Biography: Karl F. Böhringer received his Dipl.-Inform. degree from the University of Karlsruhe, Germany in 1990 and his M.S. and Ph.D. in computer science from Cornell University, Ithaca, NY in 1993 and 1997, respectively. He was a Visiting Scholar at Stanford University in 1994–1995 and a Postdoctoral Researcher at the University of California, Berkeley from 1996 to 1998. He joined the University of Washington in Seattle, WA in 1998, where he is currently Professor of Electrical & Computer Engineering and Bioengineering, Director of the Nano-engineered Systems Institute, and Site Director for the University of Washington/Oregon State University node in the NSF National Nanotechnology Infrastructure Network. He held visiting faculty positions at the Universities of Tohoku, Tokyo, Kyoto (Japan), São Paulo (Brazil), and École Polytechnique Fédérale de Lausanne (Switzerland).

Dr.Böhringer is a fellow of IEEE. His awards include the John M. Fluke Distinguished Chair of Engineering at the University of Washington in 2010, an Invitational Fellowship for Research in Japan by the Japan Society for the Promotion of Science (JSPS) in 2004, the IEEE Robotics & Automation Society Academic Early Career Award in 2004, NSF CAREER Award in 1999, and NSF Postdoctoral Associateship in 1997. His work was listed among the “Top 100 Science Stories of 2002” in Discover magazine. He has served as editor for the ASME/IEEE Journal of Microelectromechanical Systems, IEEE Transactions on Automation Science and Engineering, Frontiers in Mechanical Engineering,

and Microsystems & Nanoengineering. He has served, among others, on the technical program committees for the IEEE International Conference on Microelectromechanical Systems (MEMS) and the International Conference Solid-State Sensors, Actuators and Microsystems (Transducers) conferences, and he was general co-chair of IEEE MEMS in 2011.

Track 14: Safety Engineering, Risk, and Reliability Analysis

Wednesday, November 18, 11:00AM–11:45AM

On the Management of Cyber Risk: Five Quantitative Studies

M. Elisabeth Paté-Cornell

Abstract: Cyber risk analysis involves a quantitative representation of the network and its failure probability under cyberattack given the behaviors of both the attacker and the defender. I will present a general model structure and five specific studies (Ph.D. theses) from the Stanford Engineering Risk Research Group: (1) the cyber risk of a space organization; (2) the optimal level of connectivity in a network, balancing the risks and the benefits of added links; (3) the optimal timing of updating or replacing the software in a system; (4) warnings of cyberattacks; and (5) the cyber aspects of fake news.

Biography: Dr. Marie-Elisabeth Paté-Cornell is a Professor and the Founding Chairman of the Management Science and Engineering department at Stanford. Her specialty is engineering risk analysis, with applications to complex systems (space, medical, offshore platforms, cyber security, nuclear, etc.). She is a member of the National Academy of Engineering, the French Académie des Technologies, the Naval Post-Graduate School Advisory Board, and the NASA Advisory Council. She was a member of the President's Foreign Intelligence Advisory Board (2001–2008) and several other boards. She holds a B.S. in Mathematics and Physics, an Engineering degree in Applied Math/CS), an M.S. in Operations Research and a Ph.D. in Engineering-Economic Systems both from Stanford University. Her current research focuses on cyber risk analysis, generally for a specified organization, and related topics.

Wednesday, November 18,

Plenary: NSF Overview and Outreach: CMMI and CBET

11:00AM–11:45AM

Representatives from the Chemical, Bioengineering, Environmental and Transport Systems Division (CBET) will provide an overview of current programs with an emphasis on current NSF priorities and funding opportunities. Relevant core programs will also be highlighted. Following the presentation, there will be a live Q&A.

NSF – CMMI Overview and Proposal Development Session

12:00PM–1:30PM

Representatives from the Civil, Mechanical and Manufacturing Innovation Division (CMMI) will provide an overview of current programs with an emphasis on current NSF priorities and funding opportunities. Relevant core programs will also be highlighted. Following the presentation, there will be a live Q&A.

Program At-A-Glance

Monday, November 16th		
12:20PM-1:45PM	**2:05PM-3:30PM**	**3:50PM-5:05PM**
01-01-01: Topological and Nonreciprocal Phononics	**01-01-02:** Phononics Theory and Applications	**12-01-01:** Mechanics of Soft Materials I
01-06-01: Noise, Vibration and Harshness in Automotive Systems		
	03-01-01: Modeling, Simulation, and Design of Multifunctional Materials	**06-02-01:** CAD, CAE and CAM I
03-09-01: Modeling and Experimentation of Geomaterials & Modeling and Experimentation of Polymer Mechanics	**03-17-01:** Integrated modeling, design, and engineering of materials	**06-03-01:** Optimization
03-29-01: Printed Hybrid Electronics, Sensors and Energy Devices & General Topics	**03-30-01:** Multifunctional Intelligent Materials and Systems & General Topics	**08-01-01:** Energy-Related Experimental and Numerical Studies
06-01-01: Product and Process Design I	**06-01-02:** Product and Process Design II	**08-02-01:** Fundamentals and Applications of Thermodynamics, Electrochemical Energy Conversion and Storage, & CPS/IoT in Energy Systems
08-04-01: Design and Analysis of Energy Conversion Systems I	**08-04-02:** Design and Analysis of Energy Conversion Systems II	**08-08-01:** Environmental Aspects of Energy Systems & Electrochemical Energy Conversion and Storage II
08-11-01: Electrochemical Energy Conversion and Storage I	**08-10-01:** Renewable Energy I	**08-10-02:** Renewable Energy II
11-10-01: Radiation Heat Transfer and Radiation Properties, Thermophysical Properties of Advanced Energy Storage Materials, & Fundamentals of Boiling/Condensation including Nano-scale Effects	**11-02-01:** Numerical Analysis and Performance Assessment of Energy Systems I	**11-02-02:** Numerical Analysis and Performance Assessment of Energy Systems II, Heat Transfer Analysis in Waste Heat Recovery Systems, & Heat Transfer in Solar Power Systems
11-13-01: Advances in Molecular Scale Modeling of Thermophysical Properties & Fundamentals of Freezing and Melting	**08-11-02:** Electrochemical Energy Conversion and Storage II	**11-05-01:** Thermal Management of Battery Systems, Heat Transfer in Passive Thermal Control Systems, & Heat Transfer in Power and Refrigeration Systems
11-21-01: Thermal Transport Across Interfaces, Thermal Transport in 2D and Anisotropic Materials , & Modeling and Simulation Method	**11-24-01:** Micro/Nanoscale Phase Change Heat Transfer & Nanoscale Thermal Radiation	**11-17-01:** Fundamentals of Phonon and Electron Scattering and Transport II & Fundamentals of Machine Learning Assisted Heat Transfer Processes
11-58-01: 11-58-01 Computational Methods to Develop Ultra-low/high Thermal Conductivity Materials II & Application of Machine Learning/ Artificial Intelligence in Heat Transfer	**12-03-01:** Mechanics of Solids, Structures and Fluids General Topics	**12-10-01:** Dynamic Failure of Materials & Structures I
12-28-01: Recent Advances and Applications in Meshfree and Particle Methods I	**12-28-02:** Recent Advances and Applications in Meshfree and Particle Methods II	**12-02-01:** Functional Soft Composites - Design, Mechanics, and Manufacturing

Monday, November 16th		
12:20PM-1:45PM	**2:05PM-3:30PM**	**3:50PM-5:05PM**
12-36-01: Multifunctional and Micro/ Nano-structured Materials: Modeling and Characterization I	**12-36-02:** Multifunctional and Micro/ Nano-structured Materials: Modeling and Characterization II & Mechanics and Design of Cellular Materials	
06-07-01: Bio-Inspired Design, Big Data and AI	**12-01-02:** Mechanics of Soft Materials II	**12-37-01:** Instabilities in Solids and Structures I
12-07-01: Plasticity, Damage, and Fracture in Metallic Materials I	**12-38-01:** Peridynamic Modeling of Materials' Behavior I	**12-38-02:** Peridynamic Modeling of Materials' Behavior II
12-20-01: Symposium on Multiphysics Simulations and Experiments and Multiscale Methods for Simulation and Design of Materials Including Machine Learning and Other Emerging Methods	**01-07-01:** Human Perception of Acoustics & Vibration and Acoustic Measurements I	**12-46-01:** Data-Enabled Predictive Modeling, Machine Learning, and Uncertainty Quantification in Computational Mechanics I
14-01-01: General Topics on Risk, Safety, and Reliability I		**14-01-05:** General Topics on Risk, Safety, and Reliability V

Tuesday, November 17th		
1:25PM-2:50PM	**3:10PM-4:35PM**	**4:55PM-6:10PM**
01-02-01: General	**01-01-03:** Tunable Phononics	**01-03-01:** Passive, Semi-Active, and Active Noise and Vibration Control
		02-11-01: Robotics and Automation in Advanced Manufacturing
02-02-01: Conference-Wide Symposium on Additive Manufacturing I	**02-02-02:** Conference-Wide Symposium on Additive Manufacturing II	**02-02-03:** Conference-Wide Symposium on Additive Manufacturing III
03-02-01: Advanced Materials: Design, Processing, Characterization and Applications General Topics	**02-09-01:** Computational Modeling and Simulation for Advanced Manufacturing I	**02-09-02:** Computational Modeling and Simulation for Advanced Manufacturing II
03-20-01: Processing of Ceramics and Composites for Additive and Advanced Manufacturing	**03-19-01:** Material Processing of Flexible/ Emerging Electronics, Sensors, and Devices	**05-04-01:** Biomedical Imaging, Therapy and Tissue Characterization & Biomedical Devices
05-02-01: Injury and Damage Biomechanics I	**05-02-02:** Injury and Damage Biomechanics II	**05-08-01:** Symposium on Clinical Applications of Bioengineering & General Topics
05-06-01: Biomedical Devices I	**05-06-02:** Biomedical Devices II & Injury and Damage Biomechanics	**05-10-01:** Computational Modeling in Biomedical Applications I
06-05-01: Design for Sustainability & Social Context Aware Design	**06-09-01:** Human Modelling for Product Design and Manufacturing	**05-11-01:** Musculoskeletal and Sports Biomechanics
08-04-03: Design and Analysis of Energy Conversion Systems III & Thermoeconomics	**08-05-01:** Energy Systems Components & Energy Systems for Buildings	**06-02-02:** CAD, CAE and CAM II
08-12-01: Fuel Cell Systems Design and Applications & Nuclear Power Plants: Design, Analysis, and Safety	**08-15-01:** CMS Topics	**11-40-01:** CMS - Combustion, Flames, and Emissions Topics
11-27-01: Heat Transfer and Thermal Engineering General Topics	**12-10-02:** Dynamic Failure of Materials & Structures II	**12-10-03:** Dynamic Failure of Materials & Structures III & Modeling of the Fracture, Failure and Fatigue in Solids II
12-49-01: Drucker Medal Symposium I	**11-49-01:** Electronics Thermal Management	**12-22-01:** Computational Modeling of Extreme Events

Tuesday, November 17th		
12-15-01: Mechanical Characterization in Extreme Environments & Materials for Biology and Medicine		
07-11-02: Mobile Robots and Unmanned Ground Vehicles II & Multi-Physics Dynamics-Control & Diagnostics-Prognostics of Structures and Devices	**11-45-01:** Heat Pipes and Vapor Chambers, Heat Transfer Under Extreme Conditions of Temperature and Pressure	**12-32-02:** Constitutive Modeling of Non-Metallic Materials II & Emerging Topology and Shape Optimization Techniques in Computational Design of Materials and Structures
10-04-03: Symposium on CFD Applications for Optimization and Controls III	**12-01-03:** Mechanics of Soft Materials III	**12-37-02:** Instabilities in Solids and Structures II
11-16-01: Fundamentals of Single Phase Convection & Fundamentals of Phonon and Electron Scattering and Transport I	**12-07-02:** Plasticity, Damage, and Fracture in Metallic Materials II	
11-44-01: Evaporation and Condensation Heat Transfer	**14-01-04:** General Topics on Risk, Safety, and Reliability IV	
14-01-03: General Topics on Risk, Safety, and Reliability III	**12-49-02:** Drucker Medal Symposium II	**14-04-01:** Safety in Transportation and Agriculture II & Reliability and Risk in Energy Systems

Wednesday, November 18th		
12:05PM-1:30PM	**1:50PM-3:15PM**	**3:35PM-4:50PM**
02-04-01: Nanomanufacturing: Novel Processes, Applications, and Process-Property Relationships & Advanced Machining and Finishing Processes	**02-03-01:** Measurement Science, Sensors, Non-destructive Evaluation (NDE) and Process Control for Advanced Manufacturing I	**02-03-02:** Measurement Science, Sensors, Non-destructive Evaluation (NDE) and Process Control for Advanced Manufacturing II
02-05-01: Process-Property Relationships & Advanced Machining and Finishing Processes	**02-07-01:** Advanced Material Forming - Novel Processes, Mechanics, Characterization, and Control I	**02-07-02:** Advanced Material Forming - Novel Processes, Mechanics, Characterization, and Control II
03-03-01: Manufacturing, Integration and Characterization of Multifunctional Structure and Devices	**03-04-01:** Bioinspired Materials, Structures and Applications, Soft Robotics and Soft Machines, & Modeling and Experiments in Nanomechanics and Nanomaterials	**02-10-01:** Variation simulation and design for assembly I
03-22-01: Materials Processing and Characterization	**03-24-01:** Recent Developments in Tribology & Materials for Energy	**02-15-01:** Manufacturing: General I
04-06-01: Lightweight Sandwich Composites and Layered Structures, Materials and Structures for Extreme Environments, & Impact, Damage and Fracture of Composite Structures	**04-08-01:** Dynamics and Control of Aerospace Structures	**04-07-01:** Dynamic Behavior of Composites
05-03-01: Vibration and Acoustics in Biomedical Applications	**05-05-01:** Biomaterials and Tissue: Modelling, Synthesis, Fabrication and Characterization	**11-57-01:** Methods in Computational Heat Transfer & Computational Methods to Develop Ultra-low/high Thermal Conductivity Materials I
05-13-01: Robotics, Rehabilitation	**05-14-01:** Bio Artificial Intelligence & Biotransport (Fluid. Heat and Mass)	
07-04-01: Design and Control of Robots, Mechanisms and Structures I	**07-04-02:** Design and Control of Robots, Mechanisms and Structures II	**05-10-02:** Computational Modeling in Biomedical Applications II
07-02-01: General Dynamics, Vibration and Control I	**07-02-02:** General Dynamics, Vibration and Control II	**07-02-03:** General Dynamics, Vibration and Control III

Wednesday, November 18th

12:05PM-1:30PM	1:50PM-3:15PM	3:35PM-4:50PM
07-10-01: Vibrations of Continuous Systems I	**07-10-02:** Vibrations of Continuous Systems II, Optimization, Uncertainty and Probability, & Measurement and Analysis Techniques in Nonlinear Dynamic Systems	**09-01-01:** Curriculum Innovations, Pedagogy and Learning Methodologies
08-07-01: Thermal Energy Storage & Nuclear Power Plants: Design, Analysis, and Safety I	**07-12-01:** Control Theory and Applications	**09-05-01:** Applied Mechanics, Dynamic Systems and Control Engineering I
08-09-01: Energy Systems for Buildings II		**09-06-01:** Fluid Mechanics, Heat Transfer, Experiments and Energy Systems
10-04-01: Symposium on CFD Applications for Optimization and Controls I	**10-13-01:** 13th Forum on Fluid Measurements and Instrumentation	**10-10-01:** 29th Symposium on Industrial Flows I
12-49-03: Drucker Medal Symposium III & Young Medalist Symposium	**12-19-01:** Multiscale Models and Experimental Techniques for Composite Materials and Structures, Mechanics of Thin-Film and Multi-Layer Structures, & Modeling and Experimentation of Geomaterials	**12-12-01:** Modeling of the Fracture, Failure and Fatigue in Solids I
12-39-02: Mechanical Metamaterials II & Fracture and Failure of Reinforced Polymer Matrix Composite Materials	**12-31-01:** Modeling and Experimentation of Polymer Mechanics & Recent Advances and Applications in Meshfree and Particle Methods	**12-13-01:** Advances in Experimental Mechanics I
10-02-01: 27th Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids I	**12-17-01:** Mechanics of Adhesion and Friction, Bridging Length Scales in Experimental Mechanics, & Symposium on Modeling and Testing of Molecular-level Fracture of Materials	**09-09-01:** Pre-College (K-12) STEM, RET - University, School and Industry Alliance
13-03-01: Design and Fabrication, Analysis, Processes, and Technology for Micro and Nano Devices and Systems & Computational Studies on MEMS and Nanostructures	**13-05-01:** Applications of Micro and Nano Systems in Medicine and Biology & Micro and Nano Devices	**13-07-01:** Applied Mechanics and Materials in Micro- and Nano-Systems & Packaging Technology in Heterogeneous Integration Applications
14-03-01: Congress-Wide Symposium on NDE & SHM – System and structural health monitoring and prognostics using NDE/ SHM techniques	**12-07-03:** Plasticity, Damage, and Fracture in Metallic Materials III and Mechanics Modeling of Soft Robots	**14-06-01:** Safety in Transportation and Agriculture I
NSF – CMMI Overview and Proposal Development Session		

Thursday, November 19th

1:25PM-2:50PM	3:10PM-4:35PM	4:55-6:10PM
02-12-01: Laser-Based Advanced Manufacturing and Materials Processing	**02-14-01:** Tribological Issues in Materials, Manufacturing, and Medicine - Said Jahanmir Symposium	**02-06-01:** 5th Symposium on Fastening, Adhesive Bonding, and Welding Technology
02-13-01: Cyber-Manufacturing Aspects	**02-13-02:** Digital Twin Aspects	**02-08-01:** Innovative Product and Process Design & Robotics and Automation in Advanced Manufacturing
04-02-01: Advances in Aerodynamics & Advances in Aerospace Structures and Materials		**02-10-02:** Variation simulation and design for assembly II
04-12-01: Peridynamics Modeling	**04-13-01:** Computational Aerospace Structural Dynamics and Aeroelasticity	**02-15-02:** Manufacturing: General II
05-07-01: Dynamics and Control of Biomechanical Systems	**04-01-01:** General Aerospace I	**04-01-02:** General Aerospace II
05-10-03: Computational Modeling in Biomedical Applications III	**05-12-01:** Sensors and Actuators, Machine Learning, & Robotics, Rehabilitation	**04-10-01:** Impact, Damage and Fracture of Composite Structures

Thursday, November 19th		
1:25PM-2:50PM	**3:10PM-4:35PM**	**4:55-6:10PM**
07-02-05: General Dynamics, Vibration and Control V	**07-03-01:** Nonlinear Dynamics, Control, and Stochastic Mechanics	**05-16-01:** Biotechnology and General Applications
07-05-01: Fluid-Structure Interaction	**07-06-01:** Dynamics and Control in Micro/Nano Engineering, Novel Control of Dynamic System and Design, & Fluid Structure Interaction	**07-02-04:** General Dynamics, Vibration and Control IV
07-09-01: Multibody Dynamic Systems and Applications I	**07-09-02:** Multibody Dynamic Systems and Applications II	**09-03-01:** Engineering Accreditation, Data Collection, Assessment and ABET
07-08-01: Novel Control of Dynamic System and Design & General Topics	**09-12-01:** Engineering Research Innovation and Research Experiences for Undergraduates	
10-03-01: Symposium on Fundamental Issues and Perspectives in Fluid Mechanics I	**02-13-03:** Industry 4.0 Aspects	**09-07-01:** Problem Solving in Engineering Education, Research and Practice & Curriculum Innovations, Pedagogy and Learning Methodologies
10-04-02: Symposium on CFD Applications for Optimization and Controls II	**10-09-02:** Fluids Engineering General Topics II	**10-06-01:** Fluids Engineering in Micro- Nano-Systems
10-09-01: Fluids Engineering General Topics I	**06-04-01:** Design for Additive Manufacturing	
10-10-02: 29th Symposium on Industrial Flows II	**10-11-01:** Symposium on Wind Turbine Aerodynamics and Environment Flows	**10-08-01:** 15th Forum on Recent Developments in Multiphase Flow
12-44-01: CONCAM Distinguished Lectures on Computational Mechanics	**07-13-01:** Topic Multi-Field Coupling and Control, Dynamics and Control of Soft Structures, & Machine Learning and Artificial Intelligence in Dynamics and Vibrations	**13-09-01:** PowerMEMS & Advanced Manufacturing of Microsystems, Microstructures, and Miniaturized Actuators
10-15-01: Young Engineers Paper (YEP) Contest	**12-26-01:** Modeling and Experiments in Nanomechanics and Nanomaterials & Fatigue and Fracture Evaluation and Quantification for Failure Analysis	**12-13-02:** Advances in Experimental Mechanics II
12-01-04: Mechanics of Soft Materials IV	**12-04-01:** Mechanics and Materials of Soft Electronics and Mechanics and Manufacturing of Soft Materials and Soft Robots	**14-07-01:** Crashworthiness, Occupant Protection, and Biomechanics
03-21-01: Fracture and Damage: Nano- to Macro-Scale	**12-08-01:** Symposium on Perspective on Fracture and Failure Mechanics and Modeling of Growth, Dissolution, and Fracture	**07-11-01:** Mobile Robots and Unmanned Ground Vehicles I

IMECE SPECIAL TECHNICAL SESSIONS

Monday, November 16, 5:25PM–6:25PM ET

Utilizing Engineering Principles to Understand SARS-CoV-2 Transport, Infection, and Inactivation

This panel will address how mechanical engineers can help in medicine/COVID-19 using design principles and simulation.

Moderator: Christine Reilley, *Senior Director, Strategy and Innovation, ASME*

Panelists: John G. Georgiadis, *Ph.D., Pritzker Professor and Chairman, Biomedical Engineering Department, Illinois Institute of Technology*

Chris Hogan, *Ph.D., Director of Graduate Studies, University of Minnesota*

Akira Tsuda, *Ph.D., Bioengineer, Tsuda Lung Research Consulting, Harvard T.H. Chan School of Public Health*

Mechanical Engineering Education During COVID-19 Pandemic: Sharing Educational Strategies, Developing Outcomes, Lessons Learned, and Spring 21 Plans

This panel will provide a forum for sharing and discussing among the Mechanical Engineering educational community the current strategies for teaching during the COVID-19 pandemic. The panelists, Heads/Chairs of Mechanical Engineering Programs, will kick off with a summary of their current strategies followed by an open discussion with the participants. Different modalities are currently implemented at different institutions from fully remote to hybrid to in-person learning. Each of them will present new challenges and in some cases, new opportunities for revising teaching approaches and methods. One of the key aspects is offering meaningful hands-on projects and laboratory experiences, which in many cases require frequent collaboration and interactions. The panelists will provide an overview of their learnings thus far from the optics of their own institutions, including those aspects that are working well and those that remain a challenge. They will also provide perspective and potential plans for the next-term instruction.

Moderator: Alberto Cuitino, *Ph.D., ASME 2020 IMECE Conference Chair, Department Chair, Professor Mechanical & Aerospace Engineering, Rutgers University*

Panelists: Roberto Horowitc, *Ph.D., Chair, Department of Mechanical Engineer, James Fife Endowed Chair, Professor of Mechanical Engineering, University of California, Berkeley*
Ellen Kuhl, Ph.D., Robert Bosch Chair of Mechanical Engineering, Professor of Mechanical Engineering and, by courtesy, of Bioengineering, Stanford University

Susan Mantel, *Ph.D., Janes J. Ryan Professor, Morse Alumni Distinguished Teaching Professor, and Mechanical Engineering Department Head, University of Minnesota*

Allen L. Robinson, *Ph.D., University Professor, Engineering and Public Policy, David and Susan Coulter Head and Raymond J. Lane Distinguished University Professor, Mechanical Engineering, Carnegie Mellon University*

Karen Thole, *Ph.D., Department Head of Mechanical Engineering and Distinguished Professor, Pennsylvania State University*
Jamal Yagoobi, Ph.D., Professor and Department Head, Mechanical Engineering, Worcester Polytechnic Institute

ASME/IMECE-Information Panel

This panel will describe how to get involved in ASME, e.g., divisions, and how to be involved with IMECE, including FAQs from ASME staff (e.g., what happens to your papers now).

Moderator: Christopher Depcik, *Ph.D., ASME 2020 IMECE Technical Chair, Graduate School Director, School of Engineering, Kansas University*
Panelists: Keli Bell-Cole, Manager, Conference & Events, ASME

Stacey Cooper, *Manager, Conference Webtool, ASME*

Mary Grace Stefanchik, *Director, Publishing Development, ASME Press*

April Tone, Senior Manager, Segment Operations, ASME

Roundtable Discussion—
Please join our Moderator for an interactive discussion. Each roundtable is 30 minutes in length and will be repeated during the one-hour time frame.

Generative Design: Product Development, Workflows, and Challenges.

Moderator: Matt Burkhalter, Ph.D., Senior Mechanical Engineer, Generative Design Company

Please join our Moderator for an interactive discussion. Each roundtable is 30 minutes in length and will be repeated during the one-hour time frame.

Protecting Warfighters—
Materials Technologies and Testing.

This networking/discussion session is aimed at researchers to discuss key fundamental problems in mechanical engineering that can have applications in Warfighter protection.

Moderator: Amit Bagchi, *Ph.D., Senior Scientist, U.S. Naval Research Laboratory*

Wednesday, November 18, 5:10PM–6:25PM ET

Grand Challenge-Energy

This is an inaugural panel that brings world-class university thought leaders and National Academy of Engineering (NAE) members together, who will provide their perspectives on the frontiers of multifaceted research and engagement needs and opportunities in the broader context of energy science and engineering.

Co-Moderators: Eric Loth, *Chair of Mechanical and Aerospace Engineering and Rolls-Royce Commonwealth Professor of Engineering, University of Virginia*

Partha P. Mukherjee, *Associate Professor, School of Mechanical Engineering, Purdue University*

Panelists: Ajay P. Malshe, *R. Eugene and Susie E. Goodson Distinguished Professor of Mechanical Engineering, Purdue University*

Jayathi Murthy, *Ronald and Valerie Sugar Dean of Henry Samueli School of Engineering and Applied Engineering, University of California, Los Angeles*

Mark O'Malley, *Professor of Electrical Engineering, University College Dublin, and Founding Director of the Electricity Research Center*

Women in Space Technology

The movie Hidden Figures captured the story of three brilliant African-American women at NASA—Katherine Johnson, Dorothy Vaughan, and Mary Jackson—who served as the brains behind the Apollo 11 mission, one of the greatest operations in the history of Space Technology. The entry of SpaceX has dramatically changed Space from a domain of government agencies and departments to private commercial entities and now is on the threshold of being the frontier of the next industrial revolution. A new breed of women engineers is likely to be the focal point of the emerging workforce. This panel aims to highlight the motivation of such women who have dared to enter in Space Technology as a career. Sharing the start and progression of their careers, the panelists will articulate stories of their education, research, roles, and responsibilities. These women leaders will share their accomplishments and lessons learned in navigating multidisciplinary work environments. The panel seeks to create an awareness of an exciting realm of Space Technology that would in the next decade spread the human habitat to the far reaches of the solar system.

Moderator: Assimina (Mina) Pelegri, *ASME IMECE Steering Committee Senate Member, Professor Mechanical & Aerospace Engineering, Rutgers University*

Panelists: Diana Albarran, *Director of Internal Research & Development, Director, Cost and Schedule, Maxar Technologies*
Laura V. Fechete, *Senior Engineering Manager in Space Technology, Lockheed Martin Space*
Negar Feher, Vice President of Business Development, Momentus

Lindsay Krejcarek, *GM Systems Engineer, Stellar Solutions*

Olivia Ryu, *Senior Technical Program Manager, Astranis*

Jackelynne Silva-Martinez, *Systems Engineering & Integration Lead and Human Systems Integration Lead for the Gateway Program, NASA Johnson Space Center*

Roundtable Discussion—Please join our Moderator for an interactive discussion. Each roundtable is 30 minutes in length and will be repeated during the one-hour time frame.

Future of Batteries for Automobiles and their Challenges in Design and Manufacturing.

Moderator: Ninggang Shen, *Ph.D., Senior Manufacturing Engineer of Battery Module & Pack; Tesla, Inc.*

Roundtable Discussion—Please join our Moderator for an interactive discussion. Each roundtable is 30 minutes in length and will be repeated during the one-hour time frame.

New Directions in Energy Harvesting and Storage.

Moderator: Christopher D. Rahn, *Ph.D., the J. 'Lee' Everett Professor of Mechanical Engineering, Associate Dean for Innovation in the College of Engineering, Director of the Mechatronics Research Laboratory, and Co-Director of the Battery and Energy Storage Technology Center, Pennsylvania State University*

Roundtable Discussion—Please join our Moderator for an interactive discussion. Each roundtable is 30 minutes in length and will be repeated during the one-hour time frame.

Naval Research and Development Needs. Peter Matic will lead a discussion and answer questions about Naval R&D needs from the perspective of the Navy's Corporate Laboratory. Topics will include general Navy and DoD priorities, how we approach our topic selection, collaborative opportunities, STEM opportunities, and employment opportunities.

Moderator: Peter Matic, *Ph.D., Assistant Director of Research for the Materials Science and Component Technology Directorate, U.S. Naval Research Laboratory*

Roundtable Discussion—Please join our Moderator for an interactive discussion. Each roundtable is 30 minutes in length and will be repeated during the one-hour time frame.

How Dynamical Systems Foster Autonomous Vehicles: A U.S. Army Automotive Research Center of Excellence.

Moderator: Bogdan I. Epureaunu, *Ph.D., Arthur F. Thurnau Professor in the Department of Mechanical Engineering, courtesy appointment in the Department of Electrical Engineering and Computer Science, University of Michigan*

Special Technical Sessions Biographies

Diana Albarrán Chicas is currently Director, Cost and Schedule, and Director, Internal Research & Development, at Maxar Technologies, where she is responsible for the integrity of proposals and the development of future space technologies. There are days that she still cannot believe that she influences the technical designs of spacecrafts that are launched into space. Albarrán Chicas is also the Co-founder of the Latinas in STEM Foundation, the Co-founder of LISTAS, and served as an Advisor to Latina SciGirls, a PBS Kids show that exposes elementary and middle-school girls to STEM careers.

She was born in Mexico and came to the United States under her parents' vision of a better life for their children. She was the first one in her family to graduate from high school and graduated from the Massachusetts Institute of Technology with a degree in Electrical Engineering. Albarrán Chicas has been awarded the Science & Technology Emerging Leader Award by Silicon Valley Latino and the Rising Star Award by HITEC. She was featured as a New Guard of STEM Stars by *Vanity Fair* in 2016, named a Women in STEM Honoree by Girlstart in 2016, a 2015 Woman of Influence by the *Silicon Valley Business Journal*, a 2014 KQED Latina Local Hero, and one of the "Top 20 Latinos in Tech" by CNET. She has also been featured as a Latina Leader by NBCLatino, *Cosmo Latinas*, *Latino Leaders* magazine; has had media appearances on Univision, PBS, and BBC Radio; and has spoken at Harvard and MIT.

Amit Bagchi received BTech (Hons) from IIT, Kharagpur, MScE from UNB-Fredericton, Canada, and Ph.D. from CMU, Pittsburgh. He is a Staff Scientist in the Material Science and Technology Division at NRL, leading research in body armor, gel-based human surrogates, behind armor insults effects and blast sensor assessment, and data analysis. Dr. Bagchi has been a faculty member at OSU, Columbus, and Clemson University, an industry R&D manager, and a NIST Program Manager. With over 80 peer-reviewed publications, and four patents, he is an ASME Fellow, SME Senior Member, Sigma Xi Member, and is active on ASME Boards, Nominating Committees, and Technical Divisions. He has been (or currently) is on review panels for other agencies, like the U.S. Department of Energy and National Science Foundation, as well as on Navy and NATO STO technical groups. He has also been organizing symposium topics on injury and damage biomechanics in ASME's annual International Mechanical Engineering Congress and Exposition.

Keli Bell-Cole, CMP, CEM is the Manager, Conferences & Events, and has been with ASME for two years. She manages the meeting logistics for the live and virtual conferences for the Power and Nuclear Divisions as well as IMECE.

Stacey Cooper is the Manager, Conference Webtool, and has been with ASME for 22 years. During this time, she has supported all ASME's technical conferences including creating and managing the conference website, providing technical support for the conference webtool, and assisting in the publication of the conference proceedings.

Alberto Cuitiño is presently a Professor and Chair of Mechanical and Aerospace Engineering at Rutgers University. He was a visiting faculty in the Graduate Aeronautical Laboratories at the California Institute of Technology during 2000–2001 and in the LSPM Lab at Institut Galilee at the University of Paris 13, France, in 2010. Dr. Cuitiño received a Civil Engineering Diploma from the University of Buenos Aires, Argentina, in 1986, and an M.S. in Applied Mathematics and Ph.D. in Solid Mechanics from Brown University in 1992 and 1994, respectively. His expertise includes pharmaceutical manufacturing, computational material simulation, multiscale modeling, dislocation mechanics, fracture in metal single crystals, and granular materials. He is a Fellow of ASME and former Raisler Distinguished Teaching Endowed Chair at Rutgers University.

Bogdan I. Epureanu is an Arthur F. Thurnau Professor in the Department of Mechanical Engineering and has a courtesy appointment in the Department of Electrical Engineering and Computer Science. In 1999, he received his Ph.D. from Duke University in Mechanical Engineering and Materials Science with a focus on Nonlinear Dynamics. During his tenure at the University of Michigan, since 2002, he served as associate chair of the division of Integrative Systems and Design, associate director of the U.S. Army Automotive Research Center (ARC), and was founding Program Director of the Systems Engineering and Design Master Program. His research interests include nonlinear dynamics of complex systems, particularly those with behaviors leading to catastrophes. He focuses on understanding dynamic phenomena in teaming of autonomous vehicles, enhanced aircraft safety and performance, early detection of neurodegenerative diseases, and forecasting tipping points in disease epidemics and ecology. This research includes collaborations across interdisciplinary teams and large consortia, such as government (NIH, NSF, DOE, DoD), industry (Pratt & Whitney, GE, Airbus), academia. He has published over 350 articles in journals, conferences, and books.

In his role as the Director of the U.S. Army Automotive Research Center (ARC), he applies his research leadership to envision and realize the future of the U.S. military autonomous vehicles. He leads the ARC as a hub where new ideas are generated and translated into key technologies in several areas of autonomy of ground systems, including vehicle dynamics, control, autonomous behavior, human-autonomy teaming, high performance structures and materials, intelligent power systems, and fleet operations and vehicle system of systems integration. Such systems resonate with his background, which is in nonlinear dynamics, an area of research that helps us understand, model, and predict unique phenomena in complex systems, both engineered and natural.

Matt Burkhalter is a Senior Mechanical Engineer with the Generative Design Company. He is originally from the Midwest and grew up fascinated with the latest technology. Graduating from Iowa schools for bachelor's and graduate studies has helped ground him in his career. Early experiences at Caterpillar and NASA helped hone an interest in design. Burkhalter moved to Florida to work in the engineering services industry to support product development of gas turbine engines. He is passionate about applying the latest technology and techniques with a practical approach. Matt enjoys gardening and spending time with family.

Christopher Depcik is an ASME 2020 IMECE Technical Chair, Graduate Director and Professor, Department of Mechanical Engineering, University of Kansas. In addition, he has a Courtesy Appointment in the Aerospace Engineering Department. Prior to joining KU, he worked at the University of Michigan (UM) as a post-doctoral research fellow. He received his Ph.D. in Mechanical Engineering from UM (2003), as well as an M.S. in Aerospace Engineering (2002), and M.S. in Mechanical Engineering (1999). He received his B.S. in Mechanical Engineering from the University of Florida (1997). Dr. Depcik's laboratory conducts research revolving around a sustainable approach to energy and the transportation infrastructure. This includes analysis of electric vehicles, biofuels, combustion, and energy recovery potential. His group has published over 100 refereed articles and Dr. Depcik received the Society of Automotive Engineers Ralph R. Teetor Award for his transportation-related research and educational activities.

Laura V. Fechete is a Senior Engineering Manager working in Space Technology at Lockheed Martin Space. She leads a team of highly specialized engineers who perform all aspects of design, analysis and testing for space vehicles. Fechete has worked in the Aerospace industry for over 20 years, beginning her career as a structural analyst. She has worked in increasingly challenging roles in other technical disciplines, including product development, research and development, systems engineer, principle engineer, and IT project manager. She has lead teams in design, analysis, and mission operations and test. She earned a B.S. in Mechanical Engineering from the University of Maryland, M.S. in Materials Science and Engineering from UCLA, and is a licensed California Professional Engineer (P.E.) in Mechanical Engineering.

Negar Feher is currently VP of Business Development at Momentus responsible for sales and marketing. Prior to joining Momentus, she was the Director of Business development for Smallsats at Maxar Technologies where she was responsible for diversification strategy and sales to new market segments. At Maxar, she introduced new products and services through establishing a new division offering test services that supported New Space startups. Feher has over 15 years of experience from past technical and managerial roles at some of the world's most renowned space companies, including SSL, Lockheed Martin Space Systems, and served as the President of the Society of Women Engineers. Currently at in-space transportation company Momentus, Feher uses her product and management experience to grow a stellar team and pursue growth opportunities for the pioneering New Space transportation company. She holds a M.S. in Aerospace Engineering from Stanford University.

John Georgiadis received his Diploma from the National Technical University of Athens, Greece, and his M.S. and Ph.D. from UCLA, all in Mechanical Engineering. He taught at Duke University (1987–1992) and the University of Illinois at Urbana-Champaign (1992–2015). He is currently Chair of the Biomedical Engineering Department and R. A. Pritzker Professor at the Illinois Institute of Technology. Georgiadis' research expertise lies in the intersection of biotransport phenomena, biomechanics, and quantitative medical imaging. His research group is contributing to the development of new methods for *in vivo* MRI and ultrasound elastography applied to characterize soft tissues, such as the human brain, skeletal muscle, and lungs. The common thread through these investigations is the judicious coupling between theory and experiment in the pursuit of connecting tissue structure with function and reaching causal explanations of clinical relevance, rather than merely developing correlations.

Chris Hogan is a Professor in the Department of Mechanical Engineering at the University of Minnesota. He received his Ph.D. from Washington University in Saint Louis in 2008 and was a Post-doctoral Associate at Yale University before joining the University of Minnesota in 2009. His research work focuses on gas phase chemical physics, aerosol science, and particle technology. He has published more than 110 papers on these topics. He is the Editor-in-Chief of the *Journal of Aerosol Science*.

Roberto Horowitz is the current chair of the Department of Mechanical Engineering at UC Berkeley and holds the James Fife Endowed Chair in the College of Engineering. He received a B.S. degree with the highest honors in 1978 and a Ph.D. degree in 1983 in mechanical engineering from the University of California, Berkeley and became a faculty member in the Mechanical Engineering Department in 1982. Dr. Horowitz teaches and conducts research in the areas of adaptive, learning, nonlinear and optimal control, with applications to Micro- Electromechanical Systems (MEMS), computer disk file systems, robotics, mechatronics and Intelligent Vehicle and Highway Systems (IVHS). He is a former co-director of the Partners for Advanced Transportation Technology (PATH) research center at U.C. Berkeley. Dr. Horowitz is a member of IEEE and ASME. He is the recipient of the 2010 ASME Dynamic Systems and Control Division (DSCD) Henry M. Paynter Outstanding Investigator Award and the ASME 2018 Rufus Oldenburger Medal in recognition of his pioneering and impactful contributions to control applications in mechatronics, magnetic data storage and traffic systems.

Lindsay Krejcarek is presently a Systems Engineer at Stellar Solutions, supporting Commercial Programs. She began her career as a Systems Engineering Rotation Program Engineer at Boeing Network and Space Systems. She then continued into technical and leadership roles at various Boeing subsidiaries and organizations, including Terminal Development Lead and Chief of Staff for Commercial GeoMobile Programs at Boeing Space and Intelligence Systems, and Product Manager at Boeing Commercial Satellite Services. Prior to joining Stellar Solutions in 2020, she pivoted to the toy industry as Operations and Project Manager at Immersive Play, Inc. where she was responsible for operations for a small business specializing in interactive content and toys,

including an interactive bear toy that won a 2019 CES Innovation Award.

Lindsay received a B.S. degree in Engineering: Systems Design from Franklin W. Olin College of Engineering and a Certificate in Project Management from the California Institute of Technology. She holds an active PMP® certification, and is the co-author on two patents.

Ellen Kuhl is the Robert Bosch Chair of Mechanical Engineering at Stanford University. She received her Ph.D. from the University of Stuttgart in 2000 and her Habilitation from the University of Kaiserslautern in 2004. Her area of expertise is Living Matter Physics, the design of theoretical and computational models to simulate and predict the behavior of living structures. Dr. Kuhl has published more than 200 peer-reviewed journal articles and edited two books; she is an active reviewer for more than 20 journals at the interface of engineering and medicine and an editorial board member of seven international journals in her field. She is a founding member of the Living Heart Project, a translational research initiative to revolutionize cardiovascular science through realistic simulation with 400 participants from research, industry, and medicine from 24 countries. Dr. Kuhl is the current Chair of the U.S. National Committee on Biomechanics and a Member-Elect of the World Council of Biomechanics. She is a Fellow of the American Society of Mechanical Engineers and of the American Institute for Mechanical and Biological Engineering. She received the National Science Foundation Career Award in 2010, was selected as Midwest Mechanics Seminar Speaker in 2014, and received the Humboldt Research Award in 2016. Ellen is an all-American triathlete, a multiple Boston, Chicago, and New York marathon runner, and a Kona Ironman World Championship finisher.

Prof. Eric Loth is the Rolls Royce Professor and Chair of Mechanical and Aerospace Engineering at the University of Virginia. He has been named a Fellow of the American Society of Mechanical Engineers (ASME), a Fellow of the of the American Institute of Aeronautics and Astronautics (AIAA), a Fellow of the National Center for Supercomputing Applications, and was the Yip Visiting Fellow of the Cambridge University (Magdalene College). Loth's current research focuses on extreme-scale wind turbines, supersonic flow control, multiphase flow for energy systems, micro- and nano-texturing coatings for super-hydrophobicity, and compressed air energy-storage systems. With his students, he has authored over 200 publications and has led or co-led more than $20M in research funding in his career. Dr. Loth has given several invited talks including at Cambridge, Penn, Princeton, Oxford, Harvard, MIT, MIT A+B Energy Conference, national Renewable Energy Laboratory, National Energy Technology Laboratory, Naval Research Laboratory, Sandia National Labs. His was invited to US Congress for a Congressional Showcase has received coverage in American Scientist, Popular Science, USA Today, MIT Technology Review, CNBC, and several other media outlets.

Susan Mantell is the James J. Ryan Professor and Head of Mechanical Engineering at the University of Minnesota. She received her B.S. and Ph.D. from Stanford University. Her current research focus is on applications of polymers and polymer composites for engineering structures. Prof. Mantell is the recipient of several best paper awards from the American Society of Mechanical Engineering and has received the National Science Foundation Young Investigator Award. She has also won several student-nominated awards for outstanding teaching and received university recognition as the Morse Alumni Distinguished Teaching Professor of Mechanical Engineering.

Peter Matic is the Associate Director of Research for the Materials Science and Component Technology Directorate at the Naval Research Laboratory (NRL) in Washington, DC. His responsibilities include the technical direction, financial management, and administration of over 500 scientists, engineers, and staff. The Directorate conducts multidisciplinary research and technology development in materials, chemistry, biomolecular science, plasma and laser physics, and electronics for the Navy, Marine Corps, DoD, and other government agencies. Prior to joining NRL, he worked at the General Dynamics Corporation/Electric Boat Division. Dr. Matic has over 45 refereed publications, 50 conference proceedings, 70 presentations, 20 technical reports, and six patents. He earned a B.S. in Mechanical Engineering from the Illinois Institute of Technology and a doctorate in Applied Mechanics from Lehigh University.

Assimina (Mina) Pelegri is a Professor and the Executive Officer/Undergraduate Director of Mechanical and Aerospace Engineering at Rutgers, The State University of New Jersey. Her research interests include composite materials design, experimental and computational interfacial mechanics. With her group she has developed computational neural network multiscale material models for characterization of aerospace composites and ballistic materials. Her models have also found applications in biological fibrous tissues in the fields of traumatic brain injury and degenerative diseases. Pelegri is a fellow of ASME and an Associate Fellow of AIAA. She held the M. W. Railser Distinguished Teaching Chair at Rutgers (2010–2013). She has served as an associate editor for the *American Institute of Aeronautics and Astronautics Journal* (2009–2012) and the *Journal of Engineering Materials and Technology* (2004-2010). She is the recipient of the ASME Gold Medal (2002) and an inducted member of the Georgia Institute of Technology Council of Outstanding Young Engineering Alumni (2003). She was selected as the Career Mentor of the Year at Rutgers University (2016) and the School of Engineering Outstanding Faculty (2016).

Pelegri has been heavily involved in ASME and AIAA conference organization, minority committees, technical committees, and the Inter-Sector Committee on Federal Research and Development task force of the ASME Government Relations Board. She has served as the IMECE Technical Program Chair twice and as the Congress General Chair. Currently, she is the Chair of the Engineering Sciences Segment and serves as an associate editor on the editorial board of the *ASME Journal of Engineering and Science in Medical Diagnostics and Therapeutics*. Pelegri has a Diploma from the National Technical University of Athens (Greece) in Metallurgical Engineering & Solid State Physics and an M.S. and Ph.D. from the Georgia Institute of Technology in Aerospace Engineering.

Christopher D. Rahn graduated from the University of Michigan with a B.S. in mechanical engineering in 1985 and from the University of California, Berkeley with a M.S. in 1986. After three years as a Research and Development Engineer at Ford Aerospace, he returned to Berkeley to pursue a Ph.D. After graduating from Berkeley in 1992, Dr. Rahn joined the Department of Mechanical Engineering at Clemson University. In 2000, he moved to the Pennsylvania State University where he is the J. 'Lee' Everett Professor of Mechanical Engineering, Associate Dean for Innovation in the College of Engineering, Director of the Mechatronics Research Laboratory, and Co-Director of the Battery and Energy Storage Technology Center. His research work on the modeling, analysis, design, and control of mechatronic systems has resulted in three books (including *Battery Systems Engineering*), over 200

peer-reviewed publications, and several patents. An ASME Fellow, Dr. Rahn is the Technical Editor of an ASME journal and chaired an ASME technical committee and the executive committee of the ASME Design Engineering Division.

Christine Reilley is senior director of Strategy and Innovation for the American Society of Mechanical Engineers (ASME), based in New York City. Previously, she led the Healthcare Technology Team, which focuses on creating and growing the Society's portfolio of programs, products, and services in this area. Reilley had previously served as program manager in the ASME Emerging Technologies unit, developing content and conferences in areas focusing on bioengineering, nanotechnology, thermofluids, and materials. She also spent more than 10 years in ASME Codes and Standards Publishing as an editor, overseeing the production of codes from manuscript to final bound and digital product.

She had been a senior editor for Research and Education Association, an educational publishing company, and also had served as a technical editor and science writer for UC San Diego's Biomedical Informatics Research Network and the National Center for Microscopy and Imaging Research. At that position, she developed content plans, researched and wrote web copy and news articles, and edited grant proposals and journal articles. In addition, Christine had been a report editor for XenoBiotic Laboratories (XBL), a contract research organization specializing in pharmaceutical, environmental, and metabolism chemistry. At XBL, she coordinated the production and editing of technical reports for submission to corporate sponsors and regulatory bodies. She earned an M.S. in Biomedical Engineering with a concentration in Tissue Engineering and Biomaterials from New Jersey Institute of Technology. She received a B.A. in Journalism and Mass Media with a minor in Biological Sciences from Rutgers University, Douglass College.

Allen L. Robinson is the Raymond J. Lane Distinguished University Professor and David and Susan Head of the Department of Mechanical Engineering at Carnegie Mellon University. His research and teaching examine the air quality, climate, and health impacts of energy systems. He is a fellow and former president of the American Association of Aerosol Research. Robinson serves on the Health Effects Institute Research Committee and also directs the EPA-supported Center for Air, Climate and Energy Solutions. He was recently elected a University Professor at Carnegie Mellon.

Olivia Ryu is a Senior Technical Program Manager at Astranis. After graduating with a B.S. in physics, she followed her passion for aerospace and joined Space Systems/Loral in the AIT department. After 11 years at SSL spanning manufacturing and test, design then sales, Ryu transitioned from spacecraft to launch vehicle mission management at SpaceX. In 2013, she returned to the Bay Area to welcome her first child, then joined Skybox Google as the satellite manufacturing lead. In 2018, Olivia moved with her family to Stockholm, Sweden, where she managed manufacturing and programs for in-space thruster company, ECAPS AB. Ryu is now part of the program management team at Astranis in San Francisco, where they are building a small GEO internet satellite. She plans to continue her career in program management, focusing on the human touch of management.

Ninggang Shen is a Senior Manufacturing Engineer of Battery Module & Pack at Tesla Giga Nevada in Sparks, Nevada. He leads the efforts in combining the critical analytical thinking of manufacturing principles with his research and development knowledge to address battery cell interconnect issues for mass production at the forefront of manufacturing electric vehicle battery modules. Shen received his Ph.D. from The University of Iowa in Mechanical Engineering. His research area was in advanced laser materials processing technologies and the modeling of microstructure evolution during severe plastic

deformation processes. Dr. Shen is the author of over 40 peer-reviewed research papers and two book chapters.

Jackelynne Silva-Martinez earned two bachelor degrees from Rutgers University, one in Mechanical and Aerospace Engineering and the second one in Spanish Translation and Interpretation. She earned a Certificate in Lean Six Sigma from the Lockheed Martin Greenbelt Program and a Certificate in Engineering Management from Drexel University. Silva-Martinez obtained an M.S. in Aeronautical Science with a concentration in Human Factors Aviation/Aerospace Systems from Embry-Riddle Aeronautical University and an M.S. in Aerospace Engineering with a concentration in Space Systems Integration at Georgia Institute of Technology. She is an alumna of the Space Studies Program from the International Space University. She received a Doctor Honoris Causa degree from the Universidad Nacional de Piura-Peru and is currently pursuing a Ph.D. in Leadership with focus on organizational change management. Silva-Martinez works at NASA Johnson Space Center in the Human Health & Performance Directorate, serving as Systems Engineering & Integration Lead and as Human Systems Integration Lead for the Gateway Program. She previously worked within the Flight Operations Directorate for the International Space Station and Artemis Programs as Flight Controller and Systems Engineer executing mission planning and integration. She worked as a Mechanical Engineer and Test Operator at NASA Jet Propulsion Laboratory on the Robotic Manipulators and Deployable Booms group performing verification and validation ground tests for the Mars Science Laboratory, Curiosity Rover mission. Prior to that, she was with Lockheed Martin Space Systems Company as Antennas Mechanical Design Engineer and then Systems Integration and Test Engineer for commercial and government satellite programs.

Silva-Martinez participated in several space analog missions including Human Exploration Research Analog at Johnson Space Center, and Mars Desert Research Analog in Utah. She is the founder of the **Centro de Ciencia, Liderazgo y Cultura,** which brings topics of science, leadership and culture to the young generation at an international level. Her interests include human spaceflight, mission operations, space architecture, systems engineering, human systems integration, project management, STEM and STEAM initiatives.

Mary Grace Stefanchik is Director, Publishing Development at ASME. She is responsible for publishing strategic projects, new publications development, and other Enterprise projects that involve publishing. Special projects staff and the Conference Publishing team report to Stefanchik. She has a B.A. in Communications from Boston College and has spent her entire career in technical and medical publishing at commercial and nonprofit organizations, including Pergamon Press, Springer, ASCE, and over 20 years at ASME.

Karen A. Thole is a Distinguished Professor and head of the Department of Mechanical Engineering at The Pennsylvania State University. As the department head, her administrative and educational efforts have focused on significantly growing the faculty, diversifying the faculty and students, and emphasizing interdisciplinary research. During her tenure as the Department Head, she hired 39 faculty in mechanical engineering, of which 40% of those hires were from underserved groups. Dr. Thole successfully led the effort to establish an online Master of Science in Mechanical Engineering and the development and approval of a Master of

Science (resident)/Master of Engineering (online) in Additive Manufacturing and Design, which was the first such degree offered in the United States. She has been recognized for her efforts in mechanical engineering education and diversity as a U.S. White House Champion of Change, and by ASME's Edwin F. Church Medal, ABET's Claire L. Felbinger Diversity Award, and SWE's Distinguished Engineering Educator Award. She has also been recognized for her faculty mentoring efforts through Penn State's Rosemary Schraer Mentoring Award and Howard B. Palmer Faculty Mentoring Award.

April Tone has been the Senior Manager of Segment Operations to the divisions in engineering sciences with ASME for a little over a year. With a B.S. degree in Radio, TV and Film from the University of Texas at Austin and a M.B.A. degree from Houston Baptist University, she brings a fusion of knowledge to ASME. In the past 10 years, April's experiences have included managing partnership programs, planning expos, serving in marketing and public relations roles, building education and credential programs, creating volunteer trainings and membership relations. Within ASME, she also works with the Diversity & Inclusion Staff Group and the new ASME Media Team.

Akira Tsuda is a bioengineer at Tsuda Lung research consulting. He has been working on lung physiology at the Harvard School of Public Health for 35 years. Dr. Tsuda's research interest is at the intersection of lung biology and engineering. For many years, he has explored both theoretical/ computational and experimental aspects of the health effects of air polluting particles.

Jamal Yagoobi is a Professor and Department Head of Mechanical Engineering at Worcester Polytechnic Institute (WPI). Dr. Yagoobi received his Ph.D. degree from the University of Illinois at Urbana-Champaign in mechanical engineering in 1984. After receiving his PhD, he worked for Westvaco Corporation as a research engineer before joining Texas A&M University (TAMU) in 1987. At TAMU, he was the Paul John Faculty Fellow as well as the TEES Senior Fellow. Yagoobi joined the Illinois Institute of Technology in 2002 as the Chair of the Mechanical, Materials and Aerospace Engineering Department until 2011. In 2012, he joined WPI.

Dr. Yagoobi's research expertise includes enhancement of heat and mass transfer with electrohydrodynamics in small and large scales in the presence and absence of gravity, heat and mass transfer in porous media, and enhancement of heat transfer with phase-change materials. He has over 320 peer reviewed journal and conference publications and 14 patents (five licensed). Dr.Yagoobi is the founding director of the NSF Industry University Cooperative Research Center entitled, "Center for Advanced Research in Drying (CARD)". He has an experiment to be on board the International Space Station by 2022. He is a fellow ASME, a fellow IEEE, and has received a number of national and international awards for his research and teaching activities. Dr. Yagoobi is currently the associate editor of IEEE-IAS Transactions and previously was the associate editor for the ASME Journal of Heat Transfer.

Dr. Yagoobi has been on a number of boards and panels. He was a member of the Review Panel - Innovations in Remanufacturing Program - Science & Engineering Research Council of Singapore. He was a member of the Advisory Board of the Energy and Global Security Directorate of Argonne National Laboratory from 2010 to 2016. Dr. Yagoobi is currently a member of the Alumni Board of the Department of Mechanical Science and Engineering at the University of Illinois at Urbana-Champaign. He is also a member of the advisory boards of several international conferences.

Special Events, Awards and Lectures

There are many awards that are given out to celebrate our engineering community. Below are some of the awards that will be given out this year.

To attend these events you need to access the event app. Instructions on downloading the app are on page 6.

Robert Henry Thurston Lecture Award

Wednesday, November 18, 6:00 PM–7:00 PM

The Robert Henry Thurston Lecture, established in 1925 in honor of ASME's first president, provided an opportunity for a leader in pure and/or applied science or engineering to present to the Society a lecture on a subject of broad interest to engineers. The Thurston Lecture was elevated to a Society award in 2000.

Awardee: Andrew Alleyne, *Ph.D., Ralph M. and Catherine V. Fisher professor at the University of Illinois at Urbana–Champaign*

Title: A Systems Approach to Electrified Mobility

Abstract: We live in an increasingly electrified world. For stationary applications such as industry and manufacturing, this statement has been obvious since the start of the 20th century as steam and belt drives in factories gradually gave way to electric motors for machining, conveyor lines, and all manner of other industrial applications. For domestic stationary applications, modern conveniences blossomed as electrification grew starting in the middle of the 20th century. Lighting, air-conditioning, cooking and cleaning, as well as many types of in-home entertainment were fueled by growing abilities to provide relatively cheap electrical power over long distances.

Now, a fifth of the way through the 21st century, we are seeing electrification rise in the mobile domain. The progress has been steady for several decades, but it is really during the past several years that electrified mobility has seen a rapid growth at the level of individual consumer. Interestingly, this growth cuts across widely varying modes of mobility, from individual bicycles to on-highway vehicles to large ships and aircraft.

This talk will detail some of the trends in mobility domains and will discuss some of the technical challenges. For mobility systems, the power density is a key metric of performance that dictates viability of technology for use in the transport of goods and people. Of high relevance to an ASME audience, we will discuss the interplay between modes of power distribution within

electrified mobility systems. This includes the flow of power in the mechanical, electrical, and thermal domains. Several examples of challenges will be raised along with some solutions and open questions across the broad spectrum of Mechanical Engineering fields. In particular, we will demonstrate examples where the integration of different fields, in a systems-level approach, can afford significant advantages in power density.

Biography: Andrew Alleyne, Ph.D., Ralph M. and Catherine V. Fisher professor at the University of Illinois at Urbana–Champaign, is honored for the innovative application of systems and controls tools to meet a broad array of societal needs including energy and power systems, manufacturing systems, and transportation systems. With Illinois since 1994, Dr. Alleyne is also the director of the National Science Foundation Engineering Research Center for Power Optimization for Electro-Thermal Systems.

Track 1: Acoustics, Vibration, and Phononics
Per Bruel Gold Medal for Noise and Acoustics

Sponsored by the Noise Control and Acoustics Division

The Per Bruel Gold Medal for Noise Control and Acoustics is given in recognition of eminent achievement and extraordinary merit in the field of noise control and acoustics. The achievement must include useful applications of the principles of noise control and acoustics to the art and science of mechanical engineering.

Awardee: J. Stuart Bolton, Ph.D., Professor of Mechanical Engineering, Purdue University

Biography: J. Stuart Bolton, Ph.D., a professor of mechanical engineering at Purdue University in West Lafayette, IN, is recognized for seminal and far-reaching contributions to the field of acoustics and noise control engineering through research, education, service to the technical community and industrial engagement.

Since joining the faculty at Purdue in 1984, Dr. Bolton has maintained an active research program at the Ray W. Herrick Laboratories. He has published more than 100 archival journal articles, made over 200 conference presentations, and supervised more than 100 graduate students.

Rayleigh Lecture

Sponsored by the Noise Control and Acoustics Division

Tuesday, November 17 at 6:15PM–7:00 PM

The Rayleigh Lecture award is given to an individual who has made pioneering contributions to the sciences as well as application to industry.

Awardee: K. W. Wang, *Stephen P. Timoshenko Professor of Mechanical Engineering, University of Michigan*

Title: Vibration and Noise Control Harnessing Reconfigurable Modular Metastructures

Abstract: In recent years, new concepts have been explored to develop adaptive metastructures based on reconfigurable modular architectures. In one investigation, we study the idea of creating engineered materials and structures from synergistically assembling and controlling metastable modules (modules that exhibit coexistent stable states under the same topology) and uncover their mechanics and nonlinear dynamics behaviors due to metastability and multistability. Results show that such multifunctional metastructures yield significant adaptivity via modular reconfiguration, which would achieve numerous globally stable topologies, large variations in damping and stiffness, and tunable nontraditional wave propagation characteristics. In another study, building upon the architecture of origami, multifunctional adaptations are uncovered and explored for the control of structural shape, stiffness, energy absorption, nonlinear dynamics and vibration, acoustic band structures, and noise transmissions. These unique characteristics are realized utilizing ideas such as fluidic-induced transformation and multistability, and lattice symmetry transformation in origami modular metastructures. This presentation will discuss some of the recent research innovations and possible future directions and opportunities in synthesizing reconfigurable adaptive modular metastructures for structural vibration and acoustic control advancements.

Biography: Kon-Well Wang is the Stephen P. Timoshenko Professor of Mechanical Engineering (ME) at the University of Michigan (U-M) in Ann Arbor, MI. He received his Ph.D. from the University of California at Berkeley, worked at the General Motors Research Labs, and started his academic career as a member of the faculty at the Pennsylvania State University in 1988. At Penn State, Dr. Wang has served as the William E. Diefenderfer Chaired Professor, Associate Director of the Vertical Lift Research Center of Excellence, and Group Leader for the Center for Acoustics and Vibration. He joined the U-M ME in 2008 as the Stephen P. Timoshenko Professor. He served as the ME Department Chair at U-M from 2008 to 2018. He is on an Intergovernmental Personnel Act rotator appointment as a Division Director at the National Science Foundation since January 2019. Dr. Wang's technical interests are in the emerging areas of structural dynamics, including metastable and multi-stable metastructures, origami dynamics, and adaptive structural systems, with applications in vibration and noise controls. He has received various recognitions, such as the Pi Tau Sigma-ASME Charles Russ Richards Memorial Award, ASME J.P. Den Hartog Award, SPIE Smart Structures and Materials Lifetime Achievement Award, ASME Adaptive Structures and Materials Systems Prize, and ASME N.O. Myklestad Award. He has been the Chief Editor for the ASME Journal of Vibration and Acoustics, and is an Editorial Advisory Board Member for the Journal of Sound and Vibration. Dr. Wang is a Fellow of the ASME, AAAS, and IOP.

Track 3: Advanced Materials: Design, Processing, Characterization and Applications

Sponsored by the Materials Division

Nadai Medal

The Nadai Medal is awarded in recognition of significant contributions and outstanding achievements which broaden the field of materials engineering. Such achievements may be, for example, in the areas of education, research, development, and service to the field and profession. The Nadai Medal was established in 1975 on the proposal of the Materials Division to honor Arpad L. Nadai, who was a pioneer in the field of engineering materials, contributing particularly to the area of plasticity. His perspective also enabled him to give strong impetus to development in fatigue and high temperature behavior.

Awardee: Frank Zok, *University of California, Santa Barbara*

Biography: Frank W. Zok is Distinguished Professor of Materials at the University of California, Santa Barbara. He serves as Director of the Pratt & Whitney Center of Excellence in Composites and the IHI Turbine Materials Research Center, both at UCSB. He is a Fellow of the American Ceramic Society. He earned B.E.Sc. and M.E.Sc. from the University of Western Ontario and his Ph.D. from McMaster University, Canada, all in Materials Engineering. He has been on the UCSB faculty since 1990. His current research activities focus on high-temperature ceramic composites for use in future propulsion systems in aircraft engines and in hypersonic flight vehicles, protection systems for mitigating blast and ballistic threats, and lightweight lattice structures with high strength and straining capability. He has published over 200 articles. Dr. Zok has been active in the professional community, serving as Associate Editor of the Journal of the American Ceramic Society for over 25 years, on several National Academies' studies and review panels, and as Chair of the Scientific Advisory Board for the Canada Magnesium Network.

Sia Nemat-Nasser Early Career Award

The Sia Nemat-Nasser Early Career Award recognizes early career research excellence in the areas of experimental, computational, and theoretical mechanics and materials by young investigators who are within 10 years after their Ph.D. degree, with special emphasis placed on under-represented groups. The award was established by the by the Materials Division in 2008 and operated as a division award until 2012 when it was elevated to a Society award.

Awardee: Baoxing Xu, *University of Virginia, Charlottesville*

Biography: Dr. Baoxing Xu is currently an Associate Professor in the Department of Mechanical and Aerospace Engineering at The University of Virginia (UVa). He received his B.S. in Engineering Mechanics and M.S. in Solid Mechanics from Northwestern Polytechnical University of China in 2004 and 2007, respectively, and Ph.D. in Mechanics and Materials from Columbia University in 2012. Prior to joining the faculty at UVa in the fall of 2014, he was a Beckman Postdoctoral Fellow at the University of Illinois at Urbana-Champaign from 2012 to 2014. Dr. Xu's research interests are focused on multiscale-multiphysics mechanics driven extreme design and manufacturing of functional materials, structures and devices, in particular, heterostructures, porous structures, solid-liquid functionalized materials, soft-hard material integrated systems, and flexible devices and structures.

Orr Early Career Award

Established in 2004, the ASME ORR Early Career Award was donated by the Orr family and consists of a $3,000 honorarium and certificate. It is given annually at IMECE by the Orr Family through the Materials Division of ASME to recognize early career research excellence in the areas of experimental, computational, or theoretical fatigue, fracture, or creep.

Awardee: Kedar Kirane, *Stony Brook University*

Biography: Kedar Kirane is an assistant professor of mechanical engineering at Stony Brook University (SUNY) in New York. His research focuses on understanding the fatigue, fracturing, and scaling behavior of various conventional and advanced composite materials. These include fiber-reinforced composites, nanocomposites, geological materials, concrete, and polycrystalline alloys. Prof. Kirane obtained his Ph.D. in 2014 from Northwestern University and joined the Mechanical Engineering faculty at Stony Brook University in September 2017. He also holds an M.S. from the Ohio State University (2007) and B.S from the University of Pune, India (2004), both in mechanical engineering. Prior to joining Stony Brook, Prof. Kirane worked as a senior researcher at the ExxonMobil Upstream Research Company and has also held a development engineer position at Goodyear Tire & Rubber company in the Engineering Mechanics group. He is a member of ASME and EMI (ASCE). He serves on the Computational Mechanics and Modeling Inelastic Behavior of Materials committees of EMI (ASCE). He also serves as a reviewer for many prestigious international journals. He is the recipient of DOD Army Research Office's Young Investigator award in 2019 and ASME AMD's Haythornthwaite Research Initiation Grant in 2018 for proposing promising work in the field of fracture and scaling of advanced composite materials.

Awardee: Yan Li, *Dartmouth College*

Biography: Dr Yan Li joined the Thayer School of Engineering at Dartmouth College in January 2020. Prior to that appointment, she was an Assistant Professor in the Department of Mechanical and Aerospace Engineering at California State University, Long Beach from 2014 to 2018. Dr. Li received her Ph.D. degree in Mechanical Engineering from Georgia Institute of Technology in 2014. Her primary research interests are in the area of mechanics of advanced materials, involving multiscale/multiphysics modelling, integrated computational/experimental approaches for next generation material design, and application of material science and solid mechanics in advanced manufacturing. Dr. Li has worked on research projects supported by the U.S. Army Research Laboratory, Sandia National Laboratories, NSF NH-BioMade Center, and NSF CCMD (Center for Computational Materials Design), and collaborated with industry partners including Boeing, Gulfstream, and GE. She is the recipient of the ASME ORR Early Career Award in 2020, Best Paper Award of the 8th International Conference on Computational Methods in 2018, and WAC Teaching Writing Fellow at Cal State Long Beach in 2017, Professors around the world at Cal State Long Beach in 2016, and multiple NSF travel awards for leadership and career development.

Track 8: Energy
Frank Kreith Energy Award

The Frank Kreith Energy Award was established in 2005 to honor an individual for significant contributions to a secure energy future with particular emphasis on innovations in conservation and/or renewable energy. The award was established by the Solar Energy and Advanced Energy divisions to honor Dr. Frank Kreith's contributions to solar energy and heat transfer.

Awardee: Petros Sofronis, *University of Illinois at Urbana–Champaign*

Biography: Petros Sofronis, Ph.D., James W. Bayne professor of mechanical science and engineering at the University of Illinois at Urbana–Champaign; and director of the International Institute for Carbon-Neutral Energy Research (I2CNER), is honored for catalyzing international academic and industrial research collaborations on underlying renewable energy technologies; and for significant contributions to the advancement of understanding and mitigating materials degradation in gaseous hydrogen environments such as pipeline steels.

Since 2010, Dr. Sofronis has led I2CNER, co-hosted by Kyushu University in Japan and the University of Illinois, and been funded by the World Premier International Research Initiative of Japan. Currently, he is working to establish the Midwest Hydrogen and Fuel Cell Coalition, a partnership between Argonne National Laboratory and Illinois.

Edward F. Obert Award

The Edward F. Obert Award was established in 1987 by the Advanced Energy Systems Division to recognize an outstanding paper on thermodynamics. It was elevated to a Society award in 1996.

Awardee: **Henry A. Long III**

Biography: Henry A. Long III, Ph.D., a senior engineer at KeyLogic Systems, Inc., in Pittsburgh, and Ting Wang, Ph.D., a professor in the department of mechanical engineering at The University of New Orleans, are recognized for the paper titled, "Performance of an Integrated Mild/Partial Gasification Combined (IMPGC) Cycle With Carbon Capture in Comparison With Other Power Systems." Dr. Long was a research assistant under Dr. Ting Wang for his master's degree; under Dr. Wang's mentorship, he went on to publish more than a dozen papers. In his current position, Dr. Long supports the National Energy Technology Laboratory as an employee under the Mission Execution and Strategic Analysis contract.

Awardee: **Ting Wang**

Biography: Dr. Ting Wang, Ph.D., a professor in the department of mechanical engineering at The University of New Orleans, is also the director of the Energy Conversion and Conservation Center and Matthey endowed chair for energy research. Prior to joining UNO, he taught for 15 years at Clemson University in South Carolina. Dr. Wang has been involved in energy conservation and power generation in full spectrum for the past 40 years.

Track 11: Heat Transfer and Thermal Engineering Bergles-Rohsenow Young Investigator Award in Heat Transfer

Sponsored by the Heat Transfer Division

The Bergles-Rohsenow Young Investigator Award in Heat Transfer is given to a young engineer that is under 36 years of age and has received a Ph.D. or equivalent degree in Engineering. The individual must be committed to pursuing research in heat transfer and must have demonstrated the potential to make significant contributions to the field of heat transfer. Such contributions may take the form of, but are not limited to, analytical/numerical methods, equipment/instrumentation, or experimentation—any of which should lead to peer-reviewed publications. This year's

Bergles-Rohsenow Young Investigator Award is given to Prof. Amy Marconnet, Associate Professor of Mechanical Engineering at Purdue University, for the development of a creative, interdisciplinary approach to evaluate, understand, and control the physical mechanisms governing the thermal transport properties of materials, machines, and systems.

Heat Transfer Memorial Awards

Sponsored by the Heat Transfer Division

The Heat Transfer Memorial Award is bestowed on individuals who have made outstanding contributions to the field of heat transfer through teaching, research, practice, design, service, leadership, inventions, or a combination of such activities. Recipients of this year's Heat Transfer Memorial Awards are:

Science: Prof. Terrence W. Simon, Ernst G. Eckert Professor of Mechanical Engineering, Department of Mechanical Engineering, University of Minnesota, for widely acclaimed seminal studies on turbulent flow in transitioning boundary layers and pressure gradients; and for excellence in experimental technique.

Art: Prof. Bahgat Sammakia, Distinguished SUNY Professor and Vice President of Research, Binghamton University State University of New York, for contributions to innovations in green data centers, particularly as director of the Center for Energy-Smart Electronic Systems, a National Science Foundation industry–university cooperative research center; and for contributions to flexible electronics and electronics packaging, particularly as director of the Small Scale Systems Integration and Packaging Center at Binghamton University in New York.

General: Prof. Vishwanath Prasad, Professor, Department of Mechanical and Energy Engineering, University of North Texas, for exceptional contributions to the heat transfer community and ASME's Heat Transfer Division as chair of technical committees, organizer and chair of national and international conferences, and editor/associate editor of proceedings, journals, and book series; and for outstanding leadership in international collaborations.

George Westinghouse Medals

The George Westinghouse Medals were established to recognize eminent achievement or distinguished service in the power field of mechanical engineering to perpetuate the value of the rich contribution to power development made by George Westinghouse, honorary member and 29th president of the Society. The Gold Medal was established in 1952 and the Silver Medal in 1971.

Awardee: Darrell W. Pepper – GOLD

Biography: Darrell W. Pepper, Ph.D., a professor of mechanical engineering at the University of Nevada, Las Vegas, is honored for exemplary achievements in the areas of power associated with wind energy, advanced engine combustion modeling, energy savings, and advanced computational methods.

With UNLV since 1992, Dr. Pepper is founder and former director of the Nevada Center for Advanced Computational Methods. He has published over 350 technical papers and six books.

Awardee: Sibendu Som – SILVER

Biography: Sibendu Som, Ph.D., a principal computational scientist and manager of the multi-physics computational research section at Argonne National Laboratory in Illinois, is recognized for pioneering the implementation of machine learning tools and high performance computing techniques, and developing predictive submodels for high-fidelity simulations of power and propulsion systems, which are routinely used by industry to dramatically reduce product design time.

Dr. Som has more than a decade of experience in multi-physics and multi-scale modeling of piston engines and gas turbines on high performance computing systems. He is a co-founder of Argonne's Virtual Engine Research Institute and Fuels Initiative program.

Track 12: Mechanics of Solids, Structures and Fluids
Nancy DeLoye Fitzroy and Roland V. Fitzroy Medal
Sponsored by the Applied Mechanics Division

The Nancy DeLoye Fitzroy and Roland V. Fitzroy Medal, established in 2011, recognizes pioneering contributions to the frontiers of engineering that have led to a breakthrough in existing technology, or to new applications or new areas of engineering endeavor.

Awardee: John A. Rogers, Louis Simpson and Kimberly Querrey Professor of Materials Science and Engineering, Biomedical Engineering and Neurological Surgery (and by courtesy Electrical and Computer Engineering, Mechanical Engineering, and Chemistry)

Biography: John A. Rogers obtained B.A. and B.S. degrees in chemistry and in physics from the University of Texas, Austin, in 1989. From MIT, he received S.M. degrees in physics and in chemistry in 1992 and a Ph.D. in physical chemistry in 1995. From 1995 to 1997, Dr. Rogers was a Junior Fellow in the Harvard University Society of Fellows. He joined Bell Laboratories as a Member of Technical Staff in the Condensed Matter Physics Research Department in 1997 and served as Director of this department from 2000 to 2002. He then spent 13 years on the faculty at University of Illinois, most recently as the Swanlund Chair Professor and Director of the Seitz Materials Research Laboratory. In the Fall of 2016, he joined Northwestern University as the Louis Simpson and Kimberly Querrey Professor of Materials Science and Engineering, Biomedical Engineering and Medicine, with affiliate appointments in Mechanical Engineering, Electrical and Computer Engineering, and Chemistry, where he is also Director of the recently endowed Querrey Simpson Institute for Bioelectronics. He has published more than 750 papers, is a co-inventor on more than 100 patents, and has co-founded several successful technology companies.

His research has been recognized by many awards, including a MacArthur Fellowship (2009), the Lemelson-MIT Prize (2011), and most recently the Benjamin Franklin Medal (2019). He is a member of the National Academy of Engineering, National Academy of Sciences, National Academy of Medicine, National Academy of Inventors, and American Academy of Arts and Sciences.

Koiter Lecture

Sponsored by the Applied Mechanics Division

Tuesday, November 17, 6:00PM–6:50PM

Lecturer: Anthony M. Waas, *Felix Pawlowski Collegiate Professor and Richard A. Auhll Department Chair, Department of Aerospace Engineering, University of Michigan, Ann Arbor*

Title: On Developing Validated Models for Progressive Damage and Failure of Fiber Reinforced Laminates

Abstract: High-strength and high-stiffness carbon fiber-reinforced polymer composite laminates (CFRP) are being increasingly used for primary load bearing structures in many industries. The most common material system used is based on thermoset resins (matrix material), which come in the form of convenient prepreg tapes allowing high flexibility and productivity using advanced automated manufacturing technologies. Engineers must provide mechanics-based models for the deformation response and failure of these materials and structures. The mechanisms responsible for progressive damage accumulation and failure are (intralaminar) matrix cracks, which can lead to delamination initiation and spreading,

resulting in ultimate failure. Interlaminar fracture in CFRP, often called delamination, is defined as an out-of-plane discontinuity between two adjacent plies of a laminate. Delamination behavior has been studied by many researchers and now can be characterized in a standardized manner. Fracture properties of Mode I, Mode II, and mixed-mode (between Mode I and Mode II) delamination can be obtained from ASTM standard tests in conjunction with finite element analysis (FEA). In a CFRP structural component, the intralaminar and interlaminar modes of failure interact and developing a computational model to accurately replicate the failure mechanisms and their interaction has been challenging. In this presentation, a series of experimental results that delineate the different mechanisms of failure will be presented. Based on these results, associated mechanics models will be presented, resulting in a progressive damage and failure modeling framework that can be used for assessing the structural integrity and damage tolerance of CFRP aerospace structures.

Biography: Anthony M. Waas is the Richard A. Auhll Department Chair of Aerospace Engineering at the University of Michigan, Ann Arbor, where he holds the Felix Pawlowski Collegiate Chair. Prior to that he was the Boeing Egtvedt Endowed Chair Professor and Department Chair in the William E. Boeing Department of Aeronautics and Astronautics at the University of Washington (UW), Seattle. His current research interests are computational modeling of lightweight composite structures, robotically manufactured aerospace structures, 3D printed structures, damage tolerance of structures, mechanics of textile composites, and data science applications in structural mechanics. Professor Waas was the Felix Pawlowski Collegiate Chair Professor of Aerospace Engineering and Director, Composite Structures Laboratory at the University of Michigan, from 1988 to 2014, prior to joining UW in January 2015. He assumed his current position in Fall 2018. Professor Waas is a Fellow of the American Institute of Aeronautics and Astronautics (AIAA), American Society of Mechanical Engineering (ASME), American Society for Composites (ASC), American Academy of Mechanics (AAM), and Royal Aeronautical Society, UK. He is a recipient of several best paper awards, the 2016 AIAA/ASME SDM award, AAM Jr. Research Award, ASC Outstanding Researcher Award, and several distinguished awards from the University of Michigan, including the Stephen S. Attwood award for Excellence in Engineering, one of the highest honors for an Engineering faculty member at the University of Michigan. He received the AIAA-ASC James H. Starnes, Jr. Award, 2017, for seminal contributions to composite structures and materials, and for mentoring students and other young professionals. In 2017, Professor Waas was elected to the Washington State Academy of Sciences, and in 2018 to the European Academy of Sciences and Arts. He is also the recipient of the AIAA ICME Prize, 2019

Track 14: Safety Engineering, Risk and Reliability Analysis Safety Innovation Challenge Student Contest

Sponsored by the Safety Engineering & Risk Analysis Division

There are two levels of graduate and undergraduate contests, and two winners are selected from each category. A monetary award along with a wood plaque are given to all winners. There will be a virtual event celebrating the awardees and their accomplishments.

Best Paper Award for ASME Journal of Risk and Uncertainty in Engineering Systems

Sponsored by the Safety Engineering & Risk Analysis Division

The winner is selected from the best paper among the published papers of the previous year and a monetary award is presented along with a wood plaque. There will be a virtual event celebrating the awardees and their accomplishments.

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Committee Meetings & Special Events Highlights (By Day)

A full list of meetings/events (in chronological order) can be found in the end of this program or online at: https://event.asme.org/IMECE/Program/Committee-Meetings-Special-Events

To attend these events you need to access the event app. Instructions on downloading the app are on page 6.

SPECIAL EVENTS – TUESDAY, November 10

ASME Business Meeting
11:00AM–11:30AM

Call to order by **Bryan Erler,** ASME President, 2020–2021
Report by the Treasurer
Membership Report
2019–2020 Annual Report
State of the Society Video
Report on Proxies Received
Ratification of Auditor
Election of 2021 Nominating Committee
Other Business

ASME Board of Governors Meeting
12:00PM–3:00PM

ASME Philanthropy Impact 2020
3:30PM–4:45PM

CAMPAIGN FOR NEXT GENERATION ENGINEERS WHO TRANSFORM THE WORLD

ASME FOUNDATION

An inspiring brief review of ASME's transformative Philanthropy programs in Education, Career Enrichment, and Global Development.

Extraordinary engineer and leader, Dr. Gwendolyn Boyd, is the keynote speaker. The online event will feature the presentation of two prestigious awards honoring women engineers creating breakthrough change.

See how the ASME Foundation is *Empowering Next Generation Engineers Who Transform the World.*

SPECIAL EVENTS – THURSDAY, November 12

ECLIPSE Alumni Networking Happy Hour
4:00PM–5:30PM

Join us for a virtual networking happy hour during IMECE for alumni of ASME's ECLIPSE, LDI, and MLP leadership development programs. This will be an opportunity to catch up with old friends, meet other past interns, and hear the latest about the Early Career Leadership Intern Program to Serve Engineers (ECLIPSE) program. All are welcome to attend.

Don't Miss this outstanding IMECE event!

Special Thanks

SPECIAL EVENTS –
SATURDAY, November 14

Oral Competition
Sponsored by the Old Guard
8:30AM–2:00PM

All are invited to attend the finals of the Oral Presentation Competition sponsored by the Old Guard. View the engineering students who have successfully competed in the 2020 E-Fest and are now vying for the $2,000 ASME Old Guard Prize for outstanding presentation skills.

Like all effective professionals, engineers must possess a well-developed ability to synthesize issues and communicate both orally and in writing. This competition is designed to emphasize the value of an ability to deliver clear, concise, and effective oral presentations, particularly pertaining to some sphere in which an engineer is or should be involved. Presentation topics must address a technical, economic, or environmental aspect of engineering or other basic engineering theme, and often relate to the students' engineering design/analysis projects. For more information, please visit:

https://www.asme.org/events/competitions/old-guard-competitions/old-guard-prize-oral-presentation-competition/

From Engineer to Manager
10:00AM–11:00AM

Most engineers will at some point in their careers assume a management role (e.g., as a project manager or team leader) or consider a move into a full-time management position. The change in role is usually quick to occur but normally without preparation to assist in a smooth transition. As a result, most engineers are not aware of what being a new manager is all about before it's thrust upon them. Would you be ready for the change? What should you really expect? What are the critical things you need to know as a new manager? This session will include a practical look at some of the key elements in preparing for a successful transition from technical professional to manager, as opposed to being a "How to Manage" session.

Understanding the Engineering Hiring Process
11:30AM–12:30PM

This session includes a panel of experts who had the experience of being at the hiring end from Academia, Industry, and Government. The discussion will cover questions related to expectations, handling interview questions, being job-market ready, in their different areas, and what a hiring manager would be looking for as they go through CVs or conduct interviews.

Resume/CV Building
1:00PM–2:00PM

This is an interactive session where an expert career coach and engineering-students placement professional walks the audience through examples of resumes before opening the session for questions and discussion. Topics would also cover the current practices and mechanisms used to sort through large numbers of resumes from job seekers and what makes a resume stand out.

SPECIAL EVENTS – MONDAY, November 16

Keynote Speaker
11:00AM

Emily A. Carter, Ph.D.
Executive Vice Chancellor and Provost
Distinguished Professor of Chemical and Biomolecular Engineering
UCLA

Title: Insights into Sustainable Energy Materials Optimization from First Principles

NCAD Awards (Per Bruel Medal and Best Student Paper) and General Committee Meeting
6:00PM–7:00PM

Awardee: J. Stuart Bolton, Ph.D., Professor of Mechanical Engineering, Purdue University

ASME Annual Awards Event
7:00PM–8:15PM
Awards Reception to immediately follow
8:15PM–8:45PM

ASME presents the 2020 Annual Awards Event (formerly known as the Honors Assembly), a celebration of engineering that pays tribute to the careers and achievements of some of the world's outstanding engineers, innovators, and scholars. This virtual multimedia event will feature inspiring stories and entertainment. The event will be hosted by special guest Master of Ceremonies, Roy Firestone, a seven-time Emmy Award winner and seven-time cable ACE award winning host, interviewer, narrator, writer, and producer. As the ground-breaking, original host of ESPN's legendary Up Close, Up Close Classic, and Up Close Primetime, Firestone has interviewed more than 5,000 athletes, musicians, actors, and political figures as well as writers and filmmakers.

Performances by:

Jeffrey Li is known for his television debut on the hit NBC show, “America’s Got Talent.” His auditions received critical acclaim, reaching more than 27 million views on YouTube. He also performed on NBC’s “Little Big Shots,” produced by Ellen DeGeneres and Steve Harvey. His previous cover, “You Raise Me Up,” has gained over 124 million views on Facebook and over 50 million views on YouTube.

Allie Sherlock from Cork, Ireland first came to attention when a video she posted on Facebook of her busking on Dublin’s Grafton Street singing Ed Sheeran’s “Supermarket Flowers” went viral. Since then, she has had numerous viral YouTube videos as well as reaching over 3.5 million subscribers (and counting)!

Awards Honorees

Asad M. Madni
Soichiro Honda Medal

William S. Hammack
Ralph Coats Roe Medal

Je-Chin Han
Honorary Member

Masayoshi Tomizuka
Honorary Member

David Kwabi
Pi Tau Sigma Gold Medal

James J. Truchard
Richard J. Goldstein Energy Lecture Award

Farshid Sadeghi
Honorary Member

Subra Suresh
ASME Medal

Krishnamoorthy (Subbu) Subramanian
M. Eugene Merchant Manufacturing Medal of ASME/SME

Don't Miss this outstanding IMECE event!
Special Thanks

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The ASME Committee on Honors
Mechanical Engineering magazine

Committee Meetings & Special Events Highlights (By Day)

SPECIAL EVENTS – TUESDAY, November 17

Keynote Speaker
11:00AM

Dragos Maciuca, Ph.D.
Executive Technical Director
Ford's Research and Innovation Center

Title: Opportunities & Challenges for Mechanical Engineering in Autonomy and Artificial Intelligence

**This program is limited to individuals with an IMECE Technical Conference Registration.*

Koiter Lecture
Sponsored by the Applied Mechanics Division
6:00PM–6:50PM

Lecturer: Anthony M. Waas, *Felix Pawlowski Collegiate Professor and Richard A. Auhll Department Chair, Department of Aerospace Engineering, University of Michigan, Ann Arbor*

Title: On Developing Validated Models for Progressive Damage and Failure of Fiber Reinforced Laminates

Heat Transfer Division Awards Meeting
6:00PM–7:00PM

On this evening the Heat Transfer Division recognize the following award winners as well as Journal, Committee and Division leadership.

2020 Heat Transfer Memorial Awards

Dr. Terrence W. Simon - (Science)
Dr. Bahgat Sammakia - (Art)
Dr. Vishwanath Prasad - (General)

2020 George Westinghouse Gold Medal Award

Dr. Darrell W. Pepper

2020 George Westinghouse Silver Medal Award

Dr. Sibendu Som

2020 Bergles-Rohsenow Young Investigator Award

Dr. Amy Marconnet

Women In Engineering Reception Sponsored by the Diversity & Inclusion Strategy Committee
6:00PM–7:30PM

The reception provides a gathering point at IMECE for women from the wide range of ASME activities for networking and a bit of casual relaxation at the end of a conference day. This year's reception will feature remarks from a selection of ASME leaders, a panel discussion on staying connected in our new online world, and a breakout networking opportunity for those who are interested. The event is open to all.

Noise Control and Acoustics Division: Rayleigh Lecture
Sponsored by the Noise Control and Acoustics Division
6:15PM–7:00PM

The Rayleigh Lecture award is given to an individual who has made pioneering contributions to the sciences as well as application to industry.

Awardee: K. W. Wang, *Stephen P. Timoshenko Professor of Mechanical Engineering, University of Michigan*

Title: Vibration and Noise Control Harnessing Reconfigurable Modular Metastructures

Applied Mechanics Division Awards Ceremony
7:00PM–8:30PM

Worcester Reed Warner Medal - **Marco Amabili**
Gustus L. Larson Memorial Award - **Yuri Bazilevs**
Daniel Drucker Medal - **Glaucio H. Paulino**
Warner T. Koiter Medal – **Anthony M. Waas**
Timoshenko Medal – **Mary Boyce**

SPECIAL EVENTS – WEDNESDAY, November 18

Plenary: NSF Overview and Outreach: CMMI and CBET
11:00AM–11:45AM

Representatives from the Chemical, Bioengineering, Environmental and Transport Systems Division (CBET) will provide an overview of current programs with an emphasis on current NSF priorities and funding opportunities. Relevant core programs will also be highlighted. Following the presentation, there will be a live Q&A.

NSF – CMMI Overview and Proposal Development Session
12:00PM–1:30PM

Representatives from the Civil, Mechanical and Manufacturing Innovation Division (CMMI) will provide an overview of current programs with an emphasis on current NSF priorities and funding opportunities. Relevant core programs will also be highlighted. Following the presentation, there will be a live Q&A.

**These NSF programs are limited to individuals with an IMECE Technical Conference Registration.*

ASME LGBTQ Pride Discussion: IMECE 2020
6:00PM–7:00PM

Campaign For Next Generation Engineers – Who Transform The World

ASME Foundation

Sponsored by the ASME Foundation, please join us for a diverse discussion panel addressing the challenges and successes of the LGBTQ community within the engineering field. In partnering with LGBTQ-advocacy organizations, including oSTEM and NOGLSTP, ASME is seeking to broaden its inclusion efforts and build a more diverse engineering society. If you have any questions or feedback, please do not hesitate to contact ASME's Global Public Affairs team at GPA@asme.org.

Robert Henry Thurston Lecture Award
6:00PM–7:00PM

The Robert Henry Thurston Lecture, established in 1925 in honor of ASME's first president, provided an opportunity for a leader in pure and/or applied science or engineering to present to the Society a lecture on a subject of broad interest to engineers. The Thurston Lecture was elevated to a Society award in 2000.

Awardee: Andrew Alleyne, Ph.D., Ralph M. and Catherine V. Fisher professor at the University of Illinois at Urbana–Champaign

Title: A Systems Approach to Electrified Mobility

SER2AD Division Award Reception
6:00PM–7:00PM

The program will include the 2020 SERAD Student Safety Innovation Challenge awards, recognition of division executive committee members, IMECE Organizers and Plenary speakers and the 2019 Editor's Award for the Best Paper in the ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A & B.

ASME 2020 IMECE – Manufacturing Policy Forum: SPECIAL EVENT ....An ASME Manufacturing Engineering Division (MED) Centennial Celebration Event

6:00PM–8:00PM

This forum is being hosted by the IMECE/ Advanced Manufacturing Track and co-sponsored by the Manufacturing Engineering Division (MED) and ASME Manufacturing Public Policy Task Force (MPPTF) to bring awareness of ASME's role in U.S. Manufacturing Public Policy and the opportunities for ASME volunteers to make an impact. This panel will highlight ASME positions on various manufacturing public policy issues and their importance to ASME members. Panelists will also share their experiences serving as Executive Branch and Congressional Fellows and how it impacted their careers and the Nation.

A full program description can be found on page #79.

SPECIAL EVENTS – THURSDAY, November 19

Keynote Speaker

11:00AM

James J. Truchard, Ph.D.
Former CEO, NI

ASME 2020 Richard J. Goldstein Energy Lecture Award Recipient

Title: A Future for Energy
**This program is limited to individuals with an IMECE Technical Conference Registration.*

Fluids Engineering Division Awards Presentation

6:15PM–7:00PM

Join Fluids Engineering Division members and supporters to recognize the contestants and winners of the FED Young Engineer's Paper Contest and the FED Technical Committee Best Paper Awards. The event includes plenty of time for networking and discussion among attendees. Please join us as we try to virtually make new connections and renew friendships with our colleagues. We welcome you all to participate. Judith Bamberger, FED Executive Committee Chair, Zhongquan Charlie Zheng, FED IMECE 2020 Track Chair and Philipp Epple, FED IMECE 2020 Track Vice Chair, Terry Beck, FED Young Engineers

Committee Meetings

Meeting / Event Title	**Day/Date**	**Time** (NOTE - All times are in EASTERN TIME)
ASME Business Meeting	Tuesday, November 10, 20	11:00 AM - 11:30 AM
ASME Board of Governors Meeting	Tuesday, November 10, 20	12:00 PM - 3:00 PM
ASME Philanthropic Impact 2020	Tuesday, November 10, 20	3:30 PM - 4:45 PM
Constitutive Equations Technical Committee Meeting	Tuesday, November 10, 20	4:45 PM - 5:45 PM
Advanced Energy Systems Division – Renewable Energy and Energy Conversion (REEC) Technical Committee Meeting	Tuesday, November 10, 20	5:00 PM - 6:00 PM
Electrochemical Energy Conversion and Storage Technical Committee Meeting	Tuesday, November 10, 20	5:30 PM - 6:30 PM
Fluids Engineering Division Opening Executive Committee Meeting (Closed Meeting)	Wednesday, November 11, 20	10:00 AM - 1:00 PM
Advanced Energy Systems Division Executive Committee and Technical Committee Chairs Meeting	Wednesday, November 11, 20	12:00 PM - 1:30 PM
ASME Public Affairs & Outreach Council Meeting	Wednesday, November 11, 20	3:00 PM - 5:00 PM
MEDHC Executive Committee	Wednesday, November 11, 20	4:00 PM - 5:30 PM
MDE Meeting	Thursday, November 12, 20	9:00 AM - 11:00 AM
Fluids Engineering Division Executive Committee and Technical Committee Chairs Meeting	Thursday, November 12, 20	10:00 AM - 11:30 AM
Fluids Engineering Division Fluid Mechanics Technical Committee Meeting	Thursday, November 12, 20	11:30 AM - 1:00 PM
Auxiliary Board Meeting (Closed Meeting)	Thursday, November 12, 20	11:30 AM - 2:30 PM
Materials for Biology and Medicine Technical Committee Meeting	Thursday, November 12, 20	1:00 PM - 2:00 PM
Fluids Engineering Division Computational Fluid Dynamics Technical Committee Meeting	Thursday, November 12, 20	1:00 PM - 2:30 PM
K-13 Committee on Heat Transfer in Multiphase Systems Open Meeting	Thursday, November 12, 20	4:00 PM - 5:00 PM
ME/MET Department Heads Open Mic Reception	Thursday, November 12, 20	4:00 PM - 5:30 PM
ECLIPSE/LDI/MLP Alumni Happy Hour	Thursday, November 12, 20	4:00 PM - 5:30 PM
Committee on Engineering Education (Closed Meeting)	Thursday, November 12, 20	5:00 PM - 9:00 PM
History & Heritage Committee Meeting (Day 1)	Friday, November 13, 20	9:00 AM - 12:00 PM

Meeting / Event Title	Day/Date	**Time** (NOTE - All times are in EASTERN TIME)
Fluids Engineering Division Multiphase Flow Technical Committee Meeting	Friday, November 13, 20	10:00 AM - 11:30 AM
MDE Meeting (Closed Meeting)	Friday, November 13, 20	10:00 AM - 12:00 PM
Materials Processing Technical Committee Meeting	Friday, November 13, 20	10:30 AM - 11:30 AM
IMECE Steering Committee Kick-Off Meeting (Closed Meeting)	Friday, November 13, 20	11:00 AM - 12:00 PM
Fluids Engineering Division Micro Nano Fluid Dynamics Technical Committee Meeting	Friday, November 13, 20	11:30 AM - 1:00 PM
Committee of Past Presidents (Closed Meeting)	Friday, November 13, 20	11:30 AM - 2:00 PM
Committee on Government Relations	Friday, November 13, 20	12:00 PM - 3:00 PM
Perkins Vapor-Compression Cycle Designation/2020 Engineer-Historian Award Presentation	Friday, November 13, 20	12:30 PM - 1:00 PM
Technical Committee Meeting on Nanomaterials for Energy	Friday, November 13, 20	1:00 PM - 2:00 PM
Fluids Engineering Division Honors and Awards Committee Meeting	Friday, November 13, 20	1:00 PM - 2:30 PM
Technical Committee Meeting of ASME-Materials Division: Multifunctional Materials	Friday, November 13, 20	1:30 PM - 2:30 PM
TEC Sector Council	Friday, November 13, 20	2:00 PM - 4:30 PM
Design, Materials and Manufacturing Segment Meeting	Friday, November 13, 20	4:30 PM - 6:30 PM
Technical committee on Publications & Communications (TCPC) (Closed Meeting)	Saturday, November 14, 20	8:00 AM - 12:00 PM
Oral Competition Sponsored by the Old Guard	Saturday, November 14, 20	8:30 AM - 2:00 PM
History & Heritage Committee Meeting (Day 2)	Saturday, November 14, 20	9:00 AM - 1:00 PM
From Engineer to Manager	Saturday, November 14, 20	10:00 AM - 11:00 AM
Fluids Engineering Division Fluid Applications and Systems Technical Committee Meeting	Saturday, November 14, 20	10:00 AM - 11:30 AM
Student & Early Career Development (SECD) Meeting	Saturday, November 14, 20	11:00 AM - 12:00 PM
Understanding the Engineering Hiring Process	Saturday, November 14, 20	11:30 AM - 12:30 PM
Fluids Engineering Division Fluid Measurement and Instrumentation Technical Committee Meeting	Saturday, November 14, 20	11:30 AM - 1:00 PM
Resume / CV Building	Saturday, November 14, 20	1:00 PM - 2:00 PM
Fluids Engineering Division Graduate Student Scholarship Committee	Saturday, November 14, 20	1:00 PM - 2:30 PM

Meeting / Event Title	Day/Date	**Time** (NOTE - All times are in EASTERN TIME)
Joint Board of Editors (BOE) / Technical Committee on Publications & Communications (TCPC) (Closed Meeting)	Saturday, November 14, 20	1:00 PM - 4:00 PM
Technical Committee Meeting: Design of Engineering Materials	Sunday, November 15, 20	9:30 AM - 10:30 AM
Fluids Engineering Division Towne Hall Meeting	Sunday, November 15, 20	10:00 AM - 11:30 AM
Management Division Executive Committee	Sunday, November 15, 20	10:00 AM - 11:30 AM
Heat Transfer Division Executive Committee (Closed Meeting)	Sunday, November 15, 20	11:00 AM - 1:30 PM
Old Guard Meeting	Sunday, November 15, 20	11:00 AM - 3:00 PM
GANTT MEDAL Committee	Sunday, November 15, 20	11:30 AM - 12:30 PM
Fluids Engineering Division Advisory Committee Meeting	Sunday, November 15, 20	11:30 AM - 1:00 PM
Heat Transfer Division Executive Committee Open Meeting	Sunday, November 15, 20	2:30 PM - 5:00 PM
K-6: Heat Transfer in Energy Systems Committee Meeting	Sunday, November 15, 20	4:00 PM - 5:00 PM
ASME Material Division Electronic Materials Technical Committee Meeting	Monday, November 16, 20	9:00 AM - 10:00 AM
NCAD Awards (Per Bruel Medal and Best Student Paper) and General Committee Meeting	Monday, November 16, 20	6:00 PM - 7:00 PM
ASME Annual Awards Event	**Monday, November 16, 20**	**7:00 PM - 8:15 PM**
ASME Annual Awards Reception	**Monday, November 16, 20**	**8:15 PM - 8:45 PM**
NEES (Nanoengineering Energy and Sustainability Meeting) IMECE 2020 Annual Meeting	Tuesday, November 17, 20	9:00 AM - 10:00 AM
Koiter Lecture	Tuesday, November 17, 20	6:00 PM - 6:50 PM
Advanced Manufacturing Track Topic Organizers Meeting	Tuesday, November 17, 20	6:00 PM - 7:00 PM
Heat Transfer Division Awards Meeting	Tuesday, November 17, 20	6:00 PM - 7:00 PM
Biomedical and Biotechnology Track Organisers Meeting	Tuesday, November 17, 20	6:00 PM - 7:00 PM
Women In Engineering Reception	Tuesday, November 17, 20	6:00 PM - 7:30 PM
K-9 Nanoscale Thermal Transport Phenomena Committee Meeting	Tuesday, November 17, 20	6:00 PM - 7:30 PM
Noise Control and Acoustics Division: Rayleigh Lecture	Tuesday, November 17, 20	6:15 PM - 7:00 PM
Applied Mechanics Division Awards Ceremony	Tuesday, November 17, 20	7:00 PM - 8:30 PM

Meeting / Event Title	Day/Date	Time (NOTE - All times are in EASTERN TIME)
ASME LGBTQ Pride Discussion: IMECE 2020	Wednesday, November 18, 2020	6:00 PM - 7:00 PM
Robert Henry Thurston Lecture	Wednesday, November 18, 2020	6:00 PM - 7:00 PM
K-10 Heat Transfer Equipment Committee	Wednesday, November 18, 20	6:00 PM - 7:00 PM
SER2AD Division Award Reception	Wednesday, November 18, 20	6:00 PM - 7:00 PM
ASME 2020 IMECE - Manufacturing Policy Forum	Wednesday, November 18, 20	6:00 PM - 8:00 PM
Fluids Engineering Division Awards Presentation	Thursday, November 19, 20	6:15 PM - 7:00 PM
Fluids Engineering Division Closing Executive Committee Meeting (Closed Meeting)	Friday, November 20, 20	10:00 AM - 11:30 AM
2021 IMECE Track Organizers and Co-organizers Meeting	Friday, November 20, 20	11:00 AM - 12:00 PM
Materials Division General Meeting	Friday, November 20, 20	11:00 AM - 12:30 PM
Fluids Engineering Division Closing Executive Committee and Technical Committee Chairs Meeting	Friday, November 20, 20	11:30 AM - 1:00 PM
IMECE Steering Committee Wrap-Up Meeting (Closed Meeting)	Friday, November 20, 20	12:30 PM - 1:30 PM
NDPD Executive Committee Meeting	Friday, November 20, 20	2:30 PM - 3:30 PM
Materials Division Executive Committee Meeting (Closed Meeting)	Friday, November 20, 20	5:00 PM - 6:30 PM

ASME 2020 IMECE – Manufacturing Policy Forum: SPECIAL EVENT

....An ASME Manufacturing Engineering Division (MED) Centennial Celebration Event
6:00 PM – 8:00 PM

This forum is being hosted by the IMECE/Advanced Manufacturing Track and co-sponsored by Manufacturing Engineering Division (MED) and ASME Manufacturing Public Policy Task Force (MPPTF) to bring awareness of ASME's role in U.S. Manufacturing Public Policy and the opportunities for ASME volunteers to make an impact. This panel will highlight ASME positions on various manufacturing public policy issues, and their importance to ASME members. Panelists will also share their experiences serving as Executive Branch and Congressional Fellows and how it impacted their careers and the Nation.

Moderator

Tom Kurfess
ORNL – Chief Mfg Officer; 2012 ASME Foundation Swanson Fellow at the Office of Science and Technology Policy (OSTP)

Panelists

Asha Balakrishnan
Science and Technology Policy Institute (STPI), Research Staff Member; 2019-2020 ASME Congressional Fellow – Subcommittee on Space & Aeronautics Committee on Science, Space, and Technology

Andy Bicos
Boeing – Retired; 2016-2017 ASME Congressional Fellow - Office of U.S. Congressman Tom Reed

Connie Lausten, P.E.
ASME Committee on Government Relations, Chair and 2000 ASME Congressional Fellow

Marc Santos
Isle Utilities; 2019 ASME Congressional Fellow – Office of U.S. Senator Chris Coons

Steven Schmid
Manufacturing Public Policy Task Force (MPPTF), Chair; 2012 ASME Foundation Swanson Fellow – Advanced Manufacturing National Program Office (AMNPO), NIST

Organizers

Shawn Moylan
NIST; 2017-2018 ASME Congressional Fellow – Office of U.S. Senator Gary Peters

Gloria Wiens
Manufacturing Engineering Division (MED) Centennial Planning Committee, Chair; 2012-2015 ASME Foundation Swanson Fellow – Advanced Manufacturing National Program Office (AMNPO), NIST

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https://event.asme.org/IMECE