



IMECE[®]

ONE GREAT LEARNING EXPERIENCE.
INTERNATIONAL MECHANICAL ENGINEERING
CONGRESS & EXPOSITION[®]

COMMITTEE
MEETINGS
& SPECIAL EVENTS
NOV 8–14, 2019

EXHIBITION
NOV 10–13, 2019

TECHNICAL
CONFERENCE
NOV 11–14, 2019

Calvin L. Rampton Salt Palace Convention Center,
Salt Lake City, Utah

2019 Program



<https://event.asme.org/IMECE>

The American Society of Mechanical Engineers[®]
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SETTING THE STANDARD

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THE UNIVERSITY OF
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ONLINE LEARNING



Jacqueline M. Biskupski Mayor

WHEREAS, presented by the American Society of Mechanical Engineers (ASME), the International Mechanical Engineering Congress and Exposition (IMECE) is the world's largest interdisciplinary mechanical engineering conference; and

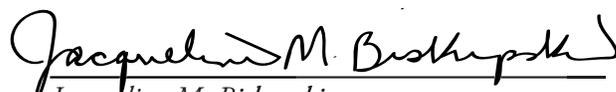
WHEREAS, IMECE will hold more than 400 sessions on 18 technical tracks exploring advanced manufacturing; advances in aerospace technology; biomedical and biotechnology engineering; engineering education; heat transfer and thermal engineering; dynamics, vibration and control; mechanics of solids, structures, and fluids; fluids engineering; design, reliability, safety, and risk; micro- and nanosystems engineering and packaging; and acoustics vibration and phononics; and

WHEREAS, IMECE will also feature 3 keynote presentations from distinguished leaders in the engineering community (Laura McGill, Dr. Steven Chu and Barbara Humpton), 21 track plenary presentations, student focused programming on Saturday, 3 technical tours (DARC Lab at the University of Utah, Boeing 787 Horizontal Stabilizer and Vertical Fin Assembly, and IM Flash), along with an exhibit hall, and 14 distinguished honorees, who will be celebrated at various luncheons and a special Annual Awards Dinner; and

NOW, THEREFORE, I, Jacqueline M. Biskupski, Mayor of Salt Lake City, do hereby proclaim November 8-14, 2019 as:

IMECE Week in Salt Lake City

Dated November 8, 2019


Jacqueline M. Biskupski
Mayor

Contents

WELCOME.....	iv
GENERAL INFORMATION	vii
FLOOR PLANS.....	xiii
SPECIAL EVENTS	xix
TRACK PLENARY	xxxiii
TECHNICAL PROGRAM AT-A-GLANCE.....	xlix
TECHNICAL PROGRAM.....	1
AUTHOR INDEX	218
COMMITTEE MEETING PROGRAM.....	271
EXHIBITOR PROGRAM	279

All travel photos courtesy of Visit Salt Lake (www.visitsaltlake.com)



Welcome from the Chairs

**ASME 2019 International Mechanical Engineering Congress and Exposition (IMECE),
November 10–14, 2019, Salt Lake City, Utah, USA**

Dear Distinguished Attendees:

Welcome to the ASME 2019 International Mechanical Engineering Congress and Exposition (IMECE) at Salt Lake City, Utah. We are excited about bringing together the International Mechanical Engineering community from academia, industry, and government to share advances in fundamental and applied research as well as innovation in education and technology. The 2019 conference includes 18 Technical Tracks with over 2,400 podium presentations and posters spanning a broad range of mechanical engineering interests relevant around the globe, from scientific research to education, to leadership development, to inspiring the next generation of mechanical engineers and scientists to contribute to our society. The IMECE technical program is a grass-root 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; we recognize our achievements, and we strategically plan for our future.

IMECE 2019 technical program will start on Sunday, November 10 with the Opening Reception and Conference Exhibit at 5:30 pm. Everybody is cordially invited to participate. Collocated with the reception we will host the Undergraduate Research and Design Expo that includes Student Design and Poster Competitions. Keynotes, Plenaries, and Technical sessions are tightly scheduled from Monday morning to Thursday afternoon.

We are delighted to feature three Keynote Presentations this year. We start our series with the Kick-off Keynote (Monday breakfast) by Laura McGill, Vice President of Engineering for Raytheon Missile Systems. Her talk will be on Converging Technology and Engineering to Meet Changing Global Needs. We continue the series with the Special Keynote (Tuesday breakfast) by Dr. Steven Chu, William R. Kenan, Jr., Professor of Physics Professor of Molecular & Cellular Physiology Stanford University Medical School, Former U.S. Secretary of Energy and Nobel Prize in Physics Co-Recipient. His lecture will be

on Climate Change and Innovative Paths to a Sustainable Future. Our series concludes with the Closing Keynote (Thursday lunch) by Barbara Humpton, Siemens USA CEO. Her presentation will be on Expanding What's Humanly Possible: The Real Purpose of Digital Technology. The Track Plenary Series will start on Monday and continue on Tuesday and Wednesday. Invited and contributed podium presentations will be held in parallel sessions from Monday through Thursday.

The National Science Foundation continues to support of IMECE by holding the CBET/CMMI Info Session, the One-on-One Session with NSF Program Directors, and the Workshop on Proposal Development. The NSF is funding the CBET/CMMI Student Competition with more than 200 applications from current CBET/CMMI graduate and undergraduate students All posters will be showcased during the general Poster Session on Wednesday during lunchtime addressing conference-wide areas of scientific research.

IMECE will also host many events for ASME divisions and committees, including the ME Department Heads Forum, Congress-Wide Symposia, the Heat Transfer Honors and Awards Luncheon and the Applied Mechanics Dinner among others. It will also host the inaugural Richard J. Goldstein Energy Lecture Award as a Special Keynote by Dr. Steven Chu. Special events for the 2019 include a new format for the Annual Award Banquet (formally denominated as Honors Assembly) on Monday; a Career Fair on Saturday co-organized with the ASME student chapters from the University of Utah, Brigham Young University, and Utah State University; the People's Choice Award Poster Competition on Sunday; the Early Career Program on Monday; and the Student Day and Networking event on Tuesday.

On behalf of the entire Conference Steering Committee, we thank all our mechanical engineering community for the exemplary dedication, passion and effort to make IMECE an open forum discussion, learning, and professional growth and development. A very special

thank you for the volunteer organizers including track chairs, topic and symposium organizers, session chairs, reviewers, and judges. We also extend our gratitude to the ASME staff for coordinating, supporting and running this extensive and multifaceted event.

We also thank Mayor Jaqueline M. Biskupski for her warm welcome to Salt Lake City. We are very pleased to add Salt Lake City as an IMECE host city. Since 2000, IMECE has been hosted in 18 different cities across the US and Canada.

We are looking forward to meeting you all at the 2019 IMECE!

Sincerely,



Stephen D. Tse
2019 Steering Committee Vice Chair
Rutgers – The State University of New Jersey



Francine Battaglia
2019 Steering Committee Chair
University of Buffalo



Alberto Cuitino
2019 IMECE Technical Program Chair
Rutgers – The State University of New Jersey



Rama Koganti
2019 Steering Committee Senate Chair
University of Texas Southwestern Medical Center



Chris Depcik
2019 Technical Program Vice Chair
University of Kansas



Assimina Pelegri
2019 Steering Committee Senate Member
Rutgers – The State University of New Jersey



Olesya I. Zhupanska
2019 IMECE General Conference Chair
University of Arizona



George Kardomateas
2019 Steering Committee Senate Member
Georgia Institute of T



NOTES



General Information

General Information



ASME (BOOTH 309)

Two Park Avenue
New York, NY 10016-5990 USA
+1 800-THE-ASME
(800-843-2763)
www.asme.org



ADDITIONAL APP INFORMATION

DOWNLOADING THE APP

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 6.0, or iOS older than version 10, you will need to use the web version of the app found here: <https://crowd.cc/imece2019>

2. After installing, the AttendeeHub icon will appear on your home screen.
3. Search the AttendeeHub for **imece2019** 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.

ASME is a not-for-profit membership organization that enables collaboration, knowledge sharing, career enrichment, and skills development across all engineering disciplines, toward a goal of helping the global engineering community develop solutions to benefit lives and livelihoods. Founded in 1880 by a small group of leading industrialists, ASME has grown through the decades to include more than 140,000 members in 151 countries

For more than 100 years, ASME has successfully enhanced performance and safety worldwide through its renowned codes and standards, conformity assessment programs, training courses, and journals.

ASME also produces nearly 40 international conferences. These industry-leading events feature advanced research and technical content spanning a range of industries impacted by mechanical engineering, including energy production, energy sources, advanced manufacturing, and engineering sciences.

While at IMECE, please take time to visit the ASME booth in the Exhibit Halls A & B on the first floor of the Salt Palace Convention Center for information about ASME's Transactions Journals, conference proceedings, ASME Press Books, Codes & Standards, and Catalogs. Representatives from ASME Publications, Sales, and Membership will be present to answer your questions.

ASME CROWD COMPASS ATTENDEE HUB APP

Download the ASME Crowd Compass Attendee Hub App and hold the entire program in the palm at your hand! The ASME Crowd Compass Attendee Hub App allows you to easily look up sessions, search for papers or people, message with other attendees, and create your own schedule. Be sure to download the app for the latest information and chances to win prizes.

ASME GIVE BACK PROJECT

Whether it's a day of appointments or an inpatient stay, waiting long hours in the hospital can take a toll on families. The Ronald McDonald Hospitality Cart hopes to make the long hours a little easier. This program aims to provide needed resources and comfort items to families directly in patient rooms and waiting areas. The Hospitality Cart can be found rolling through the halls stocked with hygiene and comfort items, a selection of healthy snacks, family-centered activities, games, and craft kits. These items are delivered with lots of love and a smile by their caring volunteers and staff.



Please consider donating any of the following items to make a real difference in families' lives. **Collection boxes will be located at the registration desks in both the convention center and the Marriott Hotel.** To learn more about the Ronald McDonald House Charities, please visit: www.rmhcslc.org

Individual Snacks

Granola & Protein Bars
Apple Sauce
Trail Mix
Crackers & Pretzels
Oatmeal
Goldfish Crackers

Hygiene Products (travel size)

Shampoo & Conditioner
Toothpaste & Toothbrushes
Deodorant
Lotion & Hand Sanitizer
Soap/Shower Gel
Baby Wipes

Entertainment

Coloring Books & Crayons
Children's Books
Card Games
Individual Toys & Games
Journals/Notebooks
Colored Pencils

AUTHORS

SPEAKERS' PRACTICE ROOM

Room 253A on the second floor of the Salt Palace Convention Center is the Authors'/Speakers' Practice Room. The schedule is Monday–Thursday, November 11–14, 7:00AM–5:00PM. The room is equipped with two (2) LCD projectors, (2) laptop computers, and two (2) screens for authors/speakers to practice their presentations.

SCANNING

All authors are required to have their badge scanned before entering a technical session. Only fully registered authors are allowed to attend plenary and technical sessions.

AUDIOVISUAL EQUIPMENT IN SESSION ROOMS

All technical sessions are equipped with one LCD projector, one laptop, one screen, and a slide advance. You may bring your presentation on USB flash drive and load onto the laptop in the session room.

BADGES ARE REQUIRED FOR ADMISSION TO ALL ACTIVITIES

All conference attendees must wear their official IMECE 2019 conference badge in order to gain admission to conference sessions/events/activities. No one will be admitted to the technical sessions unless he/she is registered and is wearing a badge that shows "Full Conference."

BUSINESS CENTER

The business center located in the convention center has limited hours. There is a FedEx Office Print & Ship Center located just two blocks away from the convention center at 19 E 200 S, Salt Lake City, UT 84111. Services include, but are not limited to, laser and color printing, document scanning, and ground/air shipping. For more information you can contact this location at (801) 533-9444.

Hours of Operation

Monday–Sunday
24 hours a day

CHILDCARE SERVICES

We are pleased to once again offer childcare reimbursement for attendees of IMECE 2019. For those who need childcare services, ASME will reimburse up to a total of \$250 per registered attendee for services incurred by a licensed service provider in Salt Lake City, UT. This offering will be available November 8–14 between the hours of 8:00AM and 5:00PM.

To be reimbursed, you must complete the **ASME Volunteer Travel Expense Contribution** form (found on the IMECE conference website under the "About" section). All requests for reimbursements must be received by ASME, with itemized receipts, no later than **November 29, 2019**.

If you have questions related to this benefit, please contact Melissa Carl at carlm@asme.org or Clare Bruff at bruffc@asme.org

Below is a list of local companies.

NOTE: ASME suggests you may wish to consult with your local hotel concierge for licensed service provider suggestions.

Guardian Angel Babysitting

<https://www.guardianangelbaby.com/>

Phone: (435) 640-1229

Find a Babysitter

<https://www.sittercity.com/babysitters/ut/salt-lake-city>

CONTINENTAL BREAKFAST

Continental breakfast will be served on Monday, November 11, and Tuesday, November 12, prior to the keynote presentations in Ballroom B; and on Wednesday, November 13, and Thursday, November 14, in the North Foyer (outside of Ballroom AB) of the Salt Palace Convention Center. Fully paid attendees are entitled to attend. The schedule is as follows:

Monday, November 11	7:30AM–8:00AM	*Ballroom B
Tuesday, November 12	7:30AM–8:00AM	*Ballroom B
Wednesday, November 13	8:00AM–8:45AM	*North Ballroom Foyer (outside of Ballroom AB)
Thursday, November 14	7:30AM–8:00AM	*North Ballroom Foyer (outside of Ballroom AB)



EMERGENCY INFORMATION

Alert convention center staff by picking up a house phone to report a medical or security emergency. Describe the exact location of the incident and the nature of the emergency. Whenever an emergency situation is detected and announced, everyone is expected to evacuate the facility and safely assemble outside until the "All Clear" is given. The designated area to assemble outside the building is the lobby of the City Creek Marriott across the street on 100 South West Temple.

General Information



EXHIBITS INFORMATION

The exhibits are located in Halls A & B on the first floor of the Salt Palace Convention Center. The expo hall is your social hub! Be sure to visit the exhibitors and check out the University of Maryland Education Theater, poster sessions and lounge. The exhibit hours are as follows:

Sunday, November 10
5:30PM–7:00PM

Monday, November 11
12:00PM–5:00PM

Tuesday, November 12
12:00PM–4:00PM

Wednesday, November 13
12:00PM–4:00PM

GUEST HOSPITALITY & FAMILY MEETING ROOM

The Guest Hospitality & Family Meeting Room is located in the Destinations Lounge, on the first floor of the Salt Lake Marriott Downtown at City Creek Hotel. The schedule is as follows:

Sunday, November 10	7:00AM–9:00AM
Monday, November 11	7:00AM–9:00AM
Tuesday, November 12	7:00AM–9:00AM
Wednesday, November 13	7:00AM–9:00AM

BADGES ARE REQUIRED FOR ADMISSION

LUNCH

Conference lunches will be served Monday–Wednesday, November 11–13, in Halls A & B of the Salt Palace Convention Center. On Thursday, November 14, lunch is served in Ballroom B. Fully paid attendees are entitled to attend. The schedule is as follows:

Monday, November 11	12:30PM–1:30PM
Tuesday, November 12	12:30PM–1:30PM
Wednesday, November 13	12:30PM–1:30PM
Thursday, November 14	12:15PM–1:45PM

MEETING INFORMATION

Main meeting information is located on the 2nd floor of the Salt Palace Convention Center. The operating hours are:

Sunday, November 10	7:00AM–6:00PM
Monday, November 11	7:00AM–6:00PM
Tuesday, November 12	7:00AM–6:00PM
Wednesday, November 13	7:00AM–6:00PM
Thursday, November 14	7:00AM–5:45PM

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.

MOTHER'S ROOM

ASME has arranged a dedicated space for parents of newborns/infants to be used as a private area for nursing mothers. The Mother's Room is located in room 252A on the second level. Please be sure to knock before entering.

OPENING RECEPTION

Exhibit Hall Grand Opening and Opening Reception

Sunday, November 10

5:30PM–7:00PM

Halls A & B, Salt Palace Convention Center

All registrants are invited to this special event to celebrate the opening of the IMECE exhibits. Come grab a drink and some food, meet this year's group of exhibitors, and learn about their products and services.

Be sure to attend the **Undergraduate Poster winner announcements** at the University of Maryland Theater at 6:15PM. Join us for the presentation of this year's ASME Engineer-Historian Award to **Dr. Teun Koetsier** for his work entitled, "The Ascent of GIM, the Global Intelligent Machine – A History of Production and Information Machines". Presentation of this award will be at the University of Maryland Theater at 6:30PM.

POSTER PRESENTATIONS

Poster presentations will be held at the following times:

Sunday, November 10

5:30PM–7:00PM

Halls A & B, Salt Palace Convention Center

Undergraduate Research and Design Expo Student Poster Competition

Poster Setup:	1:00PM–4:00PM
Judging:	4:00PM–6:15PM
Expo (General Viewing):	5:30PM–7:00PM
Winners Announced:	6:15PM–6:30PM

People’s Choice Award

Vote for your favorite poster on Sunday, November 10, from 5:30-7:00PM and Monday, November 11, from 12:00–1:00pm. Look for the voting stations near the poster section in Exhibit Halls A&B. All posters (Undergraduate Research and Design Expo Student Poster Competition, NSF Student Competition, and Virtual Podium) will be considered! Two winners will each receive \$500. Winners will be notified following the 1:00PM drawing on Monday and must be available 1:30–3:00PM for an interview as well as present at the Annual Awards Dinner in the evening.

Poster Setup:	1:00PM–4:00PM
Voting:	5:30PM–7:00PM – Sunday 12:00PM–1:00PM – Monday

Wednesday, November 13

12:00PM–2:30PM

Halls A & B, Salt Palace Convention Center

NSF Student Competition (Posters Only)

*Poster Setup	9:00AM–10:00AM
Judging	10:30AM–1:45PM
General Viewing	12:00PM–2:30PM
Awards	1:45PM–2:15PM

Virtual Podium (Posters Only)

*Poster Setup	9:00AM–10:00AM
Judging	10:30AM–1:45PM
General Viewing	12:00PM–2:30PM

If you are participating in the People’s Choice Poster Award contest, you must set up your poster on Sunday, November 10, from 1:00–4:00PM.

PRAYER ROOM

Room 253B on the second floor of the Salt Palace Convention Center is exclusively for those who need to pray in between sessions. There will be dividers in the room to create a semi-private space.

PRESENTER ATTENDANCE POLICY

According to ASME’s Conference Presenter Policy, if a paper is not presented at the Conference by a fully registered author of the paper, the paper cannot be published in the official archival Proceedings, which are published on The ASME Digital Collection post-conference. Papers not presented at the conference cannot be cited.

PUBLICATIONS: IMECE2019 CONFERENCE PAPERS AND PROCEEDINGS

Technical papers accepted for publication for IMECE2019 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 to their personal computer systems.



PHOTOGRAPHY

ASME has retained the services of a photographer to capture photo images of the events and activities from the conference. The photographer will be taking photos as assigned by the ASME Communications Department. All photographs are the sole property of ASME, and ASME retains all rights in and to said photographs. These photographs may be used for promotional purposes only, including, but not limited to, the ASME website. If you require more information about the use of IMECE photographs, please go to the media desk at Conference Registration.



SOCIAL MEDIA

Let’s be social! We encourage you to use the hashtag **#IMECE2019** to tag your social media posts and photos throughout the conference.

General Information

- 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, and several other indexing and discovery services. For further information about ASME Publications, please stop by the ASME Booth at the Exhibit Hall.



WIFI

Free Wi-Fi access is provided to IMECE conference attendees throughout the **Salt Palace Convention Center**. Free Wi-Fi access is also provided in the hotel rooms at the Salt Lake Marriott Downtown at City Creek Hotel and the Hilton Salt Lake City Center Hotel. To access the Wi-Fi in the convention center and the Marriott Hotel use these credentials (passwords are case sensitive):

Salt Palace Convention Center
Network: IMECE
Password: imece2019

Salt Lake Marriott Downtown at City Creek Hotel
Network: IMECE
Password: imece2019

REFRESHMENT BREAKS

Morning Break – North Ballroom Foyer & Foyer by Room 257

Monday, November 11	10:30AM–10:45AM
Tuesday, November 12	10:30AM–10:45AM
Wednesday, November 13	10:30AM–10:45AM
Thursday, November 14	10:00AM–10:15AM

Afternoon Break – Exhibit Halls A & B unless otherwise noted

Monday, November 11	3:45PM–4:00PM	
Tuesday, November 12	3:45PM–4:00PM	
Wednesday, November 13	3:45PM–4:00PM	
Thursday, November 14	3:45PM–4:00PM	*North Ballroom Foyer & Foyer by Room 257

REGISTRATION

Conference registration is located in the East Lobby on the second floor of the Salt Palace Convention Center. The operating hours are:

Sunday, November 10	7:00AM–6:00PM
Monday, November 11	7:00AM–6:00PM
Tuesday, November 12	7:00AM–6:00PM
Wednesday, November 13	7:00AM–6:00PM
Thursday, November 14	7:00AM–5:45PM

Registration for committee meetings and special events is located on the first floor of the Salt Lake Marriott Downtown at City Creek Hotel. The operating hours are:

Friday, November 8	8:00AM–5:00PM
Saturday, November 9	7:00AM–6:00PM
Sunday, November 10	7:00AM–6:00PM
Monday, November 11	7:00AM–6:00PM
Tuesday, November 12	7:00AM–6:00PM
Wednesday, November 13	7:00AM–6:00PM

TECHNICAL SESSIONS

All attendees are required to have their badge scanned before entering a technical session. Only fully registered conference attendees are allowed to attend plenary and technical sessions.

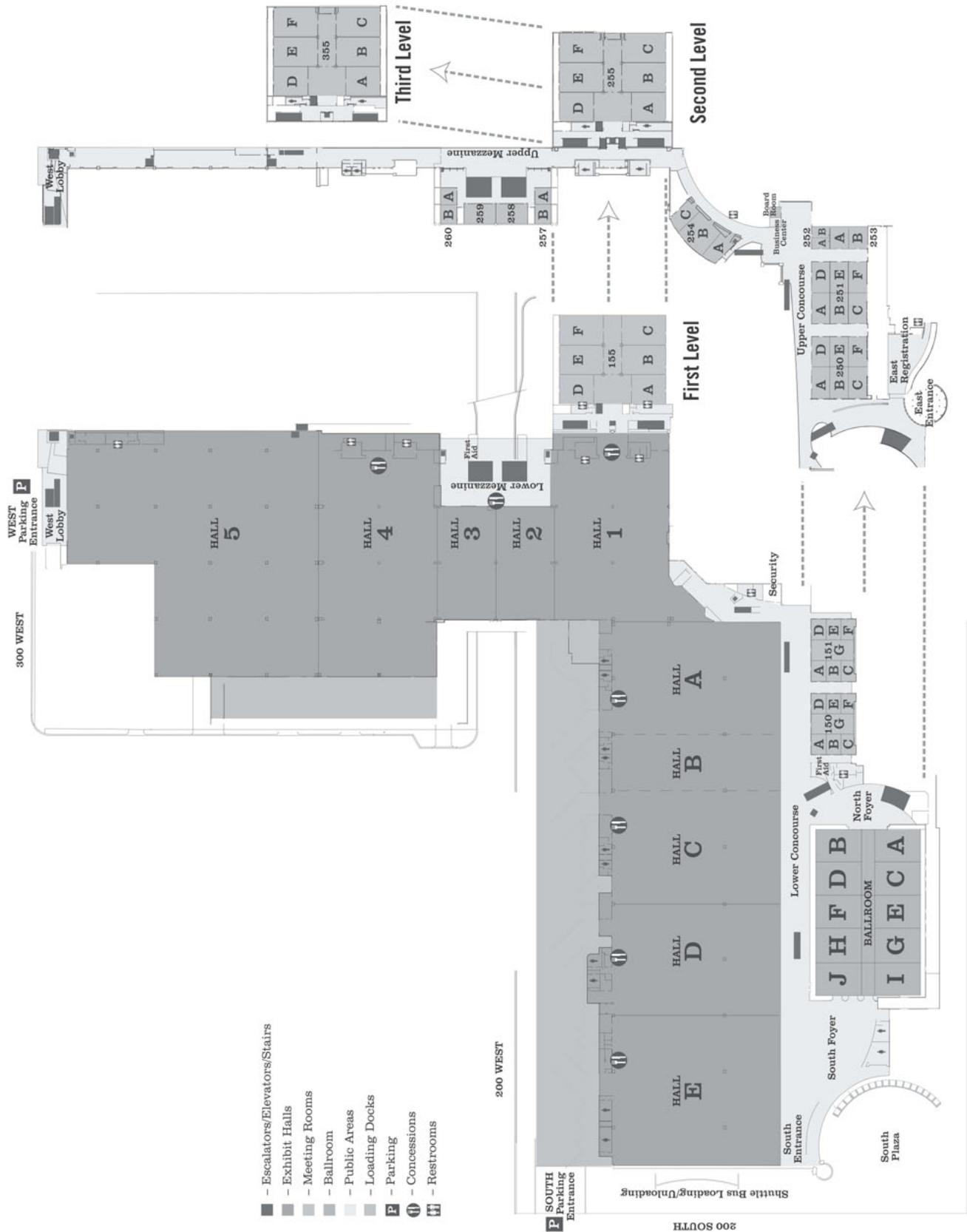
TICKET SALES

Many division and society awards are given at IMECE. Tickets for these functions may be purchased on-site at the ASME Registration Desk. Please purchase tickets as soon as possible after you register in order to avoid disappointment. In order to ensure accurate guarantees, it is possible that tickets may not be sold or available up to 48 hours prior to the event.



Floor Plans

CALVIN L. RAMPTON SALT PALACE CONVENTION CENTER

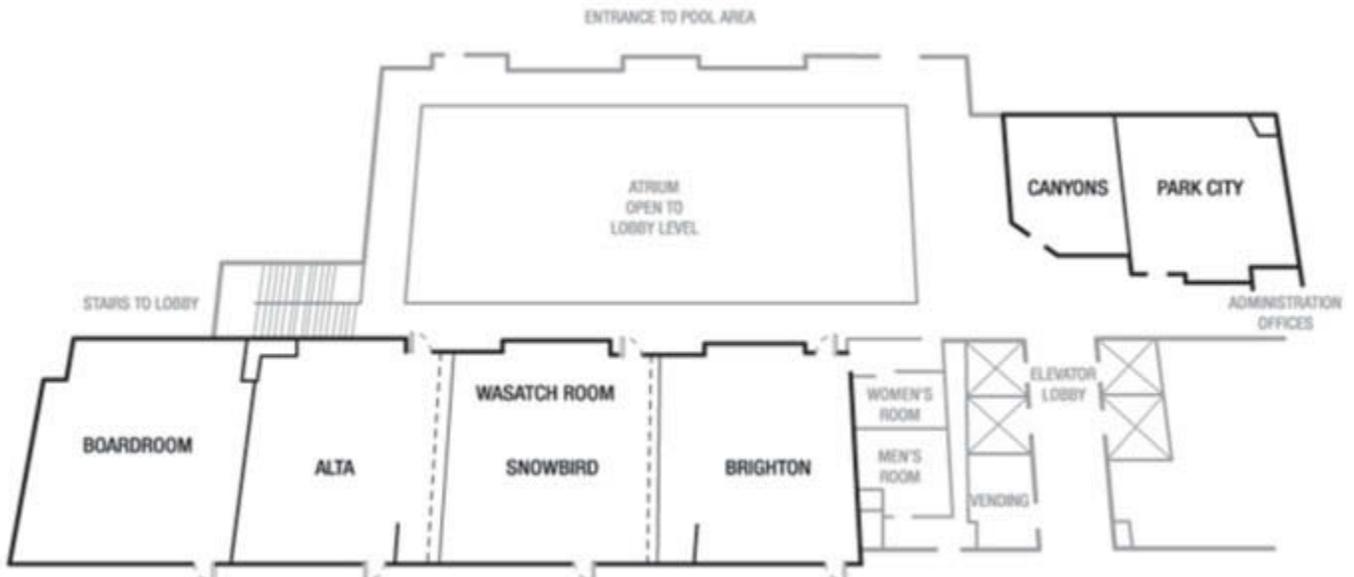


Floor Plans

SALT LAKE MARRIOTT DOWNTOWN AT CITY CREEK HOTEL – FIRST FLOOR



SALT LAKE MARRIOTT DOWNTOWN AT CITY CREEK HOTEL – SECOND FLOOR



GUEST TOURS

Sunday, November 10, 9:30AM–12:30PM
Historic Salt Lake City Tour – SOLD OUT
Price: \$50

Enjoy Salt Lake City’s most popular tour: a 30-mile adventure that provides insight into the City’s rich history. During this private tour, a knowledgeable guide will cover top attractions that include:

- Temple Square, historic buildings, statues, fountains
- State Capitol Building, with its majestic architecture
- Old Mormon Pioneer Trail & Pioneer Heritage Museum
- This is The Place Monument
- Brigham Young’s mansion, the Lion House
- Historic District mansions and cathedrals
- Pony Express Station & Old Fort Douglas Union Pacific Depot, Trolley Square, Olympic Stadium & Village

Please plan to board the bus at 9:15AM. Tours will depart promptly at 9:30AM. Bus(es) will be located along the side of the Salt Lake Marriott Downtown at City Creek Hotel at 100 South Street (between Main Street and West Temple).

Monday, November 11, 8:30AM–12:30PM
Temple Square and Genealogy Tour
Price: \$65

The temple is a worldwide icon of the Church of Jesus Christ of Latter-day Saints and the heart of Temple Square. Constructed in a neo-gothic style over the course of an astounding 40-year period between 1853 and 1893, the pioneers who settled the valley sacrificed both time and material goods to the building of the temple, which stands as a testament to their faith and devotion. The tour will lead guests through the grounds to admire the stunning workmanship of the building and the serene beauty of its immediate surroundings. Enjoy access to the research workshop for the opportunity to discover your roots in the world’s largest storehouse of family records, the Family History Library.

Please plan to board the bus at 8:15AM. Tours will depart promptly at 8:30AM. Bus(es) will be located along the side of the Salt Lake Marriott Downtown at City Creek Hotel at 100 South Street (between Main Street and West Temple).



**ALL TOUR BUSES
LEAVE FROM THE
SIDE OF THE SALT
LAKE MARRIOTT
DOWNTOWN AT CITY
CREEK HOTEL AT
100 SOUTH STREET
(BETWEEN MAIN
STREET & WEST
TEMPLE).**





**ALL TOUR BUSES
LEAVE FROM THE
SIDE OF THE SALT
LAKE MARRIOTT
DOWNTOWN AT CITY
CREEK HOTEL AT
100 SOUTH STREET
(BETWEEN MAIN
STREET & WEST
TEMPLE).**

TECHNICAL TOURS

Monday, November 11, 1:30PM–3:00PM

DARC Lab Tour at The University of Utah

Price: \$25

This 1.5-hour tour will introduce you to the faculty and research of the University of Utah Robotics Center (UURC). The Center consists of faculty and graduate students from the School of Computing and the Department of Mechanical Engineering, with a curriculum that imparts fundamental knowledge about robotics and specific courses in perception, cognition, and action. Faculty expertise is especially strong in the design of novel robot systems, including rehabilitation robotics, surgical robots, micro robots, aerial vehicles, precision positioning, and bio-inspired locomoting mechanisms, actuators, and sensors. This tour will include visits to the Telerobotics Lab directed by Prof. Jake Abbott, the DARC Lab directed by Prof. Kam K. Leang, the Bionic Engineering Lab directed by Prof. Tomasso Lenzi, as well as other labs within the Center. For more information about the Center, please see <http://robotics.coe.utah.edu>.

Please plan to board the bus at 1:00PM. Tour will depart at 1:15PM and will arrive back to the Marriott City Creek at approximately 3:30PM. Bus will be located along the side of the Salt Lake Marriott Downtown at City Creek Hotel at 100 South Street (between Main Street and West Temple).

Wednesday, November 13, 8:00AM–9:30AM

Boeing 787 Horizontal Stabilizer and Vertical Fin Assembly Tour – **SOLD OUT**

Price: \$25

Boeing's relationship with Utah began in 1927 when a Boeing Air Transport touched down in Salt Lake City. The state was a stop along an air route between Chicago and San Francisco. Since then, Utah has become a hub for Boeing business. Today, facilities provide specialized parts for Boeing Commercial Airplanes and vital services for the company's defense customers. The oldest facility, near the Salt Lake City airport, has been in operation for more than 31 years. This tour will lead guests through the Boeing facility where it assembles vertical fins and horizontal stabilizers for the 787 Dreamliner.

Please plan to board the bus at 7:15AM. Tour will depart at 7:30AM and will arrive back to the Marriott City Creek at approximately 10:00AM. Bus will be located along the side of the Salt Lake Marriott Downtown at City Creek Hotel at 100 South Street (between Main Street and West Temple).

Wednesday, November 13, 9:30AM–11:00AM

IM Flash Tour

Price: \$25

IM Flash was formed in 2006 to manufacture non-volatile memory for Intel Corporation and Micron Technology, Inc. IM Flash produces 3D XPoint used in data centers and high-end computers. This walking tour will showcase the amazing technology that goes into making memory chips.

Please plan to board the bus at 8:15AM. Tour departs at 8:30AM and will arrive back to the Marriott City Creek at approximately 12:00PM. Bus will be located along the side of the Salt Lake Marriott Downtown at City Creek Hotel at 100 South Street (between Main Street and West Temple).

Thursday, November 14, 9:30AM–11:00AM

IM Flash Tour – **SOLD OUT**

Price: \$25

IM Flash was formed in 2006 to manufacture non-volatile memory for Intel Corporation and Micron Technology, Inc. IM Flash produces 3D XPoint used in data centers and high-end computers. This walking tour will showcase the amazing technology that goes into making memory chips.

Please plan to board the bus at 8:15AM. Tour departs at 8:30AM and will arrive back to the Marriott City Creek at approximately 12:00PM. Bus will be located along the side of the Salt Lake Marriott Downtown at City Creek Hotel at 100 South Street (between Main Street and West Temple).

ASME LANDMARK

ASME Landmark #212 – EIMCO Rocker Shovel Loader, Model 12B located in nearby Park City, Utah

In 1938 the Rocker Shovel Loader was the first successful mining device to replace human labor in removing the rubble from underground hard-rock blasting.

The Rocker Shovel Loader 12B provided a significant boost to underground mining productivity by emulating the movements of the human “mucker,” the laborer who removed rubble, or “muck,” from underground mines, particularly in and narrow mine tunnels. Designed in the late 1930s by Edwin Burt Royle and John Spence Finlay, employees of the Anaconda Mining Company, the first working machine was called an “overshot loader.” Both men worked for the North Lilly Mine in Ureka, Utah, in the 1920s and early 1930s. Apparently prior to 1931, their machine had a heavy bucket attached to a rail car by two moveable rocker arms, and the car had air-motor powered wheels to push it into the rubble. In 1931, Joseph Rosenblatt of EIMCO, Salt Lake City, met Royle and Findlay, and shortly thereafter, Royle joined EIMCO as a consultant and designer. Where the first machine had been constructed from discarded Model T parts, EIMCO then developed it into the Model 12B that sold thousands.

Landmark Location

United Park City Mines Company
Miners Plaza in historic Old Park City
Park City, Utah

Visiting Info

Miner’s Plaza, or Miner’s Park, as it is called in Park City, is located on Main Street between the Crosby Collection Building, located at 419 Main Street, and Shirt Off My Back, located at 405 Main Street. The park is open from 7:00AM to 8:00PM, Monday through Saturday, and from 8:00AM to 5:30PM on Sunday. The park is free and open to the public!



**** Share your photos
of these engineering
marvels with the hashtag
#ASMELandmarks ****



Special Events

Special Events SATURDAY

SATURDAY, NOVEMBER 9

2019 Student Design Competition Finals @ IMECE Salons FGHI, 1st Floor, Salt Lake Marriott Downtown at City Creek Hotel

The 2019 Student Design Competition has challenged the imagination and technical design skills of all its participants. At the Finals on Saturday, November 9, teams who've participated in an SDC held at each E-Fest this year will compete against each other in a modified, pick-and-place competition. These teams will come equipped with a strategic game plan, robot(s), and a will to battle it out for the Championship Title.

SCHEDULE

8:00AM–8:30AM	Team Arrivals and Check-In
8:30AM–9:30AM	Robot Inspections
9:30AM–12:30PM	Practice & Preliminary Rounds
12:30PM–1:30PM	LUNCH BREAK
1:30PM–4:30PM	Secondary & Semi Final Rounds
4:30PM–5:00PM	FINALS

Old Guard Oral Presentation Competition 8:30AM–5:00PM Deer Valley I & II, 1st Floor, Salt Lake Marriott Downtown at City Creek Hotel

All are invited to attend the finals of the Society-level Old Guard Oral Presentation Competition. Meet the engineering students who have successfully competed at the 2019 E-Fests 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/>

VOLT Leadership Workshop IMECE 2019

4:30PM–6:30PM
Solitude, 1st Floor,
Salt Lake Marriott Downtown at City Creek Hotel

Your Next Volunteer Position: Navigating Your ASME Volunteer Pathway

Volunteers are essential to ASME's success. By being a volunteer you can share your skills and expertise in support of ASME's mission, while also developing strengths that will serve you outside ASME. In this workshop, we will explore different volunteer pathways, including leadership positions in ASME, and help you chart your path forward to your next volunteer position. Seasoned volunteers who have successfully forged a path to leadership roles are encouraged to participate and share their own tips for advancing in ASME and making the most of the volunteer experience.

Connect Presentation & Career Fair

5:00PM–7:30PM
Salons DE, 1st Floor,
Salt Lake Marriott Downtown at City Creek Hotel

This year IMECE will be hosting a Career Fair geared towards Undergraduate and Graduate students and Early Career Engineers looking for new opportunities. We invite you to join us for the Connect Reception and Career Fair where you can find out how to get involved with ASME, celebrate as we give out awards and network with companies looking to hire engineers. Join ASME Executive Director/CEO Tom Costabile and special guests at the ASME Connect Event @ IMECE 2019. This roundtable discussion followed by Q&A will be focused around the importance of student engagement, the benefits of professional membership and collaboration. Learn more about what ASME has to offer, the future of the society, and your role in its success.

IMECE and the ASME Student chapters from the University of Utah, Brigham Young University, and Utah State University are hosting a Career Fair open to undergraduate and graduate students from the region and those attending IMECE events. The Career Fair will be held together with the Connect Reception and Awards Presentations. Join us for this exciting event where top engineering students and early career professionals can network with leading companies in the engineering community

SUNDAY, NOVEMBER 10

ASME Business Meeting

**8:00AM–8:30AM
Salon E, 1st Floor,**

Salt Lake Marriott Downtown at City Creek Hotel

Call to order by Richard Laudenat, ASME President, 2019–2020

- Report by the Treasurer
- Membership Report
- 2018–2019 Annual Report
- State of the Society Video
- Report on Proxies Received
- Ratification of Auditor
- Election of 2020 Nominating Committee
- Other Business

IMECE First-Time Attendees Orientation

**2:30PM–3:30PM
Room 151G, 1st Level,**

Calvin L. Rampton Salt Palace Convention Center

First-time attendees to IMECE are cordially invited to this informal yet informative session to learn about how to navigate the conference, how to use the program, the new App, and more importantly, where all the best parties are. Snacks and refreshments will be served.

Exhibit Hall Grand Opening and Opening Reception

**5:30PM–7:00PM
Halls A & B, 1st Level,**

Calvin L. Rampton Salt Palace Convention Center

All registrants are invited to this special event to celebrate the opening of the IMECE exhibits. Come grab a drink and some food, meet this year’s group of exhibitors, and learn about their products and services.

International Undergraduate Research and Design Exposition

**5:30PM–7:00PM
Halls A & B, 1st Level,
Calvin L. Rampton Salt Palace Convention Center**

Poster Setup:	2:30PM–3:30PM
Expo (General Viewing):	5:30PM–7:00PM
Winners Announced:	6:30PM–7:00PM

The Student Expo provides undergraduate engineering students with a professional and technical forum for presenting their research, design project, and other engineering solutions and endeavors to top researchers and scientists from academia, industry, government, prospective employers, entrepreneurs graduate schools, and potential faculty advisors.



Special Events MONDAY

MONDAY, NOVEMBER 11

Keynote Event

8:00AM–9:30AM
(breakfast served from 7:30AM to 8:00AM)
Ballrooms ABCD, 1st Level,
Calvin L. Rampton Salt Palace Convention Center

Keynote Speaker: Laura McGill, *Vice President of Engineering, Raytheon Missile Systems*

“Converging Technology and Engineering to Meet Changing Global Needs”



Presenter Biography: **Laura McGill** is the Vice President of Engineering at Raytheon Missile Systems, an \$8.3B business of Raytheon Corporation, having previously served as the Deputy VP. From 2007 through 2011, she was the Product Line Chief Engineer for

Air Warfare Systems, for which she was responsible for all engineering activities and technical performance of a \$2B portfolio of Air-to-Air Missiles, Precision-Strike Air-to-Ground Weapons, and Tomahawk Cruise Missiles. Her earlier assignments included a progression of Program Director and Chief Engineer positions, including AMRAAM (Advanced Medium Range Air-to-Air Missile) Deputy Director and Chief Engineer of Tomahawk Cruise Missiles. She was named a Principal Engineering Fellow in 2010. Laura is an adjunct lecturer for Raytheon’s onsite M.S. in Systems Engineering program with Johns Hopkins Whiting School of Engineering. She is a Lifetime Fellow of the AIAA and has served on the Board of Directors as the Vice-President of Technical Activities, Standards and as Treasurer. She serves on numerous academic and research foundation advisory boards, and she was elected to the National Academy of Engineering in Feb. 2019.

ME/MET Department Heads Forum

1:30PM–3:30PM
Salon F, 1st Floor,
Salt Lake Marriott Downtown at City Creek Hotel

The Department Heads Forum is an annual event at the ASME Congress for mechanical engineering and mechanical engineering technology department heads. The forum is a chance to learn about some of the latest research funding developments, curricular innovations, accreditation issues, and upcoming ASME Engineering Education activities.

Early Career Program

ASME FutureME Mini-Talks & Social Meetup
Presented by the ASME Early Career Engineers Programming Committee

3:00PM–5:00PM
Halls A & B, 1st Level,
Calvin L. Rampton Salt Palace Convention Center

Join the ASME FutureME community for an opportunity to network and hear from experienced engineers as they present short inspirational talks!

At this social event, our Mini-Talks presenters will share their personal stories and experiences in career development. Our speakers range from a variety of backgrounds and experiences, and you will learn how they became successful in their fields. The Mini-Talks will offer best practices and advice that may be applicable to your own individual careers and aspirations. All Mini-Talk sessions will be followed by a Q&A session.

In addition to the Mini-Talks, you will have the opportunity to meet new people from across the globe and practice your networking skills through a fun and interactive group activity. You will also have the chance to speak one-on-one with our guests, speakers, and other experienced early career engineers and broaden your network.

Your Network is Your Net Worth!

Cupcakes and ice cream will be served. Prizes will be awarded.

Meet new people • Join a community of like-minded engineers • Learn from others in engineering • Share experiences

2019 ASME Annual Awards Dinner: *Celebrating Engineering Achievement*

6:30PM–9:30PM
Pre-Dinner Reception at 6:00PM
Ballrooms EFGHIJ, 1st Level,
Calvin L. Rampton Salt Palace Convention Center

Tickets are available at \$55.00 and \$20.00/Students and must be purchased by November 9.

ASME presents the 2019 Annual Awards Dinner (formerly known as the Honors Assembly), an event of celebration to pay tribute to the careers of outstanding engineering leaders, along with other special award recognitions, dinner, and entertainment.

This year, ASME will introduce the *People’s Choice Poster Awards* – to recognize the top two presenters from the Undergraduate Student Expo, NSF and Virtual Podium poster presentations.

The Award winners will be voted on by the IMECE registrants.



Special guest Master of Ceremonies will be Mo Rocca, CBS News correspondent best known for his off-beat news reports and satirical commentary. He is the host of The Henry Ford's Innovation Nation and the Cooking Channel's Emmy nominated show

My Grandmother's Ravioli.

Live entertainment by America's Favorite Speed Painter and international performer Dan Dunn PaintJam! Plus, performances by 2016 *America's Got Talent* finalist, Sal "The Voice" Valentinetti. Enjoy the music of extraordinarily gifted and talented 11-year old violinist Karolina Protsenko.

AWARD HONOREES

Reginald I. Vachon, ASME Medal



Established in 1920, the ASME Medal is the highest award that the Society can bestow in recognition of eminently distinguished engineering achievement.

Bilal M. Ayyub, Honorary Member



Honorary Membership has come to be regarded as recognition of a lifetime of service to engineering or related fields.

Amir Faghri, Honorary Member



Honorary Membership has come to be regarded as recognition of a lifetime of service to engineering or related fields.

D. Yogi Goswami, Honorary Member



Honorary Membership has come to be regarded as recognition of a lifetime of service to engineering or related fields.

Margaret G. McCullough, Henry Laurence Gantt Medal



The Henry Laurence Gantt Medal is given for distinguished achievement in management and for service to the community.

Steven Chu, Richard J. Goldstein Energy Lecture Award



This award is presented in recognition of pioneering contribution(s) to the frontiers of energy leading to a breakthrough(s) in existing technology, leading to new applications or new areas of engineering endeavor, or leading to policy initiatives.

Sandy Karam, Charles T. Main Student Leadership Award – Gold



The award recognizes Student Members whose leadership and service qualities have contributed, for a period of more than one year, to the program and operation of a Student Section of the Society.

Kevin G. Bowcutt, Spirit of St. Louis Medal



The Spirit of St. Louis Medal is awarded for meritorious service in the advancement of aeronautics and astronautics.

SPECIAL RECOGNITION

Michael Merker, Melvin R. Green Codes & Standards Medal



This award is presented in recognition of contributions to the development, promulgation, or management of documents, objects, or devices used in ASME programs of technical codification standardization and conformity assessment.

DON'T MISS THIS OUTSTANDING IMECE EVENT!

Special Thanks

The ASME Committee on Honors
Mechanical Engineering magazine

Special Events TUESDAY

TUESDAY, NOVEMBER 12

Keynote Event

8:00AM–9:00AM
(breakfast served from 7:30AM to 8:00AM)
Ballrooms ABCD, 1st Level,
Calvin L. Rampton Salt Palace Convention Center

Keynote Speaker: Dr. Steven Chu

Nobel Prize in Physics Co-Recipient
ASME 2019 Richard J. Goldstein Energy Lecture Award Recipient
William R. Kenan, Jr., Professor of Physics
Professor of Molecular & Cellular Physiology
Stanford University Medical School
Former U.S. Secretary of Energy

“Climate Change and Innovative Paths to a Sustainable Future”



Presenter Biography: **Steven Chu** is the William R. Kenan, Jr., Professor of Physics and Professor of Molecular & Cellular Physiology in the Medical School at Stanford University. He is President of the American Association for the Advancement of Science, the world's

largest multidisciplinary scientific society and the publisher of the Science family of journals. He has published nearly 300 papers in atomic physics, polymer physics, biophysics, molecular biology imaging, ultrasound imaging, nanoparticle synthesis, batteries, and other electrochemical applications and energy technologies. He holds 10 patents and has 11 more patent filings since 2015.

Dr. Chu was the 12th U.S. Secretary of Energy from January 2009 until the end of April 2013. He was the first scientist to hold a Cabinet position in U.S. history. As the longest serving Energy Secretary, he recruited outstanding scientists and engineers into the Department of Energy. He began several initiatives, including ARPA-E (Advanced Research Projects Agency – Energy), the Energy Innovation Hubs, and the annual Clean Energy Ministerial meetings in 2009, and he was personally tasked by President Obama to assist BP in stopping the Deepwater Horizon oil leak.

From 2004 to 2009, he was director of the Lawrence Berkeley National Laboratory, where he was active in pursuit of renewable and other forms of clean energy technologies. Previously, he was the Theodore and Francis Professor of Physics and Applied Physics at Stanford University. He was twice Chair of the Physics Department (1990–1993, 1999–2001), helped launch Bio-X in 1998, a multi-disciplinary institute combining the physical and biological sciences with medicine and engineering, and the Kavli Institute for Particle Astrophysics and Cosmology in 2002. Before joining the Stanford faculty in 1987, he was head of the Quantum Electronics Research Department at AT&T Bell Laboratories.

Dr. Chu is the co-recipient of the 1997 Nobel Prize in Physics for his contributions to laser cooling and atom trapping, and has received numerous other awards. He is a member of the

National Academy of Sciences, the American Philosophical Society, the American Academy of Arts and Sciences, and the Academia Sinica, and is a foreign member of the Royal Society, the Royal Academy of Engineering, the Chinese Academy of Sciences, the Korean Academy of Sciences and Technology, the National Academy of Sciences of Belarus, and a member of the Pontifical Academy of Sciences. He received an A.B. degree in mathematics and a B.S. degree in physics from the University of Rochester, and a Ph.D. in physics from the University of California, Berkeley, and he has been awarded 32 honorary degrees.

ME/MET Department Heads Professional Development Workshop

10:30AM–12:00PM
Salon F, 1st Floor,
Salt Lake Marriott Downtown at City Creek Hotel

As part of our ongoing effort to provide resources and development opportunities for department heads/chairs, this workshop will explore many topics. Examples from previous workshops are becoming a department head/chair, funding priorities and how to handle budget cuts, as well as development, fund-raising, and alumni engagement.

Heat Transfer Division Awards Luncheon

Sponsored by: *Heat Transfer Division*

11:45AM–1:45PM
Deer Valley, 1st Floor,
Salt Lake Marriott Downtown at City Creek Hotel

Ticket: \$40

Heat Transfer Memorial Award – Science:

Professor Satwinder S. Sadhal, University of Southern California

For seminal contributions in dropwise condensation and evaporation, spray-cooling heat transfer, thermodynamics of interfacial phenomena, heat and mass transport in acoustic fields, heat transfer and phase change with drops and bubbles, and ocular drug delivery

Heat Transfer Memorial Award – Art:

Professor Derejee Agonafer, University of Texas at Arlington

For contributions to robust thermo/mechanical design of microelectronics systems, including promoting the use of computational fluid dynamics in the upstream phase of design and enabling concurrent electrical and thermal design, resulting in reductions in both lead time and cost

Heat Transfer Memorial Award – General:

Professor James F. Klausner, Michigan State University

For a prolific career in pioneering thermal engineering research and leadership to the thermal engineering community, including groundbreaking work in boiling heat transfer, HDH desalination, thermochemical conversion, HTD Chair, and program development at the Department of Energy ARP

Bergles-Rohsenow Young Investigator Award in Heat Transfer:**Dr. Yongjie Hu**, *University of California at Los Angeles*

For significant contributions to heat transfer in developing high thermal conductivity materials for thermal management of electronics and novel experimental metrologies for nanoscale thermal transport

Heat Transfer Division Classic Paper Award:**Dr. Sanjeev Chandra**, *University of Toronto*, and
Dr. C. Thomas Avedisian, *Cornell University*

“On the Collision of a Droplet with a Solid Surface” by S. Chandra and C.T. Avedisian, *Proceedings of the Royal Society A: Mathematical and Physical Sciences*, vol. A432, pp. 13–41 (1991)

Guest LuncheonSponsored by: **ASME Auxiliary**

1:00PM–3:00PM
Solitude, 1st Floor,
Salt Lake Marriott Downtown at City Creek Hotel

Ticket: \$40

The ASME Auxiliary welcomes ASME members to an afternoon of great food and refreshments at its semi-annual Guest Luncheon.

The ASME Auxiliary’s guest speaker will be **Mathieu Francoeur** from the *Radiative Energy Transfer Lab, Department of Mechanical Engineering, University of Utah, Salt Lake City, UT*. Mr. Francoeur’s presentation will be on “A Near-Field Radiative Heat Transfer Device for Waste Heat Recovery.” Please join us for this exciting talk

Symposium for New and Prospective Faculty: Tips for Tenure and Promotion

1:30PM–3:00PM
Salon F, 1st Floor,
Salt Lake Marriott Downtown at City Creek Hotel

This workshop is designed for junior faculty, postdocs, and Ph.D. students. There will be a panel discussion in which the panel will share insights into the job search, promotion, and the tenure process. The panelists will provide recommendations from their own experience, including best practices and what to avoid. They will also answer questions from the audience.

Materials Division Sia Nemat-Nasser Award Lectures**4:00PM–4:30PM****Room 151G, 1st Level,****Calvin L. Rampton Salt Palace Convention Center**

Professor Sinan Keten, *June and Donald Brewer Professor Associate Professor, Civil & Environmental Engineering Associate Professor, Mechanical Engineering Director of Graduate Studies, Mechanical Engineering Northwestern University*



Sinan Keten is the June and Donald Brewer Associate Professor of Civil & Environmental Engineering and Mechanical Engineering at Northwestern University. He joined Northwestern University faculty in 2010 after obtaining his Ph.D. from MIT. His research

expertise is on computational materials design and mechanics with an emphasis on soft matter, and he has co-authored over 100 journal articles in this area. Prof. Keten has received a number of honors, including Presidential Early Career Award for Scientists and Engineers (PECASE), Office of Naval Research (ONR) Young Investigator Program (YIP) Award, Society of Engineering Science Young Investigator Medal, ASCE Huber Prize, JMBBM Early Career Award, and the ASME Haythornthwaite Award. He is a Fellow of the American Physical Society.

Hierarchical Design of Nanoparticle Network Materials

Biological materials excel at serving mechanical functions, which may be passive as in structural materials or dynamic as in cell motility and adhesion components. Impressively, structural biomaterials such as nacre, bone, and wood defy “rule of mixtures” relationships by employing high aspect ratio nanoparticles as building blocks in clever molecular designs. Lack of understanding of the physics of interfaces within nanoparticle assemblies makes it challenging to achieve similar mechanical properties with man-made materials. In this talk, I will present an overview of the state of the art in the bottom-up analysis of nanoparticle assemblies, touching upon new advances in interface design enabled by molecular and multi-scale simulations, machine learning tools, as well as bioinspiration. As a case study, investigations on thin films and nanocomposites made from renewable cellulose nanocrystals (CNCs) will be presented. Our theory and simulation-based inquiries into three complementary strategies for improving mechanical properties will be discussed. First, I will present analyses that explain how binary mixtures of nanocrystal lengths and microstructural features such as a twisted plywood (Bouligand) lay-up of nanocrystals yield all-cellulosic transparent films with strength and toughness comparable to mineralized biomaterials. Second, I will discuss an efficient, molecular simulation informed metamodeling framework for predicting the mechanical response of polymer grafted nanoparticle assemblies, revealing interface designs that yield Pareto optimality between stiffness and toughness. Finally, I will conclude with an outlook on dynamic interfaces in nanocomposites, specifically examining how basic allosteric principles of catch bonds in proteins could be reduced to simple mechanical models to create nanoparticle linkages with counterintuitive force-dependent kinetics.

Special Events TUESDAY

Materials Division Nadai Medal Award Lecture

4:30PM–5:15PM

Room 151G, 1st Level,

Calvin L. Rampton Salt Palace Convention Center

The Nadai Medal goes to **Dr. Ellen M. Arruda** for *pioneering and impactful research in polymer and tissue mechanics*.



Professor Ellen M. Arruda is the Tim Manganello/BorgWarner Department Chair of Mechanical Engineering, and the Maria Comninou Collegiate Professor of Mechanical Engineering at the University of Michigan. She also holds courtesy appointments in

Biomedical Engineering and in Macromolecular Science and Engineering. Professor Arruda earned her B.S. degree in Engineering Science (with Honors) and her M.S. degree in Engineering Mechanics from Penn State, and her Ph.D. degree in Mechanical Engineering from MIT.

Professor Arruda teaches and conducts research in the areas of theoretical and experimental mechanics of macromolecular materials, including polymers, elastomers, composites, soft tissues and proteins, and in tissue engineering of soft tissues and tissue interfaces. Her recent honors and awards include the 2019 Nadai medal from the American Society of Mechanical Engineers, the 2018 Rice medal from the Society of Engineering Science, the 2015 Outstanding Engineering Alumnus Award from the Pennsylvania State University, the 2014 Distinguished Faculty Achievement Award from the University of Michigan, the Ann Arbor Spark Best of Boot Camp award 2012, and the 2012 Excellence in Research Award by the American Orthopaedic Society for Sports Medicine.

Professor Arruda has more than 100 papers in scientific journals. She also holds eleven patents. Her H-index is 32 (ISI). Professor Arruda is a Fellow of the American Society of Mechanical Engineers, the American Academy of Mechanics, and the Society of Engineering Science. She is a member of the National Academy of Engineering (class of 2017). She is currently President of the American Academy of Mechanics.

Obtaining the Mechanical Properties of Soft Tissues – Challenges and Opportunities

Characterizing the mechanical properties of the soft tissues of the knee has been a major focus of my lab for the past several years. Obtaining the mechanical properties of soft tissues is challenging for a number of reasons, the first of which is that they are very soft, and direct gripping is fraught with problems. They are also anisotropic, therefore testing in multiple directions and deformation states is typically required. Our interest in developing full-knee computational models necessitates accurate constitutive models of the soft tissues of the knee. Finite element (FE) models of the knee can provide specific information on individual tissue contributions with respect to global joint function, as well as the coupling and coordination among tissues during macroscopic joint motions. Computational models offer precise, full-field, and complete descriptions of deformation manifesting from normal motions, injury causing activities, injured and diseased joints, and reconstructive procedures. FE models further have the potential to

conduct clinically meaningful, individualized joint analyses. In this talk I will show how geometric effects, heterogeneous deformation, and experimental uncertainty have manifested as subject-to-subject variability in the tensile response of the anterior cruciate ligament (ACL). I will also demonstrate via computational simulations that uncertainties in fully characterizing the anisotropic response of the ACL leads to vastly different joint kinematics and tissue level strain predictions. I will conclude with a discussion of the advent of full-field methods and the tremendous opportunity they afford to overcome challenges in characterization of the nonlinear, anisotropic mechanical properties of soft tissues.

Advanced Energy Systems Division Lecture & Reception

5:00PM–7:00PM

Solitude, 1st Floor,

Salt Lake Marriott Downtown at City Creek Hotel

FRANK KREITH ENERGY AWARD

Gang Chen, Ph.D., Carl Richard Soderberg Professor of Power Engineering at the *Massachusetts Institute of Technology, Cambridge MA*



Gang Chen is currently Carl Richard Soderberg Professor of Power Engineering at Massachusetts Institute of Technology (MIT). Gang Chen served as the head of the Department of Mechanical Engineering at MIT from July 2013 to June 2017. He directs the

Solid-State Solar Thermal Energy Conversion Center, an Energy Frontier Research Center funded by the US Department of Energy. Gang Chen's research focuses on nanoscale transport and energy conversion phenomena, and their applications in energy conversion, storage and utilization. He made seminal contributions to the understanding of heat conduction in nanostructures via both modeling and experimental studies. He and his collaborators exploited the unique nanoscale heat conduction physics to advance thermoelectric materials for energy conversion and create high thermal conductivity materials for thermal management. On thermal radiation, his group developed a method to measure radiation heat transfer between two surfaces down to tens nanometer separations and experimental demonstration that radiative heat transfer at such small spacings can exceed the prediction of the Planck blackbody radiation law by three orders of magnitude. By exploring micro/nanoscale transport phenomena, Gang Chen's group is advancing a wide range of technologies such as thermoelectric cooling and power generation, solar thermal and solar photovoltaics, desalination and waste water treatment.

Nanomaterials and Structures for Efficient Utilization of Solar Energy

This talk will summarize research we have been conducting in exploring alternative ways to more efficiently using solar energy based on nanostructured materials, including photovoltaic, thermoelectric, thermally-regenerative electrochemical cycle, concentrated and non-concentrated

solar thermal technologies. We use nanostructures to reduce the thickness of crystalline silicon thin-film solar cells and achieved over 15% efficiency in 10 micron thick crystalline silicon-based solar cells; we use nanostructures to improve materials' thermoelectric figure-of-merit and use them to build solar thermoelectric generators with over 7% solar-to-electrical energy conversion efficiency; we developed new materials for thermally regenerative electrochemical cycle and demonstrated their high efficiency potential; we developed optically-transparent and thermally-insulating aerogels to replace the vacuum-tube solar collectors in concentrated solar thermal systems; and we use floating structures to boil water without any optical concentration, reaching even superheated steam. The talk will conclude with a discussion on high thermal conductivity plastics. By properly align molecular orientations, we turn polyethylene into good thermal conductors that rivals metals. These polymers have promising applications in solar thermal systems. Website: <http://web.mit.edu/nanoengineering/>

EDWARD F. OBERT AWARD

John H. Lienhard V, Ph.D., Abdul Latif Jameel Professor; and Director of Water and Food Systems Lab, *Massachusetts Institute of Technology, Cambridge, MA*



John H. Lienhard V is the Abdul Latif Jameel Professor of Water and Mechanical Engineering at MIT. During more than three decades on the MIT faculty, Lienhard's research and educational efforts have focused on heat and mass transfer, thermodynamics, and desalination and water purification. Lienhard received his bachelor's and master's degrees in thermal engineering at UCLA from the Chemical, Nuclear, and Thermal Engineering Department. He joined MIT immediately after completing his PhD in the Applied Mechanics and Engineering Science Department at UC San Diego. Lienhard's research on desalination has included a wide range of thermal and membrane-based technologies, with a focus on energy efficiency and reduced environmental impact. Lienhard has directly supervised more than 85 graduate theses and postdoctoral associates, has authored several textbooks and more than 250 peer-reviewed publications, and he holds more than 30 issued US patents. He is the founding director of the MIT Abdul Latif Jameel Water and Food Systems Lab and has directed MIT's Rohsenow Kendall Heat Transfer Lab since 1997. Lienhard is a recipient of the 2012 ASME Technical Communities Globalization Medal and the 2015 ASME Heat Transfer Memorial Award.

Applied Mechanics Koiter Lecture

5:30PM-6:30PM

Rooms 151 DE, 1st Level,

Calvin L. Rampton Salt Palace Convention Center

K.T. Ramesh, the Alonzo G. Decker, Jr., Professor of Science and Engineering at *Johns Hopkins University*



K.T. Ramesh, the Alonzo G. Decker, Jr., Professor of Science and Engineering at Johns Hopkins University, is a leading authority in the areas of impact physics and the failure of materials under extreme conditions. Ramesh is a professor in the

Department of Mechanical Engineering, with joint appointments in Earth and Planetary Sciences and Materials Science and Engineering. He is the founding director of the Hopkins Extreme Materials Institute, has written over 200 archival journal publications, and is the author of the book "Nanomaterials: Mechanics and Mechanisms."

Ramesh has received numerous research awards including the Murray Medal and the Lazan and Hetenyi awards, from the Society for Experimental Mechanics. Ramesh is a Fellow of the American Association for the Advancement of Science, the American Academy of Mechanics, the Society for Experimental Mechanics, and the American Society of Mechanical Engineers.

Ramesh received his bachelor's degree in Mechanical Engineering from Bangalore University in India in 1982. He then studied at Brown University, where he received an Sc.M. in Solid Mechanics in 1985, an Sc.M. in Applied Mathematics in 1987, and a Ph.D. in Solid Mechanics in 1988. Ramesh joined Johns Hopkins in 1988 and served as chair of Mechanical Engineering from 1999 to 2002.

The Mechanics of Massive Dynamic Failure

Extreme conditions often result in massive dynamic failures. These conditions can be both extensive (e.g., nuclear blasts, asteroid impacts, major earthquakes) or intensive (e.g., micrometeorite impact on a spacecraft, penetrator impact on a target, rock bursts). The sense in which we think of massive dynamic failure is that (a) there are large numbers of failures that are strongly interacting and (b) the failure propagation rates must be considered to understand the interactions of the failures. The broad interest in this work is in how the characteristic lengthscales and timescales of the dynamic failure processes interact with the lengthscales and timescales associated with the extreme conditions. We examine these problems in the context of the massive failure of brittle and quasibrittle solids. We seek to link in situ visualization of failure mechanisms, micromechanics models for the mechanisms, and large-scale multi-mechanism simulations to understand extreme events.

Special Events TUESDAY

Women in Engineering Reception

Sponsored by: *Diversity & Inclusion Strategy Committee*

5:30PM–7:00PM
Salon D, 1st Floor,

Salt Lake Marriott Downtown at City Creek Hotel

The reception provides a focal point at the conference for a gathering of women from the wide range of ASME activity for networking and a bit of casual relaxation at the end of a conference day. The event is open to all ASME women engineers and engineering students.

Materials Division Reception

Sponsored by: *Materials Division*

5:30PM–7:00PM
Room 151 G, 1st Level,

Calvin L. Rampton Salt Palace Convention Center

Fluids Engineering Division Reception

Sponsored by: *Fluids Engineering Executive Committee*

6:30PM–8:30PM
Salon E, 1st Floor,

Salt Lake Marriott Downtown at City Creek Hotel

Applied Mechanics Division Honors & Awards Banquet

Sponsored by: *Applied Mechanics Division*

7:00pm–10:00pm
Salon F, 1st Floor,

Salt Lake Marriott Downtown at City Creek Hotel

Tickets: \$55

The evening's events will include honoring and presenting the following AMD awards to:

Thomas J.R. Hughes Young Investigator Award
Yihui Zhang

Ted Belytschko Applied Mechanics Award
Somnath Ghosh

Thomas K. Caughey Dynamics Award
Anil K. Bajaj and **Steven W. Shaw**

Daniel C. Drucker Medal
John Bassani

Warner T. Koiter Medal
K.T. Ramesh

Timoshenko Medal
J.N. Reddy

Journal of Applied Mechanics Award
Ahmed Elbanna



WEDNESDAY, NOVEMBER 13

**National Science Foundation
NSF (National Science Foundation) Track**

Track Chairs: Siddiq Qidwai, *NSF*, sqidwai@nsf.gov

Olesya Zhupanska, *University of Arizona*,
oiz@email.arizona.edu

In this forum, National Science Foundation (NSF) will provide various avenues for the IMECE community to interact with program directors from the Civil, Mechanical and Manufacturing Innovation (CMMI) Division and the Chemical, Bioengineering, Environmental, and Transport Systems (CBET) Division.

The track includes both NSF-sponsored workshops and 1-on-1 meetings as well as a student-centered IMECE-wide poster session for NSF-funded research.

Plenary: NSF-CMMI Overview and Outreach Panel
8:45AM–10:30AM
Room 355A,
Calvin L. Rampton Salt Palace Convention Center

In the first part of this panel, an overview of the Civil, Mechanical and Manufacturing Innovation (CMMI) division will be provided with emphasis on recent changes in organizational structure as well as funding opportunities, e.g., the 10 Big Ideas. All CMMI core programs—especially the Advanced Manufacturing Program, the Mechanics & Engineering Materials Cluster programs, and the Resilient and Sustainable Infrastructures Cluster programs—will also be highlighted. In the second part of the panel, the floor will then be opened to participants to address program directors representing these clusters.

NSF Proposal Development Workshop
10:45AM–12:30PM
Room 355A,
Calvin L. Rampton Salt Palace Convention Center

In this workshop, the fundamentals of successful grant proposal writing for the National Science Foundation (NSF) will be covered. Participants will learn about key topics, including the components of a successful proposal and finding the right home for the research. Critical aspects of the merit review process, funding profiles, and NSF programs, solicitations, and other opportunities will be presented. This workshop is geared towards early career investigators at U.S. institutions seeking to understand the NSF merit review process, but the information provided will be valuable to principal investigators in any stage of their career seeking to learn more about proposal writing and NSF funding opportunities.

**NSF-CBET Program Overview and Initiatives
Presentation**

2:00PM–3:45PM
Room 355A,

Calvin L. Rampton Salt Palace Convention Center

In this event, an overview of the Chemical, Bioengineering, Environmental, and Transport Systems (CBET) Division will be provided with emphasis on programs and funding opportunities. Relevant core programs from the Transport Phenomena Cluster will be highlighted. The floor will then be opened to participants to ask questions.

One-on-One with NSF Program Directors
1:30PM–3:15PM (Session 1)
3:45PM–5:30PM (Session 2)
Calvin L. Rampton Salt Palace Convention Center

Principal Investigators (PIs) will have an opportunity to discuss one-on-one their research proposals and concerns with program directors (PDs) of their choice. PDs representing the Advanced Manufacturing Program, the Mechanics & Engineering Materials Cluster programs, the Resilient and Sustainable Infrastructures Cluster programs, and the Transport Phenomena Cluster programs will be available. The meeting time of 20 minutes demands that the PIs come prepared with their talking points.

2019 IMECE Feedback Session
10:00AM–11:00AM
Rooms 151 AB, 1st Level,
Calvin L. Rampton Salt Palace Convention Center

Robert Henry Thurston Lecture
11:00AM–12:00PM
Room 151 G, 1st Level,
Calvin L. Rampton Salt Palace Convention Center

Thurston Lecture Award to **Prof. Yonggang Huang** for *pioneering work on fractal mechanics and its applications; and for significant contributions to the development of networked materials*

Yonggang Huang

Walter P. Murphy Professor of Mechanical and Civil Engineering, Northwestern University



Yonggang Huang is the Walter P. Murphy Professor of Mechanical Engineering, Civil and Environmental Engineering, and Materials Science and Engineering at Northwestern University. His research focuses on solid mechanics, with applications to many fields.

He is a member of the U.S. National Academy of Engineering, a foreign member of Academia Europaea, and a foreign member of the Chinese Academy of Sciences. His research awards since 2016 include the Nadai Medal (2016) from ASME, Prager Medal (2017) from the Society of Engineering Sciences,

Special Events WEDNESDAY

and the Bazant Medal (2018) and von Karman Medal (2019) from the American Society of Civil Engineers. His recognitions for undergraduate teaching since 2016 include the Cole-Higgins Award for Excellence in Teaching (2016), McCormick School of Engineering, Northwestern University; and the Associated Student Government Faculty and Administrator Honor Roll (2018–2019), Northwestern University, 2018–2019.

Soft Network Materials with Deterministic and Bio-Inspired Designs

Examples of bio-inspired hard materials can be found in the literature; far less attention has been devoted to soft systems. Here we introduce deterministic routes to low-modulus thin film materials with stress/strain responses that can be tailored precisely to match the nonlinear properties of biological tissues, with application opportunities that range from soft biomedical devices to constructs for tissue engineering. The approach combines a low-modulus matrix with an open, stretchable network as a structural reinforcement that can yield classes of composites with a wide range of desired mechanical responses, including anisotropic, spatially heterogeneous, hierarchical, and self-similar designs. Demonstrative application examples in thin, skin-mounted electrophysiological sensors with mechanics precisely matched to the human epidermis.

NSF Student Competition (Posters Only)

Halls A & B,

Calvin L. Rampton Salt Palace Convention Center

Poster Setup	9:00AM–10:00AM
Judging	10:30AM–1:45PM
General Viewing	12:00PM–2:30PM
Awards	1:45PM–2:15PM

Virtual Podium (Posters Only)

Poster Setup	9:00AM–10:00AM
Judging	10:30AM–1:45PM
General Viewing	12:00PM–2:30PM

Panel: Predictive NDE/SHM of Complex Materials and Structures

Sponsor: ASME NDPD Division

2:00PM–4:00PM

Deer Valley, 1st Floor,

Salt Lake Marriott Downtown at City Creek Hotel

Panelists: Jeff Donahue, *SpaceX*, Yuris Dzenis, *University of Nebraska-Lincoln* (co-organizer), Chuck Farrar, *LANL*, Kai Goebel, *Palo Alto Research Corporation*, Eric Lindgren, *AFRL*, Dan Perey, *NASA-LaRC*, Robert Pilarczyk, *Hill Engineering*, Massimo Ruzzene, *University of Colorado*, Jeff Wollschlager, *Altair Engineering*, Andrei Zagrai, *New Mexico Tech* (co-organizer)

Current generation of Non-Destructive Evaluation (NDE) systems, i.e., quantitative NDE (QNDE), is replacing previous generation qualitative systems. Mechanical engineering is playing an important role, as many NDE systems are utilizing vibration, acoustic, ultrasonic, or thermal phenomena. Next

generation NDE will build on QNDE by adding real-time predictive capabilities; such next gen systems will not only identify/quantify damage, but will also predict the remaining life of the structure in various operating environments. This panel of experts from the government, academia, and industry will discuss the current state of QNDE and Structural Health Monitoring (SHM), physical and data-driven predictive failure models, and the prospects of linking these into predictive NDE systems. Special emphasis will be on new complex and composite materials and on real-time acquisition and automated passage of the damage information to the multiscale predictive models. Lessons learned from the decades of relevant developments in the field of metallic structures will be analyzed. Gaps in knowledge and the R&D needs will be identified and discussed.

2020 IMECE Track Organizers and Co-Organizers Meeting

3:00PM–4:00PM

Rooms 151 AB, 1st Level,

Calvin L. Rampton Salt Palace Convention Center

Noise Control and Acoustics Division: Rayleigh Lecture

4:00PM–5:45PM

Room 151 DE, 1st Level,

Calvin L. Rampton Salt Palace Convention Center

Dr. Earl H. Dowell

William Holland Hall Professor, Pratt School of Engineering, Duke University



Earl H. Dowell is an elected member of the National Academy of Engineering, an Honorary Fellow of the American Institute of Aeronautics and Astronautics (AIAA), and a Fellow of the American Academy of Mechanics and the American Society of

Mechanical Engineers. He has also served a Vice President for Publications and member of the Executive Committee of the Board of Directors of the AIAA; as a member of the United States Air Forces Scientific Advisory Board; the Air Force Studies Board, the Aerospace Science and Engineering Board, and the Board on Army Science and Technology of the National Academies; the AGARD (NATO) advisory panel for aerospace engineering, as President of the American Academy of Mechanics, as Chair of the US National Committee on Theoretical and Applied Mechanics and as Chairman of the National Council of Deans of Engineering. From the AIAA he has received the Structure, Structural Dynamics and Materials Award, the Von Karman Lectureship the Crichlow Trust Prize, and the Reed Aeronautics Award; from the ASME he has received the Spirit of St. Louis Medal, the Den Hartog Award, and Lyapunov Medal; and he has also received the Guggenheim Medal, which is awarded jointly by the AIAA, ASME, AHS, and SAE. He has served on the boards of visitors of several universities and is a consultant to government, industry, and universities in science and

technology policy and engineering education as well as on the topics of his research. Dr. Dowell's research ranges over the topics of aeroelasticity, nonsteady aerodynamics, nonlinear dynamics and structures. In addition to being author of over 300 research articles, Dr. Dowell is the author or co-author of four books, "Aeroelasticity of Plates and Shells," "A Modern Course in Aeroelasticity," "Studies in Nonlinear Aeroelasticity," and "Dynamics of Very High Dimensional Systems." His teaching spans the disciplines of acoustics, aerodynamics, dynamics, and structures. Dr. Dowell received his B.S. degree from the University of Illinois and his S.M. and Sc.D. degrees from the Massachusetts Institute of Technology. Before coming to Duke as Dean of the School of Engineering, serving from 1983 to 1999, he taught at M.I.T. and Princeton. He has also worked with the Boeing Company.

Experimental Aeroelastic Models: Design and Wind tunnel Testing for Correlation with New Theory

A very important function of wind tunnel models and testing is to verify a new aeroelastic theory or a new computational method. For this purpose, experimental aeroelastic model design and manufacturing of scaled models, model ground vibration tests, and wind tunnel testing are essential to success. In the past 20 years, the Duke aeroelastic group has designed many aeroelastic models and conducted wind tunnel tests to evaluate new theoretical aeroelastic theories and new computational methods. They include: (1) a high aspect ratio wing model; (2) wing like plate models, delta wind-store, flapping flag, yawed plate, and folding wings; (3) airfoil section with control surface freeplay; (4) all-movable tail with freeplay model at the root similar to the horizontal tail of an aircraft; (5) a free-to-roll fuselage flutter model; and (6) an experimental oscillating airfoil model at high angles of attack for measuring aerodynamic response. Several examples of model designs, wind tunnel tests, and experimental/theoretical correlation studies with the theory are presented. The goal is not only to evaluate a new theory or a new computational method, but also to provide new insights into nonlinear aeroelastic phenomena, flutter/LCO, and gust response.

IMECE Volunteer and Student Recognition Reception
5:30PM-7:00PM
Salons F, 1st Floor,
Salt Lake Marriott Downtown at City Creek Hotel

Noise Control and Acoustics Division:
Per Bruel Gold Medal Award & NCAD Reception
Sponsored by: Noise Control and Acoustics Division
6:00PM-7:30PM
Solitude, 1st Floor,
Salt Lake Marriott Downtown at City Creek Hotel

Per Bruel Gold Medal for Noise Control and Acoustics is awarded to:

Karl Grosh, Ph.D., Fellow
University of Michigan

ASME Aerospace Division Reception
Sponsored by: Aerospace Division
5:45PM-7:15PM
Deer Valley, 1st Floor,
Salt Lake Marriott Downtown at City Creek Hotel

The Italian Way To Advanced Manufacturing Panel and Advanced Manufacturing Reception
Sponsored by: The Italian Trade Agency



6:00PM-8:00PM
Salon D, 1st Floor,
Salt Lake Marriott Downtown at City Creek Hotel

All are welcome to the Advanced Manufacturing Track Reception with complimentary food and refreshments. The reception will include an exciting panel discussion by ASME members and industry experts from Italy on novel technologies coming out of Italy and the best practices for collaborations between Italian and US companies and research centers in the area of advanced manufacturing. The Advanced Manufacturing Track will also be presenting their **Best Paper Awards** during the reception.

Special Events THURSDAY

THURSDAY, NOVEMBER 14

Closing Plenary Lunch

12:15PM–1:45PM

(lunch served from 12:15PM to 12:45PM)

Ballrooms ABCD,

Calvin L. Rampton Salt Palace Convention Center

Barbara Humpton

CEO, Siemens USA



Barbara Humpton is CEO of Siemens USA, where she guides the company's strategy and engagement in serving the company's largest market in the world, with more than 50,000 employees and over \$23 billion in revenues and \$5 billion in annual exports.

Most recently, Humpton served as president and CEO of Siemens Government Technologies, Inc. (SGT), a leading integrator of Siemens' products and services for federal government agencies and departments. In this role, Humpton also served as an officer/director member of the board of directors of SGT.

Prior to joining Siemens in 2011, Humpton served as a vice president at Booz Allen Hamilton where she was responsible for program performance and new business development for technology consulting in the Department of Justice and Department of Homeland Security. Earlier, Humpton was a vice president at Lockheed Martin Corporation with responsibility for Biometrics Programs, Border and Transportation Security and Critical Infrastructure Protection, including such critical programs as the FBI's Next Generation Identification and the TSA's Transportation Workers' Identification Credential.

Humpton is a graduate of Wake Forest University with a bachelor's degree in mathematics. Barbara is Chairman of the Siemens Foundation and of the Center for Strategic and Budgetary Assessments (CSBA). She serves on the board of directors of MorganFranklin, the American Heart Association Greater Washington Region, the Northern Virginia Tech Council, and the Seabee Memorial Scholarship Association. She resides in Washington, D.C., with her husband David.

Track Plenary

Track Plenary

Track 1: Acoustics, Vibration, and Phononics

1-14-1: ACOUSTICS, VIBRATION, AND PHONONICS

Wednesday, November 13, 9:45AM–10:30AM

Room 155C,

Calvin L. Rampton Salt Palace Convention Center

Hyperelastic Metamaterials and Phononic Media: Stretching the Truth?

(IMECE2019-11006)



William Parnell

University of Manchester (UK)

Abstract: Transformation theory is an established mechanism for the design of metamaterials. It gives rise to the required material properties of the medium in order to direct waves in the manner desired. This talk will focus on the mathematical theory underpinning the design of both acoustic and elastodynamic metamaterials and phononic media, based on transformation theory, and some aspects of the experimental confirmation of these designs. In the acoustics context it is well known that the governing equations are transform invariant and therefore a whole range of microstructural options are available for material design; although in reality, fabricating materials that can harness incoming acoustic energy in air is difficult due to the usual sharp impedance contrast between air and the metamaterial in question. In the elastodynamic context the situation is even worse, because the governing equations are not even transform invariant and therefore a new class of materials is required. In the acoustics context we will describe a new microstructure consisting of an array of rigid rods that is closely impedance matched to air and slows down sound in air. This is shown to be useful in a number of configurations, and in particular, it can be employed to halve the resonant frequency of the standard quarter-wavelength resonator. Alternatively, it can halve the size of the resonator for a specified resonant frequency. Extensions to three-dimensional configurations will also be discussed. In the elastodynamics context we will show that, although the equations are not transformation invariant, one can employ the theory of waves in pre-stressed, hyperelastic materials in order to create natural elastodynamic metamaterials whose inhomogeneous anisotropic material properties are generated naturally by an appropriate pre-stress. In particular, it is shown that a certain class of hyperelastic materials exhibits this so-called invariance property permitting the creation of, e.g., hyperelastic cloaks and invariant metamaterials. This has significant consequences for the design of, e.g, phononic media: it is a well-known and frequently exploited fact that pre-stress and large deformation of hyperelastic materials modifies the linear elastic wave speed in the deformed medium. In the context of periodic materials, this renders materials whose dynamic properties are “tunable” under pre-stress and, in particular, this permits tunable band gaps in periodic media. However, the invariant hyperelastic materials described above can be employed in order to design a class of phononic media whose band gaps are invariant to deformation. Finally, we describe the accommodation of

viscoelasticity in the theory of hyperelastic metamaterials. Incorporating this effect into models is crucial given that soft materials, capable of large deformation, are inherently lossy.

Bio: William Parnell is a Professor of Applied Mathematics in the School of Mathematics at the University of Manchester (UK) and holds an EPSRC Research Fellowship. He received a First Class degree in Applied Mathematics from the University of Bristol (UK) in 1999, before moving to the University of Oxford (UK) to study for a Masters in Mathematical Modelling and Scientific Computing, graduating with distinction in 2000. After a year travelling he began a Ph.D. in 2001 at the University of Manchester under the supervision of I. David Abrahams (now Director of the Isaac Newton Institute at the University of Cambridge), completing this in 2004. Parnell's research interests reside principally in the development of new mathematical techniques to understand the mechanical properties of inhomogeneous materials and the dynamic behaviour of particulate media. More recently his work has involved linking theory with experiments in order to develop new composites and metamaterials. He has a particular interest in understanding the constitutive behaviour of complex soft solids and tuning this via novel fillers. He leads the Mathematics of Waves and Materials (MWM) research group at Manchester, which consists of a thriving group of Postdocs, Ph.D. students and Master's students. Parnell has held visiting positions at Universite Paris 6 and 12 (France), University of Trento (Italy), University of Oxford (UK), and Colorado School of Mines and Rutgers (USA). He has published more than 60 research papers and two book chapters. He is a Fellow of the Institute of Mathematics and its Applications (UK), is the founding director of the Manchester Materials Modelling Centre, and became Editor in Chief of the journal *Wave Motion* in 2017.

Track 2: Advanced Manufacturing

2-1-1: ADVANCED MANUFACTURING

Monday, November 11, 9:45AM–10:30AM

Room 155C,

Calvin L. Rampton Salt Palace Convention Center

Finishing Freeform Surfaces, a New Surface Characterization Approach, and Future Trends in Manufacturing

(IMECE2019-13991)



Brigid Mullany

National Science Foundation

Abstract: Dr. Brigid Mullany will provide insights on the challenges of fabricating and finishing freeform surfaces. Specifics will focus on a novel fiber-based tool capable of eliminating tool path marks from earlier process steps in the fabrication of optical quality components. She will also provide insights on how common statistical metrics can be used to provide spatial information regarding surface texture, and defect detection. Based on her time as a program director

in the Advanced Manufacturing Program at the National Science Foundation, she will also provide her perspectives on future trends in Manufacturing.

Bio: Brigid Mullany received her Bachelor of Engineering Degree and Doctorate in Mechanical Engineering from University College Dublin in Ireland. Upon graduation, she received a two-year EU Marie Curie postdoctoral research position at Carl Zeiss in Germany. In 2004, she joined the Department of Mechanical Engineering and Engineering Science at the University of North Carolina at Charlotte where she is a Professor working in the area of surface finishing and advanced manufacturing. Currently, Dr. Mullany is a Program Director in the Advanced Manufacturing program at the National Science Foundation. She is active in CIRP, where she is the Vice Chair of the Scientific Technical Committee on Surfaces (STC-S), and she is on the NAMRI board of directors.

Track 2: Advanced Manufacturing

2-1-2: ADVANCED MANUFACTURING

Tuesday, November 12, 9:45AM–10:30AM

Room 155C,

Calvin L. Rampton Salt Palace Convention Center

Building Parts by Welding Millions of Little Bits of Metals Together: What Can Go Wrong and How Do We Fix It?

(IMECE2019-13991)



Lyle E. Levine

National Institute of Standards and Technology Presentation

Abstract: Additive manufacturing (AM) of metal components is a rapidly growing advanced manufacturing paradigm that promises unparalleled flexibility in the production of parts with complex geometries. However, the extreme processing conditions create position-dependent microstructures, residual stresses, and properties that complicate component and process design and certification. Quantitative modeling of these characteristics is critical, but model validation requires rigorous benchmark measurements, including comprehensive characterization of the feedstock materials, close in situ monitoring of the melt pool behavior, and extensive microstructure, residual stress, and property characterizations. To be useful, such benchmark measurements must be accepted broadly by the international AM community so that meaningful comparisons can be made between different modeling codes and approaches. Here, the underlying challenges we face in expanding metals AM beyond a niche market will be discussed along with the critical role played by computer simulation. Next, Dr. Levine will discuss the rationale behind the need for rigorous, broad-based measurements and standards. Finally, he will describe the NIST-founded Additive Manufacturing Benchmark Test Series (AM-Bench), a continuing series of highly controlled benchmark tests for additive manufacturing that modelers around the world are now using to test and validate their AM simulations.

Bio: Dr. Lyle E. Levine is a physicist in the Materials Measurement Laboratory of the National Institute of Standards and Technology (NIST) in the USA, where he leads most of NIST's materials research in additive manufacturing (AM) of metals. With a dual emphasis on world-leading, quantitative measurements and microstructure evolution modeling, this Additive Manufacturing of Metals Project provides experimental input and validation testing for both high-fidelity AM models and reduced order models for AM engineering design. Dr. Levine also founded and leads AM-Bench, an international organization that provides AM benchmark measurements for the AM community. With active participation from more than 80 organizations around the world, AM-Bench is the world's leading provider for AM benchmark data. Dr. Levine also leads the experimental validation effort for the AM application, ExaAM, for the Exascale Computing Project. ExaAM is a collaboration between Oak Ridge National Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and NIST. In addition to his work on additive manufacturing, Dr. Levine founded the continuing Dislocations Conference Series and is highly active in synchrotron X-ray science, where he co-develops and uses world-leading microbeam diffraction and small-angle scattering methods for studying material microstructures. Dr. Levine received his B.S. in physics from Caltech and his Ph.D. in physics from Washington University in St. Louis. He is an adjunct professor of Mechanical Engineering at both Northwestern University and the University of Southern California, where he advises graduate students. Dr. Levine is a recipient of NIST's highest honor for innovations in measurement science, the Allen V. Astin Measurement Science Award; the U.S. Department of Commerce Silver Medal, the department's second highest honor; and the ASM 2018 Henry Marion Howe Medal for his work on AM heat treatments.

Track 3: Advances in Aerospace Technology

3-1-1: ADVANCES IN AEROSPACE TECHNOLOGY

Tuesday, November 12, 9:45AM–10:30AM

Room 155D,

Calvin L. Rampton Salt Palace Convention Center

Very Flexible Aircraft: Performance Promises and Aeroelastic Challenges

(IMECE2019-13993)



Carlos E. S. Cesnik

University of Michigan

Abstract: Large-span aircraft configurations become dominant when designing for high fuel efficiency and/or high endurance flights due to the induced drag minimization. The combination of high aerodynamic efficiency and low structural weight fraction leads to inherently very flexible wings. These vehicles may then present large wing deformations at relatively low frequencies, which results in a direct impact into their flight dynamic characteristics. Such conditions can have a significant effect on high-altitude long-endurance (HALE) aircraft and future highly efficient commercial transport aircraft.

Track Plenary

This lecture will highlight the computational and experimental efforts at the University of Michigan to better understand the impact of large deformations on the aeroelastic characteristics of these flexible vehicles, in particular, an experimental program to evaluate in flight some of the unusual aircraft behaviors that can be predicted by our codes. The unmanned aerial vehicle, known as X-HALE, has been designed and built to be aeroelastically representative of (HALE) very flexible aircraft. The objective of this test bed is to fundamentally understand the physics involved in the presence of geometric nonlinearities, collect unique data of the geometrically nonlinear aeroelastic response coupled with the flight dynamics in support to code validation, and as an inexpensive platform for nonlinear control exploration. An outlook on the remaining challenges and future activities will conclude the lecture.

Bio: Carlos E. S. Cesnik is the Clarence L. “Kelly” Johnson Collegiate Professor of Aerospace Engineering and the founding Director of the Active Aeroelasticity and Structures Research Laboratory. He also directs the Airbus-Michigan Center for Aero-Servo-Elasticity of Very Flexible Aircraft (CASE-VFA). His research interests have focused on computational and experimental aeroelasticity of very flexible aircraft; coupled nonlinear aeroelasticity and flight dynamic response in high-altitude long-endurance (HALE) aircraft and advanced jet transport aircraft; aerothermoelastic modeling, analysis, and simulation of hypersonic vehicles; and active vibration and noise reductions in helicopters.

Professor Cesnik is a Fellow of the American Institute of Aeronautics and Astronautics (AIAA) and a Fellow of the Royal Aeronautical Society. He serves as AIAA’s Director for the Aerospace Design and Structures Group and is an elected member of AIAA’s Council of Directors. He has over 300 publications as archival journal and conference papers, and several invited lectures in the areas of aeroelasticity, smart structures, structural mechanics, and structural health monitoring.

Track 3: Advances in Aerospace Technology

3-1-2: ADVANCES IN AEROSPACE TECHNOLOGY

Monday, November 11, 9:45AM–10:30AM

Room 255C,

Calvin L. Rampton Salt Palace Convention Center

Design of Advanced Multifunctional Composites for Fly-by-Feel Autonomous Electric Vehicles

(IMECE2019-13994)



Fu-Kuo Chang
Stanford University

Abstract: It is envisioned that the next generation aerospace vehicles will be eco-friendly and designed towards being fully autonomous and highly intelligent to achieve optimal performance with highest safety assurance for all operational conditions. The vehicles will be equipped with high-resolution

state-sensing and self-awareness capabilities to diagnose their health and operating states on a real-time basis, mimicking the sensory skins of biological systems and enabling “fly-by-feel” capabilities. In addition, the vehicles will be powered by hybrid or electric propulsion systems using energy provided by advanced high-energy batteries.

In this presentation, a robust and cost-effective manufacturing technique is proposed to create a new class of Multifunctional Energy Storage Composites (MES-C) that can be used to design specifically for the next generation autonomous electric vehicles. The MES Composites will be built with distributed stretchable sensors/electronics networks and embedded lithium-ion batteries to form a completely integrated intelligent material system. Utilizing novel microfabrication methods, the sensor networks can be fabricated in nano/micro scales and then be stretched in several orders of magnitude to be embeddable into composite structures. A novel interlocking fabrication technique is developed to seamlessly integrate lithium-ion batteries into composites without sacrificing the structural integrity of the host while maintaining the energy capacity and electrical performance of the original battery materials. The fly-by-feel technology concept was successfully demonstrated in real time in a wind tunnel experiment on a composite wing with integrated sensor networks. At the same time, the health of the integrated batteries could be monitored simultaneously using the built-in sensor networks. Prototypes of the multifunctional energy-storage composites were fabricated and demonstrated the feasibility of providing up to 40% weight savings on the combined battery and structural weight of existing commercial electric vehicles.

Bio: Fu-Kuo Chang is a Professor in the Department of Aeronautics and Astronautics at Stanford University. His primary research interest is in the areas of multi-functional materials and intelligent structures with particular emphases on structural health monitoring, self-sensing diagnostics, intelligent sensor networks, and multifunctional energy storage composites for transportation vehicles as well safety-critical assets. Dr. Chang is a recipient of the SHM Lifetime Achievement Award (2004), SPIE NDE Lifetime Achievement Award (2010), and the PHM lifetime Achievement Award (2018). He is the Editor-in-Chief of the International Journal of Structural Health Monitoring. He is also a Fellow of AIAA and ASME.

Track 4: Biomedical and Biotechnology Engineering

4-1-1: BIOMEDICAL AND BIOTECHNOLOGY ENGINEERING

Monday, November 11, 9:45AM–10:30AM
Room 155D,

Calvin L. Rampton Salt Palace Convention Center

Multi-Frequency Oscillation and Lung Protective Ventilation
(IMECE2019-12478)



David W. Kaczka
University of Iowa Presentation

Abstract: Lung protective mechanical ventilation provides life-sustaining gas exchange of the failing respiratory system, while simultaneously minimizing the risk of ventilator-induced lung injury (VILI). The parameters most often adjusted on a ventilator include the amount of gas delivered with each breath (the tidal volume) and the rate at which this gas is cyclically applied (the frequency). We have recently demonstrated that oscillation of a heterogeneously lung with multiple simultaneous frequencies improves gas exchange and maintains lung recruitment at lower distending pressures compared to traditional “single-frequency” ventilation. We termed this novel ventilatory modality “multi-frequency oscillatory ventilation” (MFOV), and hypothesized that such short-term physiological improvements are due to a more even distribution of ventilation to different lung regions, in accordance with local mechanical properties. Since specific lung regions may be characterized by different preferred frequencies for oscillatory flow, MFOV is uniquely capable of enhancing gas exchange in the mechanically heterogeneous lung. As a result, MFOV produces more efficient oxygenation and CO₂ elimination. In comparison to conventional mechanical ventilation, MFOV may be a more efficacious approach to minimizing VILI in the heterogeneously injured lung, by reducing parenchymal strain heterogeneity. In this presentation, we will discuss the theoretical rationale for the use of MFOV in structurally heterogeneous pathologies such as the acute respiratory distress syndrome (ARDS). Using dynamic xenon-enhanced computed tomography and four-dimensional image registration, we will elucidate the mechanisms by which MFOV improves regional ventilation distribution, aeration, and parenchymal strain in a porcine model of ARDS. We will then demonstrate how the spectral content of MFOV waveforms may be algorithmically designed using anatomically explicit computational models of the mammalian respiratory system. We expect that these pre-clinical studies of MFOV will be ultimately translatable and testable in eventual human clinical trials, with potential to reduce morbidity and mortality associated with ARDS and other heterogeneous lung diseases.

Bio: David W. Kaczka received the B.S. (summa cum laude), M.S., and Ph.D. degrees in biomedical engineering from Boston University College of Engineering in 1990, 1993, and 2000, respectively, and the M.D. degree from the Boston

University School of Medicine in 2000. He completed his residency in anesthesiology at Johns Hopkins University in 2004. He has held previous faculty appointments with Johns Hopkins University and Harvard Medical School. In 2014 he became a Lunsford Fellow in Critical Care Medicine at the University of Iowa, where he is currently an Associate Professor of Anesthesia, Biomedical Engineering, and Radiology. He has also served as a Lieutenant Colonel in the Medical Corps of the United States Air Force Reserve. His current research interests include computational modeling of respiratory mechanics and gas exchange, design, and function of mechanical ventilators, patient monitoring, and image processing. Dr. Kaczka is a member of the American Thoracic Society, the Biomedical Engineering Society, the American Society of Anesthesiologists, the Society of Critical Care Medicine, the American Society of Mechanical Engineers, Tau Beta Pi, and Alpha Eta Mu Beta.

Track 4: Biomedical and Biotechnology Engineering

4-1-2: BIOMEDICAL AND BIOTECHNOLOGY ENGINEERING

Tuesday, November 12, 9:45AM–10:30AM
Room 155E,

Calvin L. Rampton Salt Palace Convention Center

Title:Capacitive Micromachined Ultrasonic Transducers on Glass Substrates for Imaging, Sensing, and Therapy
(IMECE2019-12490)



Ömer Oralkan
NC State University, Raleigh, NC

Abstract: The capacitive micromachined ultrasonic transducer (CMUT) technology has been subject to extensive research for the last two decades and recently reached to the market for medical ultrasound imaging. This presentation will start with a brief introduction of the CMUT and its merits in comparison to other ultrasound transducers. This will be followed by a discussion of using glass as a substrate to enable improvements such as reduced process complexity by using anodic bonding, reduced parasitic capacitance and improved device reliability facilitated by the insulating substrate, and optical transparency. Finally, a variety of applications including multimodal imaging, ultrasound neural stimulation, chemical and biological sensing, and display-embedded air-coupled human-machine interfaces will be presented to exemplify different systems that are implemented by a combination of glass-based CMUTs, integrated frontend circuits, and backend signal processing.

Bio: Ömer Oralkan received the B.S. degree from Bilkent University, Ankara, Turkey, in 1995, the M.S. degree from Clemson University, Clemson, SC, in 1997, and the Ph.D. degree from Stanford University, Stanford, CA, in 2004, all in electrical engineering.

Track Plenary

He was a Research Associate (2004–2007) and then a Senior Research Associate (2007–2011) in the E. L. Ginzton Laboratory at Stanford University. In 2012, he joined North Carolina State University, Raleigh, where he is now a Professor of Electrical and Computer Engineering. His current research focuses on developing devices and systems for ultrasound imaging, photoacoustic imaging, image-guided therapy, biological and chemical sensing, and ultrasound neural stimulation.

Dr. Oralkan is an Associate Editor for the IEEE *Transactions on Ultrasonics, Ferroelectrics and Frequency Control* and serves on the Technical Program Committee of the IEEE International Ultrasonics Symposium. He received the 2016 William F. Lane Outstanding Teacher Award at NC State, 2013 DARPA Young Faculty Award, and 2002 Outstanding Paper Award of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society.

Track 5: Dynamics, Vibration, and Control

5-1-1: DYNAMICS, VIBRATION, AND CONTROL

Monday, November 11, 9:45AM–10:30AM

Room 155E,

Calvin L. Rampton Salt Palace Convention Center

Data-Driven Model Reduction and Probabilistic Learning for Digital Twins

(IMECE2019-13995)



Charbel Farhat
Stanford University

Abstract: A digital twin refers to a digital replica of a physical asset — whether a platform or a process — that can be used, for example, to control in real time the operation of this asset, or optimize in near real time its maintenance. This lecture, however, will assert that, in the context of computational mechanics, a more rigorous realization of a digital twin can be grounded in recent advances in the data-driven reduction of the dimensionality of high-fidelity models, and the data-driven probabilistic modeling and quantification of the model-form uncertainties associated with the resulting reduced-order models. The lecture will also illustrate the aforementioned assertions with two sample digital twins constructed for this purpose — one for a UAV in order to control its automatic landing on a carrier using a real-time model predictive control (MPC) algorithm and one for a small-scale replica of an X-56 type aircraft in order to optimize in near real-time its maintenance — and will highlight their performance.

Bio: Charbel Farhat is the Vivian Church Hoff Professor of Aircraft Structures, Chairman of the Department of Aeronautics and Astronautics, Director of the Army High Performance Computing Research Center, and Director of the of the King Abdullah City of Science and Technology Center of Excellence for Aeronautics and Astronautics at Stanford University. His research interests focus on the development of mathematical

models, advanced computational algorithms, and high-performance software for the design and analysis of complex systems in aerospace, marine, mechanical, and naval engineering. He is a member of the National Academy of engineering; a member of the Royal Academy of Engineering (UK); a Fellow of AIAA, ASME, IACM, SIAM, and USACM; and an ISI Highly Cited Author in Engineering. He is also the recipient of many other professional and academic distinctions, including the Spirit of Saint Louis Medal and Lifetime Achievement Award from ASME; the Ashley Award for Aeroelasticity and the Structures, Structural Dynamics and Materials Award from AIAA; the Gordon Bell Prize and Sidney Fernbach Award from IEEE; the John von Neumann Medal from USACM; the Grand Prize from the Japan Society for Computational Engineering and Science; and the Gauss-Newton Medal from IACM. He was selected by the U.S. Navy as a Primary Key-Influencer, flown by the Blue Angels during Fleet Week 2014, and appointed to the Air Force Science Advisory Board.

Track 5: Dynamics, Vibration, and Control

5-1-2: DYNAMICS, VIBRATION, AND CONTROL

Tuesday, November 12, 9:45AM–10:30AM

Room 155F,

Calvin L. Rampton Salt Palace Convention Center

The Interplay of Nonlinearity and Noise in Tiny Resonators

(IMECE2019-13996)



Steve Shaw
Florida Institute of Technology

Abstract: Vibrating structures with dimensions on the scale of micro-meters are playing increasingly important roles in sensors and frequency sources (i.e., clocks) that are widely used in commercial devices, including smart phones. Some basic differences exist between such small structures and their macro-scale counterparts, the most important of which are their relatively high frequencies and small damping. These features provide many practical benefits that include resonant operation in the radio frequency range, the ability to utilize electrostatics for actuation and readout, and the on-chip integration of mechanical and electronic elements. However, microelectromechanical system (MEMS) resonators are highly susceptible to noise and nonlinearity and one of the basic challenges in their design is maintaining a good signal to noise ratio without driving them into nonlinearity. This presentation will provide an overview of the roles of nonlinearity and noise in MEMS resonators and describe how a fundamental understanding of these effects can play an important role in improving their performance. Specific examples will be taken from time-keeping applications, where it has been demonstrated that nonlinear operation can reduce phase noise in MEMS-based clocks, and from resonant sensors, where it is shown that the input-output gain in rotational rate vibratory gyros can be increased by exploiting nonlinear mode coupling.

The presentation will describe relevant modeling, analysis, design, and experimental results.

Acknowledgments: This work is currently supported by the NSF. It is carried out in close collaboration with groups led by Mark Dykman at Michigan State University, Daniel López at Argonne National Labs, Oriol Shoshoni at Ben Gurion University, Tom Kenny at Stanford University, and Kimberly Foster at Tulane University.

Bio: Steve Shaw is Harris Professor in the Department of Mechanical and Civil Engineering at Florida Institute of Technology, Melbourne, Florida, USA. He is also University Distinguished Professor Emeritus in the Department of Mechanical Engineering and Adjunct Professor of Physics and Astronomy at Michigan State University. He received an A.B. in Physics and an M.S.E. in Applied Mechanics from the University of Michigan and a Ph.D. in Theoretical and Applied Mechanics from Cornell University. His research interests focus on the understanding and utilization of nonlinear dynamic behavior in engineering systems. Current applications include the interplay of nonlinearity and noise in micro/nano-scale resonators and the development of torsional vibration absorbers for automotive drive-train components. Dr. Shaw has held visiting appointments at Cornell University; University of Michigan; Caltech; University of Minnesota; University of California, Santa Barbara; and McGill University. He is a Fellow of ASME and serves as an Associate Editor for the *SIAM Journal on Applied Dynamical Systems*. He is recipient of the Henry Ford Customer Satisfaction Award, the ASME Henry Hess Award, the SAE Arch T. Colwell Merit Award, the ASME N. O. Myklestad Award, and the ASME Thomas K. Caughey Dynamics Award.

Track 6: Energy

6-19-1: ENERGY

Monday, November 11, 9:45AM–10:30AM
Room 255F,

Calvin L. Rampton Salt Palace Convention Center

Battery State Estimation: A Critical Technology Where Data and Models Merge Principles From Mechanics, Thermal, Electrical, and Chemical Engineering Disciplines Merge (IMECE2019-13997)



Anna Stefanopoulou
University of Michigan

Abstract: Battery state estimation is a critical technology for the management and safety of lithium. Nearly three decades after the commercialization of lithium-ion batteries and during the year when the Noble Prize in Chemistry was awarded to the inventors of their lightweight and rechargeable electrodes, state estimation is a critical technology for their safe adoption in handheld consumer electronics and electric vehicles. Managing the potent brew of lithium ions in the large quantities necessary for vehicle propulsion is anything but straightforward. From the

Rosetta-Philae spacecraft landing three billion miles away from Earth to the daily commute of a hybrid electric automobile, the battery management system (BMS) has been critical for merging the multi-physics models and data science necessary for the high efficiency, longevity, and safety of battery electric vehicles.

The BMS is the brain of the battery system and is responsible for State of Charge (SOC), State of Health (SOH) and State of Power (SOP) estimation while protecting the cell by limiting its power. The BMS relies on accurate prediction of complex electrochemical, thermal and mechanical phenomena. This raises the question of model and parameter accuracy. Moreover, if the cells are aging, which parameters should we adapt after leveraging limited sensor information from the measured terminal voltage and sparse surface temperatures? With such a frugal sensor set, what is the optimal sensor placement? To this end, control techniques and novel sensors that measure the cell swelling during lithium intercalation and thermal expansion will be presented. We will conclude by highlighting the fundamental in predicting local hot spots, detecting internal shorts, and managing the overwhelming energy released during a thermal runaway.

Bio: Anna Stefanopoulou is the William Clay Ford Professor of Technology, Professor of Mechanical Engineering, and the Director of the Energy Institute at the University of Michigan. Her training is in Naval Architecture and Marine Engineering (91 Diploma NTUA, Athens) and in Electrical Engineering (94 MS, 96 PhD, UMICH, Ann Arbor). She was an assistant professor at the University of California, Santa Barbara and a technical specialist at Ford Motor Company.

She has been recognized as a Fellow of three different societies; the ASME (2008), IEEE (2009), and SAE (2018). She is an elected member of the Executive Committee of the ASME Dynamics Systems and Control Division (DSCD) and the Board of Governors of the IEEE Control Systems Society, and the Founding Chair of the ASME DSCD Energy Systems Technical Committee.

Her innovation in powertrain control technology has been recognized by multiple awards such as the 2019 AACC Control Engineering Practice Award, the 2017 IEEE Control System Technology award, the 2012 College of Engineering Research Award, the 2009 ASME Gustus L. Larson Memorial Award, a 2008 Univ. of Michigan Faculty Recognition award, the 2005 Outstanding Young Investigator by the ASME DSC division, a 2005 Henry Russel award, a 2002 Ralph Teetor SAE educational award, a 1997 NSF CAREER award and selected as one of the 2002 world's most promising innovators from the MIT Technology Review. She was a member of the 2016 National Research Council (NRC) committee on fuel efficient technologies and their cost effectiveness in meeting the 2025 US national vehicle fuel economy standards. She is working now with an NRC committee on the US light duty vehicle fuel economy standards "beyond-2025".

Her work has been documented in a book, 21 US patents, 340 publications (8 of which have received awards) on estimation and control of internal combustion engines and electrochemical processes such as fuel cells and batteries.

Track Plenary

Track 6: Energy

6-19-2: ENERGY

Tuesday, November 12, 9:45AM–10:30AM

Room 255B,

Calvin L. Rampton Salt Palace Convention Center

Solar Combined Heating, Cooling, and Power Systems Based on Hybrid PV-Thermal Technology

(IMECE2019-13998)



Christos Markides
Imperial College London

Abstract: By 2050, solar technologies are projected to deliver the majority of the world's electricity. Although solar energy can be used to provide both heat and electrical power, most solar panels are designed for only one of these purposes. In particular, photovoltaic (PV) panels are typically less than 20% efficient in delivering electricity from the sun's incident energy. At the same time, it is well known that PV cells experience a deterioration in performance (efficiency) when they are operated at higher temperatures, and that this leads to high losses especially when the solar resource is at its highest. For example, a drop in PV cell efficiency of up to 20% can be expected when the PV cells reach operating temperatures of ~60–70°C, which is easily experienced in hot climates.

This performance loss has motivated the development of so-called hybrid PV-thermal (PV-T) solar collector technology, which combines PV modules with a contacting fluid (gas or liquid) flow in various different geometries and configurations. Here, the fluid is used to cool the PV cells and, therefore, to increase their electrical efficiency, while delivering a potentially useful thermal output (hot fluid stream) from the collector, which offers some advantages when space is at a premium and there is demand for both heat and power. PV-T collectors have been shown to be a highly efficient technology, capable of achieving system efficiencies (electrical plus thermal) in excess of 70%.

By far, the most common use of the thermal-energy output from PV-T systems (in fact, most solar-thermal collector technologies) is to provide hot water at 50–60°C for households or commercial use. However, a wide range of opportunities arise at higher temperatures when additional power-generation cycles (e.g., with organic Rankine cycles, thermoelectric generators, amongst other) or thermally-driven cooling technologies (e.g., with desiccant, ad/absorption refrigeration cycles, amongst other) can be integrated with solar (including PV-T) collectors into wider multi/polygeneration systems. These additional options become viable at temperatures typically above ~80°C, and importantly, become increasingly efficient at progressively higher temperatures. In standard PV-T collector designs, however, the electrical and thermal outputs are traded-off each other, since any effort to collect additional thermal energy or to increase the temperature of that energy leads to an electrical loss. This has led recently

to the proposal of collector designs that can deliver useful heat at a high temperature while not sacrificing the electricity output. In this talk, we will present conventional and such advanced PV-T collector designs, their underpinning principles, discuss the challenges and opportunities of further developing this technology, and of integrating it within wider solar-energy systems capable of the affordable provision of cooling, heating and power.

Bio: Christos Markides is Professor of Clean Energy Technologies, Head of the Clean Energy Processes (CEP) Laboratory and leads the Experimental Multiphase Flow (EMF) Laboratory, which is the largest experimental space of its kind at Imperial College London. He specializes in applied thermodynamics, fluid flow, and heat/mass transfer processes as applied to high-performance devices, technologies, and systems for thermal-energy recovery, utilization, conversion, or storage. His research interests include heating, cooling, and power, and in particular, solar energy and waste heat in heat-intensive industrial applications. He is Editor-in-Chief of Elsevier journal *Applied Thermal Engineering*, Member of the Scientific Panel of the ASME ORC Power Systems Committee, the Scientific Panel of the Knowledge Centre – Organic Rankine Cycle (KCORC), the Scientific Committee of the UK Energy Storage SUPERGEN Hub, and the UK National Heat Transfer Committee.

Track 7: Engineering Education

7-13-1: ENGINEERING EDUCATION

Monday, November 11, 9:45AM–10:30AM

Room 155F,

Calvin L. Rampton Salt Palace Convention Center

Solar Combined Heating, Cooling, and Power Systems Based on Hybrid PV-Thermal Technology

(IMECE2019-13998)



Anabela C. Alves
University of Minho University

Abstract: Academic and professional worlds are kept apart from working together by an invisible barrier. Nevertheless, the academia is preparing the future professionals and to achieve this preparation, a tuning between professional needs and academic teaching is critical. Though the academia has an important role in forecasting the future needs, the professionals, many times, are in better conditions to forecast due to their proximity to the market and its needs. So a joint work must be done between these two worlds. Lean Education derives from a methodology that emerged in the industry, and nowadays is spread to all industries and services, including the education services, not only as a way to improve these services but, more importantly, as a pedagogical platform to innovate the learners' curricula and better prepare them for the professional world. Lean education allows development of competencies such as systems thinking, critical analysis,

sustainability and ethical issues, assessment challenges of the overall performance of a system as opposed to the detailed functions of a component, as well as establishing criteria for, and transparency of decision making. This plenary addresses the above deficiencies from a holistic perspective, accounting for issues in communications, teamwork across discipline and geographic borders, and project/design status visualization. Lean Education's role as a holistic perspective and as a curricular innovation capable of developing the competencies missing in the current engineering curricula that bridge the gap between the academic and professional worlds. The talk covers sustainability and systems concepts of Lean Education, identification of strategies and weaknesses in current curricula, competencies and skills needed to an organizational health and Lean Education's capability in providing content and competency mastery pulled by stakeholders (society, employers, faculty, students).

Bio: Anabela C. Alves, an expert in lean education, is a faculty in the Department of Production and Systems/School of Engineering/University of Minho. She holds a Ph.D. in Production and Systems Engineering, being affiliated to Centre ALGORITMI. Her main research interests are in the areas of Production Systems Design and Operation; Lean Production (Lean Education, Lean Healthcare, Lean Services, Lean Product Development, Lean & TRIZ, Lean-Green, and Lean & Ergonomics); Production Planning and Control, Project Management and Engineering Education, with particular interest in active learning methodologies, e.g., Project-Led Education (PLE) and Project/Problem-Based Learning (PBL). She is author/coauthor of more than 100 publications in conferences publications or communications, four books, four editions of conference proceedings, 17 book chapters and 27 international journal articles. She participated in 26 events abroad and 27 in Portugal. She directed several graduate theses during her teaching career. She is member of the Scientific and Organizing Committee of the International Symposium on Project Approaches in Engineering Education (PAEE). She is a member of the following societies and networks: SOCOLNET – Society of Collaborative Networks; Portuguese Society of Engineering Education (SPEE); Portuguese Institute of Industrial Engineering (IPEI); American Society of Mechanical Engineers (ASME); Lean Education Academic Network (LEAN); European Professors of Industrial Engineering and Management (EPIEM); and IEM Care Foundation. She participated in three partnerships R&D projects with Bosch Car Multimedia. Her publications could be consulted at ORCID.

Track 8: Fluids Engineering

8-13-1: FLUIDS ENGINEERING

Wednesday, November 13, 8:45AM–9:30AM

Room 155D,

Calvin L. Rampton Salt Palace Convention Center

Using Uncertainty Quantification With HPC to Reconcile Models and Measurements

(IMECE2019-14000)



Philip Smith

*Institute for Clean and Secure Energy
Presentation*

Abstract: Bayesian methods for uncertainty quantification (UQ) provide the opportunity to identify model form uncertainty in both measurements and models. Under sponsorship of the US DOE NNSA we have used HPC (10 - 250 thousand cores) with scalable large eddy simulations (LES) for utility scale (100–1000 MW) particle-laden pulverized coal and biomass power boilers. We have found that these UQ-methods have allowed us to use data from models and measurements to extrapolate from laboratory scale experiments to full-scale predictions. The resulting Bayesian posterior predictive includes the effect of uncertainty from model parameters, scenario parameters, and model form uncertainty in both the instrument models and the predictive physics-based LES models.

Bio: Philip Smith is presently Director, Institute for Clean and Secure Energy (ICSE), University of Utah; a Professor in the Department of Chemical Engineering, University of Utah; and Director, Carbon Capture Multidisciplinary Simulation Center (CCMSC), a U.S. Dept. of Energy NNSA Predictive Science Academic Alliance Program Center. He is also Chair, American Flame Research Committee (AFRC), a national committee of the International Flame Research Foundation, Livorno, Italy and President of CRSim Inc., a Utah company. Professor Smith has also served as department chair, Chemical Engineering, University of Utah (2000–2007); cofounder and vice-president, Reaction Engineering International (1990–1997); head of the Combustion Computations Laboratory, Advanced Combustion Engineering Research Center (ACERC), an NSF – ERC, Brigham Young University (1984–1990); staff member, Los Alamos National Laboratory, Energy (Q) Division (1982–1983); and Assistant and Associate Professor, Brigham Young University (1979–1990).

Track Plenary

Track 8: Fluids Engineering

8-13-2: FLUIDS ENGINEERING

Wednesday, November 13, 9:45AM–10:30AM

Room 155D,

Calvin L. Rampton Salt Palace Convention Center

The Smallest Fluids Technologies for the Largest Fluids
Challenge: Microfluidics for Energy and the Environment
(IMECE2019-14001)



David Sinton

University of Toronto

Abstract: Bayesian methods for uncertainty quantification (UQ) provide the opportunity to identify model form uncertainty in both measurements and models. Under sponsorship of the U.S. DOE NNSA, we have used HPC (10–250 thousand cores) with scalable large eddy simulations (LES) for utility scale (100–1000 MW) particle-laden pulverized coal and biomass power boilers. We have found that these UQ-methods have allowed us to use data from models and measurements to extrapolate from laboratory scale experiments to full-scale predictions. The resulting Bayesian posterior predictive includes the effect of uncertainty from model parameters, scenario parameters, and model form uncertainty in both the instrument models and the predictive physics-based LES models.

Bio: David Sinton is a Professor in the Department of Mechanical & Industrial Engineering at the University of Toronto, and the Canada Research Chair in Microfluidics and Energy. He was the Associate Chair of Research in Mechanical & Industrial Engineering, as well as the Interim Vice-Dean of Research in the Faculty of Applied Science & Engineering. Prior to joining the University of Toronto, Dr. Sinton was an Associate Professor and Canada Research Chair at the University of Victoria, and a Visiting Associate Professor at Cornell University. The Sinton Lab is application-driven and develops fluid systems for energy and the environment. The group developed a library of industrial fluid testing systems to improve chemical performance in the energy industry, now commercialized through the startup Interface Fluidics. The group is currently developing fluid systems to produce renewable fuels from CO₂, to develop energy efficient industrial working fluids, and to quantify the environmental impacts of future climate conditions. Dr. Sinton was an NSERC E.W.R. Steacie Memorial Fellow, and is a FASME and FAAAS. He serves on the advisory board of the journal *Lab on a Chip*.

Track 9: Heat Transfer and Thermal Engineering

9-69-1: HEAT TRANSFER AND THERMAL ENGINEERING

Tuesday, November 12, 9:45AM–10:30AM

Room 255C,

Calvin L. Rampton Salt Palace Convention Center

Using Additive Manufacturing to Advance Designs in
Convective Cooling
(IMECE2019-14002)



Karen A. Thole

Pennsylvania State University

Abstract: Recent technological advances in the field of additive manufacturing (AM) have widened the design space for complex convective cooling designs. Using additive manufacturing allows for increasingly small and complex geometries to be fabricated with little increase in time or cost. The opportunity for heat transfer engineers is to exploit the use of additive manufacturing in re-thinking how to optimize cooling schemes for components, or generate novel heat transfer surfaces. Interesting roughness features result when using additive manufacturing, which are a strong function of the build parameters. The inherent roughness using additive manufacturing can, in fact, be used to improve convective heat transfer beyond that of highly engineered surfaces. New design tools can generate components with enhanced performance; although, further improvements in accounting for roughness are needed.

Bio: Dr. Karen A. Thole is a Distinguished Professor of Mechanical Engineering and Head of the Department of Mechanical Engineering at The Pennsylvania State University. Dr. Thole's expertise is heat transfer and cooling of gas turbine airfoils through detailed experimental and computational studies. At Penn State, Dr. Thole founded the Steady Thermal Aero Research Turbine Laboratory (START) lab, which houses a unique test turbine facility and is a center of excellence in heat transfer for a major gas turbine manufacturer. Dr. Thole has published over 230 archival journal and conference papers, and supervised over 65 dissertations and theses. She currently serves as a Governor on ASME's Board of Governors and is a member of NASA's National Aeronautics Committee. She has been recognized by the U.S. White House as a Champion of Change for STEM, the Rosemary Schraer Mentoring Award, and the Howard B. Palmer Faculty Mentoring Award. Dr. Thole also received the 2014 Society of Women Engineer's Distinguished Engineering Educator Award, the 2015 ASME George Westinghouse Gold Medal, the 2016 Edwin F. Church Medal, and the 2019 AIAA Air Breathing Propulsion Award. She holds two degrees in Mechanical Engineering from the University of Illinois and a Ph.D. from the University of Texas at Austin.

Track 9: Heat Transfer and Thermal Engineering

9-69-2: HEAT TRANSFER AND THERMAL ENGINEERING

Wednesday, November 13, 9:45AM–10:30AM
Room 155E,

Calvin L. Rampton Salt Palace Convention Center

Nanowarming for Regenerative Medicine

(IMECE2019-14003)



John Bischof

University of Minnesota

Abstract: This talk will explore the underlying physics and advantages of nanoparticle-based rewarming technologies for regenerative medicine. Gold and iron oxide nanoparticles have unique and tunable properties that allow transduction of optical or radiofrequency (RF) electromagnetic fields to affect heating of biomaterials at multiple scales (1 μL droplets to L containers). Indeed, both nanoparticle types have a long history of use for controlled heating in the treatment of cancer. This talk will explore the use of nanoparticle heating for a new application entitled “nanowarming,” which allows both rapid and uniform rewarming of vitrified (i.e., cryopreserved) biomaterials back from the cryogenic state, thereby avoiding crystallization and cracking failures. This warming, which can range from 100s $^{\circ}\text{C}/\text{min}$ with iron oxide RF heating to 10,000,000 $^{\circ}\text{C}/\text{min}$ with laser gold warming, addresses a rewarming technology bottleneck for vitrified large (i.e., tissues and organs) and small systems (i.e., embryos and oocytes). New capabilities in cell, tissue, and rodent organ cryopreservation, including the first zebra fish embryo cryopreservation yielding live and reproducing fish, will be presented. In summary, this talk demonstrates the growing opportunities for nanoparticle heating in regenerative medicine.

Bio: John Bischof works in the area of thermal bioengineering with a focus on biopreservation, thermal therapy, and nanomedicine. His awards include the ASME Van Mow Medal and Fellowships in societies including Cryobiology, JSPS, ASME, and AIMBE. He has served as the President of the Society for Cryobiology and Chair of the Bioengineering Division of the ASME. Dr. Bischof obtained a B.S. in Bioengineering from U.C. Berkeley (UCB) in 1987, an M.S. from UCB and U.C. San Francisco in 1989, and a Ph.D. in Mechanical Engineering from UCB in 1992. After a Post-doctoral Fellowship at Harvard in the Center for Engineering in Medicine, he joined the faculty of the University of Minnesota in 1993. Dr. Bischof is now a Distinguished McKnight University Professor and Kuhmeyer Chair in the Departments of Mechanical and Biomedical Engineering, and the Medtronic-Bakken Endowed Chair and Director of the Institute for Engineering in Medicine at the University of Minnesota.

Track 10: Advanced Materials: Design, Processing, Characterization and Applications

10-31-1: ADVANCED MATERIALS: DESIGN, PROCESSING, CHARACTERIZATION AND APPLICATIONS

Tuesday, November 12, 9:45AM–10:30AM
Room 255F,

Calvin L. Rampton Salt Palace Convention Center

Advanced Materials: Design, Processing, Characterization, and Applications

(IMECE2019-14004)



Zhigang Suo

Harvard University

Abstract: An integrated circuit achieves its function by integrating dissimilar components, and so does a living organ. Soft materials—tissues, elastomers, hydrogels, and ionogels—are under intense development for immediate and far-reaching applications. Examples include tissue regeneration, synthetic biology, drug delivery, soft robots, ionotronics, bioelectronics, skin-attached and implanted devices, active textiles, as well as wearable and washable devices. Nearly all applications require the integration of dissimilar soft materials. This talk describes several recent examples of integrated soft materials that achieve unusual functions. Also highlighted are fundamental challenges to the mechanics and chemistry of materials, such as adhesion, fatigue, and seal. Integrated soft materials open opportunities to reinvent our disciplines and ourselves.

Bio: Zhigang Suo is Allen E. and Marilyn M. Puckett Professor of Mechanics and Materials at Harvard University. He earned a bachelor's degree from Xi'an Jiaotong University in 1985 and a Ph.D. degree from Harvard University in 1989. Dr. Suo joined the faculty of the University of California, Santa Barbara in 1989, Princeton University in 1997, and Harvard University in 2003. His research centers on the mechanics of materials. Applications include electronics, composites, and stretchable devices. He served on the executive committee of the ASME Applied Mechanics Division.

Track Plenary

Track 10: Advanced Materials: Design, Processing, Characterization and Applications

10-31-2: ADVANCED MATERIALS: DESIGN, PROCESSING, CHARACTERIZATION AND APPLICATIONS

Wednesday, November 13, 9:45AM–10:30AM
Room 155F

Calvin L. Rampton Salt Palace Convention Center

Material and Microstructural Features That Prompt Sub-Crystalline Localization in Polycrystalline High-Performance Alloys

(IMECE2019-14005)



Irene J. Beyerlein

University of California, Santa Barbara

Abstract: Improved prediction of the behavior of materials under the complex loading conditions encountered in structural components is critical to ensure reliable, long-term performance and to guide the design of new materials along high controlled processing paths. However, a major challenge for structural materials is the strong dependence of the intrinsic plastic deformation processes on material structure, with important features at the nanoscale, microscale, and mm-scale in most classes of metallic materials. Deformation processes are typically highly heterogeneous, propagating through complex microstructure-dominated networks, ultimately resulting in local damage and failure of the part. Cyclic and monotonic loading are performed on a number of high-performance alloys, such as high strength titanium aerospace alloy and Ni-based superalloys. Using a combination of in situ deformation DIC and synchrotron measurements, 3D microstructural characterization, and 3D crystal plasticity based computational modeling, we investigate the micromechanical and microstructural factors leading to strain localization and subsequent slip band initiation. This suite of techniques altogether enables full-field measurement and modeling of the plastic and elastic field at the surface and in the bulk of the specimen. The analysis focuses on the coupled role of elastic anisotropy, grain neighborhoods, and grain shape and size in determining the location of the exceptionally preferred points of high elastic strain concentration and localized slip, when the applied strain is under but near the macroscopic elastic-plastic transition. We find that the very few localized slip bands are correlated with the development of only the highest elastic strain concentrations. Strain localization is specifically favored in crystals that have an outstandingly compliant orientation relative to all its neighbors and a non-equiaxed shape with sharp corners. These results explain that the presence of annealing twins in the microstructure significantly increases the probability of localization.

Bio: Irene J. Beyerlein is a professor at the University of California, Santa Barbara with a joint appointment in the Mechanical Engineering and Materials Departments. After

receiving her Ph.D. degree in Theoretical and Applied Mechanics at Cornell University in 1997, she began a postdoctoral appointment as a J.R. Oppenheimer Fellow at Los Alamos National Laboratory, where she remained on the scientific staff in the Theoretical Division, until 2016. She has published one book, nine book chapters, and more than 290 peer-reviewed articles in the field of structural composites, materials processing, multiscale modeling of microstructure/property relationships, deformation mechanisms, and polycrystalline plasticity. She is an editor for *Acta Materialia* and *Scripta Materialia* and an associate editor for *Modelling and Simulation in Materials Science and Engineering*. In recent years, she has been awarded the Los Alamos National Laboratory Fellow's Prize for Research (2012), the International Plasticity Young Researcher Award (2013), the TMS Distinguished Scientist/Engineering Award (2018), and the Brimacombe Metal (2019).

Track 11: Mechanics of Solids, Structures and Fluids

11-49-1: MECHANICS OF SOLIDS, STRUCTURES AND FLUIDS

Monday, November 11, 9:45AM–10:30AM
Room 255B,

Calvin L. Rampton Salt Palace Convention Center

Getting Stuck and Breaking Free: Adhesion, Friction, Strength, and Toughness

(IMECE2019-14006)



Kaushik Bhattacharya

California Institute of Technology

Abstract: Many phenomena of scientific and technological interest are described by the evolution of free boundaries or free discontinuities. Examples include the peel front while peeling an adhesive tape, the rupture front of earthquakes, dislocations in solids, and the crack set during fracture. This evolution takes place in a heterogeneous medium where the length scale of the heterogeneities are much smaller than the length scale of interest. In such situations, it is natural to seek the overall or effective behavior at the scale of interest. This effective behavior is not characterized by averaging, but instead dominated by critical events. Thus, the effective behavior can be qualitatively different from the local behavior. This makes such problems difficult to study, but also offers opportunities for exploiting heterogeneities to dramatically material properties. This talk will discuss the underlying issues with examples drawn from fracture, friction, dislocation dynamics, phase boundary propagation, and peeling of adhesive tape.

Bio: Kaushik Bhattacharya is Howell N. Tyson, Sr., Professor of Mechanics and Professor of Materials Science as well. He received his B.Tech. degree from the Indian Institute of Technology, Madras, India in 1986, his Ph.D. from the University of Minnesota in 1991, and his post-doctoral training

at the Courant Institute for Mathematical Sciences during 1991–1993. He joined Caltech in 1993. He has held visiting positions at Cornell University (1988), Heriot-Watt University in Scotland (1992), Max-Planck-Institute at Leipzig (1997–1998), Isaac Newton Institute at the University of Cambridge (1999), Indian Institute of Science at Bangalore (2001), the Jet Propulsion Laboratory (2006), and the University of Cambridge (2008–2009). He has received the Distinguished Alumni Award of the Indian Institute of Technology, Madras, the Outstanding Achievement Award of the University of Minnesota (2018), the Warner T. Koiter Medal of the American Society of Mechanical Engineering (2015), Graduate Student Council Teaching and Mentoring Award at Caltech (2013), Young Investigator Prize from the Society of Engineering Science (2004), the Special Achievements Award in Applied Mechanics from the American Society of Mechanical Engineers (2004), and the National Science Foundation Young Investigator Award (1994). He was Editor of the *Journal of the Mechanics and Physics of Solids* (2004–2015) and currently serves on the Editorial Board of a number of journals.

Track 11: Mechanics of Solids, Structures and Fluids

11-49-2: MECHANICS OF SOLIDS, STRUCTURES AND FLUIDS

Tuesday, November 12, 9:45AM–10:30AM

Room 355B,

Calvin L. Rampton Salt Palace Convention Center

Getting Stuck and Breaking Free: Adhesion, Friction, Strength, and Toughness

(IMECE2019-14006)



Ellen Arruda

University of Michigan

Abstract: The anterior cruciate ligament, or ACL, of the knee is a soft tissue structure comprised of two main bundles of hierarchical collagenous structures. As with all soft tissue, the ACL is extremely difficult to mechanically test, and determining its nonlinear, anisotropic mechanical response has remained elusive. Yet, obtaining the mechanical properties of the ACL is exceedingly clinically relevant to the design of better replacement grafts for torn ACLs or to prevent ACL tears in the first place. This talk will focus on our recent efforts to characterize the ACL response utilizing full-field displacement measurement techniques that offer more accurate, repeatable, and comprehensive experimental data than traditional testing methods. We have pioneered full-volume characterization techniques that provide much needed insight into the inaccuracies associated with many current experimental protocols and also the shortcomings of some popular constitutive models in capturing the full 3D response of the ACL. I will describe how we use these data to develop an ACL constitutive model for implementation into computational models of the knee during regular gait and under impact loading simulations. Accurate computational models of the

knee such as ours may one day be used to guide clinical practice to intervene to prevent an ACL injury or to determine the best course of action to repair an injury.

Bio: Ellen M. Arruda is the Tim Manganello/BorgWarner Department Chair of Mechanical Engineering, and the Maria Comninou Collegiate Professor of Mechanical Engineering at the University of Michigan. She also holds courtesy appointments in Biomedical Engineering and in Macromolecular Science and Engineering. Professor Arruda earned her B.S. degree in Engineering Science (with Honors) and her M.S. degree in Engineering Mechanics from Penn State, and her Ph.D. degree in Mechanical Engineering from MIT.

Professor Arruda teaches and conducts research in the areas of theoretical and experimental mechanics of macromolecular materials, including polymers, elastomers, composites, soft tissues and proteins, and in tissue engineering of soft tissues and tissue interfaces. Her recent honors and awards include the 2019 Nadai medal from the American Society of Mechanical Engineers, the 2018 Rice medal from the Society of Engineering Science, the 2015 Outstanding Engineering Alumnus Award from the Pennsylvania State University, the 2014 Distinguished Faculty Achievement Award from the University of Michigan, the Ann Arbor Spark Best of Boot Camp award 2012, and the 2012 Excellence in Research Award by the American Orthopaedic Society for Sports Medicine. Professor Arruda has more than 100 papers in scientific journals. She also holds 11 patents. Her H-index is 32 (ISI). Professor Arruda is a Fellow of the American Society of Mechanical Engineers, the American Academy of Mechanics, and the Society of Engineering Science. She is a member of the National Academy of Engineering (class of 2017). She is currently President of the American Academy of Mechanics.

Track 12: Micro- and Nano-Systems Engineering and Packaging

12-2-1: MICRO- AND NANO-SYSTEMS ENGINEERING AND PACKAGING

Wednesday, November 13, 8:45AM–9:30AM

Room 255B,

Calvin L. Rampton Salt Palace Convention Center

Taking Microfluidics From Research Ideas to a Real Product

(IMECE2019-14008)



Bruce K. Gale

University of Utah

Abstract: Microfluidics have promised to revolutionize medicine and biology for decades now, but the promise has been slow to be realized. Many applications of microfluidics are now having an impact. This presentation will focus on a few technologies and how they have transitioned (or begun to transition) from the research lab to commercialization. The talk

Track Plenary

will show how simple microfluidic platforms can be used to solve complex biological problems with an emphasis on mechanical engineering approaches. The presentation will explore a few of our recently developed technologies, in particular, human sperm trapping and sorting for fertility treatment using inertial microfluidics with non-Newtonian fluids, pathogen detection from food using complex microfluidic devices, and fast polymerase chain reaction (PCR) chips for rapid personal and medical analysis that take advantage of microfluidic scaling laws. A few of our recent medical device projects will also be highlighted, including a vascular coupling device and a nerve regeneration device.

Bio: Bruce K. Gale received his undergraduate degree in Mechanical Engineering from Brigham Young University in 1995 and his Ph.D. in Bioengineering from the University of Utah in 2000. He was an assistant professor of Biomedical Engineering at Louisiana Tech University before returning to the University of Utah in 2001, where he is now Chair and a professor of Mechanical Engineering. He is currently Director of the Utah State Center of Excellence for Biomedical Microfluidics, a center devoted to research and commercialization activities around microfluidic devices. His primary interests include solving medical, biology, and chemistry problems using a variety of microfluidic approaches to complete complex and challenging medical and biological assays. Specifically, he is working to develop a microfluidic toolbox and approaches for the rapid design, simulation, and fabrication of devices with medical and biological applications. The ultimate goal is to develop platforms for personalized medicine, which should allow medical treatments to be customized to the needs of individual patients. As an outgrowth of his work, five companies have been formed and he maintains a role at each. The first is Carterra, a multiplexed instrument development company focused on protein characterization in the pharmaceutical industry that was spun out of his lab in 2005. The others include: Espira, which focuses on pathogen detection and exosome separations; Nanonc, which focuses on reproductive medicine applications of microfluidics; wFluidx, which focuses on genotyping zebrafish embryos; and Microsurgical Innovations, which focuses on miniature medical devices.

Track 12: Micro-and Nano-Systems Engineering and Packaging

12-2-2: MICRO-AND NANO-SYSTEMS ENGINEERING AND PACKAGING

Wednesday, November 13, 9:45AM–10:30AM

Room 255B,

Calvin L. Rampton Salt Palace Convention Center

Drag Reduction of Watercraft: Microfluidics Applied to Macroscale Objects

(IMECE2019-14009)



Chang-Jin "CJ" Kim

University of California, Los Angeles

Abstract: When an object (e.g., boat) moves in a liquid (e.g., water), drag impedes its motion, consuming energy and limiting speed. Since maritime transportation alone accounts for a significant portion of the global oil consumption and greenhouse gas generation, a reduction of the water drag by even a small fraction would have a considerable benefit worldwide. Because the skin friction drag is the largest portion of the total drag experienced by most water vehicles, numerous mechanisms to reduce the skin friction have been explored for decades. However, none has been widely accepted because of poor energy efficiency. About a decade ago, superhydrophobic (SHPo) surfaces started to receive significant attention because the air layer between water and the surface can lubricate the water flows, decreasing the skin friction. Unlike other existing gas-lubricating methods, SHPo surfaces would hold a gas layer (called plastron) within the microscopic structures on the surface, making it possible to reduce skin friction without consuming energy to provide the gas. Despite two decades of research, however, drag reduction with SHPo surfaces has not been obtained for the most coveted application example, i.e., high Reynolds number flows in open water. This talk will present our recent achievement, i.e., the first successful large drag reductions (~30%, up to ~40%) with SHPo surfaces using credit-card-size samples tested under a boat on the sea at Reynolds number as high as 1.14×10^7 (friction Reynolds number as high as 5800). The results attest the importance of microscopic nuances of SHPo surfaces for a given application even if it is of macroscale, suggesting directions for other future goals as well.

Bio: Professor Chang-Jin "CJ" Kim received his B.S. from Seoul National University, M.S. from Iowa State University, and Ph.D. from the University of California, Berkeley, all in mechanical engineering, and joined the faculty at UCLA in 1993. Holding the Distinguished Professor title and the Volgenau Endowed Chair in Engineering, he directs the Micro and Nano Manufacturing Lab to perform research in MEMS and Nanotechnology, including design and fabrication of micro/nano structures, actuators, and systems, with a focus on the use of surface tension. The recipient of the Research Excellence Award (Iowa State University), TRW Outstanding Young Teacher Award (UCLA), NSF CAREER Award,

ALA Achievement Award, Samueli Outstanding Teacher Award (UCLA), and Ho-Am Prize in Engineering. Professor Kim has served on numerous professional and governmental committees and panels in MEMS and nanotechnology, including General Chair of the 2014 IEEE International Conference on MEMS. An ASME Fellow, he is currently serving as Senior Editor of the IEEE *Journal of MEMS* and on the Editorial Advisory Board for IEEE *Transactions on Electrical and Electronic Engineering*. He has also been active as a scientific advisor, consultant, and founder of start-up companies.

Track 13: Safety Engineering, Risk and Reliability Analysis

13-12-1: SAFETY ENGINEERING, RISK AND RELIABILITY ANALYSIS

Wednesday, November 13, 9:45AM–10:30AM
Room 255C,

Calvin L. Rampton Salt Palace Convention Center

Drag Reduction of Watercraft: Microfluidics Applied to Macroscale Objects

(IMECE2019-14009)



Bilal Ayyub
University of Maryland, College Park

Abstract: The concept of resilience is applicable to systems with anticipated performances and subject to disturbances. Understanding and quantifying resilience enable societies to use resources efficiently for enhancing or maintaining the performance of systems such as infrastructure. For example, natural disasters as disturbances resulted in worldwide direct damages of US\$366 billion and 29,782 fatalities in 2011 alone. Storms and floods accounted for up to 70% of the 302 natural disasters worldwide, with earthquakes producing the greatest number of fatalities. Managing these risks and others rationally requires an appropriate definition of resilience and associated metrics. This presentation provides a resilience definition that meets a set of requirements with clear relationships to reliability and risk as key relevant metrics. Such metrics provide a sound basis for the development of effective decision- and policy-making methods for multihazard environments for various system types, including lifeline, environmental, financial, etc., systems. The presentation also examines recovery, with its classifications based on level, spatial, and temporal considerations. The economics of resilience is briefly discussed.

Bio: Dr. Bilal Ayyub is a University of Maryland Professor of Civil and Environmental Engineering, Professor of Reliability Engineering, and Professor of Applied Mathematics and Scientific Computation. Dr. Ayyub's main research interests are risk, resilience, uncertainty, decisions, and systems applied to civil, mechanical, infrastructure, energy, defence, and maritime fields. Dr. Ayyub is a distinguished member of ASCE, and a fellow of the Structural Engineering Institute, the Society for

Risk Analysis, ASME, and SNAME. He completed projects for governmental and private entities, such as the National Science Foundation, Department of Defence, Hartford, Chevron, Bechtel, etc. Dr. Ayyub is the recipient of several awards and research prizes from ASCE, ASNE, ASME, ENR, the Department of the Army, etc. He has authored and co-authored more than 650 publications, including eight textbooks and more than 15 edited books. He is also the founding Editor-in-Chief of the *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems*. His most recent 2018 edited book on *Climate-Resilient Infrastructure*, published by ASCE, was selected as an Engineering-News Record Newsmaker in 2017.

Track 14: Design, Systems and Complexity

14-6-1: DESIGN, SYSTEMS AND COMPLEXITY

Wednesday, November 13, 9:45AM–10:30AM
Room 255F,

Calvin L. Rampton Salt Palace Convention Center

Design for Additive Manufacturing: Opportunities and Challenges

(IMECE2019-14011)



David Rosen
Singapore University of Technology & Design
and Georgia Institute of Technology

Abstract: Broadly speaking, the idea of design for additive manufacturing (DFAM) is to explore new design spaces to take advantage of the unique capabilities of AM processes. With tremendous design freedom available, resulting device designs can be complex geometrically, with complex material and property distributions, that perform multiple functions. At the same time, AM processes perform millions of operations to fabricate a part. Is it any wonder that parts exhibit more variability than in conventional manufacturing processes? In this talk, I explore the opportunities and challenges surrounding these issues of DFAM. Regarding opportunities, I highlight two directions. First, I present the idea of simultaneous design of a part, its material, and its manufacturing process since these are intimately linked in additive manufacturing. The fundamental need is to integrate materials information, specifically process-structure-property relationships, in order to determine if desired spatial distributions of properties are feasible given a material and a manufacturing process. Second, I highlight the need for methods of robust and reliability design to address process variabilities and enable part qualification. Regarding challenges, several topics are addressed, starting with the rapid changes in the AM industry. Additionally, a core attribute of AM processes is that both the part geometry and part material is fabricated simultaneously, in contrast to conventional manufacturing processes, which is the source of many challenges. The talk concludes with an overview of commercial software offerings to support DFAM, as well as standardization efforts that offer guidance to designers.

Track Plenary

Bio: David Rosen is a Professor in the School of Mechanical Engineering at the Georgia Institute of Technology (on leave). Additionally, he is the Research Director of the Digital Manufacturing and Design Centre at the Singapore University of Technology & Design. He received his Ph.D. at the University of Massachusetts in 1992 in mechanical engineering. His research interests lie at the intersection of design, manufacturing, and computing with specific focus on additive manufacturing (AM), computer-aided design, and design methodology. He has industry experience, working as a software engineer at Computervision Corp. and a Visiting Research Scientist at Ford Research Laboratories. He is a Fellow of ASME and has served on the ASME Computers and Information in Engineering Division Executive Committee. He is the recipient of the 2013 Solid Freeform Fabrication Symposium, International Freeform and Additive Manufacturing Excellence (FAME) Award, and he is the co-author of a leading textbook in the AM field.

Track 18: Conference Wide Symposium

18-1-1: DESIGN, SYSTEMS AND COMPLEXITY

Wednesday, November 13, 8:45AM–9:30AM

Room 355B,

Calvin L. Rampton Salt Palace Convention Center

Failure Is Not an Option: Avoiding Operational Disruptions With Mechanistic and Data-Driven Damage Prognostics – Sponsored by the NDPD Division
(IMECE2019-14012)



Kai Goebel

Palo Alto Research Center

Abstract: We are in an age where pervasive sensing, high communication bandwidth, and advances in AI have arrived at industrial equipment. The question is how one can leverage these advances for operational gain. To uphold operational functionality, these techniques flow into a Condition-Based Maintenance (CBM) strategy, where maintenance is only performed on evidence of need identified through direct or indirect monitoring. Knowledge of an asset's condition and how it will evolve is required such that the remedial action can be prescribed with sufficient lead time to minimize the cost and operational impact of the occurrence of a potential disruption. This strategy differs from "on-condition" maintenance in that an understanding of how much time is available before the asset loses functionality can be leveraged. The basic concept entails collecting and assessing data from NDE inspections and in situ sensors to estimate remaining life of the system in question. This is done using either mechanistic, physics-based models, or as suitable, data-driven AI techniques. This talk lays out a roadmap of the tools and methods that are to be used to realize the promise of making failure not an option.

Bio: Dr. Kai Goebel is a Principal Scientist in the System Sciences Lab at Palo Alto Research Center (PARC). His interest is broadly in condition-based maintenance and systems health management for a broad spectrum of cyber-physical systems in the transportation, energy, aerospace, defense, and manufacturing sectors. Prior to joining PARC, Dr. Goebel worked at NASA Ames Research Center and General Electric Corporate Research & Development center. At NASA, he was a branch chief leading the Discovery and Systems Health tech area, which included groups for machine learning, quantum computing, physics modeling, and diagnostics & prognostics. He founded and directed the Prognostics Center of Excellence, which advanced our understanding of the fundamental aspects of prognostics. He holds 18 patents and has published more than 350 papers, including a book on Prognostics. Dr. Goebel was an adjunct professor at Rensselaer Polytechnic Institute and is now adjunct professor at Lulea Technical University. He is a member of ASME, co-founder of the Prognostics and Health Management Society, and associate editor of the *International Journal of PHM*.



Technical Program

Technical Program At-A-Glance

EXHIBIT HALL POSTER SESSIONS		
Undergraduate Research and Design Expo Student Poster Competition	Sunday, November 10	5:30pm–7:00pm
NSF Student Competition	Wednesday, November 13	12:00pm–2:30pm
Virtual Podium	Wednesday, November 13	12:00pm–2:30pm

MONDAY, NOVEMBER 11								
Room	9:45am–10:30am	PG.	10:45am–12:30pm	PG.	2:00pm–3:45pm	PG.	4:00pm–5:45pm	PG.
155A	5-8-1 : Novel Control of Dynamic System and Design-1	48	4-6-1 : Biomedical Devices I	36	4-6-2 : Biomedical Devices II	37		
155B	5-3-3 : Nonlinear Dynamics, Control, and Stochastic Mechanics III	47	5-3-1 : Nonlinear Dynamics, Control, and Stochastic Mechanics I	49	5-3-2 : Nonlinear Dynamics, Control, and Stochastic Mechanics II	50		
155C	2-1-1 : Advanced Manufacturing Plenary Session	7	2-9-1 : Computational Advanced Manufacturing: Machining, Milling	7	2-9-2 : Computational Advanced Manufacturing: Ceramics, Composites	9	2-9-3 : Computational Advanced Manufacturing: Nanostructures, Polymers	12
155D	4-1-1 : Biomedical and Biotechnology Engineering Plenary Session I	33	2-10-1 : Tolerance Analysis and Robust Design	7	2-10-2 : Variation Simulation	10	2-10-3 : Geometric Modeling and Inspection	12
155E	5-1-1 : Dynamics, Vibration, and Control Plenary Session I	47	2-13-1 : Digital Twin Aspects	8	2-13-2 : Industry 4.0 Aspects	11	2-13-3 : Cyber-Manufacturing Aspects	13
155F	7-13-1 : Engineering Education Plenary Session	77	2-11-1 : Robotics and Automation in Advanced Manufacturing	8			2-12-2 : Laser-based Additive Manufacturing	13
250A			5-9-1 : Multibody Dynamic Systems and Applications I	48	5-9-2 : Multibody Dynamic Systems and Applications II	50	5-9-3 : Multibody Dynamic Systems and Applications III	51
250B			5-5-1 : Fluid-structure Interaction I	47	5-10-2 : Vibrations of Continuous Systems II	50	5-10-1 : Vibrations of Continuous Systems I	52
250C			11-46-1 : Young Medalist Symposium I	136	5-8-2 : Novel Control of Dynamic System and Design-2	49	11-46-2 : Young Medalist Symposium II	143
250D			7-1-1 : Curriculum Innovations, Pedagogy and Learning Methodologies – I	77	7-1-2 : Curriculum Innovations, Pedagogy and Learning Methodologies – II	78	7-3-1 : Engineering Accreditation, Data Collection, Assessment and ABET	79
250E			9-43-1 : K13-1 Heat Transfer in MultiPhase Systems – I	93	7-6-1 : Fluid Mechanics, Heat Transfer, Experiments and Energy Systems	78	9-45-1 : Condensation	96
250F			9-23-1 : Panel: Engaging with the Heat Transfer Division (HTD) and Technical Committees	93	9-43-2 : K13-1 Heat Transfer in MultiPhase Systems – II	95	9-64-1 : K20-3 Methods and Algorithms in Computational Heat Transfer	97
251A			11-11-1 : Multiscale Mechanics of Ductile Failure	134	9-63-1 : K20-2 Applications of Computational Heat Transfer	95	9-66-1 : K21-1 Panel on Recent Advancements and Discussions in Heat Transfer and Thermal Science Education	97
251B			11-10-1 : Dynamic Failure of Materials and Structures – 1	134	11-10-2 : Dynamic Failure of Materials and Structures – 2	138	11-10-3 : Dynamic Failure of Materials and Structures-3	140
251C			11-7-1 : From Single-crystal to Polycrystalline Behavior: Experiments and Modeling	133	11-7-2 : Plastic Anisotropy (I)	137	11-7-3 : Glass and Ceramic Materials	140
251D			11-42-1 : Nonlinear Dynamics, Control and Stochastic Mechanics IV	136	11-44-1 : Keynote Lectures on Computational Mechanics – 1	139	11-44-2 : Keynote Lectures on Computational Mechanics – 2	143
251E			11-18-1 : In-Situ and Quantitative Visualization Techniques: Bio-materials and Optical Techniques	135	11-18-2 : In-Situ and Quantitative Visualization Techniques: Microscopy in Experimental Mechanics	138	11-18-3 : In-Situ and Quantitative Visualization Techniques: Macro-scale Phenomena	141

MONDAY, NOVEMBER 11								
Room	9:45am–10:30am	PG.	10:45am–12:30pm	PG.	2:00pm–3:45pm	PG.	4:00pm–5:45pm	PG.
254B					9-20-1 : Fundamentals of Electron and Phonon Nonequilibrium Transport (Joint with K-9)	94	5-8-3 : Novel Control of Dynamic System and Design – 3	51
255A			11-39-1 : Multiphysics Simulations and Experiments for Solids I	136	11-39-2 : Multiphysics Simulations and Experiments for Solids II	138	11-39-3 : Multiphysics Simulations and Experiments for Solids III	142
255B	11-49-1 : Mechanics of Solids, Structures and Fluids Plenary Session I	133	4-7-1 : Dynamics and Control of Biomechanical Systems I	34	2-6-1 : 4th Symposium on Fastening, Adhesive Bonding, and Welding Technology – 1	9	2-6-2 : 4th Symposium on Fastening, Adhesive Bonding, and Welding Technology – 2	11
255C	3-1-2 : Advances in Aerospace Technology Plenary Session II	29	4-3-1 : Vibration and Acoustics Applications in Internal Organs	33	4-3-2 : Biomedical Characteristics and Characterisation	35	4-2-1 : Injury and Damage Biomechanics I	36
255D			11-17-1 : Mechanics of Adhesion and Friction – I	134	11-42-2 : Nonlinear Dynamics, Control and Stochastic Mechanics V	139	11-25-1 : High-Performance Nanostructural Materials and Nanocomposites	142
255E			11-8-1 : Perspective on Fracture and Failure Mechanics I	133	11-8-2 : Perspective on Fracture and Failure Mechanics II	137	11-8-3 : Perspective on Fracture and Failure Mechanics III	140
255F	6-19-1 : Energy Plenary Session I	61	4-4-1 : Biomedical Imaging, Therapy and Tissue Characterization I	33	4-4-2 : Biomedical Imaging, Therapy and Tissue Characterization II	35	4-8-1 : Clinical Applications of Bioengineering	37
257			6-3-1 : Thermoconomics	61	11-43-1 : Fluid-structure Interaction	139	11-22-1 : Computational Modeling of Extreme Events - 1	141
258			6-1-1 : Modelling of Energy-Related Components	61	6-1-2 : Experimental Analysis on Energy-Related Materials and Components	62	6-1-3 : Energy-Related Scenarios and Theoretical Studies	63
259			11-28-1 : Recent Advances and Applications in Meshfree and Particle Methods	135	6-5-1 : Energy Systems Components – 1	62	6-5-2 : Energy Systems Components – 2	63
260			7-10-1 : Teaching Laboratories, Machine Shop Experiences, and Technology-Aided Learning – I	77	7-10-2 : Teaching Laboratories, Machine Shop Experiences, and Technology-Aided Learning- II	78	7-12-1 : Engineering Research Innovation and REU	79
355B			4-5-1 : Microstructural, Mechanical and Cryogenic Properties of Biomaterials	34	4-5-2 : Modeling, Hyperelastic Characterization and Dynamic Behavior of Biomaterials	35	4-5-3 : Stenosis Diagnosis, Astrocytes Encapsulation, and Core Sheath Wet Electrospinning	37
355C			5-15-1 : Multi-Physics Dynamics-Control & Diagnostics-Prognostics of Structures and Devices	48	2-12-1 : Material Processing Based on Laser Heat Transfer and Laser Ablation	10		
355D			3-6-1 : Lightweight Sandwich Composites and Layered Structures – I	27	3-6-2 : Lightweight Sandwich Composites and Layered Structures – II	27	3-2-1 : Advances in Aerodynamics	28
355E			3-5-1 : Beam, Plate, and Shell Structures	27	3-7-1 : Dynamic Behavior of Composites	28	9-41-1 : K11-3 CMS - Applied Combustion	96
355F			9-32-1 : K10-1 Single Phase Heat Transfer Equipment	93	9-35-1 : K10-4 Heat Exchangers	94	9-36-1 : K10-5 Advances in Heat Exchangers Design and Analysis – I	95

Technical Program At-A-Glance

TUESDAY, NOVEMBER 12

Room	9:45am–10:30am	PG.	10:45am–12:30pm	PG.	2:00pm–3:45pm	PG.	4:00pm–5:45pm	PG.
155A			6-2-1 : Thermodynamics of Thermal and Cooling Processes	64	6-2-2 : Energy and Exergy Analysis of Power Cycles	65	6-2-3 : Chemical Thermodynamic Processes	66
155B			6-4-1 : Energy Harvesting Devices	64	6-4-2 : Stirling Engines and Flywheel Batteries	66	6-4-3 : Advanced Power Cycles and Chemical Processes	67
155C	2-1-2 : Advanced Manufacturing Plenary Session II	14	2-5-1 : Advanced Machining: Milling	15	2-5-2 : Advanced Machining: Turning	16	2-5-3 : Advanced Machining: Drilling	17
155D	3-1-1 : Advances in Aerospace Technology Plenary Session I	27	2-4-1 : Nanomanufacturing: Synthesis and Assembly of Nanomaterials and Nanocomposites	14	2-4-2 : Nanomanufacturing: Additive, Top-Down, and Self-Assembly Approaches	15	2-8-1 : Innovative Product and Process Design I	17
155E	4-1-2 : Biomedical and Biotechnology Engineering Plenary Session II	39	2-2-1 : Metals Additive Manufacturing I	14	2-2-2 : Metals Additive Manufacturing II	15	2-2-3 : Metals Additive Manufacturing III	16
155F	5-1-2 : Dynamics, Vibration, and Control Plenary Session II	53	3-12-1 : Peridynamics Modeling – I	29	3-12-2 : Peridynamics Modeling – II	31	3-3-1 : Novel Aerospace Propulsion Systems	32
250A			6-16-1 : Biomass Technologies and Conversion for Bioenergy	65	6-7-1 : Thermal Energy Storage I	66	6-7-2 : Thermal Energy Storage II	67
250B			7-4-1 : Systems Engineering and Sustainable Engineering Education	80	7-5-1 : Applied Mechanics, Dynamic Systems and Control Engineering	81	7-9-1 : K-12 STEM, RET-University, School and Industry Alliance	81
250C			7-7-1 : Problem Solving in Engineering Education, Research and Practice	80	8-14-1 : Young Engineers Paper (YEP) Contest	83	8-7-1 : 15th Forum on Recent Developments in Multiphase Flow	84
250D			8-9-1 : Industrial Flows I	83	8-9-2 : Industrial Flows II	83	8-9-3 : Industrial Flows III	84
250E			9-6-1 : K6-6 Radiative Heat Transfer of Energy Systems	98	9-7-1 : K6-7 Heat Transfer in Passive Thermal Control Systems	99	9-9-1 : K6-9 Two Phase Transport in Energy Systems and Non-equilibrium and Dynamic Energy Systems	101
250F			9-36-2 : K10-5 Advances in Heat Exchangers Design and Analysis – II	99	9-39-1 : K11-1 CMS – Combustion Processes – I	100	9-39-2 : K11-1 CMS – Combustion Processes – II	101
251A			10-26-1 : Materials Processing and Characterization – I	114	10-26-2 : Materials Processing and Characterization – II	115	10-26-3 : Materials Processing and Characterization – III	117
251B			10-10-1 : Multifunctional Composite Materials and Structures – I	113	10-10-2 : Multifunctional Composite Materials and Structures – II	115	10-10-3 : Multifunctional Composite Materials and Structures – III	116
251C			10-4-1 : Active Mechanical Metamaterials	113	10-4-2 : Anomalous Physical Properties of Mechanical Metamaterials	114	10-4-3 : Multiphysics Behavior of Mechanical Metamaterials	116
251D			10-20-1 : ONR, NIST, ARO	114	10-20-2 : NSF, DARPA, AFOSR	115	11-39-4 : Multiphysics Simulations and Experiments for Solids IV	150
251E			11-47-1 : Drucker Medal Symposium – I	146	11-47-2 : Drucker Medal Symposium – II	148	11-47-3 : Drucker Medal Symposium – III	151
254B			9-25-1 : K9-2 Thermal Transport in 2D and Anisotropic Materials	98	9-25-2 : K9-2 Thermal Transport in 2D and Anisotropic Materials – II	100		
255A			11-1-1 : Polymer Gel-1	144	11-1-2 : Polymer Gel-2	146	11-1-3 : Biomechanics and Biomaterials	148
255B	6-19-2 : Energy Plenary Session II	64	3-15-1 : Structural Health Monitoring of Composite Materials and Structures	30	3-10-1 : Impact, Damage and Fracture of Composite Structures	31	4-9-1 : Biotransport	42
255C	9-69-1 : Heat Transfer and Thermal Engineering Plenary Session I	98	4-2-2 : Injury and Damage Biomechanics II	39	4-2-3 : Injury and Damage Biomechanics III	40	4-2-4 : Injury and Damage Biomechanics IV	41

TUESDAY, NOVEMBER 12

Room	9:45am–10:30am	PG.	10:45am–12:30pm	PG.	2:00pm–3:45pm	PG.	4:00pm–5:45pm	PG.
255D			11-14-1 : Mechanics of Materials in Extreme Environments: Constitutive Modeling of Polymers	145	11-14-2 : Mechanics of Materials in Extreme Environments: Dynamic Behavior	147	11-14-3 : Mechanics of Materials in Extreme Environments: Extreme Temperatures	149
255E			11-7-4 : Plastic anisotropy (II)	144	11-7-5 : Novel Experimental Methods	147	11-7-6 : Plasticity and Damage	149
255F	10-31-1 : Advanced Materials: Design, Processing, Characterization, and Applications Plenary Session I	113	4-10-1 : Computational Modeling 1	40	4-10-2 : Computational Modeling 2	41	4-10-3 : Computational Modeling 3	42
257			11-22-2 : Computational Modeling of Extreme Events – 2	145	11-33-1 : Multiscale Methods for Simulation and Design of Materials Including Machine Learning and Other Emerging Methods – I	147	11-33-2 : Multiscale Methods for Simulation and Design of Materials Including Machine Learning and Other Emerging Methods – II	150
258			11-38-1 : Peridynamic Modeling of Materials' Behavior I	145	11-38-2 : Peridynamic Modeling of Materials' Behavior II	148	11-38-3 : Peridynamic Modeling of Materials' Behavior III	150
259			11-10-4 : Dynamic Failure of Materials and Structures – 4	144	5-7-1 : Smart Structures and Structronic Systems I	55	5-2-1 : General Dynamics, Vibration and Control I	56
260			5-5-2 : Fluid-structure Interaction II	53	5-4-1 : Robot Control	54	5-4-2 : Robot Design	56
355B			11-49-2 : Mechanics of Solids, Structures and Fluids Plenary Session II	144	4-5-4 : Bio-3D Printing, Fused Filament Fabrication, and Printable Hydrogels	39	4-14-1 : Biotechnology and General Applications	41
355C			5-16-1 : Renewable Energy, Structural Health Monitoring I	54	5-11-1 : Mobile Robots and Unmanned Ground Vehicles I	55	5-11-2 : Mobile Robots and Unmanned Ground Vehicles II	57
355D			5-12-1 : Control Theory and Applications I	53	3-14-1 : Nonlinear Problems in Aerospace Structures	32	10-30-1 : Nanomaterials for Energy I	117
355E			3-4-1 : Advances in Aerospace Structures and Materials – I	29	3-4-2 : Advances in Aerospace Structures and Materials – II	30	10-11-1 : Multifunctional Nanomaterials	116
355F			3-13-1 : Computational Aerospace Structural Dynamics and Aeroelasticity	29	3-8-1 : Dynamics and Control of Aerospace Structures	30	5-6-1 : Dynamics and Control in Micro/Nano Engineering I	56

WEDNESDAY, NOVEMBER 13

Room	8:45am–9:30am	PG.	9:45am–10:30am	PG.	10:45am–12:30pm	PG.	2:00pm–3:45pm	PG.	4:00pm–5:45pm	PG.
155A					4-13-1 : Design of Limb Rehabilitation Robots	43	4-13-2 : Data-Driven Design for Rehabilitation Robots	45	4-13-3 : System Analysis for Rehabilitation Robotics	46
155B					5-13-1 : Stochastic Optimization, Uncertainty and Probability	58	10-1-1 : In-Situ Techniques in Experimental Mechanics	119	9-2-1 : K6-2 Numerical Analysis and Performance Assessment of Energy Systems	104
155C			1-14-1 : Acoustics, Vibration, and Phononics Plenary Session	1	1-1-1 : Theoretical Phononics	1	1-1-2 : Nonlinear Phononics	1	1-1-3 : Computational and Spacetime Phononics	2
155D	8-13-1 : Fluids Engineering Plenary Session I	85	8-13-2 : Fluids Engineering Plenary Session II	85	1-2-1 : Passive, Semi-Active and Active Noise Control I	1	1-6-1 : Vibration/ Acoustic Measurements, Signal Processing and System Identification I	2		

Technical Program At-A-Glance

WEDNESDAY, NOVEMBER 13

Room	8:45am–9:30am	PG.	9:45am–10:30am	PG.	10:45am–12:30pm	PG.	2:00pm–3:45pm	PG.	4:00pm–5:45pm	PG.
155E			9-69-2 : Heat Transfer and Thermal Engineering Plenary Session II	102	2-5-4 : Advanced Finishing Processes	19	2-5-5 : Non-conventional Machining Processes: EDM and ECM	20	2-5-6 : Other Innovative Machining Processes	22
155F			10-31-2 : Advanced Materials: Design, Processing, Characterization and Applications Plenary Session II	118	2-8-2 : Innovative Product and Process Design II	19	2-8-3 : Innovative Product and Process Design III	20	2-8-4 : Innovative Product and Process Design IV	22
250A					9-26-1 : K9-3 Thermal Transport in Metamaterials	102	9-29-1 : K9-6 Nanoscale Modeling and Simulation – I	103	9-29-2 : K9-6 Nanoscale Modeling and Simulation – II	105
250B					6-16-2 : Biomass Technologies and Conversion for Biofuel	69	6-4-4 : Design and Analysis of Energy Systems – 1	69	6-4-5 : Design and Analysis of Energy Systems – 2	70
250C					6-6-1 : Low Temperature Energy Conversion Systems	68	6-7-3 : Thermal Energy Storage III	70	6-8-1 : Environmental Aspects of Energy Systems	71
250D					6-11-1 : Lithium Batteries and Beyond	68	6-11-2 : Modeling of Lithium Batteries	70	6-11-3: Electrochemical Systems – Materials and Optimization	71
250E					8-11-1 : 19th International Symposium on Measurement and Modeling of Environmental Flows and Wind Turbine Aerodynamics and Control	85	8-2-1 : 26th Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids – I	86	8-2-2 : 26th Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids – II	87
250F					8-9-4 : Industrial Flows and Fluid Measurement & Instrumentation	85	8-12-1 : 12th Forum on Fluid Measurements and Instrumentation	86	8-1-1 : 17th Symposium on Electric, Magnetic and Thermal Phenomena in Micro and Nano-Scale Systems	87
251A					10-26-4: Materials Processing and Characterization – IV	118	10-26-5: Materials Processing and Characterization – V	120	10-26-6: Materials Processing and Characterization – VI	121
251B					9-14-1 : K6-14 Radiation Properties	102	9-10-1 : K6-10 Panel on the Key Role of Heat Transfer Analysis in Energy Systems Research	103		
251C					9-46-1 : K14-1 Gas Turbine Heat Transfer and Cooling	102	9-19-1 : K8-2 Fundamentals of Single Phase Convection I	103	9-19-2 : K8-2 Fundamentals of Single Phase Convection II	104
251D					10-10-4 : Multifunctional Composite Materials and Structures – IV	118	10-10-5 : Multifunctional Composite Materials and Structures – V	119	10-20-3 : Center Directors	120

WEDNESDAY, NOVEMBER 13

Room	8:45am–9:30am	PG.	9:45am–10:30am	PG.	10:45am–12:30pm	PG.	2:00pm–3:45pm	PG.	4:00pm–5:45pm	PG.
251E					10-4-4 : Reconfigurable Mechanical Metamaterials	118	10-4-5 : Dynamical and Transient Phenomena in Mechanical Metamaterials	119	10-17-1 : Constitutive Modeling of the Mechanical Behavior and Performance of Electronic, Photonic, MEMS, and NEMS Materials, Assemblies, Packages, Modules, and Systems – I	120
255B	12-2-1 : Micro-and Nano-Systems Engineering and Packaging Plenary Session I	169	12-2-2 : Micro-and Nano-Systems Engineering and Packaging Plenary Session II	169	2-2-4 : Polymer Additive Manufacturing I	18	2-2-5 : Polymer Additive Manufacturing II	19	2-2-6 : Hybrid Additive Manufacturing Processes	21
255C			13-12-1 : Safety Engineering, Risk and Reliability Analysis Plenary Session	175	2-2-7 : Additive Manufacturing of Composites & Ceramics	18	2-14-1 : General Manufacturing	21		
255D					5-2-2 : General Dynamics, Vibration and Control II	58	5-2-3 : General Dynamics, Vibration and Control III	59	5-2-4 : General Dynamics, Vibration and Control IV	60
255E					5-4-3 : Mechanism Design I	58	5-4-4 : Mechanism Design II	59	5-4-5 : Compliant Mechanisms	60
255F			14-6-1 : Design, Systems and Complexity Plenary Session	181	4-2-5 : Injury and Damage Biomechanics V	43	4-10-4 : Computational Modeling 4	44	4-10-5 : Computational Modeling 5	45
257					11-1-4 : Liquid Crystal Elastomer	152	11-1-5 : Soft Actuating Materials	153	11-1-6 : Mechanics of Indentation, Injection and Cavitation	154
258					11-47-4 : Drucker Medal Symposium – IV	153			11-5-1 : Mechanics, Modeling and Manufacturing of Soft Materials and Soft Robots – I	155
259					11-7-7 : Plasticity of Heterogeneous Materials	152	11-37-1 : liSS Session 1 Composite Instabilities	154	11-37-2 : liSS Session 2 Material Instabilities	156
260					11-23-1 : Multi-Scale Computations 1	152	11-23-2 : Multi-Scale Computations 2	153	11-23-3 : Multi-Scale Computations 3	155
355B	18-1-1 : Conference Wide Symposium Plenary Session	217			4-11-1 : Musculoskeletal and Sports Biomechanics 1	43	4-11-2 : Musculoskeletal and Sports Biomechanics 2	44	4-12-1 : Sensors and Actuators	45
355C					12-7-1 : Applied Mechanics and Materials in Micro and Nano-Systems – 1	169	11-27-1 : Mechanics of Thin-Film and Multi-Layer Structures	153	11-32-1 : Congress-Wide Symposium on Additive Manufacturing: Failure of Additively Manufactured Materials – 1	155
355D					13-6-1 : Prognostic and Health Management – I				13-1-1 : Reliability Methods	
355E					14-4-1 : Design for Additive Manufacturing I	181	14-4-2 : Design for Additive Manufacturing II	181	14-3-1 : Optimisation I	182

Technical Program At-A-Glance

WEDNESDAY, NOVEMBER 13

Room	8:45am–9:30am	PG.	9:45am–10:30am	PG.	10:45am–12:30pm	PG.	2:00pm–3:45pm	PG.	4:00pm–5:45pm	PG.
355F					14-2-1 : CAD, CAM and CAE Design I	181	12-3-1 : Design and Fabrication, Analysis, Processes, and Technology for Micro and Nano Devices and Systems	169	12-8-1 : Microfluidics and Nanofluidics in Bioengineering Applications II	170

THURSDAY, NOVEMBER 14

Room	8:15am–10:00am	PG.	10:15am–12:00pm	PG.	2:00pm–3:45pm	PG.	4:00pm–5:45pm	PG.
155A	10-9-1 : Modeling, Simulation, and Design of Multifunctional Materials – I: Multiscale and Multiphysical Phenomena	122	10-9-2 : Modeling, Simulation, and Design of Multifunctional Materials – II: Metamaterials and Lattice Structures	124	10-9-3 : Modeling, Simulation, and Design of Multifunctional Materials – III: Composites and Engineering Materials	127	10-15-1 : Lithium-ion Battery Safety under Abusive Conditions	129
155B	10-17-2 : Constitutive Modeling of the Mechanical Behavior and Performance of Electronic, Photonic, MEMS, and NEMS Materials, Assemblies, Packages, Modules, and Systems – II	122	10-27-1 : Phase Transformations in Materials Processing – I	126	10-27-2 : Phase Transformations in Materials Processing – II	128	10-27-3 : Phase Transformations in Materials Processing – III	131
155C	1-1-4 : Topological States and Instabilities in Phononics	3	1-1-5 : Control of Phononic Materials	3	1-1-6 : Beyond Elastic Phononics: Acoustics, Thermoelectricity, and Electromagnetics	4	1-12-2 : NDE & SHM II: Ultrasonic Waves for Material Characterization and Damage Assessment	6
155D	6-10-1 : Renewable Energy 1	72	6-10-2 : Renewable Energy 2	73	6-10-3 : Renewable Energy 3	74	6-10-4 : Renewable Energy 4	75
155E	6-12-1 : Fuel Cells and Electrolyzers	73	6-12-2 : PEM Fuel Cells	74	6-14-1 : Nuclear Power Plants: Design, Analysis, and Safety – I	75	6-14-2 : Nuclear Power Plants: Design, Analysis, and Safety – II	76
155F	6-9-1 : Performance Evaluations of Envelopes and Materials of Buildings and HVAC Systems	72	6-9-2 : Innovations in HVAC Systems	73	6-9-3 : Control and Optimization of Energy Systems for Buildings	74	8-3-3 : 25th Symposium on Fundamental Issues and Perspectives in Fluid Mechanics – III	91
250A	10-25-1 : Material Processing of Flexible Electronics, Sensors, and Devices – I	123	10-25-2 : Material Processing of Flexible Electronics, Sensors, and Devices – II	125	10-29-1 : Recent Developments in Tribology – I	128	10-29-2 : Recent Developments in Tribology – II	131
250B	11-1-7 : Structure and Device	157	11-1-8 : Constitutive Modelling	160	11-1-9 : Aging and Damaging	163	11-1-10 : Soft Matter Physics	165
250C	11-2-1 : Design of Functional Soft Composites	157	11-2-2 : Fabrication and Processing of Soft Composites	160	11-3-1 : 3D Printing of Functional Materials and Composites	163	11-3-2 : 3D/4D Printing of Structures and Biomaterials	165
250D	11-5-2 : Mechanics, Modeling and Manufacturing of Soft Materials and Soft Robots – II	157	11-5-3 : Mechanics, Modeling and Manufacturing of Soft Materials and Soft Robots – III	160	11-5-4 : Mechanics, Modeling and Manufacturing of Soft Materials and Soft Robots – IV	163	11-5-5 : Mechanics, Modeling and Manufacturing of Soft Materials and Soft Robots – V	166
250E	11-12-1 : Damage and Fatigue in Engineering Applications	158	11-12-2 : Atmospheric Scale Crack Nucleation and Propagation Modeling	161	11-12-3 : Multiscale Fracture and Fatigue Modeling in Materials	164	11-12-4 : Modeling of Fatigue Crack and Interface Behavior	166
250F	11-35-1 : Mechanics and Design of Cellular Materials	158	11-19-1 : Multiscale Models and Experimental Techniques for Composite Materials and Structures	161	13-8-1 : General Topics on Risk, Safety and Reliability	178	13-9-1 : Safety in Transportation, Agriculture, and Off-Road Vehicles	179
251A	14-1-1 : Product and Process Design I	183	14-1-2 : Product and Process Design II	183	14-1-3 : Product and Process Design III	184	14-1-4 : Product and Social Aware Design	185
251B	12-5-1 : Micro and Nano Systems in Medicine and Biology	171	12-10-1 : Inertial Navigation: MEMS/NEMS to Bio-Inspired	173	12-7-2 : Applied Mechanics and Materials in Micro and Nanosystems – 2	173	12-7-3 : Applied Mechanics and Materials in Micro and Nanosystems – 3	174

THURSDAY, NOVEMBER 14

Room	8:15am–10:00am	PG.	10:15am–12:00pm	PG.	2:00pm–3:45pm	PG.	4:00pm–5:45pm	PG.
251C	12-6-1 : Micro/Nano Materials and Devices	171	12-8-2 : Micro/ Nanoscale Electrokinetics	172	2-3-1 : Non-destructive Examination Techniques for Additive Manufacturing	24	2-3-2 : Measurement Science and Sensors to Support Advanced Manufacturing	25
251D	2-7-1 : Novel Processes	23	2-7-2 : Incremental Forming	23	2-7-3 : Numerical Modeling	24	2-7-4 : Properties and Defects	25
251E	14-2-2 : CAD, CAM and CAE Design II	183	14-3-2 : Optimisation II	184	14-3-3 : Optimisation III	184	9-51-2 : K16-1: Heat Transfer in Electronic Equipment II	111
255A	10-24-1 : Fracture and Damage: Nano- to Macro-Scale- I	123	10-24-2 : Fracture and Damage: Nano- to Macro-Scale- II	125	1-12-1 : NDE & SHM I: Ultrasonic Waves for Material Characterization and Damage Assessment	5	10-13-1 : Bioinspired Materials, Processes and Applications	129
255B	8-5-1 : EFD/CFD Choice – A Dilemma for Industries	88	8-4-1 : Symposium on CFD Applications for Optimization and Controls – I	89	8-4-2 : Symposium on CFD Applications for Optimization and Controls – II	90	8-4-3 : Symposium on CFD Applications for Optimization and Controls – III	91
255C	8-2-3 : 26th Symposium on Fluid Mechanics & Rheology of Nonlinear Materials and Complex Fluids – III	88	8-3-1 : 25th Symposium on Fundamental Issues and Perspectives in Fluid Mechanics – I	88	9-15-1 : K7-1 Spatially Resolved Thermophysical Property Measurements	108	9-16-1 : K7-2 Thermophysical Properties of Next-Generation Thermal Storage Materials	111
255D	1-10-1 : Computational Acoustics and Human Perception of Sound	3	1-2-2 : Passive, Semi-Active and Active Noise Control II	4	9-51-1 : K16-1: Heat Transfer in Electronic Equipment I	109	9-53-1 : K18-1 Thermal Transport under High Temperature and/or Pressure Conditions	112
255E	9-57-1 : K19-1 Heat and Mass Transfer in the Natural and Built Environment	107	9-30-1 : K9-7 Nanoscale Thermal Radiation	108	9-30-2 : K9-7 Nanoscale Thermal Radiation	109	9-31-1 : K9-8 Nanoscale Materials for Thermal Energy Systems	111
255F	9-4-1 : K6-4 Heat Transfer in Solar Power Systems	106	10-20-4 : Center Director and Panel Discussion	124	9-59-1 : Advances in Water and Wastewater Processing and Water Desalination Technologies	110	10-23-2 : Nanoengineered, Nano Modified, Hierarchical, Multi-Scale Materials and Structures – II	130
257	9-18-1 : K8-1 Fundamentals of Boiling, Evaporation, and Condensation Including Micro/Nano-scale Effects I	106	9-18-2 : K8-1 Fundamentals of Boiling, Evaporation, and Condensation Including Micro/Nano-scale Effects II	107	9-49-1 : K15-3 Transport Phenomena in Additive Manufacturing	109	9-5-1 : K6-1 Simulation and Validation Methods of Mixed Convection and Conjugate Heat Transfer Analyses in Annular or Ducting Systems	110
258	11-36-1 : Multifunctional and Micro/Nano-structured Materials: Modeling and Characterization (I)	159	11-36-2 : Multifunctional and Micro/Nano-structured Materials: Modeling and Characterization (II)	162	8-3-2 : 25th Symposium on Fundamental Issues and Perspectives in Fluid Mechanics – II	90	1-6-2 : Vibration/Acoustic Measurements, Signal Processing and System Identification II	5
259	8-6-1 : Microfluidics and Nanofluidics in Bioengineering Applications I	88	8-6-2 : Multiphase Flows	89	8-6-3 : Fundamentals and Applications in Micro/ Nanofluidics I	90	8-6-4 : Fundamentals and Applications in Micro/ Nanofluidics II	92
260	11-26-1 : Nanomechanics and Nanomaterials 1	158	11-26-2 : Nanomechanics and Nanomaterials 2	161	11-26-3 : Nanomechanics and Nanomaterials 3	164	11-26-4 : Nanomechanics and Nanomaterials 4	167
355B	9-24-1 : K9-1 Thermal Transport across Hard/Soft Interfaces	107	10-23-1 : Nanoengineered, Nano Modified, Hierarchical, Multi-Scale Materials and Structures – I	125	10-2-1 : Multiscale Modeling for Materials Design – I	126	10-2-2 : Multiscale Modeling for Materials Design – II	128
355C	11-37-3 : IiSS Session 3 Material and Structural Instabilities	159	11-37-4 : IiSS Session 4 Architected Materials Instabilities	162	11-37-5 : IiSS Session 5 Surface Instabilities	165	11-34-1 : Phase-field Modeling and Simulation in Mechanics	167
355D	13-10-1 : Crashworthiness, Occupant Protection, and Biomechanics – I	177	13-10-2 : Crashworthiness, Occupant Protection, and Biomechanics – II	177	13-4-1 : Reliability and Risk in Energy Systems	177	13-5-1 : Reliability and Risk in Manufacture Systems	178
355E	12-1-1 : MENS/NEMS: Manufacturing and Applications	171	12-4-1 : Computational Studies on MEMS and Nanostructures	172	10-19-1 : Design of Engineered Materials and Components for Additive Manufacturing: Spatial Programming and 3D Design	127	10-19-2 : Design of Engineered Materials and Components for Additive Manufacturing: Meso-, Micro- and Nano-architecture	130
355F	10-14-1 : Soft Robotics and Soft Machines – I	122	10-14-2 : Soft Robotics and Soft Machines – II	124	10-5-1 : Multifunctional and Micro/Nano-structured Materials: Modeling and Characterization (III)	126	10-12-1 : Mechanics in Manufacturing of Multifunctional Materials and Structure	128

TRACK 1 ACOUSTICS, VIBRATION, AND PHONONICS

- 1-1-1: Theoretical Phononics**
- 1-1-2: Nonlinear Phononics**
- 1-1-3: Computational and Spacetime Phononics**
- 1-1-4: Topological States and Instabilities in Phononics**
- 1-1-5: Control of Phononic Materials**
- 1-1-6: Beyond Elastic Phononics: Acoustics, Thermoelectricity, and Electromagnetics**
- 1-2-1: Passive, Semi-Active, and Active Noise Control I**
- 1-2-2: Passive, Semi-Active, and Active Noise Control II**
- 1-6-1: Vibration/Acoustic Measurements, Signal Processing, and System Identification I**
- 1-6-2: Vibration/Acoustic Measurements, Signal Processing, and System Identification II**
- 1-10-1: Computational Acoustics and Human Perception of Sound**
- 1-12-1: NDE & SHM I: Ultrasonic Waves for Material**
- 1-12-2: NDE & SHM II: Ultrasonic Waves for Material Characterization and Damage Assessment**
- 1-14-1: Plenary Session**

ACKNOWLEDGMENT

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TRACK 1 ACOUSTICS, VIBRATION, AND PHONONICS

WEDNESDAY, NOVEMBER 13

1-14 PLENARY PRESENTATION

1-14-1 Plenary Session

Convention Center, 155C

9:45AM–10:30AM

9:45am – Hyperelastic Metamaterials and Phononic Media: Stretching the Truth?

Plenary Presentation. IMECE2019-11006

William J. Parnell, *University of Manchester, Manchester, United Kingdom*

1-1 PHONONIC CRYSTALS AND METAMATERIALS

1-1-1 Theoretical Phononics

Convention Center, 155C

10:45AM–12:30PM

Session Organizer: Mahmoud Hussein, *University of Colorado, Boulder, Boulder, CO, United States*

10:45am – Guiding Stress With Discrete Wire Networks

Technical Presentation. IMECE2019-10644

Graeme Milton, *University of Utah, Salt Lake City, UT, United States*, Guy Bouchitte, *University of Toulon, Toulon, France*, Ornella Mattei, *University of Utah, Salt Lake City, UT, United States*, Pierre Seppecher, *University of Toulon, Toulon, France*

11:06am – Resonance: Beyond Bandgaps and Towards Cloaking

Technical Presentation. IMECE2019-13891

Hussein Nassar, Yangyang Chen, Xianchen Xu, Guoliang Huang, *University of Missouri, Columbia, Columbia, MO, United States*

11:27am – Field Homogenization, Scattering, and Band Structure for Oblique Stress Waves in Layered Media

Technical Presentation. IMECE2019-13010

Vahidreza Alizadeh, Alireza Amirkhizi, *University of Massachusetts, Lowell, Lowell, MA, United States*

11:48am – Wave Characterization in Chiral and Non-Chiral Dynamic Elastic Lattices

Technical Presentation. IMECE2019-12500

Ian S. Jones, *Liverpool John Moores University, Liverpool, Merseyside, United Kingdom*, Giorgio Carta, Alexander Movchan, Natasha Movchan, *University of Liverpool, Liverpool, United Kingdom*

12:09pm – Wave-Mode Identification and Bandgap Classification in Periodic Structures

Technical Presentation. IMECE2019-13695

Maria J. Carrillo-Munoz, Bisham Sharma, *Wichita State University, Wichita, KS, United States*

1-2 PASSIVE, SEMI-ACTIVE, AND ACTIVE NOISE CONTROL

1-2-1 Passive, Semi-Active, and Active Noise Control I

Convention Center, 155D

10:45AM–12:30PM

Session Organizer: John Collinger, *Naval Nuclear Laboratory, West Mifflin, PA, United States*

Session Co-Organizer: Yousof Azizi, *Bridgestone Americas, Akron, OH, United States*

10:45am – Effect of an Electric Fan Blade Geometry on Noise Generation

Technical Presentation. IMECE2019-10096

Prathamesh Ghankutkar, Fred Barez, *San Jose State University, San Jose, CA, United States*, Yazdan Razi, *Cisco Systems, San Jose, CA, United States*, Hussameddine Kabbani, Ernest Thurlow, *San Jose State University, San Jose, CA, United States*

11:06am – The Feasibility of Noise Insulating Materials With Variability of Frequencies and Amplitudes

Technical Paper Publication. IMECE2019-11024

Zach Kitowski, *Texas A&M University, Colleyville, TX, United States*, Andrew Marsh, Roy Graves, *Texas A&M University, College Station, TX, United States*

11:27am – Acoustic Control of a Maneuverable Marine Hydrokinetic Cycloturbine

Technical Paper Publication. IMECE2019-11381

Margalit Goldschmidt, *Penn State University/ARL, State College, PA, United States*, Michael Jonson, *Penn State University, State College, PA, United States*, Joseph Horn, *Penn State University, University Park, PA, United States*

11:48am – On the Detection Method for the Air-Flow Disturbance Come Into the Microphone for the Active Noise Control as an Error Signal

Poster Presentation. IMECE2019-12748

Osamu Terashima, Reon Nishikawa, *Toyama Prefectural University, Toyama, Japan*

1-1 PHONONIC CRYSTALS AND METAMATERIALS

1-1-2 Nonlinear Phononics

Convention Center, 155C

2:00PM–3:45PM

Session Organizer: Ankit Srivastava, *Illinois Institute of Technology, Chicago, IL, United States*

2:00pm – Analysis of the Evolution of Nonlinear Waves in Homogeneous and Periodic Rods

Technical Presentation. IMECE2019-13300

Romik Khajehtourian, Mahmoud Hussein, *University of Colorado Boulder, Boulder, CO, United States*

2:21pm – Tuning of Elastic Waveguides Through the Interplay of Quadratic and Cubic Nonlinearities

Technical Presentation. IMECE2019-12949

Weijian Jiao, Stefano Gonella, *University of Minnesota, Minneapolis, MN, United States*

2:42pm – Analysis of Internally-Resonant Wave Energy Exchange in Nonlinear Lattices

Technical Presentation. IMECE2019-13564

Matthew Fronk, *Georgia Institute of Technology, Smyrna, GA, United States*, Michael Leamy, *Georgia Institute of Technology, Atlanta, GA, United States*

3:03pm – Broadband Non-Reciprocity in a Passive, Nonlinear Metamaterial

Technical Presentation. IMECE2019-13605

Lezheng Fang, Amir Darabi, *Georgia Institute of Technology, Atlanta, GA, United States*, Alireza Mojahed, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*, Alexander Vakakis, *University of Illinois, Urbana, IL, United States*, Michael Leamy, *Georgia Institute of Technology, Atlanta, GA, United States*

3:24pm – Multistability and Strain Engineering for Tunable, Reversible Elastic Wave Propagation

Technical Presentation. IMECE2019-11782

Vinod Ramakrishnan, Michael Frazier, *University of California, San Diego, La Jolla, CA, United States*

1-6 VIBRATION/ACOUSTIC MEASUREMENTS, SIGNAL PROCESSING AND SYSTEM IDENTIFICATION

1-6-1 Vibration/Acoustic Measurements, Signal Processing and System Identification I

Convention Center, 155D

2:00PM–3:45PM

Session Organizer: Robert Tomko, *Naval Nuclear Laboratory, South Park, PA, United States*

Session Co-Organizers: Matthew Plutt, *Fluor Marine Propulsion LLC, West Mifflin, PA, United States*, Kristin Cody, *Naval Nuclear Laboratory, Jefferson Hills, PA, United States*

2:00pm – Preliminary Results of Microwave Induced Thermoacoustics Imaging in Geological Media

Technical Paper Publication. IMECE2019-11943

Chang Liu, Xu Mao, Juan Heredia Juesas, Ali Molaei, Jose Martinez Lorenzo, *Northeastern University, Boston, MA, United States*

2:21pm – Aero-Engine Vibration Propagation Analysis Using Bond Graph Transfer Path Analysis and Transmissibility Theory

Technical Paper Publication. IMECE2019-10773

Seyed-Ehsan Mir-Haidari, Kamran Behdinan, *University of Toronto, Toronto, ON, Canada*

2:42pm – An Experimental Approach in Defect Detection of a Single Row Ball Bearing Using Noise Generation Signal

Technical Paper Publication. IMECE2019-12146

Seyed Hamid Sanei, *Penn State University, Erie, PA, United States*, Aref Afsharfard, *Ferdowsi University of Mashhad, Mashhad, Islamic Republic of Iran*

3:03pm – Self-Vibration Analysis of the Free-Fall Absolute Gravimeter

Technical Paper Publication. IMECE2019-10836

Zhenxing Li, Kang Wu, Yi Wen, Jiamin Yao, Meiyong Guo, Lijun Wang, *Tsinghua University, Beijing, Beijing, China*

3:24pm – An Optimal Band-Pass Filter Based on Adaptive Identification of Bearing Resonant Frequency Band

Technical Paper Publication. IMECE2019-12200

Wei Guo, Ronghui Li, Xiang Li, *University of Electronic Science and Tech of China, Chengdu, China*

1-1 PHONONIC CRYSTALS AND METAMATERIALS

1-1-3 Computational and Spacetime Phononics

Convention Center, 155C

4:00PM–5:45PM

Session Organizer: Michael Frazier, *University of California, San Diego, San Diego, CA, United States*

4:00pm – On the Properties of Phononic Eigenvalue Problems

Technical Presentation. IMECE2019-12850

Amir Ashkan Mokhtari, Yan Lu, Ankit Srivastava, *Illinois Institute of Technology, Chicago, IL, United States*

4:21pm – Influence of Eigenvalue Degeneracies on the Scattered Field for an In-Plane Problem

Technical Presentation. IMECE2019-13566

Yan Lu, Amir Ashkan Mokhtari, Ankit Srivastava, *Illinois Institute of Technology, Chicago, IL, United States*

4:42pm – Dispersion Behavior of Metamaterials Modeled by CUF Beam Elements

Technical Presentation. IMECE2019-12607

Maria Cinefra, Alberto Garcia De Miguel, *Politecnico di Torino, Turino, Italy*, Paolo Celli, *California Institute of Technology, Pasadena, CA, United States*, Alfonso Pagani, Erasmo Carrera, *Politecnico di Torino, Torino, Italy*

5:03pm – Non-Reciprocal Wave Propagation in a Temporally Modulated Metabeam

Technical Presentation. IMECE2019-12852

Mohammad Ali Attarzadeh, Jesse Callanan, Mostafa Nouh, *University at Buffalo, Buffalo, NY, United States*

5:24pm – Space-Time Phononic Crystals With Anomalous Topological Edge States

Technical Presentation. IMECE2019-13051

Mourad Oudich, Yuanchen Deng, *North Carolina State University, Raleigh, NC, United States*, Molei Tao, *Geor Tech, Atlanta, GA, United States*, Yun Jing, *North Carolina State University, Raleigh, NC, Uni*

THURSDAY, NOVEMBER 14

1-1 PHONONIC CRYSTALS AND METAMATERIALS

1-1-4 Topological States and Instabilities in Phononics

Convention Center, 155C

8:15AM–10:00AM

Session Organizer: Stefano Gonella, *University of Minnesota, Minneapolis, MN, United States*

8:15am – Corner States in Second Order Acoustic Topological Insulator

Technical Presentation. IMECE2019-13645

Ze-Guo Chen, *Hong Kong Baptist University, Hong Kong, Hong Kong*, **Changqing Xu**, *King Abdullah University of Science and Technology, Jeddah, Saudi Arabia*, **Jun Mei**, *South China University of Technology, Guangzhou*, **Ying Wu**, *King Abdullah University of Science and Technology, Thuwal, Saudi Arabia*

8:36am – Electrically Tunable Topological State in a Piezoelectric Rod

Technical Presentation. IMECE2019-12616

Weiqiu Chen, *Zhejiang University, Hangzhou, Zhejiang, China*

8:57am – Topological Vector Solitons in Elastic Metamaterial

Technical Presentation. IMECE2019-12106

Michael Frazier, *University of California, San Diego, La Jolla, CA, United States*, **Romik Khajehtourian**, **Dennis M. Kochmann**, *ETH Zürich, Zürich, Switzerland*

9:18am – Pulse-Driven Robot: Motion via Solitary Waves

Technical Presentation. IMECE2019-13354

Bolei Deng, **Liyuan Chen**, **Donglai Wei**, *Harvard University, Cambridge, MA, United States*, **Vincent Tournat**, *Laboratoire d'Acoustique de l'Université du Mans, Le Mans, cedex, France*, **Katia Bertoldi**, *Harvard University, Cambridge, MA, United States*

1-10 COMPUTATIONAL ACOUSTICS AND HUMAN PERCEPTION OF SOUND

1-10-1 Computational Acoustics and Human Perception of Sound

Convention Center, 255D

8:15AM–10:00AM

Session Organizer: Haijun Liu, *Temple University, Philadelphia, PA, United States*

Session Co-Organizer: Albert Kirwan, *General Dynamics Electric Boat, Waterford, CT, United States*

8:15am – Tactile Display for Improving Music Appreciation of Cochlear Implant Users

Technical Presentation. IMECE2019-12977

Runar Unnthorsson, *University of Iceland, Reykjavik, Iceland*

8:36am – Analysis of Binaural Impulse Response Data in a Non-Diffuse Sound Field

Poster Presentation. IMECE2019-12269

Heather Lai, **Anne Balant**, *SUNY New Paltz, New Paltz, NY, United States*

8:57am – An Investigation Into Structural-Induced Noise in an Electric Motor

Technical Paper Publication. IMECE2019-10197

Tung Vuong, *Manukau Institute of Technology, Auckland, New Zealand*, **Willow Yangliu Li**, *University of Auckland, Auckland, New Zealand, New Zealand*, **Ahmed Al-Jumaily**, *Auckland University of Technology, Auckland, New Zealand*, **Neel Pandey**, *Manukau Institute of Technology, Auckland, New Zealand, New Zealand*

9:18am – Echolocation Training Environment for the Visually Impaired

Technical Presentation. IMECE2019-12978

Runar Unnthorsson, *University of Iceland, Reykjavik, Iceland*

9:39am – An Air Suspension System With Adjustable Height, Damping and Stiffness Using No Viscous Dampers

Technical Paper Publication. IMECE2019-10153

Reza Kashani, *University of Dayton, Dayton, OH, United States*

1-1 PHONONIC CRYSTALS AND METAMATERIALS

1-1-5 Control of Phononic Materials

Convention Center, 155C

10:15AM–12:00PM

Session Organizer: Kathryn Matlack, *University of Illinois Urbana-Champaign, Urbana, IL, United States*

10:15am – Shear Wave Propagation in Finitely Deformed Magnetoactive Layered Materials

Technical Presentation. IMECE2019-13647

Neda Karami Mohammadi, *University of Wisconsin-Madison, Madison, WI, United States*, **Pavel Galich**, *Rice University, Houston, TX, United States*, **Anastasiia Krushynska**, *ENTEG University of Groningen, Groningen, Netherlands*, **Stephan Rudykh**, *University of Wisconsin-Madison, Madison, WI, United States*

10:36am – Experimental Analysis of Noise Filtration Using Magneto-Elastic Phononic Crystal

Technical Presentation. IMECE2019-13716

Mostafa Tavakkoli Anbarani, *State University of Buffalo, Buffalo, NY, United States*, **M. Amin Karami**, *University at Buffalo, Buffalo, NY, United States*

10:57am – Control Wave Propagation in Tunable Phononic Crystals With Ferromagnetic Shape Memory Alloys

Technical Presentation. IMECE2019-13364

Xiaowei Xue, **Feng Jin**, *Xi'an Jiaotong University, Xi'an, Shan Xi, China*

11:18am – Shape Memory Metamaterials With Adaptive Bandgaps for Ultra-Wide Frequency Spectrum Vibration Control

Technical Paper Publication. IMECE2019-10902
Yihao Song, Yanfeng Shen, *Shanghai Jiao Tong University, Shanghai, Shanghai, China*

11:39am – Vibration Absorption in a Nonlinear Metamaterial Beam Incorporating Shape Memory Alloys

Technical Paper Publication. IMECE2019-11302
Ralston Fernandes, James G. Boyd, *Texas A&M University, College Station, TX, United States*, Sami El-Borgi, *Texas A&M University at Qatar, Doha, Qatar*, Dimitris Lagoudas, *Texas A&M University, College Station, TX, United States*

1-2 PASSIVE, SEMI-ACTIVE, AND ACTIVE NOISE CONTROL

1-2-2 Passive, Semi-Active and Active Noise Control II

Convention Center, 255D 10:15AM–12:00PM

Session Organizer: John Collinger, *Naval Nuclear Laboratory, West Mifflin, PA, United States*

Session Co-Organizer: Yousof Azizi, *Bridgestone Americas, Akron, OH, United States*

10:15am – Analysis of Structural Acoustic Design Variables for a Periodically Stiffened Plate Using the Finite Element Method

Technical Paper Publication. IMECE2019-10259
Joseph Blochberger, *Penn State University, University Park, PA, United States*

10:36am – Development and Design of the Dynamic Vibration Absorber Using Magneto-Rheological Elastomer for the Weight and Power Consumption Saving

Technical Paper Publication. IMECE2019-10776
Osamu Terashima, Mika Nakata, *Toyama Prefectural University, Imizu, Toyama, Japan*, Toshihiko Komatsuzaki, *Kanazawa University, Kanazawa, Japan*

10:57am – Influence of Active Part Stiffness on Radiated Sound Power Level in Power Transformers

Technical Paper Publication. IMECE2019-11513
Cassiano Costa Linhares, João Filipe Seabra Costa, Ricardo Emanuel da Rocha Teixeira, Cristiano Pereira Coutinho, Sérgio Manuel Oliveira Tavares, João Pedro Anselmo do Espírito Santo, Hélder Fernando Gonçalves Mendes, *Efacec Energia, Máquinas e Equipamentos Eléctricos, S.A, Porto, Portugal*

11:18am – Electronic Cooling Fan Noise Abatement Using Blade Geometry

Poster Presentation. IMECE2019-13053
Prathamesh Ghankutkar, Fred Barez, *San Jose State University, San Jose, CA, United States*

1-1 PHONONIC CRYSTALS AND METAMATERIALS

1-1-6 Beyond Elastic Phononics: Acoustics, Thermoelectricity, and Electromagnetics

Convention Center, 155C 2:00PM–3:45PM

Session Organizer: Mostafa Nouh, *University at Buffalo, Buffalo, NY, United States*

2:00pm – Low Frequency Absorption of Additively Manufactured Cylinders

Technical Paper Publication. IMECE2019-11338
Sophie Kaye, Ethan Casavant, Paul Slaboch, *University of Hartford, West Hartford, CT, United States*

2:21pm – Doping Effects on the Thermoelectric Properties of SnSe: A First-Principles Study

Technical Presentation. IMECE2019-10817
Shouhang Li, Zhen Tong, Hua Bao, *Shanghai Jiao Tong University, Shanghai, Shanghai, China*

2:42pm – Scalable Nanomanufacturing of Mid-Wavelength Infrared Metasurface Based on Low-Cost Sulfuric Polymer

Technical Presentation. IMECE2019-10449
Jon Ryu, Md. Didarul Islam, *North Carolina State University, Raleigh, NC, United States*, Aaron Berndt, *Indiana University-Purdue University, Indianapolis, Indianapolis, IN, United States*, Jehwan Hwang, *Korea Research Institute of Standards and Science, Daejeon, Korea (Republic)*, Augustine Urbas, Zahyun Ku, *Air Force Research Laboratory, WPAFB, OH, United States*, David Czaplewski, *Argonne National Laboratory, Lemont, IL, United States*, Sang Lee, *Korea Research Institute of Standards and Science, Daejeon, Korea (Republic)*, Zhanhu Guo, *University of Tennessee, Knoxville, TN, United States*

3:03pm – Electrically Tunable Midwavelength Infrared Metasurface Based on a Metacomposite Substrate Film

Technical Presentation. IMECE2019-11866
Md Didarul Islam, *North Carolina State University, Raleigh, NC, United States*, Ilwoo Seok, *Arkansas State University, Jonesboro, Arkansas*, Sipan Liu, *North Carolina State University, Raleigh, NC, United States*, Zhanhu Guo, *University of Tennessee, Knoxville, TN, United States*, Zahyun Ku, Augustine Urbas, *Air Force Research Laboratory, WPAFB, OH, United States*, Jon Ryu, *North Carolina State University, Raleigh, NC, United States*

1-12 CONGRESS-WIDE SYMPOSIUM ON NDE & SHM: ULTRASONIC WAVES FOR MATERIAL CHARACTERIZATION AND DAMAGE ASSESSMENT

1-12-1 NDE & SHM I: Ultrasonic Waves for Material Characterization and Damage Assessment

Convention Center, 255A 2:00PM–3:45PM

Session Organizer: Weidong Zhu, *University of Maryland, Baltimore Ct, Baltimore, MD, United States*

Session Co-Organizer: Albert Kirwan, *General Dynamics Electric Boat, Waterford, CT, United States*

2:00pm – Ultrasonic Characterization of the Elastic Constants in an Aging Ti-6Al-4V ELI Alloy

Poster Paper Publication. IMECE2019-10194

Hector Carreon, *Universidad Michoacana, Morelia, Mexico*

2:21pm – Time-Domain Spectral Element Simulation of Lamb Wave Time Reversal Method for Detecting a Breathing Crack in a Plate

Technical Paper Publication. IMECE2019-10495

Zexing Yu, Fei Du, *Northwestern Polytechnical University, Xi'an, China*, Chao Xu, *Northwestern Polytechnical University, Shaanxi Province, China*

2:42pm – Selective Lamb Mode Transmission Enabled by Local Resonance Based Ultrasonic Metamaterial

Technical Paper Publication. IMECE2019-10872

Yiran Tian, Yanfeng Shen, *Shanghai Jiao Tong University, Shanghai, Shanghai, China*

3:03pm – Mechanical Design and Development of a Payload for Structural Health Monitoring Experiments on the International Space Station

Technical Paper Publication. IMECE2019-12093

Douglas MacNinch, Daniel Pacheco, Arjun Tandon, Carl Bancroft, Isaac Flores, Matthew Rue, Andrei Zagrai, *New Mexico Institute Mining and Technology, Socorro, NM, United States*

3:24pm – Swarm Intelligence Enhanced Parameters Estimation for Multi-Mode Separation and Scattering Coefficient Matrix Reconstruction

Technical Paper Publication. IMECE2019-12199

Yeja Liu, Xiang Li, Wei Guo, Xiaoping Chen, *University of Electronic Science and Technology of China, Chengdu, China*, Xuebin Ma, *Chongqing Dixingtian Technology Co. Ltd., Chongqing, China*

1-6 VIBRATION/ACOUSTIC MEASUREMENTS, SIGNAL PROCESSING AND SYSTEM IDENTIFICATION

1-6-2 Vibration/Acoustic Measurements, Signal Processing and System Identification II

Convention Center, 258 4:00PM–5:45PM

Session Organizer: Matthew Plutt, *Fluor Marine Propulsion LLC, West Mifflin, PA, United States*

Session Co-Organizers: Robert Tomko, *Naval Nuclear Laboratory, South Park, PA, United States*, Kristin Cody, *Naval Nuclear Laboratory, Jefferson Hills, PA, United States*

4:00pm – Simulation of the Impact Process and Acoustic Wave Propagation in a Split Hopkinson (Kolsky) Pressure Bar

Technical Presentation. IMECE2019-12377

Bakhtier Farouk, Hussein Bassindowah, *Drexel University, Philadelphia, PA, United States*

4:21pm – Impact Acoustic Spectroscopy for Finding Elastic Moduli at Cryogenic Temperatures

Poster Presentation. IMECE2019-13266

Michael Patoto, *Gordon College, Baxter, TN, United States*, Christian Kunis, James St. Julien, David Lee, Oleksiy Svitelskiy, *Gordon College, Wenham, MA, United States*

4:42pm – Coupled Vibro-Acoustic Analysis of Advanced Materials by CUF Finite Elements

Technical Presentation. IMECE2019-12608

Maria Cinefra, Erasmo Carrera, Enrico Zappino, *Politecnico di Torino, Torino, Torino, Italy*, Antonio Palermo, *Università di Bologna, Bologna, Italy*, Sergio De Rosa, *Università degli Studi di Napoli Federico II, Napoli, Italy*

5:03pm – Simulation Analysis of a Novel Enhancing Method of Acoustic Emission Waves Based on Acoustic Black Hole

Poster Presentation. IMECE2019-12973

Xiaoran Wang, Tian He, Xiandong Liu, Yingchun Shan, Yue Zhang, Xianyu Zeng, *Beihang University, Beijing, China*

5:24pm – Vibration Isolation Analysis of a Seating System With Scissor-Like Structure Isolators

Poster Presentation. IMECE2019-12470

Linchuan Guo, *RMIT University, Malvern East, VIC, Australia*, Ranglin Fan, *University of Science and Technology Beijing, Beijing, China*, Axconny Khiu, Xu Wang, *RMIT University, Bundoora, VIC, Australia*

1-12 CONGRESS-WIDE SYMPOSIUM ON NDE & SHM: ULTRASONIC WAVES FOR MATERIAL CHARACTERIZATION AND DAMAGE ASSESSMENT

1-12-2 NDE & SHM II: Ultrasonic Waves for Material Characterization and Damage Assessment

Convention Center, 155C

4:00PM–5:45PM

Session Organizer: Weidong Zhu, *University of Maryland,
Baltimore County, Baltimore, MD, United States*

Session Co-Organizer: Albert Kirwan, *General Dynamics
Electric Boat, Waterford, CT, United States*

4:00pm – Isogeometric iFEM Analysis

Technical Presentation. IMECE2019-13177

Adnan Kefal, *Istanbul Technical University, Istanbul, Turkey*,
Erkan Oterkus, *University of Strathclyde, Glasgow, United
Kingdom*

4:21pm – Embedded Ultrasonic Sensors for Wear/Corrosion Monitoring

Technical Presentation. IMECE2019-13621

Silvio Kruger, **Zhigang Sun**, **Kuo-Ting Wu**, *National Research
Council - Canada, Boucherville, QC, Canada*

4:42pm – An Improved Damage Index for Non-Destructive Evaluation of Honeycomb Sandwich Structures Using Guided Waves

Technical Presentation. IMECE2019-13653

Lifu Wang, *University of California, Los Angeles, Los Angeles,
CA, United States*, **Fei Gao**, *Beihang University, Beijing,
Beijing, China*, **Leonardo Araque**, *University of California, Los
Angeles, Los Angeles, CA, United States*, **Steffen Tai**,
*University of California, Los Angeles, Culver City, CA, United
States*, **Ajit Mal**, *University of California, Los Angeles, CA,
United States*

5:03pm – Elastodynamic Green's Functions for Anisotropic Layered Plates

Technical Presentation. IMECE2019-13669

Leonardo Araque, **Lifu Wang**, *University of California Los
Angeles, Los Angeles, CA, United States*, **Steffen Tai**,
*University of California, Los Angeles, Culver City, CA, United
States*, **Ajit Mal**, *University of California, Los Angeles, Los
Angeles, CA, United States*

5:24pm – Ultrasonic Elastic Waves Interactions in Stiffened Composite Structures With Defects

Technical Presentation. IMECE2019-13691

Steffen Tai, *University of California, Los Angeles, Culver City,
CA, United States*, **Fumika Kotobuki**, **Lifu Wang**, **Leonardo
Araque**, **Ajit Mal**, *University of California, Los Angeles, Los
Angeles, CA, United States*

TRACK 2 ADVANCED MANUFACTURING

- 2-1-1: Plenary Session
- 2-1-2: Plenary Session II
- 2-2-1: Metals Additive Manufacturing I
- 2-2-2: Metals Additive Manufacturing II
- 2-2-3: Metals Additive Manufacturing III
- 2-2-4: Polymer Additive Manufacturing I
- 2-2-5: Polymer Additive Manufacturing II
- 2-2-7: Additive Manufacturing of Composites & Ceramics
- 2-2-6: Hybrid Additive Manufacturing Processes
- 2-3-1: Non-Destructive Examination Techniques for Additive Manufacturing
- 2-3-2: Measurement Science and Sensors to Support Advanced Manufacturing
- 2-4-1: Nanomanufacturing: Synthesis and Assembly of Nanomaterials and Nanocomposites
- 2-4-2: Nanomanufacturing: Additive, Top-Down, and Self-Assembly Approaches
- 2-5-1: Advanced Machining: Milling
- 2-5-2: Advanced Machining: Turning
- 2-5-3: Advanced Machining: Drilling
- 2-5-4: Advanced Finishing Processes
- 2-5-5: Non-Conventional Machining Processes: EDM and ECM
- 2-5-6: Other Innovative Machining Processes
- 2-6-1: 4th Symposium on Fastening, Adhesive Bonding, and Welding Technology – 1
- 2-6-2: 4th Symposium on Fastening, Adhesive Bonding, and Welding Technology – 2
- 2-7-1: Novel Processes
- 2-7-2: Incremental Forming
- 2-7-3: Numerical Modeling
- 2-7-4: Properties and Defects
- 2-8-1: Innovative Product and Process Design I
- 2-8-2: Innovative Product and Process Design II
- 2-8-3: Innovative Product and Process Design III
- 2-8-4: Innovative Product and Process Design IV
- 2-9-1: Computational Advanced Manufacturing: Machining, Milling
- 2-10-1: Tolerance Analysis and Robust Design
- 2-11-1: Robotics and Automation in Advanced Manufacturing
- 2-13-1: Digital Twin Aspects
- 2-9-2: Computational Advanced Manufacturing: Ceramics, Composites
- 2-9-3: Computational Advanced Manufacturing: Nanostructures, Polymers
- 2-10-2: Variation Simulation
- 2-10-3: Geometric Modeling and Inspection
- 2-12-1: Material Processing Based on Laser Heat Transfer and Laser Ablation
- 2-12-2: Laser-Based Additive Manufacturing
- 2-13-2: Industry 4.0 Aspects
- 2-13-3: Cyber-Manufacturing Aspects
- 2-14-1: General Manufacturing

ACKNOWLEDGMENT

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 Mingshao Zhang, *Southern Illinois University Edwardsville, United States*
 Xin Zhao, *Clemson University, United States*

TRACK 2 ADVANCED MANUFACTURING MONDAY, NOVEMBER 11

2-1 ADVANCED MANUFACTURING PLENARY SPEAKERS (BY INVITATION)

2-1-1 Plenary Session
Convention Center, 155C 9:45AM–10:30AM

9:45am – Finishing Freeform Surfaces, a New Surface Characterization Approach, and Future Trends in Manufacturing

Plenary Presentation. IMECE2019-13991
Brigid A. Mullany, NSF, Alexandria, VA, United States

2-9 COMPUTATIONAL MODELING AND SIMULATION FOR ADVANCED MANUFACTURING

**2-9-1 Computational Advanced Manufacturing:
Machining, Milling**
Convention Center, 155C 10:45AM–12:30PM

Session Organizer: Yucheng Liu, Mississippi State University, Mississippi State University, MS, United States

Session Co-Organizer: Muhammed Muaz, Indian Institute of Technology Kanpur, Kanpur, Uttar Pradesh, India

10:45am – A Realistic 3-D Finite Element Model to Simulate Milling Operation With Multiple Rotations of Cutting Tool
Technical Paper Publication. IMECE2019-10440

Muhammed Muaz, Sounak Kumar Choudhury, Indian Institute of Technology Kanpur, Kanpur, Uttar Pradesh, India, Sanan H. Khan, Aligarh Muslim University, Aligarh, Uttar Pradesh, India

11:06am – Contact Properties Research for Linear Sliding Guide Rail With the Fractal Theory

Technical Paper Publication. IMECE2019-10832
Xinxin Li, Zhimin Li, Sun Jin, Shanghai Jiao Tong University, Shanghai, China, Jichang Zhang, Shanghai SmartState Technology Co., Ltd., Shanghai, China, Zhihua Niu, Jinyu Liu, Shanghai Jiao Tong University, Shanghai, China

11:27am – A Novel Approach for the Simulation of Spiral Bevel Gear Manufacturing Processes

Technical Presentation. IMECE2019-12611
Chara Efstathiou, Technical University of Crete, Thessaloniki, Greece, Nikolaos Tapoglou, University of Sheffield, Sheffield, United Kingdom

11:48am – Simulation of Manufacturing Gears Through Power Skiving Using a CAD Based Approach

Technical Presentation. IMECE2019-12883
Nikolaos Tapoglou, Advanced Manufacturing Research Centre, University of Sheffield, Sheffield, United Kingdom, Chara Efstathiou, Technical University of Crete, Thessaloniki, Greece

12:09pm – Understanding Band Saw Cutting Process Using Finite Element Analysis

Technical Presentation. IMECE2019-13859
Chandra Sekhar Rakurty, Joseph A Tarr, The M. K. Morse Company, Canton, OH, United States

2-10 VARIATION SIMULATION AND DESIGN FOR ASSEMBLY

2-10-1 Tolerance Analysis and Robust Design
Convention Center, 155D 10:45AM–12:30PM

Session Organizer: Kristina Wärmefjord, Chalmers University of Technology, Gothenburg, NA, Sweden

Session Co-Organizer: Hua Wang, Shanghai Jiao Tong University, Shanghai, China

10:45am – Anisotropy Oriented Tolerance Analysis of Composite Assembly With T-Maps Method

Technical Paper Publication. IMECE2019-10306
Hua Wang, Chen Yan, Junyang Yu, Shanghai Jiao Tong University, Shanghai, China

11:06am – Boolean Algebra-Based Dimensional Error Accumulation in Solid and Fluid Domain for Turbines

Technical Paper Publication. IMECE2019-10231
Jun Ni, Yu Sun, Kai Wu, Nanjing University of Science and Technology, Nanjing, Jiangsu Province, China

11:27am – Robust Design of Aero-Engine Assembly Using Taguchi Method Based on Jacobian-Torsor Model

Technical Paper Publication. IMECE2019-10020
Siyi Ding, Xiaohu Zheng, Jinsong Bao, Jie Zhang, Dong Hua University, Shanghai, China

11:48am – A Knowledge-Based Engineering Workbench for Automated Tolerance Specification

Technical Paper Publication. IMECE2019-11225
Christopher Sauer, Bjoern Heling, Simon Schmutzler, Benjamin Schleich, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany

12:09pm – Barriers for Virtual Assessment of Structural Robustness

Technical Paper Publication. IMECE2019-11251
Tim Brix Nerenst, Technical University of Denmark, Lyngby, Denmark, Martin Ebro, Morten Nielsen, Novo Nordisk, Hilleroed, Denmark, Tobias Eifler, Kim Lau Nielsen, Technical University of Denmark, Kgs. Lyngby, Denmark

2-11 ROBOTICS AND AUTOMATION IN ADVANCED MANUFACTURING

2-11-1 Robotics and Automation in Advanced Manufacturing

Convention Center, 155F 10:45AM–12:30PM

Session Organizer: Daniel Cox, *Georgia Southern University, Saint Augustine, FL, United States*

Session Co-Organizers: Mingshao Zhang, *Southern Illinois University Edwardsville, Edwardsville, IL, United States*, Andrzej Nycz, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*

10:45am – Influence of the Form of Pulse of Excitation on the Speed and Power Parameters of the Linear Pulse Electromechanical Converter of the Induction Type
Technical Paper Publication. IMECE2019-10388
Vladimir F. Bolyukh, *Celltronix, Escondido, CA, United States*, **Igor Katkov**, *Belgorod State University & Vitronix, LLC, Belgorod, Russia*

11:06am – Effect of the Die Hole Structure and Distribution on the Strength of Ring Die in Pelletizing Equipment
Technical Paper Publication. IMECE2019-10851
Junhong Li, Yu Sun, Kai Wu, Yu Wang, *Nanjing University of Science and Technology, Nanjing, China*

11:27am – Development of Vision-Based Control System for Mobile 3D Printer
Technical Paper Publication. IMECE2019-11577
Pengji Duan, Yutong Liu, *Southern Illinois University Edwardsville, Edwardsville, IL, United States*, **Junjun Ding**, *Alfred University, Alfred, NY, United States*, **Mingshao Zhang**, *Southern Illinois University Edwardsville, Edwardsville, IL, United States*

11:48am – Designing a Fuzzy Controller for a Flexible and Programmable Fixture of Producing Car Body
Poster Presentation. IMECE2019-13244
H. Soleimanimehr, H. Rezaei, *Islamic Azad University, Tehran, Islamic Republic of Iran*, **Nariman Ashrafi**, *Payame Noor University, Tehran, Islamic Republic of Iran*

12:09pm – Implementation of Production Robotics and Automation Flexible Manufacturing System for Manufacturing Engineering
Technical Presentation. IMECE2019-12460
Daniel Cox, *Georgia Southern University, Saint Augustine, FL, United States*

2-13 DIGITAL MANUFACTURING FOR INDUSTRY 4.0 APPLICATIONS

2-13-1 Digital Twin Aspects

Convention Center, 155E 10:45AM–12:30PM

Session Organizer: Vladimir Kuts, *Tallinn University of Technology, Tallinn, Harju, Estonia*

Session Co-Organizer: David Guerra-Zubiaga, *Kennesaw State University, Marietta, GA, United States*, Kai He, *Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China, Shenzhen, Guangdong, China*

10:45am – Digital Twin: Concept of Hybrid Programming for Industrial Robots – Use Case
Technical Paper Publication. IMECE2019-10583
Vladimir Kuts, Martinš Sarkans, Tauno Otto, Toivo Tähemaa, Yevhen Bondarenko, *Tallinn University of Technology, Tallinn, Harju, Estonia*

11:06am – Digital Twin in a Manufacturing Integrated System: Siemens TIA and PLM Case Study
Technical Paper Publication. IMECE2019-11023
David Guerra-Zubiaga, Alex Bondar, *Kennesaw State University, Marietta, GA, United States*, **Gilberto Escobedo**, *INP North America, Inc., Alpharetta, GA, United States*, **Arthur Schumacher**, *Siemens, Ann Arbor, MI, United States*

11:27am – An Application of a Digital Twin to Robotic System Design for an Unstructured Environment
Technical Paper Publication. IMECE2019-11337
Matthew Marshall, Cameron Redovian, *Kennesaw State University, Marietta, GA, United States*

11:48am – Physics-Based Simulation of Agile Robotic Systems
Technical Paper Publication. IMECE2019-11345
Pavel Piliptchak, Murat Aksu, Fred Proctor, John Michalowski, *National Institute of Standards and Technology, Gaithersburg, MD, United States*

12:09pm – Realizing the Digital Twin: Simulation of an OEM Machine and Manufacturing Line as a Multi-Layered Interdisciplinary Concept Through the Current State-of-the-Art and a Solution Agnostic Toolset
Technical Presentation. IMECE2019-11306
Derrick Stacey, Connor Trostel, *B&R Industrial Automation Corp., Roswell, GA, United States*

2-6 4TH SYMPOSIUM ON FASTENING, ADHESIVE BONDING, AND WELDING TECHNOLOGY

2-6-1 4th Symposium on Fastening, Adhesive Bonding, and Welding Technology – 1

Convention Center, 255B 2:00PM–3:45PM

Session Organizer: Marriner Merrill, *U.S. Naval Research Laboratory, Washington, DC, United States*

Session Co-Organizer: Toshiyuki Sawa, *Hiroshima University, Koto-city, Tokyo, Tokyo, Japan*

2:00pm – Finite-Element Analysis of the Load Factor and Design for Bolted Circular Flange Joints Consisting of Dissimilar Clamped Parts Under Tensile Loadings

Technical Paper Publication. IMECE2019-10567

Shunichiro Sawa, *Hardlock Industry Co. Ltd., Koto-city, Tokyo, Japan*, **Yasuhisa Sekiguchi**, *Hiroshima University, Higashi-Hiroshima, Hiroshima, Japan*, **Toshiyuki Sawa**, *Hiroshima University, Koto-city, Tokyo, Japan*

2:21pm – Improvement of Axial Tension Distribution of Bolted Joints Tightened by Calibrated Wrench Method From Viewpoint of Quality and Process Control Using Elliptical Confidence Limit

Technical Paper Publication. IMECE2019-10524

Soichi Hareyama, *Tokyo Metropolitan University, Chiba, Japan*, **Ken-Ichi Manabe**, *Tokyo Metropolitan University, Tokyo, Japan*, **Satoshi Kobayashi**, *Tokyo Metropolitan University, Hachioji, Tokyo, Japan*

2:42pm – Investigation on Mechanical Properties and Corrosion Resistance of Cobalt-Based Alloy Cladding Layer

Technical Paper Publication. IMECE2019-11104

Zhiyi Jin, **Zhenqiang Yao**, **Hong Shen**, *Shanghai Jiao Tong University, Shanghai, China*

3:03pm – Weld Bead Performance Assessment of P-GMAW Using Acoustic Emission (AE) Signals Through NDT Methods for MS ASTM A 106 B Grade Material

Technical Paper Publication. IMECE2019-11208

Rudreshi Addamani, **Holalu Venkatadasu Ravindra**, *P.E.S. College of Engineering, Mandya, Karnataka, India*

2-9 COMPUTATIONAL MODELING AND SIMULATION FOR ADVANCED MANUFACTURING

2-9-2 Computational Advanced Manufacturing: Ceramics, Composites

Convention Center, 155C 2:00PM–3:45PM

Session Organizer: Robert Saunders, *U.S. Naval Research Lab, Washington, DC, United States*

Session Co-Organizer: Marco Petrolo, *Politecnico di Torino, Torino, Italy*

2:00pm – Three-Dimensional Modeling of Reduced Material Properties in Ceramics With Added Porosity

Technical Paper Publication. IMECE2019-10608

Stephanie Wimmer, **Virginia DeGiorgi**, **Edward Gorzkowski**, **Heonjune Ryou**, *U.S. Naval Research Laboratory, Washington, DC, United States*

2:21pm – Numerical Studies of Extreme High-Speed Laser Material Deposition Processes at Powder-Scale

Technical Paper Publication. IMECE2019-10730

Huming Liao, **Jiang Fan**, **Huoxing Liu**, **Gaoxiang Chen**, *Beihang University, Beijing, China*, **Bo Li**, *Case Western Reserve University, Cleveland, OH, United States*

2:42pm – Determination of Critical Velocities in Aerosol Deposition Through Finite Element Analysis

Technical Presentation. IMECE2019-10930

Tyler Martin, **Robert Saunders**, **Scooter Johnson**, **Edward Gorzkowski**, *U.S. Naval Research Laboratory, Washington, DC, United States*

3:03pm – Computationally Efficient Thermo-Mechanical Analysis for Predicting Process-Induced Deformations of Composite Structures

Technical Paper Publication. IMECE2019-11261

Enrico Zappino, *Politecnico di Torino, Torino, Italy*, **Navid Zobeiry**, *University of British Columbia, Vancouver, BC, Canada*, **Marco Petrolo**, *Politecnico di Torino, Torino, Italy*, **Reza Vaziri**, *University of British Columbia, Vancouver, BC, Canada*, **Erasmus Carrera**, *Politecnico di Torino, Torino, Italy*, **Anoush Poursartip**, *University of British Columbia, Vancouver, BC, Canada*

3:24pm – Predictive Shimming of Frame-Panel Assemblies Using FEM and Laser Scanning

Technical Paper Publication. IMECE2019-11232

Gustavo Ospina-Aldana, **Mohamed Ali**, *Khalifa University, Abu Dhabi, United Arab Emir.*, **Hendrik Odendaal**, **Abdelqader Abusafieh**, *Strata Manufacturing PJSC, Abu Dhabi, United Arab Emir.*, **Wei Woon**, *Khalifa University, Abu Dhabi, United Arab Emir.*

2-10 VARIATION SIMULATION AND DESIGN FOR ASSEMBLY

2-10-2 Variation Simulation

Convention Center, 155D

2:00PM–3:45PM

Session Organizer: Hua Wang, *Shanghai Jiao Tong University, Shanghai, China*

Session Co-Organizer: Kristina Wärmefjord, *Chalmers University of Technology, Gothenburg, NA, Sweden*

2:00pm – Non-Rigid Variation Simulation for Ready-to-Assemble Furniture

Technical Paper Publication. IMECE2019-10285
Kristina Wärmefjord, Rikard Söderberg, Lars Lindkvist, Andreas Dagman, Chalmers University of Technology, Goteborg, Sweden

2:21pm – Enabler Study for Plan View Outline Styling of Front End Based on Variation Simulation

Technical Paper Publication. IMECE2019-10566
Siyuan Jin, Min Hu, Yabin Chen, Pan Asia Technical Automotive Center Co., Ltd., Shanghai, China

2:42pm – Simulation of Body Force Impact on the Assembly Process of Aircraft Parts

Technical Paper Publication. IMECE2019-10635
Sergey Lupuleac, Alexander Smirnov, Maria Churilova, Julia Shinder, Nadezhda Zaitseva, Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russia, Elodie Bonhomme, Airbus SAS, Toulouse, France

3:03pm – Equilibrium Equations of Incremental Forces and Its Application in Assembly Variation Analysis of Compliant Structures

Technical Paper Publication. IMECE2019-10871
Zhihua Niu, Zhimin Li, Sun Jin, Xinxin Li, Shanghai Jiao Tong University, Shanghai, China

3:24pm – Variation Analysis for Composite Parts With Considering Local Delamination Defects

Technical Paper Publication. IMECE2019-11060
Jinyu Liu, Zhimin Li, Tao Liu, Xinxin Li, Shanghai Jiao Tong University, Shanghai, China

2-12 LASER-BASED ADVANCED MANUFACTURING AND MATERIALS PROCESSING

2-12-1 Material Processing Based on Laser Heat Transfer and Laser Ablation

Convention Center, 355C

2:00PM–3:45PM

Session Organizer: Xin Zhao, *Clemson University, Clemson, SC, United States*

Session Co-Organizer: Wenda Tan, *University of Utah, Salt Lake City, UT, United States*

2:00pm – Experimental Study on Geometric Precision of Microholes Drilling by Picosecond Laser

Technical Paper Publication. IMECE2019-11002
Zhan-fei Zhang, Wenhui Wang, Northwestern Polytechnical University, Xi'an, China, Ruisong Jiang, Sichuan University, Chengdu, China, Cheng-cheng Jin, Xiaoxiang Zhu, Xiaofen Liu, Northwestern Polytechnical University, Xian, Shaanxi, China

2:21pm – Effects of Laser Ablation Parameters to Pattern High Purity Magnesium Surfaces

Technical Paper Publication. IMECE2019-11810
Yahya E. Yayoglu, Nathan Gallant, Ryan Toomey, University of South Florida, Tampa, FL, United States, Nathan Crane, Brigham Young University, Provo, UT, United States

2:42pm – Femtosecond Laser Ablation of Fused Silica in Air

Technical Presentation. IMECE2019-11970
Xiao Jia, Xin Zhao, Clemson University, Clemson, SC, United States

3:03pm – Advanced Packaging Solution for High Density FCCSP Molding Warpage

Technical Paper Publication. IMECE2019-10563
Shuai-Lin Liu, Ward Ye, Yu-Po Wang, Long-Yuan Wang, Fred Lin, Siliconware Precision Industries Co., Ltd., Taichung, Taiwan

3:24pm – Study of Metallurgical and Mechanical Behavior of Laser Butt-Welded Dissimilar Joint of Inconel and Stainless Steel

Technical Paper Publication. IMECE2019-12238
Sanjib Jaypuria, Santosh Kumar Gupta, Sulthan S F, Dilip Kumar Pratihari, Debalay Chakrabarti, Indian Institute of Technology, Kharagpur, Kharagpur, West Bengal, India, Mahanand Jha, Bhaba Atomic Research Center, Mumbai, India, Mumbai, Maharastra, India

2-13 DIGITAL MANUFACTURING FOR INDUSTRY 4.0 APPLICATIONS

2-13-2 Industry 4.0 Aspects

Convention Center, 155E

2:00PM–3:45PM

Session Organizer: Kai He, *Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, Shenzhen, Guangdong, China*

Session Co-Organizer: David Guerra-Zubiaga, *Kennesaw State University, Marietta, GA, United States*, Vladimir Kuts, *Tallinn University of Technology, Tallinn, Harju, Estonia*

2:00pm – Configuration and Business Protocol of International Load Sharing of Manufacturing and Its Challenges Under I4.0 and IIoT

Technical Paper Publication. IMECE2019-10158

Samir Mekid, Usman Akbar, *King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia*

2:21pm – Design of Two-Stage Cycloidal Speed Reducer With Dual Gear

Technical Paper Publication. IMECE2019-10537

He Mao, Guanyi Liu, Kai He, *Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, Shenzhen, Guangdong, China*, **Zheng Li**, *Chinese University of Hong Kong, Shatin NT, Hong Kong*

3:03pm – Digital Tools to Capture Manufacturing Tacit Knowledge to Support Next Generation Automation Systems

Technical Paper Publication. IMECE2019-10889

David Guerra-Zubiaga, *Kennesaw State University, Marietta, GA, United States*, **Kathy Schwaig, Sabih Nasir**, *Kennesaw State University, Kennesaw, GA, United States*, **Alex Bondar**, *Kennesaw State University, Marietta, GA, United States*

3:24pm – An Initial Framework for Implementation of Industry 4.0 in the High Technological Manufacturing Sector in Southern California

Technical Paper Publication. IMECE2019-12050

Sagil James, Anupam Shetty, *California State University Fullerton, Fullerton, CA, United States*

3:30pm – Real-Time Assembly Recognition Based on the Similarity Between Spatial Increment and Part Model

Technical Paper Publication. IMECE2019-11160

Jiazhen Pang, Li Yuan, Jie Zhang, Yu Jianfeng, *Northwestern Polytechnical University, Xi'an, China*

2-6 4TH SYMPOSIUM ON FASTENING, ADHESIVE BONDING, AND WELDING TECHNOLOGY

2-6-2 4th Symposium on Fastening, Adhesive Bonding, and Welding Technology – 2

Convention Center, 255B

4:00PM–5:45PM

Session Organizer: Chandra Sekhar Rakurty, *The M. K. Morse Company, Canton, OH, United States*

Session Co-Organizer: Toshiyuki Sawa, *Hiroshima University, Koto-city, Tokyo, Tokyo, Japan*

4:00pm – Improving the Surface Characteristics by Employing FSP on the Composites for the Automobile Brake Pad Application

Technical Paper Publication. IMECE2019-10026

Ashwath P, M. Anthony Xavier, *Vellore Institute of Technology, Vellore, India*, **Rajendran R**, *Combat Vehicles Research and Development Establishment, Chennai, India*

4:21pm – Estimation and Comparison of Welding Responses Using MRA, GMDH, and ANN Technique of Al6061 and Al7075 Material in FSW

Technical Paper Publication. IMECE2019-11168

Ugrasen Gonchikar, *B.M.S. College of Engineering, Bangalore, Karnataka, India*, **Holalu Venkatadasu Ravindra**, *P.E.S. College of Engineering, Mandya, Karnataka, India*, **Prathik Jain S, Umeshgowda B M, Suresh S M**, *B.M.S. College of Engineering, Bangalore, India*

4:42pm – Joining of Q235 Low-Carbon Steel Plates by Friction Stir Welding With AA2A12 Strip as an Auxiliary Solder

Technical Paper Publication. IMECE2019-11297

Peng Zhang, Shengdun Zhao, Peng Dong, Yongfei Wang, *Xi'an Jiaotong University, Xi'an, China*, **Chao Chen**, *Central South University, Changsha, China*, **Dean Meng**, *Xi'an Jiaotong University, Xi'an, China*

5:03pm – On Increasing Productivity of Micro-Friction Stir Welding With Aid of Tool Shoulder Micro-Features

Technical Paper Publication. IMECE2019-11445

Shuja Ahmed, Akash Mukhopadhyay, Probir Saha, *Indian Institute of Technology Patna, Patna, Bihar, India*

2-9 COMPUTATIONAL MODELING AND SIMULATION FOR ADVANCED MANUFACTURING

2-9-3 Computational Advanced Manufacturing: Nanostructures, Polymers

Convention Center, 155C 4:00PM–5:45PM

Session Organizer: Peter Oviroh, *University of Johannesburg, Johannesburg, Gauteng, South Africa*

Session Co-Organizer: Virginia DeGiorgi, *Naval Research Lab, Washington, DC, United States*

4:00pm – Simulation of MoS₂ Nanolayer Membrane Performance for Water Desalination Using ReaxFF

Technical Paper Publication. IMECE2019-10578

Peter Oviroh, *University of Johannesburg, Johannesburg, South Africa*, **Jitian Han**, *Shandong University, Jinan, Shandong, China*, **Tien-Chien Jen**, *University of Johannesburg, Johannesburg, South Africa*

4:21pm – Modeling of Process-Induced Residual Deformations in Frontal Polymerization Based Manufacturing of Thermosetting Polymer Components

Technical Presentation. IMECE2019-13415

Xiang Zhang, *University of Illinois, Urbana, IL, United States*, **Behrad Koohbor**, **Leon Dean**, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*, **Nancy Sottos**, *University of Illinois, Urbana, IL, United States*, **Jeffrey Moore**, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*, **Philippe Geubelle**, *University of Illinois, Urbana, IL, United States*

4:42pm – Multi-Physics Modeling and Experimental Characterization of Needleless Electrospinning for Scalable Nanofiber Production

Poster Presentation. IMECE2019-13763

Xiangfa Wu, *North Dakota State University, Fargo, ND, United States*

5:03pm – Aluminum Cerium Casting Simulations for Use in Casted Heat Exchanger Design Improvements

Technical Presentation. IMECE2019-13613

Ryan Lane, *Virginia Tech, Christiansburg, VA, United States*, **Ayyoub M. Momen**, **Orlando Rios**, *Oak Ridge National Lab, Oak Ridge, TN, United States*, **Reza Mirzaeifar**, *Virginia Tech, Blacksburg, VA, United States*

2-10 VARIATION SIMULATION AND DESIGN FOR ASSEMBLY

2-10-3 Geometric Modeling and Inspection

Convention Center, 155D 4:00PM–5:45PM

Session Organizer: Rikard Söderberg, *Chalmers University of Technology, Goteborg, Sweden*

Session Co-Organizer: Kristina Wärmefjord, *Chalmers University of Technology, Gothenburg, Sweden*

4:00pm – Consideration and Impact Assessment of Measurement Uncertainty in the Context of Tolerance Analysis

Technical Paper Publication. IMECE2019-11328

Bjoern Heling, **Andreas Michael Mueller**, **Benjamin Schleich**, **Tino Hausotte**, **Sandro Wartzack**, *Friedrich-Alexander-Universitaet Erlangen-Nuernberg, Erlangen, Germany*

4:21pm – Definition and Evaluation of Induced Geometry for Design

Technical Paper Publication. IMECE2019-10711

Bryan Fischer, *TDP360 LLC, Sherwood, OR, United States*, **Edward Morse**, *UNC Charlotte, Concord, NC, United States*

4:42pm – Mutual Information-Based Sensing Optimization for In-Process Quality Inspection of Multi-Station Assembly Processes

Technical Paper Publication. IMECE2019-10843

Yinhua Liu, **Xiaolei Hu**, *University of Shanghai for Science and Technology, Shanghai, China*, **Xiaowei Yue**, *Virginia Tech, Blacksburg, VA, United States*

5:03pm – Deck Lid Surround Fit Correlation Study Between Dimensional Variation Simulation and Physical Vehicle

Technical Paper Publication. IMECE2019-10539

Zhongwu Han, **Min Hu**, **Zhenhai Ma**, **Xiaoxu Niu**, **Ni Cao**, *Pan Asia Technical Automotive Center Co., Ltd., Shanghai, China*

5:24pm – Low-Order Representation of Manufacturing Variations Based on B-Spline Morphing

Technical Paper Publication. IMECE2019-10294

Jose Urbano, **Dieter Bestle**, *Brandenburg University of Technology Cottbus-Senftenberg, Cottbus, Brandenburg, Germany*, **Ulf Gerstberger**, **Peter Flassig**, *Rolls-Royce Deutschland Ltd. & Co. KG, Blankenfelde-Mahlow, Brandenburg, Germany*

2-12 LASER-BASED ADVANCED MANUFACTURING AND MATERIALS PROCESSING

2-12-2 Laser-Based Additive Manufacturing

Convention Center, 155F 4:00PM–5:45PM

Session Organizer: Wenda Tan, *University of Utah, Salt Lake City, UT, United States*

Session Co-Organizer: Xin Zhao, *Clemson University, Clemson, SC, United States*

4:00pm – Effect of External Magnetic Field on the Microstructure of 316L Stainless Steel Fabricated by Directed Energy Deposition

Technical Paper Publication. IMECE2019-12122

Jin Wang, *Xi'an Key Laboratory of Intelligent Additive Manufacturing, Xi'an City, China*, **Yachao Wang, Jing Shi, Yutai Su**, *University of Cincinnati, Cincinnati, OH, United States*

4:21pm – Multiphase Thermo-Fluid Dynamics Simulation of Laser Powder Bed Fusion Processes

Technical Presentation. IMECE2019-10286

Xuxiao Li, Wenda Tan, *University of Utah, Salt Lake City, UT, United States*

4:42pm – Laser Power Variation Mechanical Property Influence on Laser Cladded Titanium Powder

Technical Presentation. IMECE2019-12513

Victor Aladesanmi, *University of Johannesburg, Westdene, Gauteng, South Africa*, **Esther Akinlabi, Samuel Fatoba**, *University of Johannesburg, Johannesburg, Gauteng, South Africa*

5:03pm – Selective Laser Melting Fabrication of Fully Dense Ultra-High Strength Martensitic Steel

Technical Presentation. IMECE2019-12784

Raiyan Seede, David Shoukr, Bing Zhang, Austin Whitt, *Texas A&M University, College Station, TX, United States*, **Sean Gibbons, Philip Flater**, *Air Force Research Laboratory, Eglin AFB, FL, United States*, **Alaa Elwany, Raymundo Arroyave, Ibrahim Karaman**, *Texas A&M University, College Station, TX, United States*

2-13 DIGITAL MANUFACTURING FOR INDUSTRY 4.0 APPLICATIONS

2-13-3 Cyber-Manufacturing Aspects

Convention Center, 155E 4:00PM–5:45PM

Session Organizer: David Guerra-Zubiaga, *Kennesaw State University, Marietta, GA, United States*

Session Co-Organizers: Kai He, *Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China, Shenzhen, Guangdong, China*, Vladimir Kuts, *Tallinn University of Technology, Tallinn, Harju, Estonia*

4:00pm – Intrusion Detection of Cyber-Physical Attacks in Manufacturing Systems: A Review

Technical Paper Publication. IMECE2019-10135

Mingtao Wu, *Syracuse University, Fayetteville, NY, United States*, **Young Moon**, *Syracuse University, Syracuse, NY, United States*

4:21pm – A Secure Cyber-Manufacturing System Augmented by the Blockchain

Technical Paper Publication. IMECE2019-10366

Jinwoo Song, Young Moon, *Syracuse University, Syracuse, NY, United States*

4:42pm – Physical Data Auditing for Attack Detection in Cyber-Manufacturing Systems: Blockchain for Machine Learning Process

Technical Paper Publication. IMECE2019-10442

Jinwoo Song, Diksha Shukla, *Syracuse University, Syracuse, NY, United States*, **Mingtao Wu**, *Syracuse University, Fayetteville, NY, United States*, **Vir Phoha, Young Moon**, *Syracuse University, Syracuse, NY, United States*

5:03pm – Integration of Digital Equipment Based on General Information Model and Model Mapping to MTConnect

Technical Paper Publication. IMECE2019-10732

Zhaokun Zhang, Zhufeng Shao, Liping Wang, *Tsinghua University, Beijing, China*, **Yong Luo**, *University of Electronic Science and Technology of China, Chengdu, China*

5:24pm – How to Establish Digital Thread Using 3D Factory

Technical Paper Publication. IMECE2019-12309

Ajay Holey, Shashank Alandikar, John Deere, *Pune, Maharashtra, India*

TUESDAY, NOVEMBER 12

2-1 ADVANCED MANUFACTURING PLENARY SPEAKERS (BY INVITATION)

2-1-2 Plenary Session II

Convention Center, 155C 9:45AM–10:30AM

9:45am – Building Parts by Welding Millions of Little Bits of Metals Together: What Can Go Wrong and How Do We Fix It?

Plenary Presentation. IMECE2019-13992
Lyle Levine, *National Institute of Standards and Technology, Gaithersburg, MD, United States*

2-2 CONFERENCE-WIDE SYMPOSIUM ON ADDITIVE MANUFACTURING

2-2-1 Metals Additive Manufacturing I

Convention Center, 155E 10:45AM–12:30PM

Session Organizer: Scott Thompson, *Kansas State University, Manhattan, KS, United States*

Session Co-Organizer: Robert L. Lowe, *University of Dayton, Dayton, OH, United States*

10:45am – Optimizing Electron Beam Melting Powder Bed Process for Long Term Sustainability

Technical Presentation. IMECE2019-10256
Leila Ladani, *University of Texas at Arlington, Arlington, TX, United States*, Carmen Green, Jafar Razmi, *University of Texas at Arlington Research Institute, Fort Worth, TX, United States*

11:06am – Parametric Study of Metal 3D Printing Process Using Finite Element Simulation

Technical Paper Publication. IMECE2019-10745
Kshitiz Khanna, Raymond Yee, *San Jose State University, San Jose, CA, United States*

11:27am – Thermal-Kinetic-Mechanical Modeling of Laser Powder Deposition Process for Rail Repair

Technical Paper Publication. IMECE2019-10758
Ershad Mortazavian, *University of Nevada, Las Vegas, Las Vegas, NV, United States*, Zhiyong Wang, Hualiang Teng, *University of Nevada, Las Vegas, Henderson, NV, United States*

11:48am – Combined Smoothed Particle Hydrodynamics: Ray Tracing Method for Simulations of Keyhole Formation in Laser Melting of Bulk and Powder Metal Targets

Technical Paper Publication. IMECE2019-11596
Deepak Shah, Alexey Volkov, *University of Alabama, Tuscaloosa, AL, United States*

12:09pm – On Characterizing Uncertainty Sources in Laser Powder Bed Fusion Additive Manufacturing Models

Technical Paper Publication. IMECE2019-11727
Tefsaye Moges, Paul Witherell, *National Institute of Standards and Technology, Gaithersburg, MD, United States*, Gaurav Ameta, *Dakota Consulting Inc., Silver Spring, MD, United States*

2-4 NANOMANUFACTURING: NOVEL PROCESSES, APPLICATIONS, AND PROCESS-PROPERTY RELATIONSHIPS

2-4-1 Nanomanufacturing: Synthesis and Assembly of Nanomaterials and Nanocomposites

Convention Center, 155D 10:45AM–12:30PM

Session Organizer: Chih-Hao Chang, *North Carolina State University, Raleigh, NC, United States*

Session Co-Organizer: Pilgyu Kang, *George Mason University, Fairfax, VA, United States*

10:45am – Deterministic Ångström-Precise Subtractive Manufacturing of 2D Materials via Tunable Interfacial Incommensurabilities

Technical Presentation. IMECE2019-11868
Yunjo Jeong, Emily Phan, Md. Rubayat-E Tanjil, Zhewen Yin, Wyatt Panaccione, Michael Cai Wang, *University of South Florida, Tampa, FL, United States*

11:06am – The Route Toward Graphene-Metal Composites

Technical Presentation. IMECE2019-12011
Kaihao Zhang, Mitisha Surana, Sameh Tawfick, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

11:27am – Electrothermal Nanomanufacturing of High-Performance Carbon Nanotube-Fiber Composite

Poster Presentation. IMECE2019-12640
Yuanyuan Shang, Baohui Shi, Kun Fu, *University of Delaware, Newark, DE, United States*

11:48am – Digital Nanomanufacturing of Nanocomposites and Wearable Devices With On-the-fly Modulation of Nanostructures and Functions

Technical Presentation. IMECE2019-13199
Jimi Wang, Yuebing Zheng, *University of Texas at Austin, Austin, TX, United States*

12:09pm – Exploration of Carbon Nanotube Forest Synthesis-Structure-Property Relationships Using Physics-Based Simulation and Deep Learning

Technical Presentation. IMECE2019-13312
Taher Hajilounezhad, Ramakrishna Surya, Zakariya Oraibi, Filiz Bunyak, Kannappan Palaniappan, Prasad Calyam, Matthew Maschmann, *University of Missouri, Columbia, MO, United States*

2-5 ADVANCED MACHINING AND FINISHING PROCESSES

2-5-1 Advanced Machining: Milling

Convention Center, 155C

10:45AM–12:30PM

Session Organizer: Ramulu Mamidala, *University of Washington, Seattle, WA, United States*

Session Co-Organizer: Nikolaos Tapoglou, *University of Sheffield, Sheffield, United Kingdom*

10:45am – Improvement of Machining Performance by Side Flank Face Textures Combined With Cutting Edge Micro-Serrations on Milling Insert

Technical Paper Publication. IMECE2019-10376

Muhammed Muaz, Sounak Kumar Choudhury, *Indian Institute of Technology Kanpur, Kanpur, Uttar Pradesh, India*

11:06am – Study of Peripheral Milling of Magnesium Matrix Composite

Technical Paper Publication. IMECE2019-11436

Nishita Anandan, Ramulu Mamidala, *University of Washington, Seattle, WA, United States*

11:27am – Ultrasonic Vibration Assisted Milling of Aerospace Materials

Technical Paper Publication. IMECE2019-11780

Nikolaos Tapoglou, Chris Taylor, *University of Sheffield, Sheffield, United Kingdom*

11:48am – Increasing Tool Life in Metals via True Variable Depth Milling

Technical Presentation. IMECE2019-13374

Durul Ulutan, *Kadir Has University, Istanbul, Turkey*

12:09pm – Local Corner Trajectory Smoothing Approach for Machining Short-Segmented Toolpaths

Technical Paper Publication. IMECE2019-10355

Weixin Wang, Kai Zhou, Chuxiong Hu, Suqin He, *Tsinghua University, Beijing, China*

2-2 CONFERENCE-WIDE SYMPOSIUM ON ADDITIVE MANUFACTURING

2-2-2 Metals Additive Manufacturing II

Convention Center, 155E

2:00PM–3:45PM

Session Organizer: Seyed Soheil Daryadel, *University of Illinois at Urbana-Champaign, Champaign, IL, United States*

Session Co-Organizer: Yaozhong Zhang, *Michigan State University, East Lansing, MI, United States*

2:00pm – Effect of Build Direction in Direct Metal Laser Sintering (DMLS) of Inconel 718 on Microstructure and Mechanical Behavior

Technical Paper Publication. IMECE2019-12213

Sachin Alya, Chaitanya Vundru, Khushahal Thool, *Indian Institute of Technology Bombay, Mumbai, Maharashtra, India*, Anil Saigal, *Tufts University, Medford, MA, United States*, Ramesh Singh, *Indradev Samajdar, Indian Institute of Technology Bombay, Mumbai, Maharashtra, India*

2:21pm – 3D Scanning for Dimensional Comparison of a Cold Spray Additive Manufacturing

Technical Presentation. IMECE2019-13224

Rebecca Murray, Garrick Foy, *Charles Darwin University, Darwin, Northern Territory, Australia*, Lee Clemon, *University of Technology Sydney, Ultimo, NSW, Australia*

2:42pm – Effects of Processing Parameters and Surface Roughness on the High-Cycle Fatigue Life of Inconel 718 Manufactured by Laser Powder Bed Fusion

Technical Presentation. IMECE2019-13226

Dillon S. Watring, Kristen C. Carter, Bart Raeymaekers, Ashley D. Spear, *University of Utah, Salt Lake City, UT, United States*

3:03pm – A Comprehensive Study on 3D-Printed Ti-6AL-4V Structures

Technical Presentation. IMECE2019-13670

Yaozhong Zhang, Shengyuan Bai, Elias Garratt, Aljoscha Roch, *Michigan State University, East Lansing, MI, United States*

3:24pm – Process-Microstructure-Property Relationships in Nanotwinned Copper Interconnects Additively Manufactured by the Localized Pulsed Electrodeposition

Technical Presentation. IMECE2019-12807

Seyed Soheil Daryadel, *University of Illinois at Urbana-Champaign, Champaign, IL, United States*, Majid Minary, *University of Texas at Dallas, Richardson, TX, United States*

2-4 NANOMANUFACTURING: NOVEL PROCESSES, APPLICATIONS, AND PROCESS-PROPERTY RELATIONSHIPS

2-4-2 Nanomanufacturing: Additive, Top-Down, and Self-Assembly Approaches

Convention Center, 155D

2:00PM–3:45PM

Session Organizer: Matthew Maschmann, *University of Missouri, Columbia, MO, United States*

Session Co-Organizer: Michael Cai Wang, *University of South Florida, Tampa, FL, United States*

2:00pm – A First Principle Study on the Adhesion and Stability of Al₂O₃ (0001)/Pt (111) Film Interface

Technical Paper Publication. IMECE2019-10693

Lesego Mohlala, Rigardt Coetzee, Tien-Chien Jen, Peter Olubambi, *University of Johannesburg, Johannesburg, Gauteng, South Africa*

2:21pm – Freeform Advanced Manufacturing of 0D/1D/2D Nanomaterials into 3D Architectures With Voxel-by-Voxel Tunable Properties

Technical Presentation. IMECE2019-11327

Zhewen Yin, Wyatt Panaccione, Xiaohe Luan, Yunjo Jeong, Md. Rubayat-E Tanjil, Michael Cai Wang, *University of South Florida, Tampa, FL, United States*

2:42pm – Fiber Creation and Deposition on Arbitrary Surfaces With Gas-Modified Electrospinning
Poster Paper Publication. IMECE2019-11456

Emily A. Kooistra-Manning, Lane G. Huston, Jack L. Skinner, Jessica M. Andriolo, *Montana Technological University, Butte, MT, United States*

3:03pm – Direct Nanomanufacturing of Functional Nanofibers on Non-Planar Surfaces Using Self-Aligning Nanojet (SA-N)

Technical Presentation. IMECE2019-13114
Dongwoon Shin, JongHyun (Joe) Kim, Abiral Regmi, Jiyoung Chang, *University of Utah, Salt Lake City, UT, United States*

3:24pm – Roll-to-Roll Self-Assembly and Analysis of Non-Monodispersed Nanospheres

Technical Presentation. IMECE2019-13698
I-Te Chen, Timothy Chen, Chih-Hao Chang, *North Carolina State University, Raleigh, NC, United States*

2-5 ADVANCED MACHINING AND FINISHING PROCESSES

2-5-2 Advanced Machining: Turning
Convention Center, 155C **2:00PM–3:45PM**

Session Organizer: Yang Guo, *Michigan State University, East Lansing, MI, United States*

Session Co-Organizer: Salman Pervaiz, *Rochester Institute of Technology - Dubai, Dubai, United Arab Emir.*

2:00pm – Experimental Investigation on Turning of Monel K500 Alloy Using Nano Graphene Cutting Fluid Under Minimum Quantity Lubrication

Technical Paper Publication. IMECE2019-10056
Senthil Kumar Santhanam, Arul K, *Anna University, Chennai, Tamil Nadu, India*

2:21pm – Numerically Constructed Energy Consumption Mapping for the Orthogonal Machining of Ti₆Al₄V

Technical Paper Publication. IMECE2019-10952
Ibrahim Nouzil, Salman Pervaiz, *Rochester Institute of Technology – Dubai, Dubai, United Arab Emir.*, Sathish Kannan, *American University of Sharjah, Sharjah, Dubai, United Arab Emir.*

2:42pm – Study on Turning of Non-Axisymmetric Three-Dimensional Curved Surfaces

Technical Paper Publication. IMECE2019-11100
Kensuke Nakagawa, Taichi Mori, Yoshitaka Morimoto, Akio Hayashi, *Kanazawa Institute of Technology, Nonoichi, Ishikawa, Japan*, Yoshiyuki Kaneko, Naohiko Suzuki, Ryo Hirono, *Takamatsu Machinery Co., Ltd., Hakusan, Ishikawa, Japan*

3:03pm – Application of Trochoidal Turning Method at Bearing Rings Machining

Technical Paper Publication. IMECE2019-11439
M. Ömer Kayki, Gokhan Sagir, *ORS Bearings, Ankara, Polatl, Turkey*

3:24pm – Effects of Modulation Assisted Machining (MAM) and Nano-Platelet Minimum Quantity Lubrication (n-MQL) on Tool Wear in Turning of Compacted Graphite Iron (CGI) With Coated Carbide Tool

Technical Presentation. IMECE2019-13390
Juan Sandoval, Patrick Kwon, Yang Guo, *Michigan State University, East Lansing, MI, United States*

2-2 CONFERENCE-WIDE SYMPOSIUM ON ADDITIVE MANUFACTURING

2-2-3 Metals Additive Manufacturing III
Convention Center, 155E **4:00PM–5:45PM**

Session Organizer: Sriraghav Sridharan, *ANSYS Inc., Canonsburg, PA, United States*

Session Co-Organizer: Roozbeh Ross Salary, *Marshall University, Huntington, WV, United States*

4:00pm – Melt Geometry for Laser and E-Beam Powder Bed Additive Manufacturing

Technical Presentation. IMECE2019-11863
Faiyaz Ahsan, Leila Ladani, *University of Texas at Arlington, Arlington, TX, United States*

4:21pm – Numerical Simulation of Laser-Powder Bed Fusion of Overhanging Structures

Technical Presentation. IMECE2019-13869
Scott Thompson, *Kansas State University, Manhattan, KS, United States*, Basil Paudel, *Auburn University, Auburn, AL, United States*

4:42pm – Light Weighting Solutions for Additively Manufactured Aviation Components

Technical Paper Publication. IMECE2019-10805
Sandeep Medikonda, Sriraghav Sridharan, Sunil Acharya, John Doyle, *ANSYS Inc., Canonsburg, PA, United States*

5:03pm – Simulations of Online Non-Destructive Acoustic Diagnosis of 3D-Printed Parts Using Air-Coupled Ultrasonic Transducers

Technical Paper Publication. IMECE2019-11101
Sean Rooney, Kishore Pochiraju, *Stevens Institute of Technology, Hoboken, NJ, United States*

5:24pm – A Computational Fluid Dynamics (CFD) Study of Pneumatic Atomization in Aerosol Jet Printing (AJP) Process

Technical Paper Publication. IMECE2019-12027
Roozbeh Ross Salary, *Marshall University, Huntington, WV, United States*, Jack Lombardi, *Binghamton University, Binghamton, NY, United States*, Darshana Weerawarne, *State University of New York at Binghamton, Vestal, NY, United States*, Prahalad Rao, *University of Nebraska-Lincoln, Lincoln, NE, United States*, Mark Poliks, *State University of New York at Binghamton, Vestal, NY, United States*

25 ADVANCED MACHINING AND FINISHING PROCESSES

2-5-3 Advanced Machining: Drilling

Convention Center, 155C

4:00PM–5:45PM

Session Organizer: Salman Pervaiz, *Rochester Institute of Technology - Dubai, Dubai, United Arab Emir.*

4:00pm – New Analytical Model for Delamination of CFRP During Drilling With CFRP Plate Elastic Deformation

Technical Paper Publication. IMECE2019-10801

Chen Chen, Zhenyuan Jia, Fuji Wang, Qi Wang, Chuanhe Dong, Chong Zhang, *Dalian University of Technology, Dalian, Liaoning, China*

4:21pm – Effect of the Step-Drill Margins Structure on Hole Diameters in Drilling Ti/CFRP Stacks

Technical Paper Publication. IMECE2019-10802

Chong Zhang, Zhenyuan Jia, Fuji Wang, Yue Li, Yu Bai, Chen Chen, *Dalian University of Technology, Dalian, Liaoning, China*

4:42pm – 3D Finite Element Assisted Numerical Simulation of Orbital Drilling Process of Ti6Al4V

Technical Paper Publication. IMECE2019-10973

Salman Pervaiz, Ali Daneji, *Rochester Institute of Technology - Dubai, Dubai, United Arab Emir.*, Sathish Kannan, *American University of Sharjah, Sharjah, Dubai, United Arab Emir.*

5:03pm – Comparative Study of Material Damage and Tool Wear Mechanisms During Drilling of CFRP/Ti Stack

Technical Paper Publication. IMECE2019-11191

Vijayathithan M, Anil Meena, *Indian Institute of Technology, Madras, Chennai, India*

5:24pm – Investigation on the Effect of Drilling Parameters on Quality of Hole in Epoxy Resin With and Without Carbon Fiber Reinforced With 6% and 10% Si₃N₄ Using FEA

Technical Paper Publication. IMECE2019-11188

Rakshith Gowda D S, Murali Krishna N L, Holalu Venkatadasu Ravindra, *P.E.S. College of Engineering, Mandya, Karnataka, India*

2-8 INNOVATIVE PRODUCT AND PROCESS DESIGN

2-8-1 Innovative Product and Process Design I

Convention Center, 155D

4:00PM–5:45PM

Session Organizer: Jonathan Holman, *University of Pittsburgh, Johnstown, PA, United States*

Session Co-Organizer: Xinyi Xiao, *Pennsylvania State University, University Park, PA, United States*

4:00pm – Support-Free 3D Toolpath Generation for 5-Axis Additive Manufacturing

Technical Presentation. IMECE2019-13245

Xinyi Xiao, Sanjay Joshi, *Pennsylvania State University, University Park, PA, United States*

4:21pm – Joining Techniques for Novel Metal Polymer Hybrid Heat Exchangers

Technical Paper Publication. IMECE2019-10621

Gowtham Kuntumalla, Yuquan Meng, Manjunath C. Rajagopal, Ricardo S. Toro, Hanyang Zhao, Ho Chan Chang, Sreenath Sundar, Srinivasa Salapaka, Nenad Miljkovic, Chenhui Shao, Placid Ferreira, Sanjiv Sinha, *University of Illinois at Urbana-Champaign, Champaign, IL, United States*

4:42pm – Stress and Mesh Stiffness Evaluation of Bimaterial Spur Gears

Technical Paper Publication. IMECE2019-11554

Fatih Karpaz, Tufan Yilmaz, Oguz Dogan, Onur Can Kalay, *Bursa Uludag University, Bursa, Turkey*

5:03pm – A Composite Printer With Direct Bonded Fiber Modeling Process

Technical Presentation. IMECE2019-12926

Serdar Tumkor, Jonathan Holman, Tanner Badoud, *University of Pittsburgh at Johnstown, Johnstown, PA, United States*

5:24pm – A Lightweight Design Approach for Machine Tool Worktable Using Carbon Fiber Tube and Special Assembly Structure

Technical Paper Publication. IMECE2019-10541

Miannuo Chen, Jun Zha, Fan Kan, Zelong Yuan, Yaolong Chen, *Xi'an Jiaotong University, Xi'an, China*

WEDNESDAY, NOVEMBER 13

2-2 CONFERENCE-WIDE SYMPOSIUM ON ADDITIVE MANUFACTURING

2-2-4 Polymer Additive Manufacturing I

Convention Center, 255B 10:45AM–12:30PM

Session Organizer: Heather Lai, *SUNY New Paltz, New Paltz, NY, United States*

Session Co-Organizer: Kishore Pochiraju, *Stevens Institute of Technology, Belmar, NJ, United States*

10:45am – FDM 3D-Printed Thermoplastic Elastomers: Experiments, Modeling, and Influence of Process Parameters on Properties

Technical Paper Publication. IMECE2019-11615
Brad Hripko, Luke Hoover, Priyadarsini Damodara, Timothy Reissman, Robert L. Lowe, *University of Dayton, Dayton, OH, United States*

11:06am – Effect of Moisture on the Mechanical Properties of Additively Manufactured PLA, ABS, and PLA/SiC Composites

Technical Paper Publication. IMECE2019-11627
Padmalatha Kakanuru, *Stevens Institute of Technology, Hoboken, NJ, United States*, **Kishore Pochiraju,** *Stevens Institute of Technology, Belmar, NJ, United States*

11:27am – Experimental Investigation of PolyJet 3D Printing Process: Effects of Finish Type and Material Color on Color Appearance

Technical Paper Publication. IMECE2019-11917
Xingjian Wei, Li Zeng, Zhijian Pei, *Texas A&M University, College Station, TX, United States*

11:48am – Study of Printing Orientation on Mechanical Properties in Additive Manufacturing Process

Technical Paper Publication. IMECE2019-11997
Peyman Honarmandi, Hongbin Xu, *Manhattan College, Riverdale, NY, United States*

12:09pm – Multi-Material FDM 3D Printing Process Parameter Development Based on Bending Test Characterization

Technical Paper Publication. IMECE2019-10496
Heather Lai, Aaron Nelson, *SUNY New Paltz, New Paltz, NY, United States*

2-2-7 Additive Manufacturing of Composites & Ceramics

Convention Center, 255C 10:45AM–12:30PM

Session Organizer: Robert L. Lowe, *University of Dayton, Dayton, OH, United States*

Session Co-Organizer: Peyman Honarmandi, *Manhattan College, Riverdale, NY, United States*

Session Organizer: Baohui Shi, *University of Delaware, Newark, DE, United States*

10:45am – Polychromatic Coloring of Dental Zirconia by Inkjet Printing

Technical Paper Publication. IMECE2019-11277
Christoph Rehekampff, Dominik Rumschoettel, Franz Irlinger, Tim C. Lueth, *Technical University of Munich, Garching, Germany*

11:06am – Additive Manufacturing of Kevlar Reinforced Epoxy Composites

Technical Paper Publication. IMECE2019-12215
Baohui Shi, *University of Delaware, Newark, DE, United States*, **Emrah Celik, Jordan Chabot, Mutabe Aljaghtham, Cagri Oztan, Edward Dauer,** *University of Miami, Coral Gables, FL, United States*, **Recep Muhammet Gorguluarslan, Teyfik Demir,** *TOBB University of Economics and Technology, Ankara, Turkey*

11:27am – Additive Manufacturing of Continuous Carbon Fiber Composites

Poster Presentation. IMECE2019-12523
Baohui Shi, Kun Fu, Yuanyuan Shang, Ping Zhang, Tiankuo Chu, *University of Delaware, Newark, DE, United States*

11:48am – Microbially Enabled Healing of 3D-Printed Ceramics

Technical Presentation. IMECE2019-13151
An Xin, Qiming Wang, *University of Southern California, Los Angeles, CA, United States*

12:09pm – Piezoresistive Material Design for Functionalized Devices via Additive Manufacturing

Technical Presentation. IMECE2019-13365
Behrokh Abbasnejad, David McGloin, *University of Technology Sydney, Sydney, NSW, Australia*, **Lee Clemon,** *University of Technology Sydney, Ultimo, NSW, Australia*

2-5 ADVANCED MACHINING AND FINISHING PROCESSES

2-5-4 Advanced Finishing Processes

Convention Center, 155E

10:45AM–12:30PM

Session Organizer: Salman Pervaiz, *Rochester Institute of Technology - Dubai, Dubai, United Arab Emir.*

10:45am – Investigation of Surface Characteristics and Chip Morphology in High Speed Cutting of Inconel718 Based on SHPB System

Technical Paper Publication. IMECE2019-11036

Zeng-qiang Wang, Zhan-fei Zhang, Wenhui Wang, *Northwestern Polytechnical University, Xi'an, Shaanxi, China,* Rui-song Jiang, *Sichuan University, Chengdu, China,* Kunyang Lin, Hong-liang Xue, Biao Guo, *Northwestern Polytechnical University, Xi'an, Shaan-xi, China*

11:06am – Simulation and Experimental Investigation of Scallop Removal Using Friction Stir Processing and Complex Toolpath

Technical Paper Publication. IMECE2019-11375

Tyler Grimm, *Clemson University, Greenville, SC, United States,* Laine Mears, *Clemson University, Anderson, SC, United States*

11:27am – Surface Integrity of Fiber Reinforced Plastics

Technical Presentation. IMECE2019-12234

Harinder Singh Oberoi, *Boeing Research and Technology, Everett, WA, United States,* Ramulu Mamidala, *University of Washington, Seattle, WA, United States*

11:48am – High Performance Grinding (HPG) of Aerospace Engine Materials

Technical Presentation. IMECE2019-10037

K. Philip Varghese, *Norton/Saint-Gobain, Northborough R&D Center, Northborough, MA, United States*

12:09pm – Reviewing Machinability of Fibre-Reinforced Polymer (FRP)/Metallic Stacks Using MQL

Technical Paper Publication. IMECE2019-10961

Abhishek Ghoshal, Adnan Khan, Moosa Zahid, Salman Pervaiz, *Rochester Institute of Technology - Dubai, Dubai, United Arab Emir.,* Sathish Kannan, *American University of Sharjah, Sharjah, Dubai, United Arab Emir.*

2-8 INNOVATIVE PRODUCT AND PROCESS DESIGN

2-8-2 Innovative Product and Process Design II

Convention Center, 155F

10:45AM–12:30PM

Session Organizer: Joao Silva, *Universidade do Minho, Guimarães, Portugal*

Session Co-Organizer: Wenjun Su, *Xi'an Jiaotong University, Xi'an, China*

10:45am – Definition of Basic Functional Geometries: A Survey to Support Automatic Metrology

Technical Paper Publication. IMECE2019-11582

André Vale, Joao Silva, Carlos A.P. Costa, Michael Machado, *University Minho, Guimarães, Portugal*

11:06am – The Evolution of Tridimensional Metrology: The Era of Computer Aided Metrology

Technical Paper Publication. IMECE2019-11600

Michael Machado, Joao Silva, João Sousa, André Vale, *University of Minho, Guimarães, Portugal*

11:27am – Development of a Cleaning Robot for Trench Drains

Technical Paper Publication. IMECE2019-11785

Adithya Kaushik, Janet Dong, Ce Gao, Hazem Elzarka, *University of Cincinnati, Cincinnati, OH, United States*

11:48am – Temperature Change of Spindle Using Non-Contact Controllable Excitation and Response Measurement

Technical Paper Publication. IMECE2019-11807

Wenjun Su, Shaoke Wan, Jun Hong, *Xi'an Jiaotong University, Xi'an, China*

2-2 CONFERENCE-WIDE SYMPOSIUM ON ADDITIVE MANUFACTURING

2-2-5 Polymer Additive Manufacturing II

Convention Center, 255B

2:00PM–3:45PM

Session Organizer: Scott L. Thomson, *Brigham Young University, Provo, UT, United States*

Session Co-Organizers: Brett Reeder, *University of Utah, Boise, ID, United States,* Peyman Honarmandi, *Manhattan College, Riverdale, NY, United States*

2:00pm – Experimental Investigation of PolyJet 3D Printing Process: Effects of Orientation and Layer Thickness on Thermal Glass Transition Temperature

Technical Paper Publication. IMECE2019-11999

Jackson Sanders, *Texas A&M University, Katy, TX, United States,* Xingjian Wei, Zhijian Pei, *Texas A&M University, College Station, TX, United States*

2:21pm – Anisotropic Constitutive Behavior of Additively Manufactured Parts Using Stereolithography

Poster Presentation. IMECE2019-12371

Sunil Aravind Shanmugasundaram, *University of Texas at Arlington, Arlington, TX, United States*, Jafar Razmi, *University of Texas at Arlington Research Institute, Fort Worth, TX, United States*, Leila Ladani, *University of Texas at Arlington, Arlington, TX, United States*

2:42pm – Pore Size Effects in Mechanical Behavior of Micro-Architected Porous Structures

Technical Presentation. IMECE2019-12981

Brett Reeder, *University of Utah, Boise, ID, United States*, Robert Wheeler, *UES Inc., Dayton, OH, United States*, Pania Newell, *University of Utah, Salt Lake City, UT, United States*, Matthew Dickerson, *Air Force Research Laboratory, Dayton, OH, United States*

3:03pm – Effects of Environmental Temperature and Humidity on the Geometry and Strength of Polycarbonate Specimens Prepared by Fused Filament Fabrication

Technical Presentation. IMECE2019-13113

Lichen Fang, Yishu Yan, Ojaswi Agarwal, *Johns Hopkins University, Baltimore, MD, United States*, Jonathan Seppala, *National Institute of Standards and Technology, Gaithersburg, MD, United States*, Sung Hoon Kang, *Johns Hopkins University, Baltimore, MD, United States*

3:24pm – 3D Printing Ultra-Soft, Multi-Layer Organ Phantoms

Technical Presentation. IMECE2019-13601

Clayton Young, Scott L. Thomson, *Brigham Young University, Provo, UT, United States*

2-5 ADVANCED MACHINING AND FINISHING PROCESSES

2-5-5 Non-conventional Machining Processes: EDM and ECM

Convention Center, 155E **2:00PM–3:45PM**

Session Organizer: Muhammad Jahan, *Miami University, Oxford, OH, United States*

Session Co-Organizer: Harnam Singh Farwaha, *Guru Nanak Dev Engineering College, Ludhiana, Punjab, India*

2:00pm – Investigating the Micro-EDM Machinability of Bulk Metallic Glass in Micro-EDM Drilling

Technical Paper Publication. IMECE2019-10940

Chong Liu, Asif Rashid, Muhammad Jahan, *Miami University, Oxford, OH, United States*, Jianfeng Ma, *Saint Louis University, Saint Louis, MO, United States*

2:21pm – Machining of High Aspect Ratio Micro-Holes on Titanium Alloy Using Silver Nano Powder Mixed Micro EDM Drilling

Technical Paper Publication. IMECE2019-10944

Chong Liu, Asif Rashid, Muhammad Jahan, *Miami University, Oxford, OH, United States*, Jianfeng Ma, *Saint Louis University, Saint Louis, MO, United States*

2:42pm – Development of Trends and Methodologies for Shaping Ceramics by Electrical Discharge Machining: A Review

Technical Paper Publication. IMECE2019-10946

Asif Rashid, Muhammad Jahan, *Miami University, Oxford, OH, United States*, Asma Perveen, *Nazarbayev University, Astana, Kazakhstan*, Jianfeng Ma, *Saint Louis University, Saint Louis, MO, United States*

3:03pm – Performance Monitoring of Electrode Wear and Surface Roughness in WEDM of Al-10%Si₃N₄ Using Machine Vision System

Technical Presentation. IMECE2019-13117

Gurupavan H R, Holalu Venkatadasu Ravindra, *P.E.S. College of Engineering, Mandya, Karnataka, India*

3:24pm – Prediction and Experimental Investigations of Ultrasonic Assisted Electrochemical Magnetic Abrasive Finishing Process

Technical Paper Publication. IMECE2019-10188

Harnam Singh Farwaha, *Guru Nanak Dev Engineering College, Ludhiana, Punjab, India*, Dharpal Deepak, *Punjabi University, Patiala, India*, Gurinder Singh Brar, *National Institute of Technology, Srinagar (Garhwal), Srinagar, India*

2-8 INNOVATIVE PRODUCT AND PROCESS DESIGN

2-8-3 Innovative Product and Process Design III

Convention Center, 155F **2:00PM–3:45PM**

Session Organizer: Joao Sarraipa, *UNINOVA, Caparica, Portugal*

Session Co-Organizer: Carlos Agostinho, *UNINOVA, Caparica, Portugal*

2:00pm – Integration of Vibration Absorbers in Milling Chucks

Technical Paper Publication. IMECE2019-11266

Mihir Joshi, Matthias Weigold, Michael Schöll, *Technical University of Darmstadt, Darmstadt, Germany*

2:21pm – A Digital Twin for Intra-Logistics Process Planning for the Automotive Sector Supported by Big Data Analytics

Technical Paper Publication. IMECE2019-11362

Guilherme Guerreiro, Paulo Figueiras, Ruben Costa, Maria Marques, *UNINOVA, Caparica, Portugal*, Diogo Graca, Gisela Garcia, *Volkswagen Autoeuropa, Quinta do Anjo, Portugal*, Ricardo Jardim-Goncalves, *Universidade Nova de Lisboa, Caparica, Portugal*

2:42pm – Computational Model for Knowledge Transfer Skills in Industry 4.0 in an Enhanced and Effective Way

Technical Paper Publication. IMECE2019-11393

Andreia Artifice, Fernando Luis-Ferreira, Joao Sarraipa, *UNINOVA, Caparica, Portugal*, Ricardo Jardim-Goncalves, *Universidade Nova de Lisboa, Caparica, Portugal*

3:03pm – Discovery of Public Transportation Patterns Through the Use of Big Data Technologies for Urban Mobility

Technical Paper Publication. IMECE2019-11415
 Hugo Antunes, Paulo Figueiras, Ruben Costa, *UNINOVA, Caparica, Portugal*, Joel Teixeira, *Link Consulting, Lisboa, Portugal*, Ricardo Jardim-Goncalves, *Universidade Nova de Lisboa, Caparica, Portugal*

3:24pm – A Methodology for Virtual Factory Applications Definition, Development and Validation

Technical Paper Publication. IMECE2019-11527
 Elsa Marcelino-Jesus, Joao Sarraipa, *UNINOVA, Caparica, Portugal*, Francisco Fraile, Raul Poler, *Universitat Politècnica de València, Valencia, Spain*

2-14 GENERAL MANUFACTURING

2-14-1 General Manufacturing

Convention Center, 255C **2:00PM–3:45PM**

Session Organizer: Tien-Chien Jen, *University of Johannesburg, Johannesburg, South Africa*

2:00pm – Eccentricity of Rotor Prediction of Aero-Engine Rotor Based on Image Identification and Machine Learning

Technical Paper Publication. IMECE2019-10919
 Zihao Zhang, Junkang Guo, Yanhui Sun, Jun Hong, *Xi'an Jiaotong University, Xi'an, Shaanxi, China*

2:21pm – Grinding of Additively Manufactured Aerospace Alloys

Technical Presentation. IMECE2019-10040
 K. Philip Varghese, John Hagan, *Norton/Saint-Gobain, Northborough, MA, United States*

2:42pm – A Lightweight Framework of R-LATs for Large-Scale Application

Technical Paper Publication. IMECE2019-10383
 Kang Jia, Ruihua He, Gang Fu, Wenjun Su, Zhigang Liu, *Xi'an Jiaotong University, Xi'an, China*

3:03pm – Development of IoT system Supported by Data Mining Method in Mold Manufacturing

Technical Presentation. IMECE2019-12509
 Hiroyuki Kodama, Masahiro Yamauchi, Hikaru Ohira, Kazuhito Ohashi, *Okayama University, Okayama, Japan*

3:24pm – Investigating the Purge Flow Rate in a Reactor Scale Simulation of an Atomic Layer Deposition Process

Technical Paper Publication. IMECE2019-10692
 Emeka C. Nwanna, Rigardt Coetzee, Tien-Chien Jen, *University of Johannesburg, Johannesburg, South Africa*

2-2 CONFERENCE-WIDE SYMPOSIUM ON ADDITIVE MANUFACTURING

2-2-6 Hybrid Additive Manufacturing Processes

Convention Center, 255B **4:00PM–5:45PM**

Session Organizer: Nikolaos Tapoglou, *Advanced Manufacturing Research Centre, University of Sheffield, Sheffield, United Kingdom*

Session Co-Organizer: Andrew Gross, *University of South Carolina, Columbia, SC, United States*

4:00pm – A Rapid Manufacturing Process for Extrusion-Based 3D Printers

Technical Paper Publication. IMECE2019-10022
 Andreas Schroeffer, Matthias Trescher, Konstantin Struebig, Yannick Krieger, Tim C. Lueth, *Technical University of Munich, Bavaria, Garching, Germany*

4:21pm – Interrupted Hybrid Additive and Subtractive Manufacturing of Parts for the Aerospace and the Oil and Gas Industries

Technical Presentation. IMECE2019-12774
 Nikolaos Tapoglou, Joseph Clulow, *Advanced Manufacturing Research Centre, University of Sheffield, Sheffield, United Kingdom*

4:42pm – Load Capacity of Support Structures for Direct Machining of Selective Laser Melted Parts

Technical Paper Publication. IMECE2019-11134
 Christian Höller, Philipp Zopf, Philipp Schwemberger, Rudolf Pichler, Franz Haas, *Graz University of Technology, Graz, Austria*

5:03pm – Fused Deposition Modeling With Added Vibrations: A Parametric Study on the Accuracy of Printed Parts

Technical Paper Publication. IMECE2019-11698
 Joseph Dei Rossi, Ozgur Keles, Vimal Viswanathan, *San Jose State University, San Jose, CA, United States*

5:24pm – Subtractive Postprocessing to Overcome Constraints of Direct Laser Writing

Technical Presentation. IMECE2019-13903
 Andrew Gross, *University of South Carolina, Columbia, SC, United States*

2-5 ADVANCED MACHINING AND FINISHING PROCESSES

2-5-6 Other Innovative Machining Processes

Convention Center, 155E 4:00PM–5:45PM

Session Organizer: Chandra Sekhar Rakurty, *The M. K. Morse Company, Canton, OH, United States*

Session Co-Organizer: Xiaolan Han, *Xi'an Shiyou University, Xi'an, China*

4:00pm – Ultra-Fine Surface Finishing Process for Metals and Ceramics Through Magnetic-Field Assisted Finishing (MAF)

Technical Presentation. IMECE2019-13150
Bibek Poudel, Haseung Chung, Patrick Kwon, Guangchao Song, *Michigan State University, East Lansing, MI, United States*

4:21pm – Investigation on Deep Hole Trepanning of TC10 Titanium Alloy

Technical Paper Publication. IMECE2019-11235
Xiaolan Han, Zhanfeng Liu, *Xi'An Shiyou University, Xi'an, China*

4:42pm – Band Saw Blade: Design Engineering Perspective

Technical Presentation. IMECE2019-13880
Chandra Sekhar Rakurty, Lucas A. Whitmer, *The M. K. Morse Company, Canton, OH, United States*

5:03pm – Band Saw Cutting Process: Optimizing Cutting Conditions

Technical Presentation. IMECE2019-13868
Chandra Sekhar Rakurty, Connor Zwick, Grant M. Waters, *The M. K. Morse Company, Canton, OH, United States*

2-8 INNOVATIVE PRODUCT AND PROCESS DESIGN

2-8-4 Innovative Product and Process Design IV

Convention Center, 155F 4:00PM–5:45PM

Session Organizer: Maria Marques, *UNINOVA, Caparica, Portugal*

Session Co-Organizer: Joao Sarraipa, *UNINOVA, Caparica, Portugal*

4:00pm – A Methodology for Modelling Tugger Train Systems Using Modelica

Technical Paper Publication. IMECE2019-10452
João Veiga, João Sousa, José Machado, Joao Silva, *Universidade do Minho, Guimarães, Portugal, Toni Machado, Pedro Silva, Bosch BrgP, Braga, Portugal*

4:21pm – Artificial Intelligence Based Architecture to Support Dementia Patients

Technical Paper Publication. IMECE2019-10985
Fernando Luis-Ferreira, Joao Sarraipa, Jorge Calado, Joana Andrade, Daniel Rodrigues, *UNINOVA, Caparica, Portugal, Ricardo Jardim-Goncalves, Universidade Nova de Lisboa, Caparica, Portugal*

4:42pm – Innovative Information Model to Improve Quality and Collaboration on Stone Industry

Technical Paper Publication. IMECE2019-11659
Adriana Cunha, Joao Silva, *University of Minho, Guimarães, Portugal*

5:03pm – Innovative Product/Service for Personalized Health Management

Technical Paper Publication. IMECE2019-11711
Maria Marques, Fabio Lopes, *UNINOVA, Caparica, Portugal, Ruben Costa, Carlos Agostinho, Pedro Oliveira,* *Knowledgebiz, Almada, Portugal, Ricardo Jardim-Goncalves, Universidade Nova de Lisboa, Caparica, Portugal*

THURSDAY, NOVEMBER 14

2-7 ADVANCED MATERIAL FORMING - NOVEL PROCESSES, MECHANICS, CHARACTERIZATION, AND CONTROL

2-7-1 Novel Processes

Convention Center, 251D 8:15AM–10:00AM

Session Organizer: Xuedao Shu, *Ningbo University, Ningbo, Zhejiang, China*

Session Co-Organizer: Chetan Nikhare, *Pennsylvania State University, Erie, PA, United States*

8:15am – Preliminary Results: The Design, Instrumentation, and Performance of FSBE Tooling for Aluminum Tubes
Technical Paper Publication. IMECE2019-10032

William Emblom, *University of Louisiana at Lafayette, Lafayette, LA, United States*, **Scott Wagner**, *Michigan Tech, Atlantic Mine, MI, United States*, **Ayotunde Olayinka, Courtney Richard, Quinn Anglada, Paige Cutright, Andrew Granger, Jonathan Matthysen**, *University of Louisiana at Lafayette, Lafayette, LA, United States*, **Muhammad Wahab**, *Louisiana State University, Baton Rouge, LA, United States*

8:36am – Forming Technology and Microstructure Distribution of Automobile Oil Pump Shaft by Extruded Cross Wedge Rolling

Technical Paper Publication. IMECE2019-10341
Xuedao Shu, T.Z. Chen, Y. Chang, Y. Zhu, W.W. Gong, *Ningbo University, Ningbo, Zhejiang, China*

8:57am – Optimizing Process and Geometry Parameters in Bulging of Pipelines

Technical Paper Publication. IMECE2019-10600
Shabbir Memon, Obaidur Rahman Mohammed, D.V.Suresh Koppisetty, Hamid Lankarani, *Wichita State University, Wichita, KS, United States*

9:18am – Buckling of Tube for Tube Hydroforming

Technical Paper Publication. IMECE2019-10630
Chetan Nikhare, *Pennsylvania State University, Erie, PA, United States*

9:39am – The Influence Rule of Geometric Parameters on the Closure of Inside Cavity of the Skew Rolled Steel Ball by Floating Pressure Method

Technical Paper Publication. IMECE2019-10472
Chang Shu, *University of North Carolina at Charlotte, Charlotte, NC, United States*, **Yingxiang Xia, Xuedao Shu**, *Ningbo University, Ningbo, Zhejiang, China*, **Duanyang Tian**, *Wuhan University of Technology, Wuhan, Hubei, China*

2-7 ADVANCED MATERIAL FORMING - NOVEL PROCESSES, MECHANICS, CHARACTERIZATION, AND CONTROL

2-7-2 Incremental Forming

Convention Center, 251D

10:15AM–12:00PM

Session Organizer: Tyler Grimm, *Clemson University, Greenville, SC, United States*

Session Co-Organizer: Xuedao Shu, *Ningbo University, Ningbo, Zhejiang, China*

10:15am – Numerical and Experimental Analysis of Attaching-Mandrel Process Under Multi-Pass Cold Spinning Process on Superalloy GH3030

Technical Paper Publication. IMECE2019-10349
Zixuan Li, Xuedao Shu, Zewei Cen, Song Zhang, *Ningbo University, Ningbo, Zhejiang, China*

10:36am – Single Point Incremental Forming of Large Sheet Metal Components

Technical Paper Publication. IMECE2019-10390
Frank Schieck, Reinhard Mauermann, Dieter Weise, Matthias Demmler, *Fraunhofer Institute for Machine Tools and Forming Technology, Chemnitz, Saxony, Germany*

10:57am – Experimental Study on Residual Formability of Single Point Incrementally Formed Part

Technical Paper Publication. IMECE2019-10619
Chetan Nikhare, *Pennsylvania State University, Erie, PA, United States*

11:18am – Experimental Investigation of a Backing Sheet Stiffener in Incremental Forming of Polycarbonate

Technical Paper Publication. IMECE2019-11231
Tyler Grimm, Shubhamkar Kulkarni, *Clemson University, Greenville, SC, United States*, **Laine Mears**, *Clemson University, Anderson, SC, United States*, **Gregory Mocko**, *Clemson University, Clemson, SC, United States*

11:39am – Research on Wall Thickness Uniformity of Hollow Axles by Three-Roll Skew Rolling

Technical Paper Publication. IMECE2019-10486
Song Zhang, Xuedao Shu, Chang Xu, Jitai Wang, Zixuan Li, *Ningbo University, Ningbo, Zhejiang, China*

2-3 MEASUREMENT SCIENCE, SENSORS, NON-DESTRUCTIVE EVALUATION (NDE) AND PROCESS CONTROL FOR ADVANCED MANUFACTURING

2-3-1 Non-Destructive Examination Techniques for Additive Manufacturing
Convention Center, 251C **2:00PM–3:45PM**

Session Organizer: Linkan Bian, *Mississippi State University, Mississippi State, MS, United States*

2:00pm – In-Situ Fatigue Prediction of Direct Laser Deposition Parts Based on Thermal Profile

Technical Paper Publication. IMECE2019-10323
Seyyed H. Seifi, Wenmeng Tian, Mississippi State University, Mississippi State, MS, United States, Aref Yadollahi, Haley Doude, Mississippi State University, Starkville, MS, United States, Linkan Bian, Mississippi State University, Mississippi State, MS, United States

2:21pm – Influence Study of Gas Pressure on the Volume Measurement of Engine Combustion Chamber by Using Helmholtz Resonance

Technical Paper Publication. IMECE2019-10822
Kun Chen, Sun Jin, Shun Liu, Ang Tian, Wei Mo, Shanghai Jiao Tong University, Shanghai, China

2:42pm – Rapid Qualification of Additive Manufactured Parts Using OpenMETA

Technical Paper Publication. IMECE2019-10981
Mike Myers, Oregon Institute of Technology, Wilsonville, OR, United States

3:03pm – An Initial Study Towards In-Situ Ultrasonic Monitoring and Measurement of Part Properties During Photo-polymer Based Additive Manufacturing

Technical Paper Publication. IMECE2019-10993
Tong Su, Menghan Jiang, Qing-Ming Wang, Xiayun Zhao, University of Pittsburgh, Pittsburgh, PA, United States

3:24pm – An Optimized 3D Probe Using Sensitivity and Compliance Analysis

Technical Paper Publication. IMECE2019-11184
Weikang Zheng, Zhigang Liu, Junkang Guo, Xi'an Jiaotong University, Xi'an Shaanxi, China

2-7 ADVANCED MATERIAL FORMING - NOVEL PROCESSES, MECHANICS, CHARACTERIZATION, AND CONTROL

2-7-3 Numerical Modeling
Convention Center, 251D **2:00PM–3:45PM**

Session Organizer: Chetan Nikhare, *Pennsylvania State University, Erie, PA, United States*

Session Co-Organizer: Tyler Grimm, *Clemson University, Greenville, SC, United States*

2:00pm – Deformation Mechanics of Tube in Variation of Process Sequence During Low Pressure Tube Hydroforming

Technical Paper Publication. IMECE2019-10625
Chetan Nikhare, Pennsylvania State University, Erie, PA, United States

2:21pm – Two Methods for the Constitutive Modeling of TiB₂/7050 Al Composites

Technical Paper Publication. IMECE2019-11034
Kunyang Lin, Wenhui Wang, Northwestern Polytechnical University, Xi'an, China, Ruisong Jiang, Sichuan University, Chengdu, China, Xiaofen Liu, Xiaoxiang Zhu, Zhan-fei Zhang, Northwestern Polytechnical University, Xi'an, Shaanxi, China

2:42pm – Numerical Determination of Unconstrained Area Effect on Springback in Incremental Forming of 5052-H32 Aluminum

Technical Paper Publication. IMECE2019-11255
Tyler Grimm, Clemson University, Greenville, SC, United States, Laine Mears, Clemson University, Anderson, SC, United States

3:03pm – Miniature Hemispherical Bowl-Shaped Forming Using SLA Punch and Die: Modeling and Experimental Analysis

Technical Paper Publication. IMECE2019-11630
Debabrata Mondal, Jeffrey David Morris, University of New Orleans, New Orleans, LA, United States, Bin Zhang, Wen Meng, Louisiana State University, Baton Rouge, LA, United States, Uttam Chakravarty, University of New Orleans, Kenner, LA, United States, Paul Herrington, Paul Schilling, University of New Orleans, New Orleans, LA, United States

3:24pm – Sheet Metal Forming Optimization Using Finite Element Methods (FEM)

Technical Presentation. IMECE2019-12693
Alie Wube Dametew, Addis Ababa University Institute of Technology-Ethi, Addis Ababa, Ethiopia, Tafesse Gebresenbet, Saint Mary's University in San Antonio, Texas, San Antonio, TX, United States

2-3 MEASUREMENT SCIENCE, SENSORS, NON-DESTRUCTIVE EVALUATION (NDE) AND PROCESS CONTROL FOR ADVANCED MANUFACTURING

2-3-2 Measurement Science and Sensors to Support Advanced Manufacturing

Convention Center, 251C **4:00PM–5:45PM**

Session Organizer: Ankur Krishna, *Tata Consultancy Services, Pune, Maharashtra, India*

4:00pm – The Geometric Error Measurement and Compensation for a Five-Axis Machining Center's Tilting Rotary Table

Technical Paper Publication. IMECE2019-10280
Kuo Liu, Haibo Liu, *Dalian University of Technology, Dalian, Liaoning, China*, **Mingjia Sun,** *Shenyang Machine Tool (Group) Co., Ltd., Shenyang, China*, **Wei Han, Nan Xie, Y.-Q. Wang,** *Dalian University of Technology, Dalian, China*

4:21pm – Remaining Useful Life Prediction Based on Spindle Load and Cutting Process Parameters in Machining

Technical Paper Publication. IMECE2019-10571
Ankur Krishna, Bilal Muhammed, *Tata Consultancy Services, Pune, Maharashtra, India*

4:42pm – Univariate and Multivariate Gauge Repeatability and Reproducibility Analysis on the High Frequency Dynamic Mechanical Analysis (DMA) Measurement System

Technical Paper Publication. IMECE2019-10986
Roja Esmaeeli, Haniph Aliniagerdroudbari, Seyed Reza Hashemi, Hammad Al-Shammari, *University of Akron, Akron, OH, United States*, **Muapper Alhadri,** *University of Akron, Cuyahoga Falls, OH, United States*, **Siamak Farhad,** *University of Akron, Akron, OH, United States*

5:03pm – Application of Extended Kalman Filter to Dynamic Tracking Problem in R-LATs

Technical Paper Publication. IMECE2019-11791
Wenjun Su, Kang Jia, Jun Hong, Zhigang Liu, *Xi'an Jiaotong University, Xi'an, China*

2-7 ADVANCED MATERIAL FORMING - NOVEL PROCESSES, MECHANICS, CHARACTERIZATION, AND CONTROL

2-7-4 Properties and Defects

Convention Center, 251D **4:00PM–5:45PM**

Session Organizer: Amit Kumar Gupta, *BITS Pilani, Hyderabad Campus, Hyderabad, Telangana, India*

Session Co-Organizer: Wen Meng, *Louisiana State University, Baton Rouge, LA, United States*

4:00pm – Anisotropic Yielding Behaviour of Inconel 718 Alloy at Elevated Temperatures

Technical Paper Publication. IMECE2019-11126
Gauri Rajendra Mahalle, Omkar Salunke, Nitin Kotkunde, Amit Kumar Gupta, *Birla Institute of Technology and Science, Pilani, Hyderabad Campus, Hyderabad, Telangana, India*, **Swadesh Kumar Singh,** *GRIET, Hyderabad, Telangana, India*

4:21pm – Optimizing Material Parameters for Better Formability of DQ Steel Pipe

Technical Paper Publication. IMECE2019-10602
Shabbir Memon, Obaidur Rahman Mohammed, D.V. Suresh Koppisetty, Hamid Lankarani, *Wichita State University, Wichita, KS, United States*

4:42pm – Effect of Processing Technique on the Mechanical Properties of a Functionalized Superhydrophobic Silane

Technical Paper Publication. IMECE2019-10715
Akinsanya Damilare Baruwa, Esther Akinlabi, *University of Johannesburg, Johannesburg, South Africa*, **O.P. Oladijo,** *Botswana International University of Science & Technology, Palapye, Palapye, Botswana*, **J. Dutta Majumdar, S. Krishna,** *Indian Institute of Technology, Kharagpur, West Bengal, India*

5:03pm – Analysis and Assessment of the Spring-Back Effect of Steel Sheet Metal Under Bending Operations

Technical Paper Publication. IMECE2019-11422
Omar Pérez-Martínez, Hugo Ivan Medellín Castillo, *Universidad Autónoma San Luis Potosí, San Luis Potosí, Mexico*

5:24pm – Mechanical Response and Incomplete Filling in Compression Molding With Microscale Double-Punch Sets

Technical Paper Publication. IMECE2019-11521
Bin Zhang, Mohammad Dodaran, Shuai Shao, Wen Meng, *Louisiana State University, Baton Rouge, LA, United States*

TRACK 3 ADVANCES IN AEROSPACE TECHNOLOGY

- 3-1-1: Plenary Session I**
- 3-1-2: Plenary Session II**
- 3-2-1: Advances in Aerodynamics**
- 3-3-1: Novel Aerospace Propulsion Systems**
- 3-4-1: Advances in Aerospace Structures and Materials – I**
- 3-4-2: Advances in Aerospace Structures and Materials – II**
- 3-5-1: Beam, Plate, and Shell Structures**
- 3-6-1: Lightweight Sandwich Composites and Layered Structures – I**
- 3-6-2: Lightweight Sandwich Composites and Layered Structures – II**
- 3-7-1: Dynamic Behavior of Composites**
- 3-8-1: Dynamics and Control of Aerospace Structures**
- 3-10-1: Impact, Damage and Fracture of Composite Structures**
- 3-12-1: Peridynamics Modeling – I**
- 3-12-2: Peridynamics Modeling – II**
- 3-13-1: Computational Aerospace Structural Dynamics and Aeroelasticity**
- 3-14-1: Nonlinear Problems in Aerospace Structures**
- 3-15-1: Structural Health Monitoring of Composite Materials and Structures**

ACKNOWLEDGMENT

TRACK ORGANIZER

Yingtao Liu, *University of Oklahoma, United States*
Weihua Su, *University of Alabama, United States*

TOPIC ORGANIZERS

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Yiska Goldfeld, *Technion, Israel*
George Kardomateas, *Georgia Institute of Technology, United States*
Yingtao Liu, *University of Oklahoma, United States*
Weiyi Lu, *Michigan State University, United States*

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Michele Trancossi, *Ethical Property Management Italia, Italy*
Yi Wang, *University of South Carolina, United States*
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Carlos Xisto, *Chalmers University of Technology, Sweden*
Baoxing Xu, *University of Virginia, United States*
Zhangxian Yuan, *Georgia Institute of Technology, United States*
Dianyun Zhang, *University of Connecticut, United States*

SESSION ORGANIZERS

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Erkan Oterkus, *University of Strathclyde, United Kingdom*

TRACK 3 ADVANCES IN AEROSPACE TECHNOLOGY

MONDAY, NOVEMBER 11

3-1 PLENARY PRESENTATIONS

3-1-1 Plenary Session I

Convention Center, 255C 9:45AM–10:30AM

9:45am – Design of Advanced Multifunctional Composites for Fly-by-Feel Autonomous Electric Vehicles

Plenary Presentation. IMECE2019-13994

Fu-kuo Chang, *Stanford University, Stanford, CA, United States*

3-5 BEAM, PLATE, AND SHELL STRUCTURES

3-5-1 Beam, Plate, and Shell Structures

Convention Center, 355E 10:45AM–12:30PM

10:45am – Analytical and Numerical Modelling of Sheet Plate Cold Expanded Hole Subjected to Reverse Yielding

Technical Paper Publication. IMECE2019-10019

Abdel-Hakim Bouzid, Hacene Touahri, *Ecole de Technologie Supérieure, Montreal, QC, Canada*

11:06am – Levy-Type Boundary Fourier Analysis of Clamped Thick Cross-Ply Hyperbolic-Paraboloidal Cross-ply Panels

Technical Presentation. IMECE2019-10325

Reaz Chaudhuri, *University of Utah, Salt Lake City, UT, United States*, A. Sinan Oktem, *Gebze Technical University, Kocaeli, Turkey*

11:27am – A Nonlinear Resonance (Eigenvalue) Approach for Computation of Elastic Collapse Pressures of Harmonically Imperfect Relatively Thin Rings

Technical Presentation. IMECE2019-10823

Reaz Chaudhuri, *University of Utah, Salt Lake City, UT, United States*

11:48am – Optimization of 3D Printed Elastomeric Nanocomposites for Flexible Strain Sensing Applications

Technical Paper Publication. IMECE2019-11467

Mohammad Abshirini, Mohammad Charara, Mrinal Saha, M. Cengiz Altan, Yingtao Liu, *University of Oklahoma, Norman, OK, United States*

12:09pm – Fatigue Modeling of Friction-Stir-Welded (FSW) Butt-Joints for Aerospace Applications

Technical Paper Publication. IMECE2019-11723

Muhammad Wahab, *Louisiana State University, Baton Rouge, LA, United States*, Vinay Raghuram, *Proquip Technologies Pvt. Ltd., Bangalore, Karnataka, India*

3-6 LIGHTWEIGHT SANDWICH COMPOSITES AND LAYERED STRUCTURES

3-6-1 Lightweight Sandwich Composites and Layered Structures – I

Convention Center, 355D 10:45AM–12:30PM

10:45am – Best Structural Theories for Free Vibrations of Sandwich Composites via Machine Learning

Technical Paper Publication. IMECE2019-10296

Marco Petrolo, Erasmo Carrera, *Politecnico di Torino, Torino, Italy*

11:06am – Comparative Structural Optimization Study of Composite and Aluminum Horizontal Tail Plane of a Helicopter

Technical Paper Publication. IMECE2019-11153

Bertan Arpacioğlu, *Turkish Aerospace Industries Inc./Middle East Technical University, Ankara, Turkey*, Altan Kayran, *Middle East Technical University, Ankara, Turkey*

11:27am – Nonlinear Dynamic Analysis of Interfacial Crack Propagation in Sandwich Panels

Technical Presentation. IMECE2019-12725

Itay Odessa, Yeoshua Frostig, Oded Rabinovitch, *Technion - Israel Institute of Technology, Haifa, Israel*

11:48am – Integrative Gauge Factor for Smart Carbon Based TRC Beams

Technical Presentation. IMECE2019-12641

Yiska Goldfeld, Lidor Yosef, *Technion - Israel Institute of Technology, Haifa, Israel*

12:09pm – Nonlinear Geometrical Behavior With Nonlinear Material Laws of Sandwich Panels With a Compliant Core

Technical Presentation. IMECE2019-13065

Gil Soffer, Oded Rabinovitch, Yeoshua Frostig, *Technion - Israel Institute of Technology, Haifa, Israel*

3-6 LIGHTWEIGHT SANDWICH COMPOSITES AND LAYERED STRUCTURES

3-6-2 Lightweight Sandwich Composites and Layered Structures – II

Convention Center, 355D 2:00PM–3:45PM

2:00pm – Tensile Buckling and Post-Buckling of Annular Plates

Technical Presentation. IMECE2019-13071

Gil Soffer, Yeoshua Frostig, *Technion - Israel Institute of Technology, Haifa, Israel*

2:21pm – Micromechanics Modeling of Overall Properties of Polymer Matrix Composites Undergoing Pyrolysis

Technical Presentation. IMECE2019-13678

Teja Konduri, Olesya Zhupanska, *University of Arizona, Tucson, AZ, United States*

2:42pm – Energy Release Rate and Mode Mixity of Sandwich Beams With Interfacial Debonds

Technical Presentation. IMECE2019-13681

Zhangxian Yuan, *Georgia Institute of Technology, Atlanta, GA, United States*, George Kardomateas, *Georgia Institute of Technology, Alpharetta, GA, United States*

3:03pm – Dynamic Stability Analysis of Sandwich Beams/Panels With Initial Imperfections: A High Order Approach

Technical Presentation. IMECE2019-13684

Zhangxian Yuan, *Georgia Institute of Technology, Atlanta, GA, United States*, George Kardomateas, *Georgia Institute of Technology, Alpharetta, GA, United States*

3:24pm – Closed Form Solution for the Energy Release Rate and Mode Partitioning of the Single Cantilever Beam (SCB) Sandwich Specimen

Technical Presentation. IMECE2019-13704

George Kardomateas, *Georgia Institute of Technology, Alpharetta, GA, United States*, Zhangxian Yuan, *Georgia Institute of Technology, Atlanta, GA, United States*

3-7 DYNAMIC BEHAVIOR OF COMPOSITES

3-7-1 Dynamic Behavior of Composites

Convention Center, 355E

2:00PM–3:45PM

2:00pm – Effect of Property of Interphase Layer on Damping Properties of Polymer Composites Using Sensitivity Analysis

Technical Paper Publication. IMECE2019-10070

Shank S. Kulkarni, Alireza Tabarraei, Pratik Ghag, *University of North Carolina at Charlotte, Charlotte, NC, United States*

2:21pm – Adaptive Liquid Flow Speed in 3D Nanostructured Liquid Nanofoam

Technical Presentation. IMECE2019-12730

Mingzhe Li, Weiyi Lu, *Michigan State University, East Lansing, MI, United States*

2:42pm – Nanofluidics-Enabled Energy Capture Mechanism for Impact Mitigation

Technical Presentation. IMECE2019-12937

Weiyi Lu, *Michigan State University, East Lansing, MI, United States*

3:03pm – The Driving Force of Liquid Outflow From Hydrophobic Nano-Channels

Technical Presentation. IMECE2019-13128

Lijiang Xu, Mingzhe Li, Weiyi Lu, *Michigan State University, East Lansing, MI, United States*

3-2 ADVANCES IN AERODYNAMICS

3-2-1 Advances in Aerodynamics

Convention Center, 355D

4:00PM–5:45PM

4:00pm – Low-Cost Particulate Detection in Bleed Air

Technical Paper Publication. IMECE2019-10460

Mir Seliman Waez, Steven Eckels, Christopher Sorensen, *Kansas State University, Manhattan, KS, United States*

4:21pm – Fluidic Injection Thrust Reverser System for High Bypass Ratio Turbofan Engines: Experimental Model

Technical Paper Publication. IMECE2019-10938

Raghav Kumar, Pankaj Rajput, Sunil Kumar, *New York University Abu Dhabi, Abu Dhabi, United Arab Emir.*

4:42pm – Investigations of Three-Dimensional Flow Field Development in an Axial Compressor Cascade

Technical Paper Publication. IMECE2019-11047

Saeed A. El-Shahat, *Xi'an Jiaotong University, Xi'an, Shaanxi, China*, Hesham M. El-Batsh, Ali M.A. Attia, *Benha University, Benha, Qalyobiya, Egypt*, Guojun Li, Lei Fu, *Xi'an Jiaotong University, Xi'an, Shaanxi, China*

5:03pm – Effect of Volute Tongue Shape and Position on Performance of Industrial Centrifugal Compressor

Technical Paper Publication. IMECE2019-11091

Anuj Srivastava, *Bharat Forge Ltd., Pune, Maharashtra, India*, Kuldeep Kumar, Ganesh Banda, *Bharat Forge Ltd., Pune, India*

5:24pm – Plasma Actuators Optimization Using Stair Shaped Dielectric Layers

Technical Paper Publication. IMECE2019-11515

Frederico Rodrigues, Jose Pascoa Marques, *Universidade da Beira Interior, Covilha, Reagia da Beira, Portugal*, Michele Trancossi, *Ethical Property Management Italia, Pama, Emilia-Romagna, Italy*

TUESDAY, NOVEMBER 12

3-1 PLENARY PRESENTATIONS**3-1-2 Plenary Session II****Convention Center, 155D****9:45AM–10:30AM****9:45am – Very Flexible Aircraft: Performance Promises and Aeroelastic Challenges**

Plenary Presentation. IMECE2019-13993

Carlos Cesnik, *University of Michigan, Ann Arbor, MI, United States***3-4 ADVANCES IN AEROSPACE STRUCTURES AND MATERIALS****3-4-1 Advances in Aerospace Structures and Materials - I****Convention Center, 355E****10:45AM–12:30PM****10:45am – Effect of Shear Overloads on Crack Propagation in Al-7075 Under In-Plane Biaxial Fatigue Loading**

Technical Paper Publication. IMECE2019-10142

Abhay Singh, Siddhant Datta, Aditi Chattopadhyay, *Arizona State University, Tempe, AZ, United States*, Nam Phan, *U.S. Naval, Patuxent River, MD, United States***11:06am – X-Ray Induced Acoustic Computed Tomography for Non-Destructive Testing of Aircraft Structure**

Technical Paper Publication. IMECE2019-10480

Tiffany Tran, Pratik Samant, Liangzhong Xiang, Yingtao Liu, *University of Oklahoma, Norman, OK, United States***11:27am – A Biaxial Infrared and Geomagnetic Composite Attitude Measurement Method of Rotating Projectile**

Technical Paper Publication. IMECE2019-10492

Yihan Cao, Xiongzhu Bu, Wei Han, Zilu He, *Nanjing University of Science and Technology, Nanjing, China***11:48am – Structural and Thermal Loads for Hypersonic HEXAFly-INT Vehicle**

Technical Paper Publication. IMECE2019-10577

Domenico Cristillo, *CIRA SCpA, Capua, Italy*, Roberto Scigliano, Sara Di Benedetto, *Italian Aerospace Research Centre, Capua, Italy*, Salvatore Cardone, *TecnoSistem(TET), Naples, Italy*, Matteo Appolloni, *European Space Agency, Noordwijk, Holland Netherlands*, Attila Jasko, *RHEA Group, Noordwijk, Netherlands***12:09pm – Robust Design of a Test Bench for PHM Study of Ball Screw Drives**

Technical Paper Publication. IMECE2019-10713

Antonio C. Bertolino, Andrea De Martin, Giovanni Jacazio, Stefano Mauro, Massimo Sorli, *Politecnico di Torino, Torino, Italy***3-12 PERIDYNAMICS MODELING****3-12-1 Peridynamics Modeling- I****Convention Center, 155F****10:45AM–12:30PM**Session Organizer: Erdogan Madenci, *University of Arizona, Tucson, AZ, United States***10:45am – Increasing Toughness by Introducing Micro-cracks**

Technical Presentation. IMECE2019-13171

Muhammed Fatih Basoglu, Zihni Zerir, *Ondokuz Mayıs University, Samsun, Turkey*, Adnan Kefal, *Istanbul Technical University, Istanbul, Turkey*, Erkan Oterkus, *University of Strathclyde, Glasgow, United Kingdom***11:06am – Peridynamic Differential Operator/Sparse Optimization for Learning Partial Differential Equations**

Technical Presentation. IMECE2019-13202

Ali Can Bekar, Erdogan Madenci, *University of Arizona, Tucson, AZ, United States***11:27am – Peridynamic Impact Analysis in the Presence of Contact and Friction**

Technical Presentation. IMECE2019-13204

Sundaram Vinod Kumar Anicode, Cagan Diyaroglu, Erdogan Madenci, *University of Arizona, Tucson, AZ, United States***11:48am – Polycrystalline Ice Modelling Using Peridynamics**

Technical Presentation. IMECE2019-10049

Wei Lu, Mingyang Li, Bozo Vazic, Selda Oterkus, Erkan Oterkus, *University of Strathclyde, Glasgow, United Kingdom***3-13 COMPUTATIONAL AEROSPACE STRUCTURAL DYNAMICS AND AEROELASTICITY****3-13-1 Computational Aerospace Structural Dynamics and Aeroelasticity****Convention Center, 355F****10:45AM–12:30PM****10:45am – A Semi-Empirical Approach to Determine Dynamic Stability of In-Flight Morphing Platforms**

Technical Paper Publication. IMECE2019-10274

Timothy Marchelli, Nesrin Sarigul-Klijn, *University of California, Davis, Davis, CA, United States***11:06am – Computational Design of Microstructures With Stochastic Property Closures**

Technical Paper Publication. IMECE2019-10531

Pinar Acar, *Virginia Tech, Blacksburg, VA, United States***11:27am – Parametric Data-Driven Reduced Order Models With State Consistency for Aeroelastic Analysis**

Technical Paper Publication. IMECE2019-11333

William Krolick, *CFD Research Corporation, Huntsville, AL, United States*, Yi Wang, *University of South Carolina, Columbia, SC, United States*, Kapil Pant, *CFD Research Corporation, Huntsville, AL, United States*

11:48am – Statistical Energy Analysis for Energy Harvesting

Technical Presentation. IMECE2019-11412

Zahra Sotoudeh, *California State Polytechnic University, Pomona, Chino Hills, CA, United States*

12:09pm – Aeroelastic Modeling and Analysis of High Aspect Ratio Wings With Different Fidelity Structural Models

Technical Paper Publication. IMECE2019-11483

Gökçen Çiçek, *Turkish Aerospace, Ankara, Turkey*, **Altan Kayran**, *Middle East Technical University, Ankara, Turkey*

12:30pm – Optimization of Machining Parameters During Turning of Tungsten Heavy Alloys Using Taguchi Analysis

Technical Paper Publication. IMECE2019-10958

CHITHAJALU KIRAN SAGAR, *Amrita Priyadarshini, Amit Kumar Gupta*, *Birla Institute of Technology and Science, Pilani, Hyderabad Campus, Hyderabad, Telangana, India*

3-15 STRUCTURAL HEALTH MONITORING OF COMPOSITE MATERIALS AND STRUCTURES

3-15-1 Structural Health Monitoring of Composite Materials and Structures

Convention Center, 255B

10:45AM–12:30PM

10:45am – Recent Advances in Optical and Non-Contact Sensing of Large-Scale Composite Structures for Dynamic Sensing and Structural Health Monitoring

Technical Presentation. IMECE2019-13638

Christopher Niezrecki, *University of Massachusetts Lowell, Nashua, NH, United States*

11:06am – Electrical Characterization of Intelligent Carbon Roving Reinforcement for Structural Health Monitoring

Technical Presentation. IMECE2019-13211

Yiska Goldfeld, Mahdi Gaben, *Technion - Israel Institute of Technology, Haifa, Israel*

11:27am – Cure Monitoring of Adhesive for Composite/Metal Bonded Structure Based on Highly Nonlinear Solitary Waves

Technical Paper Publication. IMECE2019-10717

Bin Wu, Mingzhi Li, Xiucheng Liu, *Beijing University of Technology, Beijing, China*, **Zongfa Liu**, *Henan University of Science and Technology, Luoyang, China*, **Heying Wang, Cunfu He**, *Beijing University of Technology, Beijing, China*

11:48am – Dent Damage Prediction by Using iFEM

Technical Presentation. IMECE2019-13175

Mingyang Li, *University of Strathclyde, Glasgow, United Kingdom*, **Adnan Kefal**, *Istanbul Technical University, Istanbul, Turkey*, **Burak Can Cerik**, *Inha University, Incheon, Korea (Republic)*, **Erkan Oterkus**, *University of Strathclyde, Glasgow, United Kingdom*

12:09pm – Detection of Defects in Composite Structures Using Guided Ultrasonic Waves

Technical Presentation. IMECE2019-13603

Ajit Mal, *University of California, Los Angeles, Los Angeles, CA, United States*

3-4 ADVANCES IN AEROSPACE STRUCTURES AND MATERIALS

3-4-2 Advances in Aerospace Structures and Materials – II

Convention Center, 355E

2:00PM–3:45PM

2:00pm – Effect of Cryogenic Temperature Rolling on High Speed Impact Behavior of AA 6082 Thin Targets

Technical Paper Publication. IMECE2019-10931

Rahul Dubey, Raja A, R. Velmurugan, R. Jayaganthan, *Indian Institute of Technology Madras, Chennai, Tamil Nadu, India*

2:21pm – Neural Network Inverse Based Omnidirectional Rotation Decoupling Control to the Electrodynamics Reaction Sphere

Technical Paper Publication. IMECE2019-11129

Zhouyu Huai, Ming Zhang, Yu Zhu, Anlin Chen, Xin Li, Leijie Wang, *Tsinghua University, Beijing, China*

2:42pm – Numerical Study of the Percussive Riveting Process: Initial Results

Technical Paper Publication. IMECE2019-11544

Sai Krovvidi, Ramulu Mamidala, Per Reinhall, *University of Washington, Seattle, WA, United States*

3:03pm – The Recent Progress of Neural Network Modeling in Aerospace Structures and Materials

Technical Presentation. IMECE2019-13574

Xin Liu, Fei Tao, Wenbin Yu, *Purdue University, West Lafayette, IN, United States*

3:24pm – On Constitutive Modeling of Thin-Walled Composite Structures

Technical Presentation. IMECE2019-13585

Ankit Deo, Wenbin Yu, *Purdue University, West Lafayette, IN, United States*

3-8 DYNAMICS AND CONTROL OF AEROSPACE STRUCTURES

3-8-1 Dynamics and Control of Aerospace Structures

Convention Center, 355F

2:00PM–3:45PM

2:00pm – An Inertial/Altimetric/Infrared/Geomagnetic Integrated Navigation Method for Unmanned Aerial Vehicles

Technical Paper Publication. IMECE2019-10948

Zilu He, Xiongzhu Bu, Yihan Cao, Miaomiao Xu, *Nanjing University of Science and Technology, Nanjing, China*

2:21pm – A Case Study of the Unsteady Response of a Hingeless Helicopter Rotor Blade**Technical Paper Publication. IMECE2019-11084****Pratik Sarker**, *University of Wisconsin-Platteville, Platteville, WI, United States*, **Uttam Chakravarty**, *University of New Orleans, Kenner, LA, United States***2:42pm – Thermal Behavior and Melt-Pool Dynamics of Cu-Cr-Zr Alloy in Powder-Bed Selective Laser Melting Process****Technical Paper Publication. IMECE2019-11087****M Shafiqur Rahman, Paul Schilling, Paul Herrington**, *University of New Orleans, New Orleans, LA, United States*, **Uttam Chakravarty**, *University of New Orleans, Kenner, LA, United States***3:03pm – An Analysis of the Aerodynamic Response of an Electroactive Membrane****Technical Paper Publication. IMECE2019-11455****Mohammad Khairul Habib Pulok**, *University of New Orleans, New Orleans, LA, United States*, **Pratik Sarker**, *University of Wisconsin-Platteville, Platteville, WI, United States*, **Uttam Chakravarty**, *University of New Orleans, Kenner, LA, United States***3:24pm – Characterizations of the Paper-Based Microfluidic Devices Used for Detecting Fentanyl and Related Synthetic Opioids****Technical Paper Publication. IMECE2019-11581****M Shafiqur Rahman**, *University of New Orleans, New Orleans, LA, United States*, **Uttam Chakravarty**, *University of New Orleans, Kenner, LA, United States***3:45pm – A Study of the Aerodynamics of a Helicopter Rotor Blade****Technical Paper Publication. IMECE2019-11477****Mohammad Khairul Habib Pulok**, *University of New Orleans, New Orleans, LA, United States*, **Uttam Chakravarty**, *University of New Orleans, Kenner, LA, United States***3-10 IMPACT, DAMAGE AND FRACTURE OF COMPOSITE STRUCTURES****3-10-1 Impact, Damage and Fracture of Composite Structures****Convention Center, 255B****2:00PM–3:45PM****2:00pm – Composite Overwrapped Pipe Burst Test: Modeling and Experimentation****Technical Paper Publication. IMECE2019-10387****Andrew Littlefield, Lucas Smith, Michael Macri, Joshua Root**, *U.S. Army CCDC Armaments Center Benét Labs, Watervliet, NY, United States***2:21pm – On the Role of Segmentation in the Analysis of Micro-CT Data of Impact Damage in the CFRP Composites****Technical Paper Publication. IMECE2019-11037****Olesya Zhupanska**, *University of Arizona, Tucson, AZ, United States***2:42pm – Effects of Absorbed Moisture Content on the Impact Response of Specially-Orthotropic Composite Plates****Technical Paper Publication. IMECE2019-12221****Furqan Ahmad**, *Dhofar University, Salalah, Dhofar, Oman*, **Fethi Abbassi**, *American University of the Middle East, Dasman, Kuwait*, **Sajjad Miran**, *University of Gujrat, Gujrat, Pakistan***3:03pm – Impact and After-Impact Performance of Composite Sandwich Structures in Extreme Environment****Technical Presentation. IMECE2019-12750****Kwek Tze Tan, M.H. Khan**, *University of Akron, Akron, OH, United States***3:24pm – Blast Wave Loading of Carbon Fiber Reinforced Polymer Plates in a Compartmentalized Setup and the Structural Health State of the Plates Post-Blast****Technical Presentation. IMECE2019-13483****Benjamin J. Katko, Lingzhi Zheng, Claire McGuire, Barry Lawlor, Jane Zanteson, Kevin Nguyen, Jessica Chan, Veronica Eliasson**, *University of California, San Diego, La Jolla, CA, United States***3-12 PERIDYNAMICS MODELING****3-12-2 Peridynamics Modeling – II****Convention Center, 155F****2:00PM–3:45PM****Session Organizer:** Erkan Oterkus, *University of Strathclyde, Glasgow, United Kingdom***2:00pm – Peridynamic Evaluation of Free Energy due to Thermal Fluctuation in Thin Layers****Technical Presentation. IMECE2019-13205****Erdogan Madenci, Atila Barut**, *University of Arizona, Tucson, AZ, United States***2:21pm – Weak Form of Peridynamics in MOOSE Framework for Damage Prediction****Technical Presentation. IMECE2019-13399****Deepak Kumar Behera, Erdogan Madenci**, *University of Arizona, Tucson, AZ, United States*, **Hailong Chen**, *University of Kentucky, Lexington, KY, United States*, **Benjamin Spencer**, *Idaho National Laboratory, Idaho Falls, ID, United States***2:42pm – Toward Validation of Peridynamic Failure Models of Fiber-Reinforced Composite Laminates****Technical Presentation. IMECE2019-13308****Pablo Seleson**, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*, **Danielle Zeng**, *Ford Motor Company, Dearborn, MI, United States*, **Bo Ren, C.T. Wu**, *Livermore Software Technology Corporation, Livermore, CA, United States***3:03pm – Structural Dynamic Testing Results for Air-Independent Proton Exchange Membrane (PEM) Fuel Cell Technologies for Space Applications****Technical Paper Publication. IMECE2019-11691****Ryan Gilligan, Ian Jakupca, Phillip J. Smith, William Bennett, Monica Guzik, Henry Kacher**, *NASA Glenn*

3-14 NONLINEAR PROBLEMS IN AEROSPACE STRUCTURES

3-14-1 Nonlinear Problems in Aerospace Structures
Convention Center, 355D 2:00PM–3:45PM

2:00pm – Fast Colored Point Feature Histograms Global Registration

Technical Paper Publication. IMECE2019-10827
Xingjie Liu, Guolei Wang, Ken Chen, Simin Zhang, *Tsinghua University, Beijing, Beijing, China*

2:21pm – Post-Buckling Analysis of Variable Angle Tow Composite Structures Through Refined Kinematic Models

Technical Paper Publication. IMECE2019-11281
Andrea Viglietti, Matteo Filippi, Alfonso Pagani, Enrico Zappino, *Erasmus Carrera, Politecnico di Torino, Torino, Italy*

2:42pm – Multidimensional Geometrical Nonlinear Finite Element Models for Helicopter Blades

Technical Paper Publication. IMECE2019-11314
Matteo Filippi, Alfonso Pagani, Enrico Zappino, Erasmo Carrera, *Politecnico di Torino, Torino, Italy*

3:03pm – The Impacts of Reschedule-Overhaul and Degradation of Gas turbine on the Economics of Natural Gas Pipeline Transportation Network

Technical Presentation. IMECE2019-11339
DUABARI Aziaka, Uyioghosa Igie, Pericles Pilidis, Abdulkarim Nasir, *Cranfield University, Bedfordshire, Cranfield, United Kingdom*

3:24pm – Large-Deformation Analysis of Elastomeric Structures by Carrera Unified Formulation

Technical Paper Publication. IMECE2019-11364
Erasmo Carrera, Alfonso Pagani, Bin Wu, Matteo Filippi, *Politecnico di Torino, Torino, Italy*

3:45pm – Mapping the Potential for Infectious Disease Transmission in a Wide-Body Aircraft Cabin

Technical Paper Publication. IMECE2019-11377
Seif Mahmoud, *Kansas State University, Manhattan, KS, United States*, James Bennett, *NIOSH, Cincinnati, OH, United States*, Mohammad Hosni, Byron Jones, *Kansas State University, Manhattan, KS, United States*

3-3 NOVEL AEROSPACE PROPULSION SYSTEMS

3-3-1 Novel Aerospace Propulsion Systems
Convention Center, 155F 4:00PM–5:45PM

4:00pm – Influence of Fuel on a Valveless Pulsejet Engine Performance and Pollutant Emissions

Technical Paper Publication. IMECE2019-11229
Andreia Melo, *Universidade da Beira Interior, Covilha, Portugal*, Francisco Brojo, *Universidade da Beira Interior, Beira, Portugal*

4:21pm – Flow Modelling of Propulsion Nozzles for Nano-Satellites

Technical Paper Publication. IMECE2019-11712
Jose Pascoa Marques, Gustavo Ribeiro, *Universidade da Beira Interior, Covilhã, Portugal*, Francisco Brojo, *Universidade da Beira Interior, Beira, Portugal*

4:42pm – Mechanical Design of Distributed Solar Sail Deployment Systems

Technical Paper Publication. IMECE2019-11968
Ni Li, Salla Kim, Jason Lin, B. De La Torre, M. Wong, He Shen, V. Patel, *California State University, Los Angeles, CA, United States*

5:03pm – Optimal Injector Design for Hybrid Rocket Engine

Technical Presentation. IMECE2019-12881
Andrew Larkey, *University of Illinois at Urbana-Champaign, Bridgewater, NJ, United States*, Vignesh Sella, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

5:24pm – Development of a Prototype GH₂ Heater for Nuclear Thermal Propulsion System Testing

Technical Presentation. IMECE2019-12919
Kazim Akyuzlu, Denis Pansolin, *University of New Orleans, New Orleans, LA, United States*, David Coote, *Stennis Space Center, Stennis Space Center, MS, United States*

TRACK 4 BIOMEDICAL & BIOTECHNOLOGY ENGINEERING

- 4-1-1: Plenary Session I**
- 4-1-2: Plenary Session II**
- 4-2-1: Injury and Damage Biomechanics I**
- 4-2-2: Injury and Damage Biomechanics II**
- 4-2-3: Injury and Damage Biomechanics III**
- 4-2-4: Injury and Damage Biomechanics IV**
- 4-2-5: Injury and Damage Biomechanics V**
- 4-3-2: Biomedical Characteristics and Characterization**
- 4-4-1: Biomedical Imaging, Therapy and Tissue Characterization I**
- 4-4-2: Biomedical Imaging, Therapy and Tissue Characterization II**
- 4-5-1: Microstructural, Mechanical and Cryogenic Properties of Biomaterials**
- 4-5-2: Modeling, Hyperelastic Characterization and Dynamic behavior of Biomaterials**
- 4-5-3: Stenosis Diagnosis, Astrocytes Encapsulation, and Core Sheath Wet Electrospinning**
- 4-5-4: Bio-3D Printing, Fused Filament Fabrication, and Printable Hydrogels**
- 4-5-5: Biomaterials and Tissue: Modelling, Synthesis, Fabrication and Characterization**
- 4-6-1: Biomedical Devices I**
- 4-6-2: Biomedical Devices II**
- 4-7-1: Dynamics and Control of Biomechanical Systems I**
- 4-8-1: Clinical Applications of Bioengineering**
- 4-9-1: Biotransport**
- 4-10-1: Computational Modeling 1**
- 4-10-2: Computational Modeling 2**
- 4-10-3: Computational Modeling 3**
- 4-10-4: Computational Modeling 4**
- 4-10-5: Computational Modeling 5**
- 4-11-1: Musculoskeletal and Sports Biomechanics 1**
- 4-11-2: Musculoskeletal and Sports Biomechanics 2**
- 4-12-1: Sensors and Actuators**
- 4-13-1: Design of Limb Rehabilitation Robots**
- 4-13-2: Data-Driven Design for Rehabilitation Robots**
- 4-13-3: System Analysis for Rehabilitation Robotics**
- 4-14-1: Biotechnology and General Applications**

ACKNOWLEDGMENT

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TRACK 4 BIOMEDICAL & BIOTECHNOLOGY ENGINEERING

MONDAY, NOVEMBER 11

4-1 BIOMEDICAL AND BIOTECHNOLOGY PLENARY PRESENTATION

4-1-1 Plenary Session I

Convention Center, 155D

9:45AM–10:30AM

9:45am – Multi-Frequency Oscillation and Lung Protective Ventilation

Plenary Presentation. IMECE2019-12478

David Kaczka, *University of Iowa, Iowa City, IA, United States*

4-3 VIBRATION AND ACOUSTICS IN BIOMEDICAL APPLICATIONS

4-3-1 Vibration and Acoustics Applications in Internal Organs

Convention Center, 255C

10:45AM–12:30PM

Session Organizer: Toshihiko Shiraishi, *Yokohama National University, Yokohama, Japan*

Session Co-Organizer: Takashi Saito, *Yamaguchi University, Yamaguchi, Japan*

10:45am – Study on Velocity Distribution Estimation Using Blood Pressure Data Based on the Coupled Wave Theory of Elastic Pipes and Fluids

Technical Paper Publication. IMECE2019-10548

Takeshi Tokunaga, Koji Mori, Hiroko Kadowaki, Takashi Saito, *Yamaguchi University, Ube, Yamaguchi, Japan*

11:06am – A Model and Vibrational Analysis of a Dolphin's Acoustic System

Technical Paper Publication. IMECE2019-10806

Alec Dryden, *Saint Martin's University, Lacey, WA, United States*, Brianna M. Huhmann, *Saint Martin's University, Puyallup, WA, United States*, Oscar Martin-Garcia, *Saint Martin's University, Yelm, WA, United States*, Shawn Duan, *Saint Martin's University, Lacey, WA, United States*

11:27am – Model-Based EEG Analysis: Proposal and Verification of Mathematical Model for Application to Neurotechnology

Technical Paper Publication. IMECE2019-11643

Kenyu Uehara, Takashi Saito, *Yamaguchi University, Ube, Yamaguchi, Japan*

11:48am – Effect of Feedback Conditions on Blood Viscosity Estimation Method in Two-Dimensional Ultrasonic-Measurement-Integrated Blood Flow Analysis

Technical Paper Publication. IMECE2019-11837

Takuya Kishimoto, Hiroko Kadowaki, Takeshi Tokunaga, Koji Mori, Takashi Saito, *Yamaguchi University, Ube, Yamaguchi, Japan*

12:09pm – Experimental Analysis of the Thermally Buckled Energy Harvesters for Powering Leadless Pacemakers

Technical Presentation. IMECE2019-13712

Mostafa Tavakkoli Anbarani, M. Amin Karami, *State University of New York at Buffalo, Buffalo, NY, United States*

4-4 BIOMEDICAL IMAGING, THERAPY AND TISSUE CHARACTERIZATION

4-4-1 Biomedical Imaging, Therapy and Tissue Characterization I

Convention Center, 255F

10:45AM–12:30PM

Session Organizer: Ramjee Repaka, *Indian Institute of Technology Ropar, Rupnagar, Punjab, India*

Session Co-Organizer: Mostafa Fatemi, *Mayo College of Medicine, Rochester, MN, United States*

10:45am – Patient-Specific Mitral Valve Replicas for Preoperative Planning of Mitral Valve Repair

Technical Paper Publication. IMECE2019-10347

Michael Kruttschnitt, Nouray N. Hassan, Klaus Tiemann, *Technical University of Munich, Munich, Niklas Hitschrich, Tomtec Imaging Systems GmbH, Unterschleissheim, Germany*, Ralf Sodian, *Ludwig-Maximilians-University Munich, Munich, Germany*, Tim C. Lueth, *Technical University of Munich, Garching, Germany*

11:06am – Influence of Input Image Configurations on Output of a Convolutional Neural Network to Detect Cerebral Aneurysms

Technical Paper Publication. IMECE2019-11125

Kazuhiro Watanabe, Hitomi Anzai, *Tohoku University, Sendai, Miyagi, Japan*, Norman Juchler, Sven Hirsch, *Zürich University of Applied Sciences, Wädenswil, Zürich, Switzerland*, Philippe Bijlenga, *Hôpitaux Universitaire de Genève, Genève, Switzerland*, Makoto Ohta, *Tohoku University, Sendai, Miyagi, Japan*

11:27am – FFT Peak Density Pattern and Its Relation to Scatterer Size and Volume Ratio in Ultrasound Analysis of Tissue Phantoms

Technical Presentation. IMECE2019-11765

Koushik Paul, Leila Ladani, *University of Texas at Arlington, Arlington, TX, United States*

11:48am – Brain White Matter Model of Orthotropic Viscoelastic Properties in Frequency Domain

Technical Paper Publication. IMECE2019-12182

Xuehai Wu, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*, John Georgiadis, *Illinois Institute of Technology, Chicago, IL, United States*, Assimina Pelegri, *Rutgers, The State University of New Jersey, East Brunswick, NJ, United States*

12:09pm – FFT Peak Density Pattern and Its Relation to Scatterer Size and Volume Ratio in Ultrasound Analysis of Tissue Phantoms

Technical Presentation. IMECE2019-11760
 Koushik Paul, Leila Ladani, *University of Texas at Arlington, Arlington, TX, United States*

4-5 BIOMATERIALS AND TISSUE: MODELLING, SYNTHESIS, FABRICATION AND CHARACTERIZATION

4-5-1 Microstructural, Mechanical and Cryogenic Properties of Biomaterials

Convention Center, 355B **10:45AM-12:30PM**

Session Organizer: Seyed Allameh, *Northern Kentucky University, Newport, KY, United States*

Session Co-Organizer: Karen Chang Yan, *The College of New Jersey, Ewing Township, NJ, United States*

10:45am – Cryogenic Material Properties of Polycaprolactone

Technical Paper Publication. IMECE2019-10180
 Amrit Sagar, *MathWorks, Inc., Natick, MA, United States*,
 Christopher Nehme, *Qiagen Sciences LLC, Waltham, MA, United States*,
 Anil Saigal, *Tufts University, Medford, MA, United States*,
 Thomas P. James, *Rose-Hulman Institute of Technology, Terre Haute, IN, United States*

11:06am – Effect of Photoactivated Cross-Linking Compound on Mechanical Properties of Porcine Carotid Arteries Post-Angioplasty

Technical Paper Publication. IMECE2019-11661
 Farshad Mogharrabi, Jonathan D. Kuhlenthal, *University of Utah, Salt Lake City, UT, United States*,
 Blake Anderson, Katalin Kauser, *Alucent Biomedical Inc., Salt Lake City, UT, United States*,
 Kenneth L. Monson, *University of Utah, Salt Lake City, UT, United States*

11:27am – Quantifying Mechanical Properties of PCL-Based Nanofiber Mats Using Atomic Force Microscopy

Technical Paper Publication. IMECE2019-11944
 Allison White, Amanda DeVos, Amr Elhussein, Jack Blank, Kalyani Nair, *Bradley University, Peoria, IL, United States*

11:48am – On the Bending and Tensile Tests of a Single Human Hair

Technical Presentation. IMECE2019-12800
 Hironori Tohmyoh, *Tohoku University, Sendai, Miyagi, Japan*

12:09pm – Bioinspired Routes to Damage Tolerant Materials: Unique Microstructure and Fracture Properties of Enamel in the Mammal-Like Grinding Dentition of a Hadrosaurid Dinosaur

Technical Presentation. IMECE2019-13127
 Soumya Varma, Manish Jain, *University of Nevada Reno, Reno, NV, United States*,
 Yi Teng Lee, *Exxon Mobil, Kuala Lumpur, Malaysia*,
 Shane Johnson, *University of Nevada Reno, Reno, NV, United States*,
 Brandon A. Krick, *Lehigh University, Bethlehem, PA, United States*,
 Gregory M. Erickson, *Florida State University, Tallahassee, FL, United States*,
 Johann Michler, Daniele Casari, Jakob Schwiedrzik, *EMPA, Thun, Bern, Switzerland*,
 Shraddha J. Vachhani, *Bruker Nano Surfaces, Minneapolis, MN, United States*,
 Siddhartha Pathak, *University of Nevada, Reno, Reno, NV, United States*

4-7 DYNAMICS AND CONTROL OF BIOMECHANICAL SYSTEMS

4-7-1 Dynamics and Control of Biomechanical Systems I

Convention Center, 255B **10:45AM-12:30PM**

Session Organizer: Dumitru Caruntu, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

Session Co-Organizer: Davide Piovesan, *Gannon University, Erie, PA, United States*

10:45am – Effect of Obesity on Human Squat Exercise

Technical Paper Publication. IMECE2019-11233
 Dumitru Caruntu, Simon Vasquez, Jose Galarza, Jennifer Ramos, Michael Sander, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

11:06am – Temperature Regulated Sleeve for Leg Prosthesis

Technical Paper Publication. IMECE2019-10984
 Rachel Grubbs, Matthew Yough, Olivia Rose, Anthony P. Lee, Teresa Sicree, Saeed Tiari, Davide Piovesan, *Gannon University, Erie, PA, United States*

11:27am – Design and Fabrication of a Universal Gripper for Children With Special Needs

Technical Paper Publication. IMECE2019-10992
 Ajay Kumar Vijaya Kumar, Emily E. Schweitzer, *Gannon University, Erie, PA, United States*,
 Julie Bear, *Barber National Institute, Erie, PA, United States*,
 Davide Piovesan, *Gannon University, Erie, PA, United States*

11:48am – Energetics of Load Carriage by Bamboo Carrying Poles

Technical Paper Publication. IMECE2019-10584
 Yuning Xu, Lianxin Yang, Ken Chen, Jiwen Zhang, *Tsinghua University, Beijing, China*,
 Chenglong Fu, *Southern University of Science and Technology, China, Beijing, China*

4-3 VIBRATION AND ACOUSTICS IN BIOMEDICAL APPLICATIONS

4-3-2 Biomedical Characteristics and Characterisation

Convention Center, 255C 2:00PM–3:45PM

Session Organizer: Toshihiko Shiraishi, *Yokohama National University, Yokohama, Japan*

Session Co-Organizer: Peyman Honarmandi, *Manhattan College, Riverdale, NY, United States*

2:00pm – Spatial Variations in Achilles Tendon Shear Wave Speed Using a Cost-Effective Method of Accelerometers

Technical Paper Publication. IMECE2019-11001
Muhammad Salman, Conghui Ge, Clint Morris, *Kennesaw State University, Marietta, GA, United States*

2:21pm – A Fast Estimation Model for Angular Spectrum Based Focused Ultrasound Wave Simulation in Layered Tissue Media

Technical Paper Publication. IMECE2019-11088
Tariq Arif, *Weber State University, Ogden, UT, United States*,
Zhiming Ji, *New Jersey Institute of Technology, Newark, NJ, United States*

2:42pm – A Study of Mechanosensing of an Osteoblast at Focal Adhesions Under Cyclic Strain Using Magnetic Micropillars

Technical Paper Publication. IMECE2019-11132
Toshihiko Shiraishi, Kota Nagai, *Yokohama National University, Yokohama, Japan*

3:03pm – Study of Frequency Response of Micropillar Based Acoustic Wave Sensors

Technical Presentation. IMECE2019-12514
Siqi Ji, Hamed Esmaeilzadeh, Junwei Su, *University of Massachusetts Lowell, Lowell, MA, United States*, **Majid Charmchi,** *University of Massachusetts Lowell, Jamaica Plain, MA, United States*, **Hongwei Sun,** *University of Massachusetts Lowell, Lowell, MA, United States*

3:24pm – The Ultrasonic Backscatter Amplitude Decay Constant (BADC): Relation to Young's Modulus, Yield Strength, and Ultimate Strength of Human Cancellous Bone

Undergrad Expo. IMECE2019-12769
Aubrey Gray, Phoebe C. Sharp, Brent K. Hoffmeister, *Rhodes College, Memphis, TN, United States*

4-4 BIOMEDICAL IMAGING, THERAPY AND TISSUE CHARACTERIZATION

4-4-2 Biomedical Imaging, Therapy and Tissue Characterization II

Convention Center, 255F 2:00PM–3:45PM

Session Organizer: Xiaoning Jiang, *NC State University, Raleigh, NC, United States*

Session Co-Organizer: Assimina Pelegri, *Rutgers, The State University of New Jersey, East Brunswick, NJ, United States*

2:00pm – Influence of Human Hair Medulla in Solar UV Transmission Through Skin

Technical Paper Publication. IMECE2019-10405
Xiyong Huang, Ahmed Al-Jumaily, Michael D. Protheroe, Andrew N. Chalmers, *Auckland University of Technology, Auckland, New Zealand*, **Sharad P. Paul,** *University of Auckland, Auckland, New Zealand*, **Xiang Fu,** *Auckland University of Technology, Auckland, New Zealand*

2:21pm – An Improved Holographic Microwave Breast Imaging Based on Deep Neural Network

Technical Paper Publication. IMECE2019-10910
Lulu Wang, *Shenzhen Technology University, Shenzhen, China*

2:42pm – Miniaturized Ultrasound Transducer Composed of a Composite of Multiple Piezoelectric Stacks

Technical Paper Publication. IMECE2019-12208
Howuk Kim, Huaiyu Wu, Leela Goel, Xiaoning Jiang, *North Carolina State University, Raleigh, NC, United States*

3:03pm – Laser Ablation Tomography for 3D Tissue Imaging and Analysis

Technical Paper Publication. IMECE2019-12282
Asheesh Lanba, Benjamin Hall, *L4iS, State College, PA, United States*

4-5 BIOMATERIALS AND TISSUE: MODELLING, SYNTHESIS, FABRICATION AND CHARACTERIZATION

4-5-2 Modeling, Hyperelastic Characterization and Dynamic Behavior of Biomaterials

Convention Center, 355B 2:00PM–3:45PM

Session Organizer: Karen Chang Yan, *The College of New Jersey, Ewing Township, NJ, United States*

Session Co-Organizer: Anil Saigal, *Tufts University, Medford, MA, United States*

2:00pm – A Constitutive Material Model With Strain-Rate Dependency for Brain Tissue

Technical Paper Publication. IMECE2019-10742
Mohammad Hosseini Farid, Mohammadreza Ramzanpour, Mariusz Ziejewski, Ghodrat Karami, *North Dakota State University, Fargo, ND, United States*

2:21pm – A Biphase Viscoelastic Constitutive Model for Brain Tissue

Technical Paper Publication. IMECE2019-10743
 Mohammad Hosseini Farid, Mohammadreza Ramzanpour, Mariusz Ziejewski, Ghodrat Karami, *North Dakota State University, Fargo, ND, United States*

2:42pm – Dynamic Behaviour of a Dacron Aortic Graft

Technical Paper Publication. IMECE2019-11520
 Eleonora Tubaldi, *University of Arizona, Tucson, AZ, United States*, Giovanni Ferrari, Prabakaran Balasubramanian, Marco Amabili, *McGill University, Montreal, QC, Canada*

3:03pm – Microstructural Hyperelastic Characterization of Brain White Matter in Tension

Technical Paper Publication. IMECE2019-11549
 Mohammadreza Ramzanpour, Mohammad Hosseini Farid, Mariusz Ziejewski, Ghodrat Karami, *North Dakota State University, Fargo, ND, United States*

4-6 BIOMEDICAL DEVICES

4-6-1 Biomedical Devices I

Convention Center, 155A 2:00PM–3:45PM

Session Organizer: Martin L. Tanaka, *Western Carolina University, Cullowhee, NC, United States*

Session Co-Organizer: Lulu Wang, *Shenzhen Technology University, Shenzhen, China*

2:00pm – Robotic Knee Orthosis for Hemiplegic Patients to Prevent Falls During Walking Rehabilitation

Technical Paper Publication. IMECE2019-10382
 Ryuji Tsuzuki, Taku Itami, Kenichi Yano, *Mie University, Tsu, Japan*, Takaaki Aoki, *Gifu University Hospital, Gifu, Japan*, Yutaka Nishimoto, *Gifu University, Gifu, Japan, Japan*

2:21pm – A Clinical Test to Capture Humidity From Exhalation: Self-Humidification

Technical Paper Publication. IMECE2019-11049
 Sandra Grau Bartual, Ahmed Al-Jumaily, *Auckland University of Technology, Auckland, New Zealand*

2:42pm – Technical Issues Associated With Arterial Pulse Signal Measurements Using a Microfluidic-Based Tactile Sensor

Technical Paper Publication. IMECE2019-11389
 Dan Wang, Leryn Reynolds, Thomas Alberts, Linda Vahala, Zhili Hao, *Old Dominion University, Norfolk, VA, United States*

3:03pm – Monitoring the Cardiovascular Changes of a Rabbit Caused by Phenylephrine via a Microfluidic-Based Tactile Sensor

Technical Paper Publication. IMECE2019-11416
 Dan Wang, *Old Dominion University, Norfolk, VA, United States*, Frank A. Lattanzio, Mario C. Rodriguez, *Eastern Virginia Medical School, Norfolk, VA, United States*, Zhili Hao, *Old Dominion University, Norfolk, VA, United States*

4-2 INJURY AND DAMAGE BIOMECHANICS

4-2-1 Injury and Damage Biomechanics I

Convention Center, 255C 4:00PM–5:45PM

Session Organizer: Reuben Kraft, *Pennsylvania State University, University Park, PA, United States*

Session Co-Organizer: Karim Muci, *South Dakota School of Mines and Technology, Rapid City, SD, United States*

4:00pm – Controlled Positioning and Collapse of Microbubbles Near Soft Microfibers

Technical Presentation. IMECE2019-12885
 Alex H. Wrede, Nicole Hashemi, *Iowa State University, Ames, IA, United States*

4:21pm – Statistical Analysis of Fractional Anisotropy Effects on Traumatic Brain Injury

Technical Presentation. IMECE2019-12931
 Robert Saunders, Anthony Romano, *U.S. Naval Research Lab, Washington, DC, United States*

4:42pm – Effects of Animal Orientation on Brain Responses to Primary Blast

Technical Presentation. IMECE2019-13067
 Ginu Unnikrishnan, *Biotechnology High Performance Computing Software Applications Institute (BHSAI), Frederick, MD, United States*, Haojie Mao, *Western University, London, ON, Canada*, Aravind Sundaramurthy, *HJF, Frederick, MD, United States*, V Sajja, Stephen van Albert, *Blast Induced Neurotrauma Division, Silver Spring, MD, United States*, Joseph Long, *Walter Reed Army Institute of Research, Silver Spring, MD, United States*, Jose Rubio, Dhananjay Subramaniam, *HJF, Frederick, MD, United States*, Jaques Reifman, *United States Army Medical Research and Development Command, Fort Detrick, MD, United States*

5:03pm – Insight Into Blast Orientation Effects on Pressure Transmission Into the Brain Using Three-Dimensional Simulations

Technical Presentation. IMECE2019-13140
 X. Gary Tan, Peter Matic, *U.S. Naval Research Laboratory, Washington, DC, United States*

5:24pm – Effect of an Advanced Combat Helmet on Axonal Injury Caused By Primary Blast Loading

Technical Presentation. IMECE2019-13531
 Ritika Menghani, *Pennsylvania State University, University Park, PA, United States*, Harsha T. Garimella, Andrzej J. Przekwas, *CFD Research Corporation, Huntsville, AL, United States*, Reuben Kraft, *Pennsylvania State University, University Park, PA, United States*

4-5 BIOMATERIALS AND TISSUE: MODELLING, SYNTHESIS, FABRICATION AND CHARACTERIZATION

4-5-3 Stenosis Diagnosis, Astrocytes encapsulation, and Core Sheath Wet Electrospinning

Convention Center, 355B 4:00PM–5:45PM

Session Organizer: Anil Saigal, *Tufts University, Medford, MA, United States*

Session Co-Organizer: Mohammadreza Ramzanpour, *North Dakota State University, Fargo, ND, United States*

4:00pm – Enhancing Fractional Flow Reserve Procedure in Stenosis Diagnosis

Technical Paper Publication. IMECE2019-10425

Mahmoud Ahmed, *Assiut University, Toronto, ON, Canada*,
Yasser Abuouf, *E-JUST, Alexandria, Egypt*, **Shinichi Ookawara**, *Tokyo Institute of Technology, Tokyo, Japan*

4:21pm – A Method for Approximating the Mechanical Section Properties of Structural Members With Highly Complex Cross-Sections

Technical Paper Publication. IMECE2019-10445

William Munsell, Jr., *University of Oklahoma, Norman, OK, United States*

4:42pm – Encapsulation of Astrocytes Within Tunable Microfluidic Alginate Fibers

Technical Presentation. IMECE2019-12903

Marilyn C. McNamara, Nicole Hashemi, *Iowa State University, Ames, IA, United States*

5:03pm – Biomimetic Nanoporous Microtubes by Core-Sheath Wet Electrospinning

Technical Presentation. IMECE2019-13028

George Tan, Yingge Zhou, *Texas Tech University, Lubbock, TX, United States*

4-6 BIOMEDICAL DEVICES

4-6-2 Biomedical Devices II

Convention Center, 155A 4:00PM–5:45PM

Session Organizer: Martin L. Tanaka, *Western Carolina University, Cullowhee, NC, United States*

Session Co-Organizers: Lulu Wang, *Shenzhen Technology University, Shenzhen, China*, Xun Yu, *New York Institute of Technology, Old Westbury, NY, United States*

4:00pm – Highly Porous Shape Memory Nanocomposites for Applications in Biomedical Devices

Technical Paper Publication. IMECE2019-10514

Jishan Luo, Robert Kunkel, Jingyu Wang, *University of Oklahoma, Norman, OK, United States*, **Bradley Bohnstedt**, *University of Oklahoma Health Science Center, Oklahoma City, OK, United States*, **Mrinal Saha, Yingtao Liu, Chung-Hao Lee**, *University of Oklahoma, Norman, OK, United States*

4:21pm – Portable Cold Plasma Device for Biomedical Applications

Technical Presentation. IMECE2019-12549

Zhitong Chen, Daniel Tang, Richard Wirz, *University of California, Los Angeles, Los Angeles, CA, United States*

4:42pm – Design and Performance of a Directional Permeability Membrane

Technical Paper Publication. IMECE2019-11565

Hamidreza Bayat, David Willis, Paul Krueger, *Southern Methodist University, Dallas, TX, United States*

5:03pm – Design and Evaluation of a Blood-Contacting Medical Device for Improving Functionality and Durability of Vascular Anastomosis

Technical Paper Publication. IMECE2019-10922

Gurjap Singh, *University of Iowa, Iowa City, IA, United States*, **Mehdi Esmaeilpour**, *Marshall University, Huntington, WV, United States*, **Jay K. Bhama**, *Baptist Health Medical Center, Little Rock, AR, United States*, **Albert Ratner**, *University of Iowa, Iowa City, IA, United States*

4-8 SYMPOSIUM ON CLINICAL APPLICATIONS OF BIOENGINEERING

4-8-1 Clinical Applications of Bioengineering

Convention Center, 255F 4:00PM–5:45PM

Session Organizer: Karen Chang Yan, *The College of New Jersey, Ewing Township, NJ, United States*

Session Co-Organizer: Douglas E. Dow, *Wentworth Institute of Technology, Boston, MA, United States*, Hai-Chao Han, *University of Texas at San Antonio, San Antonio, TX, United States*

4:00pm – Identification and Analysis of the Biomechanical Parameters Used for the Assessment of Normal and Pathological Gait: A Literature Review

Technical Paper Publication. IMECE2019-10140

Juan Carlos Arellano-Gonzalez, Hugo Ivan Medellin Castillo, *Universidad Autonoma de San Luis Potosi, San Luis Potosi, San Luis Potosi, Mexico*, **J. Jesus Cervantes-Sanchez**, *Universidad de Guanajuato, Salamanca, Mexico*

4:21pm – Assessment of Parkinson's Disease Tremor and Correlation Analysis With Applied Signal Processing

Technical Paper Publication. IMECE2019-10622

Na Zhu, Nathaniel S. Miller, *University of Michigan-Flint, Flint, MI, United States*

4:42pm – Biomechanical Structural Effect of Pinball Region Contact Applied to a Finite Element Model of Human Foot

Technical Paper Publication. IMECE2019-11085

Agustin Vidal-Lesso, Carlos Lara-Velazquez, *Universidad de Guanajuato, Salamanca, Guanajuato, Mexico*, **Javier Bayod-Lopez**, *Universidad de Zaragoza, Zaragoza, Spain*, **Ricardo Becerro de Bengoa Vallejo**, *Universidad Complutense de Madrid, Madrid, Spain*, **Natali Mancera Campos**, *Universidad de Guanajuato, Salamanca, Guanajuato, Mexico*

**5:03pm – Physical Thorax Model and 2D Grid of Force
Sensors to Monitor Respiration**

Technical Paper Publication. IMECE2019-11238

Matthew R. Dean, Noah J. Martins, Joseph D. Brown,
Wentworth Institute of Technology, Boston, MA, United States,
James McCusker, *Wentworth Institute of Technology, Salem,*
NH, United States, **Guohua Ma, Douglas E. Dow,** *Wentworth*
Institute of Technology, Boston, MA, United States

5:24pm – The Natural Sit-to-Stand-Walk of the Frail

Technical Paper Publication. IMECE2019-11889

Dorothy Taylor, Andrew Merryweather, Jan Morse,
Bob Wong, *University of Utah, Salt Lake City, UT, United*
States

TUESDAY, NOVEMBER 12

4-1 BIOMEDICAL AND BIOTECHNOLOGY PLENARY PRESENTATION

4-1-2 Plenary Session II

Convention Center, 155E

9:45AM–10:15AM

9:45am – An Overview of Intracardiac Echocardiography Technology With Its Application and Advancement in Interventional Cardiology

Plenary Presentation. IMECE2019-12490

Wei Luo, *Siemens Medical Solutions USA, Inc., Seattle, WA, United States*

4-2 INJURY AND DAMAGE BIOMECHANICS

4-2-2 Injury and Damage Biomechanics II

Convention Center, 255C

10:45AM–12:30PM

Session Organizer: Reuben Kraft, *Pennsylvania State University, University Park, PA, United States*

Session Co-Organizer: Karim Muci, *South Dakota School of Mines and Technology, Rapid City, SD, United States*

10:45am – Effect of Heterogeneity of White Matter Structures on Stress Wave Propagation During Blunt Head Trauma

Technical Presentation. IMECE2019-11985

Martin Ostoja-Starzewski, Amit Madhukar, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

11:06am – Reparative Molecular Effects of P188 to Attenuate bTBI

Technical Presentation. IMECE2019-12809

Edidiong Inyang, Bo Chen, Michael Cho, *University of Texas at Arlington, Arlington, TX, United States*

11:27am – Structure-Property Relationships of Porcine Brain Under High Strain Rates

Technical Presentation. IMECE2019-13209

Lakiesha Williams, *University of Florida, Gainesville, FL, United States*, Raj Prabhu, *Mississippi State University, Mississippi State, MS, United States*, Haden Johnson, *University of Mississippi, Jackson, MS, United States*

11:48am – Potential Cause of Primary, Blast-Induced Brain Injury: Direct Versus Indirect Mechanisms

Technical Presentation. IMECE2019-13542

Jose Rubio, *HJF, Frederick, MD, United States*, Ginu Unnikrishnan, *Biotechnology High Performance Computing Software Applications Institute, Frederick, MD, United States*, V Sajja, Stephen van Albert, *Blast Induced Neurotrauma Division, Silver Spring, MD, United States*, Joseph Long, *Walter Reed Army Institute of Research, Silver Spring, MD, United States*, Maciej Skotak, Eren Alay, Namas Chandra, *New Jersey Institute of Technology, Newark, NJ, United States*, Aravind Sundaramurthy, Dhananjay Subramaniam, *HJF, Frederick, MD, United States*, Jaques Reifman, *United States Army Medical Research and Development Command, Fort Detrick, MD, United States*

12:09pm – Characterization of Cavitation Induced Damage in Soft Materials

Technical Presentation. IMECE2019-13923

Fuad Hasan, Ashfaq Adnan, *University of Texas Arlington, Arlington, TX, United States*

4-5 BIOMATERIALS AND TISSUE: MODELLING, SYNTHESIS, FABRICATION AND CHARACTERIZATION

4-5-4 Bio-3D Printing, Fused Filament Fabrication, and Printable Hydrogels

Convention Center, 355B

10:45AM–12:30PM

Session Organizer: Seyed Allameh, *Northern Kentucky University, Newport, KY, United States*

Session Co-Organizer: Karen Chang Yan, *The College of New Jersey, Ewing Township, NJ, United States*

10:45am – Effects of Extrusion Temperature and Printing Direction in Bioprinting on Profile Accuracy of 3D Printed Constructs

Technical Paper Publication. IMECE2019-12150

Ketan Thakare, Xingjian Wei, Hongmin Qin, Zhijian Pei, *Texas A&M University, College Station, TX, United States*

11:06am – Utilizing the Fused Filament Fabrication Technique for 3D Printing Ag-Doped Bioactive Glass-Ceramic Scaffolds

Technical Presentation. IMECE2019-13841

Yaozhong Zhang, Adam C. Marsh, Xanthippi Chatzistavrou, Aljoscha Roch, *Michigan State University, East Lansing, MI, United States*

11:27am – Predictive Modeling of Polymer Saturation in Porous 3D Printed Matrix

Technical Paper Publication. IMECE2019-10988

Adam Mihalko, Robert J. Michael, Davide Piovesan, *Gannon University, Erie, PA, United States*

11:48am – Printability of Hydrogels for Hydrogel Molding Based Microfluidic Device Fabrication

Technical Paper Publication. IMECE2019-11545

Adam Vicente, *The College of New Jersey, Mount Laurel, NJ, United States*, Zachary McCreery, *The College of New Jersey, Budd Lake, NJ, United States*, Karen Chang Yan, *The College of New Jersey, Ewing Township, NJ, United States*

4-10 COMPUTATIONAL MODELING IN BIOMEDICAL APPLICATIONS

4-10-1 Computational Modeling 1

Convention Center, 255F 10:45AM–12:30PM

Session Organizer: Haibo Dong, *University of Virginia, Charlottesville, VA, United States*

Session Co-Organizer: Shawn Duan, *Saint Martin's University, Lacey, WA, United States*

10:45am – Fluid-Structure Interaction of Superelastic Nitinol Stents for Endovascular Aortic Repair (EVAR): A Numerical Study

Technical Presentation. IMECE2019-10333

Jayendiran Raja, *Texas A&M University, Doha, Qatar*, **Bakr Nour**, *Weill Cornell Medicine-New York, Weill Cornell Medicine-Qatar, Doha, Qatar*, **Annie Ruimi**, *Texas A&M University at Qatar, College Station, TX, United States*

11:06am – Influence of Fractional Flow Reserve Setting on the Procedure Precision

Technical Paper Publication. IMECE2019-10427

Mahmoud Ahmed, *Assiut University, Toronto, ON, Canada*, **Yasser Abuouf**, *E-JUST, Alexandria, Egypt*, **Shinichi Ookawara**, *Tokyo Institute of Technology, Tokyo, Japan*

11:27am – Novel Electro-FSI Model of Trabecular Network in the Brain Sub Arachnoid Space

Technical Paper Publication. IMECE2019-10529

Khashayar Teimoori, **Ali Sadegh**, **Bhaskar Paneri**, *City College of the City University of New York, New York, NY, United States*

11:48am – Effect of Uvula Length on Airflow and Pressure Oscillation in a Human Pharynx Model

Technical Paper Publication. IMECE2019-11697

Xuanming Zhao, **Junshi Wang**, **Pan Han**, *University of Virginia, Charlottesville, VA, United States*, **Jinxiang Xi**, *California Baptist University, Riverside, CA, United States*, **Haibo Dong**, *University of Virginia, Charlottesville, VA, United States*

12:09pm – Computational Fluid Dynamics (CFD) Modeling of Sterilization Process

Technical Presentation. IMECE2019-13476

Ab Rahman Md Ismail Ansari, **Venkateswaran Perumal**, *Stryker, Gurgaon, Haryana, India*

4-2 INJURY AND DAMAGE BIOMECHANICS

4-2-3 Injury and Damage Biomechanics III

Convention Center, 255C 2:00PM–3:45PM

Session Organizer: Reuben Kraft, *Pennsylvania State University, University Park, PA, United States*

Session Co-Organizer: Amit Bagchi, *Naval Research Laboratory, Washington DC, DC, United States*

2:00pm – A Biomechanical Investigation of Collagen, Platelet-Rich Plasma, and Mesenchymal Stromal Cells on the Achilles Tendon in a Rat Model

Technical Paper Publication. IMECE2019-10641

Brittany L. Austin, *Youngstown State University, Hermitage, PA, United States*, **Hazel Marie**, *Youngstown State University, Boardman, OH, United States*, **Diana Fagan**, *Youngstown State University, Canfield, OH, United States*, **Jared Vanasdale**, *Youngstown State University, Boardman, OH, United States*, **Stuart Drew**, *St. Elizabeth Youngstown Hospital, Warren, OH, United States*

2:21pm – Surgical Bone Drilling: A Review

Technical Paper Publication. IMECE2019-10945

Chandana D. Samarasinghe, *University of South Australia, Modbury, South Australia, Australia*, **Mohammad S Uddin**, **Saiful Bari**, **Cory Xian**, *University of South Australia, Adelaide, South Australia, Australia*

2:42pm – Relationship Between the Frictional Shear Stresses and the Normal Pressure on the Buttocks While Lying on a Spine Board

Technical Paper Publication. IMECE2019-11814

Vinay Kumar Pallerla, **Mohamed Samir Hefzy**, *University of Toledo, Toledo, Ohio*

3:03pm – Bacteria Distribution in Partial Penetration Surrogate Ballistic Wounds

Technical Presentation. IMECE2019-13157

Karim Muci-Kuchler, **Michelle Frybarger**, *South Dakota School of Mines and Technology, Rapid City, SD, United States*

3:24pm – Effect of Strain Rate on Single Tau, Dimerized Tau and Tau-Microtubule Interface: A Molecular Dynamics Simulation Study

Technical Presentation. IMECE2019-13906

Md. I. Khan, **Ashfaq Adnan**, *University of Texas at Arlington, Arlington, TX, United States*

4-10 COMPUTATIONAL MODELING IN BIOMEDICAL APPLICATIONS

4-10-2 Computational Modeling 2

Convention Center, 255F

2:00PM–3:45PM

Session Organizer: Yi Hua, *University of Nebraska-Lincoln, Lincoln, NE, United States*

Session Co-Organizers: Douglas Cook, *Brigham Young University, Provo, UT, United States*, Jason Hua, *University of Pittsburg, Pittsburg, PA, United States*

2:00pm – Modeling Prestress-Driven Buckling Behavior of Elastic Lamina in the Aortic Media

Technical Paper Publication. IMECE2019-10530

Atsutaka Tamura, Yuya Kato, *Tottori University, Tottori, Japan*

2:21pm – Improving Cutting Path on Custom 3D-Printed Surgical Guides for Bone-Tumor Resection

Technical Paper Publication. IMECE2019-10627

Carlos G. Helguero, Jorge L. Amaya, Emilio A. Ramirez, Fausto Maldonado, Juan Castro, Cesar Ochoa, *Escuela Superior Politecnica del Litoral, Guayaquil, Guayas, Ecuador*

2:42pm – Finite Element Analysis of Human Scapula: Comparison of Screw, Wedge Plate, and Endobutton Fixation Methods

Technical Paper Publication. IMECE2019-11530

Fatih Karpat, Nazmi Bülent Alp, Onur Can Kalay, Oguz Dogan, Tufan Yilmaz, *Bursa Uludag University, Bursa, Turkey*, Morshed Khandaker, Abdellah Ait Moussa, *University of Central Oklahoma, Edmond, OK, United States*

3:03pm – Osteoporotic Bone Augmentation Utilizing Curved Pattern of PMMA Injection: A Combined Finite Element and Optimization Investigation

Technical Paper Publication. IMECE2019-12023

Amirhossein Farvardin, Mehran Armand, *Johns Hopkins University, Baltimore, MD, United States*

4-14 BIOTECHNOLOGY AND GENERAL APPLICATIONS

4-14-1 Biotechnology and General Applications

Convention Center, 355B

2:00PM–3:45PM

Session Organizer: Parisa Saboori, *Manhattan College, Bronx, New York, NY, United States*

Session Co-Organizer: Anne Schmitz, *University of Wisconsin Stout, Menomonie, WI, United States*

2:00pm – A Hypothesized Mechanistic Model of Longitudinal Wall Motion at the Common Carotid Artery

Technical Paper Publication. IMECE2019-10654

Zhili Hao, Leryn Reynolds, *Old Dominion University, Norfolk, VA, United States*, John Herre, *Eastern Virginia Medical School, Norfolk, VA, United States*

2:21pm – Decontamination of Heavy Metals From Municipal Sewage Sludge (MSS) by Electrokinetic Remediation

Technical Paper Publication. IMECE2019-11221

Andre Ribeiro, Andre Mota, Jorge Araujo, Ricardo Campos, *CVR - Centro Para a Valorização de Resíduos, Guimarães, Portugal*, Candida Vilarinho, *University of Minho, Guimarães, Portugal*, Joana Carvalho, *CT2M Center for Mechanical and Materials Technologies, Guimarães, Portugal*

2:42pm – Bone-Integrated Optical Microlasers for In-Vivo Diagnostic Biomechanical Performances

Technical Paper Publication. IMECE2019-11406

Omar Cavazos, Maurizio Manzo, *University of North Texas, Denton, TX, United States*, Erick G. Ramirez-Cedillo, *Tecnologico de Monterrey, Monterrey, Mexico*, Hector R. Siller, *University of North Texas, Denton, TX, United States*

3:03pm – Numerical Evaluation of Recalling Elasticity due to Surface Roughness by Finite Element Modeling of Human Skin

Technical Paper Publication. IMECE2019-11881

Tomohisa Yamamoto, Atsushi Sakuma, *Kyoto Institute of Technology, Kyoto, Japan*

3:24pm – Mechanical Behavior of Lattice Structures Fabricated by Direct Light Processing With Compression Testing and Size Optimization of Unit Cells

Technical Paper Publication. IMECE2019-12260

Marinela Peto, *University of North Texas, Denton, TX, United States*, Erick G. Ramirez-Cedillo, *Tecnologico de Monterrey, Monterrey, Mexico*, Mohammad J. Uddin, *University of North Texas, Denton, TX, United States*, **Ciro A. Rodriguez**, *Tecnologico de Monterrey, Monterrey, Nuevo Leon, Mexico*, **Hector R. Siller**, *University of North Texas, Denton, TX, United States*

4-2 INJURY AND DAMAGE BIOMECHANICS

4-2-4 Injury and Damage Biomechanics IV

Convention Center, 255C

4:00PM–5:45PM

Session Organizer: Reuben Kraft, *Pennsylvania State University, University Park, PA, United States*

Session Co-Organizer: Amit Bagchi, *Naval Research Laboratory, Washington DC, DC, United States*

4:00pm – Interconnected Fluid-Filled Cells Design for Reduction of Linear Acceleration and Force Transfer to Prevent Concussion

Technical Paper Publication. IMECE2019-10675

Alexandra R. Lindsay, Usamah Chaudhary, Taylor N. Terry, Mahdi Haghshenas-Jaryani, Muthu B.J. Wijesundara, *UTA Research Institute, Fort Worth, TX, United States*

4:21pm – Computational Analysis of Combat Helmet Protection Against Blunt Impact to Head

Technical Paper Publication. IMECE2019-10903

X. Gary Tan, Amit Bagchi, *U.S. Naval Research Laboratory, Washington, DC, United States*

4:42pm – Effects of Curvature and Architecture on Ballistic Performance of UHMWPE Helmets

Technical Paper Publication. IMECE2019-11566
Timothy Zhang, *Army Research Laboratory, Bel Air, MD, United States*, **Lionel R. Vargas-Gonzalez, James Gurganus, Sikhanda Satapathy**, *Army Research Laboratory, Aberdeen Proving Ground, MD, United States*

5:03pm – Human Pelvis Bayesian Injury Probability Curves From Whole Body Lateral Impact

Technical Paper Publication. IMECE2019-11860
Narayan Yoganandan, Nicholas DeVogel, Frank Pintar, Anjishnu Banerjee, *Medical College of Wisconsin - VA Medical Center, Milwaukee, WI, United States*

5:24pm – Simulation of the Strain Amplification in Sulci due to Blunt Impact to the Head

Technical Presentation. IMECE2019-12650
Brian Fagan, *ORAU, Aberdeen Proving Ground, MD, United States*, **Sikhanda Satapathy**, *Army Research Laboratory, Aberdeen Proving Ground, MD, United States*, **Steven Kornguth**, *University of Texas at Austin, Austin, TX, United States*

4-9 BIOTRANSPORT (FLUID, HEAT AND MASS)

4-9-1 Biotransport
Convention Center, 255B 4:00PM–5:45PM

Session Organizer: Ramjee Repaka, *Indian Institute of Technology Ropar, Rupnagar, Punjab, India*

Session Co-Organizers: Cahit Evrensel, *University of Nevada Reno, Reno, NV, United States*, X. Gary Tan, *U.S. Naval Research Laboratory, Washington, DC, United States*

4:00pm – Application of the Tornado-Like Flow Theory to the Study of Blood Flow in the Heart and Main Vessels: Study of the Potential Swirling Jets Structure in an Arbitrary Viscous Medium

Technical Paper Publication. IMECE2019-11298
Eugeny Talygin, Gennadiy Kiknadze, Andrey Agafonov, Alexander Gorodkov, *Bakulev National Medical Research Center for Cardiovascular Surgery, Moscow, Russia*

4:21pm – Effects of the Non-Newtonian Viscosity of Milk Flow in the Breast Ductal System

Technical Paper Publication. IMECE2019-12159
Jamasp Azarnoosh, *The University of Texas at Dallas, Richardson, TX, United States*, **Fatemeh Hassanipour**, *University of Texas at Dallas, Plano, TX, United States*

4:42pm – Transient Heat Release During Induced Mitochondrial Thermogenesis

Technical Presentation. IMECE2019-12849
Manjunath C. Rajagopal, Rhanor Gillette, Sanjiv Sinha, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

5:03pm – Design of an Experiment for Validating 3D Heat Transfer Simulations During Magnetic-Assisted Cochlear Implant Surgery

Technical Presentation. IMECE2019-13034
Fateme Esmailie, Mathieu Francoeur, Timothy Ameal, *University of Utah, Salt Lake City, UT, United States*

5:24pm – Analytical and Computational Modeling of Sustained-Release Drug Implants in the Vitreous Humor

Technical Presentation. IMECE2019-13228
Anita Penkova, Amin Naghdloo, Satwindar Sadhal, *University of Southern California, Los Angeles, CA, United States*

4-10 COMPUTATIONAL MODELING IN BIOMEDICAL APPLICATIONS

4-10-3 Computational Modeling 3
Convention Center, 255F 4:00PM–5:45PM

Session Organizer: Yi Hua, *University of Nebraska-Lincoln, Lincoln, NE, United States*

Session Co-Organizer: Andrew Merryweather, *University of Utah, Salt Lake City, UT, United States*

4:00pm – Subject-Specific Models of the Head and Neck for Reproducing Experimentally Obtained Head Impacts in OpenSim

Technical Paper Publication. IMECE2019-11932
Jonathan Douglas Mortensen, Mohammad Homayounpour, Andrew Merryweather, *University of Utah, Salt Lake City, UT, United States*

4:21pm – A Passive Hybrid Model to Estimate the Elastic Performance of Left Ventricular Cardiac Fibres

Technical Paper Publication. IMECE2019-12124
Jacobo Córdova Aquino, *Universidad Popular de la Chontalpa, Cárdenas, Tabasco, Mexico*, **Hugo Ivan Medellin Castillo**, *Universidad Autonoma San Luis Potosi, San Luis Potosi, San Luis Potosi, Mexico*

4:42pm – The Relationship Between the Arterial Geometry and Wall Shear Stress in the Vertebrobasilar System

Technical Paper Publication. IMECE2019-10866
Fangjia Pan, Hitomi Anzai, Shunji Mugikura, Ko Kitamura, Makoto Ohta, *Tohoku University, Sendai, Miyagi, Japan*

5:03pm – Design of Metacarpophalangeal Single-Piece Joint Prosthesis to Increase Motion in Abduction/Adduction

Technical Paper Publication. IMECE2019-11005
Raymond Yee, *San Jose State University, San Jose, CA, United States*, **Nathan Millard**, *San Jose State University, Hercules, CA, United States*

WEDNESDAY, NOVEMBER 13

4-2 INJURY AND DAMAGE BIOMECHANICS**4-2-5 Injury and Damage Biomechanics V****Convention Center, 255F****10:45AM–12:30PM****Session Organizer:** Reuben Kraft, *Pennsylvania State University, University Park, PA, United States***Session Co-Organizer:** Amit Bagchi, *Naval Research Laboratory, Washington DC, United States***10:45am – An Analytical Study of BMI Effects on Obese Senior Females in Vehicle Frontal Impact****Technical Paper Publication. IMECE2019-10918****Huijie Xu**, *Chongqing University, Chongqing, Chongqing, China*, **Zhenfei Zhan**, *State Key Laboratory of Vehicle NVH and Safety Tec, Chongqing, China*, **Yunlei Yin**, *Chongqing University/State Key Laboratory of Vehicle NVH and Safety, Chongqing, China*, **Wenxiang Dong**, **Qingmiao Wang**, *Chongqing University, Chongqing, China*, **Ruyi Chen**, *Changan Automobile Co., Ltd., Chongqing, China*, **Xin Jin**, *Wayne State University, Detroit, MI, United States***11:06am – Pelvic Response of a Total Human Body Finite Element (FE) Model During Simulated Under Body Blast Impacts****Technical Presentation. IMECE2019-11981****Caitlin Weaver**, *ARL-APG Futures Command, Aberdeen Proving Ground, MD, United States***11:27am – Sensor-Enabled Cloud Based Computational Modeling of the Brain****Technical Presentation. IMECE2019-13428****Reuben Kraft**, **Ritika Menghani**, *Pennsylvania State University, University Park, PA, United States*, **Adam Bartsch**, *Prevent Biometrics, Minneapolis, MN, United States***11:48am – Engineering Characteristics of High Energy Head Impacts in Athletes that Cause Functional Impairment****Technical Presentation. IMECE2019-13506****Adam Bartsch**, *Prevent Biometrics, Minneapolis, MN, United States*, **Vincent Miele**, *University of Pittsburgh Medical Center, Pittsburgh, PA, United States*, **Edward Benzel**, *Cleveland Clinic, Cleveland, OH, United States***4-11 MUSCULOSKELETAL AND SPORTS BIOMECHANICS****4-11-1 Musculoskeletal and Sports Biomechanics 1****Convention Center, 355B****10:45AM–12:30PM****Session Organizer:** Parisa Saboori, *Manhattan College, Bronx, New York, NY, United States***Session Co-Organizer:** Anne Schmitz, *University of Wisconsin Stout, Menomonie, WI, United States***10:45am – Quantifying the Stiffness of Biceps Muscle Using Accelerometer****Technical Paper Publication. IMECE2019-10228****Muhammad Salman**, *Kennesaw State University, Marietta, GA, United States*, **Alan Palmer**, *Kennesaw State University, Canton, GA, United States*, **Sajid Iqbal**, *University of Engineering and Technology, Lahore, Lahore, Pakistan***11:06am – Impact Analysis of Bubble Soccer to Prevent Head Injuries****Technical Paper Publication. IMECE2019-10650****Rafi Mahir**, *City College of New York, New York, NY, United States*, **Ali Sadegh**, *City University of New York, New York, NY, United States*, **Zelda Frankel**, *City College of New York, Monsey, NY, United States***11:27am – Effect of Motion Type on Joint Contact Forces****Technical Paper Publication. IMECE2019-10980****Anne Schmitz**, *University of Wisconsin Stout, Menomonie, WI, United States*, **Jaclyn Norberg**, *Salem State University, Salem, MA, United States***11:48am – Integration Protocol of Different Measurement Methods for the Analysis of the Physiological and Biomechanical Efficiency of a Professional Athlete****Technical Paper Publication. IMECE2019-11774****Massimo Milani**, **Luca Montorsi**, **Luca Fontanili**, **Salvatore Rossini**, *University of Modena and Reggio Emilia, Reggio Emilia, Italy*, **Roberto Citarella**, *CTR Reggio Emilia, Reggio Emilia, Italy***4-13 ROBOTICS, REHABILITATION****4-13-1 Design of Limb Rehabilitation Robots****Convention Center, 155A****10:45AM–12:30PM****Session Organizer:** Marvin Cheng, *Embry-Riddle Aeronautical University, Daytona Beach, FL, United States***Session Co-Organizer:** Ping Zhao, *Hefei University of Technology, Hefei, Anhui, China***10:45am – Motion Estimation and Path Planning for Assistive Robotic Devices****Technical Paper Publication. IMECE2019-12296****Marvin Cheng**, *Embry-Riddle Aeronautical University, Daytona Beach, FL, United States*, **Po-Lin Huang**, **Hao-Chuan Chu**, *National Tsing Hua University, Hsinchu, Taiwan*, **E.A. McKenzie**, *West Virginia University, Morgantown*

11:06am – Design of a Detachable Multi-Functional Rehabilitation Robot

Technical Paper Publication. IMECE2019-10477
Hao Zhang, Yuhang He, Huachen Shao, Wenxiu Chen,
Hefei University of Technology, Hefei, Anhui, China

11:27am – Motion Synthesis for Upper-Limb Rehabilitation Motion With Clustering-Based Machine Learning Method

Technical Paper Publication. IMECE2019-10435
Wenxiu Chen, Wanbing Song, *Hefei University of Technology, Hefei, Anhui, China,* **Haodong Chen,** *Missouri University of Science and Technology, Rolla, MO, United States,* **Qi Li,** **Ping Zhao,** *Hefei University of Technology, Hefei, Anhui, China*

11:48am – Design, Modeling, and Validation of a Pneumatic Upper Limb Rehabilitation Robot With Controllable Resistance

Technical Paper Publication. IMECE2019-10845
Yibin Li, Han Xu, Dong Xu, Xu Zhang, *Tongji Zhejiang College, Jiaxing, China,* **Mingming Zhang,** *Southern University of Science and Technology, Shenzhen, Guangdong Province, China,* **Xiaolong Li,** *Tongji Zhejiang College, Jiaxing, China,* **Sheng Q. Xie,** *University of Leeds, Leeds, United Kingdom*

4-10 COMPUTATIONAL MODELING IN BIOMEDICAL APPLICATIONS

4-10-4 Computational Modeling 4
Convention Center, 255F **2:00PM–3:45PM**

Session Organizer: Yi Hua, *University of Nebraska-Lincoln, Lincoln, NE, United States*

Session Co-Organizer: Ramjee Repaka, *Indian Institute of Technology Ropar, Rupnagar, Punjab, India*

2:00pm – The Effect of Impact Angle and Height on Skull Fracture Patterns in Infants

Technical Presentation. IMECE2019-13221
Jiawei Yan, Junyan He, Brittany Coats, Ashley D. Spear,
University of Utah, Salt Lake City, UT, United States

2:21pm – A Conductive Cooling Scheme for Bone Augmentation of the Proximal Femur With PMMA: An Experimental and Finite Element Study

Technical Paper Publication. IMECE2019-12142
Mahsan Bakhtiari Nejad, Amirhossein Farvardin, Alireza Chamani, Mehran Armand, *Johns Hopkins University, Baltimore, MD, United States*

2:42pm – An Adaptive-Remeshing Framework for Prediction of Impact-Induced Skull Fracture in Infants

Technical Presentation. IMECE2019-12313
Junyan He, Jiawei Yan, Ashley D. Spear, Brittany Coats,
University of Utah, Salt Lake City, UT, United States

3:03pm – Genetic Algorithm-based Optimization of Synthetic Vocal Fold Models

Technical Presentation. IMECE2019-13198
Austin C. Vaterlaus, Scott L. Thomson, *Brigham Young University, Provo, UT, United States*

4-11 MUSCULOSKELETAL AND SPORTS BIOMECHANICS

4-11-2 Musculoskeletal and Sports Biomechanics 2
Convention Center, 355B **2:00PM–3:45PM**

Session Organizer: Peyman Honarmandi, *Manhattan College, Riverdale, NY, United States*

Session Co-Organizer: Yuan Feng, *Shanghai Jiao Tong University, Northborough, MA, United States*

2:00pm – Performance of Prophylactic Knee Brace

Technical Paper Publication. IMECE2019-11789
Parisa Saboori, *Manhattan College, Bronx, New York, NY, United States,* **Margarita Corado,** *Manhattan College, Riverdale, NY, United States*

2:21pm – Shoulder Proprioception Device (S.P.D.): A Novel Design for Measuring Shoulder Joint Proprioception

Technical Paper Publication. IMECE2019-11948
Jeremy R. Schnipke, Thomas G. Rounds, Jacob P. Sroka, Zachary B. Lowe, Gregory M. Freisinger, Margaret Nowicki, *United States Military Academy, West Point, NY, United States,* **Kenneth Cameron,** *Keller Army Community Hospital, West Point, NY, United States,* **Brittany Hotaling, Richard Westrick,** *United States Army Research Institute of Environmental Medicine, Natick, MA, United States*

2:42pm – A Study of Concussions in Women's Lacrosse

Technical Paper Publication. IMECE2019-12024
Peyman Honarmandi, Lisa Toscano, Michael Calicchia, *Manhattan College, Riverdale, NY, United States,* **Miguel Diaz,** *Manhattan College, Bronx, NY, United States,* **Emma Kaishian, William Stallings,** *Manhattan College, Riverdale, NY, United States*

3:03pm – Machine Learning Classification of Head Impact Sensor Data

Technical Paper Publication. IMECE2019-12173
Tyler Rooks, *U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL, United States,* **Andrea Dargie, Henry M. Jackson Foundation (HJF) for the Advancement of Military Medicine, Bethesda, MD, United States, **Valeta Carol Chancey,** *U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL, United States***

4-13 ROBOTICS, REHABILITATION

4-13-2 Data-Driven Design for Rehabilitation Robots Convention Center, 155A 2:00PM–3:45PM

Session Organizer: Haodong Chen, *Missouri University of Science and Technology, Rolla, MO, United States*

Session Co-Organizer: Vimal Viswanathan, *San Jose State University, San Jose, CA, United States*

2:00pm – Clustering of Human Motion Trajectory for Lower Limb Rehabilitation Robot Design Based on Machine Learning

Technical Paper Publication. IMECE2019-10471
Kangren Zhao, Zhiqiang Teng, Ningtao Gong, Fangkang Chen, Ping Zhao, *Hefei University of Technology, Hefei, Anhui, China*

2:21pm – Design and Characterization of an Automated Assistive Knee Brace for Leg Muscle Rehabilitation

Technical Paper Publication. IMECE2019-11802
Sohail Zaidi, Austin Huynh, Pearsa Thach, Isaac Rubio, Harsh Patel, Vimal Viswanathan, *San Jose State University, San Jose, CA, United States*

2:42pm – EMG Controlled Soft Robotic Bicep Augmentation

Technical Paper Publication. IMECE2019-11716
Jiayue Zhang, Daniel Vanderbilt, Ethan Fitz, Janet Dong, *University of Cincinnati, Cincinnati, OH, United States*

3:03pm – Real Time Pattern Recognition for Prosthetic Hand

Technical Paper Publication. IMECE2019-11788
Mario A. Benitez Lopez, Carlos Rodriguez, *University of Los Andes, Bogota, Cundinamarca, Colombia,* **Jonathan Camargo,** *Georgia Institute of Technology, Atlanta, GA, United States*

4-10 COMPUTATIONAL MODELING IN BIOMEDICAL APPLICATIONS

4-10-5 Computational Modeling 5 Convention Center, 255F 4:00PM–5:45PM

Session Organizer: Yi Hua, *University of Nebraska-Lincoln, Lincoln, NE, United States*

Session Co-Organizer: Shawn Duan, *Saint Martin's University, Lacey, WA, United States*

4:00pm – Analysis of Ablation Volume Produced During Microwave Ablation of Breast Cancerous Lesion Using Fourier and Non-Fourier Models

Technical Paper Publication. IMECE2019-10800
Satish Vellavalapalli, Jatin Kumar, Ramjee Repaka, *Indian Institute of Technology Ropar, Rupnagar, Punjab, India*

4:21pm – Electroporation as the Result of Electromechanical Breakdown of Cell Membranes: 1. Basic Fundamentals and Some Practical Applications in Biotechnology Engineering

Technical Presentation. IMECE2019-10447
Igor Katkov, *Belgorod State University & Vitronix, LLC, Belgorod, Russia,* **Birgit Glasmacher, Vitalii Mutsenko, Oleksander Gryshkov,** *Institute for Multiphase Processes, Hannover, Germany*

4:42pm – A Two-Dimensional Parameterized Model for Transverse Deformation of Maize Stems

Technical Presentation. IMECE2019-13812
Ryan Larson, *Brigham Young University, Provo, UT, United States,* **Christopher Stubbs,** *New York University, Brooklyn, NY, United States,* **Douglas Cook,** *Brigham Young University, Provo, UT, United States*

5:03pm – Mapping Spatially Distributed Material Properties in Maize Stem Finite Element Models Using Computed Tomography

Technical Presentation. IMECE2019-13757
Christopher Stubbs, *New York University, New York, NY, United States,* **Ryan Larson, Douglas Cook,** *Brigham Young University, Provo, UT, United States*

4-12 SENSORS AND ACTUATORS

4-12-1 Sensors and Actuators Convention Center, 355B 4:00PM–5:45PM

Session Organizer: Lulu Wang, *Shenzhen Technology University, Shenzhen, China*

Session Co-Organizer: Yu Liandong, *Hefei University of Technology, Hefei, China*

4:00pm – Analysis of Bio-Inspired Structures for 3D Force Sensing Using Virtual Prototyping

Technical Paper Publication. IMECE2019-11089
Ahmed M. Alotaibi, *Purdue University, West Lafayette, IN, United States,* **Sohel Anwar,** *Indiana University Purdue University Indianapolis, Indianapolis, IN, United States*

4:21pm – Bio-Inspired Artificial Semicircular Duct Piezoresistive Sensor Design and Fabrication

Technical Presentation. IMECE2019-13225
Behrokh Abbasnejad, David McGloin, *University of Technology Sydney, Sydney, NSW, Australia,* **Lee Clemon,** *University of Technology Sydney, Ultimo, NSW, Australia*

4:42pm – Printed Graphene Biosensors and Fluidics for Environmental and Health Monitoring in the Field

Technical Presentation. IMECE2019-13895
Jonathan Claussen, Kshama Parate, Bolin Chen, Lucas Hall, *Iowa State University, Ames, IA, United States,* **John Hundred,** *Iowa State University, Des Moines, IA, United States,* **Nate Garland, Cicero C. Pola, Carmen L. Gomes,** *Iowa State University, Ames, IA, United States*

4-13 ROBOTICS, REHABILITATION

4-13-3 System Analysis for Rehabilitation Robotics **Convention Center, 155A 4:00PM-5:45PM**

Session Organizer: Hisham Kamel, *Military Technical College, Cairo, Egypt*

Session Co-Organizer: Vidya Nandikolla, *California State University, Northridge, CA, United States*

4:00pm – Hybrid BCI Controller for a Semi-Autonomous Wheelchair

Technical Paper Publication. IMECE2019-10463

Vidya Nandikolla, Travis Van Leeuwen, Amiel Hartman,
California State University Northridge, Northridge, CA, United States

4:21pm – Developing a Cost-Effective and Functional Prosthetic Foot for Below Knee Amputees Using Topology Optimization and 3D Printing

Technical Paper Publication. IMECE2019-10616

Hisham Kamel, Omar Harraz, Tamer Attia, *Military Technical College, Cairo, Egypt*

4:42pm – Space Index Based Dimensional Optimization for Minimally Invasive Surgery Robot

Technical Paper Publication. IMECE2019-10887

Yang Jing, Jin Lingyan, Zhao Deming, Hu Ming, *Zhejiang Sci-Tech University, Hangzhou, China, Yu Lingtao,* *Harbin Engineering University, Harbin, China*

5:03pm – A User Motion Data Acquisition and Processing Method for the Design of Rehabilitation Robot With Few Degree-of-Freedom

Technical Paper Publication. IMECE2019-11318

Peng Chen, De Dong, Hao Lv, *Southwest Jiaotong University, Chengdu, China, Liuxian Zhu,* *Sichuan Provincial Engineering Laboratory of Super Alloy Cutting Technology, Deyang, China*

5:24pm – Design, Modeling and Validation of a Pneumatic Upper Limb Rehabilitation Robot With Controllable Resistance

Technical Presentation. IMECE2019-12652

Yibin Li, *Tongji Zhejiang College, Jiaxing, China*

TRACK 5 DYNAMICS, VIBRATION, AND CONTROL

- 5-1-1: Plenary Session I
- 5-1-2: Plenary Session II
- 5-2-1: General Dynamics, Vibration and Control I
- 5-2-2: General Dynamics, Vibration and Control II
- 5-2-3: General Dynamics, Vibration and Control III
- 5-2-4: General Dynamics, Vibration and Control IV
- 5-3-1: Nonlinear Dynamics, Control, and Stochastic Mechanics I
- 5-3-2: Nonlinear Dynamics, Control, and Stochastic Mechanics II
- 5-3-3: Nonlinear Dynamics, Control, and Stochastic Mechanics III
- 5-4-1: Robot Control
- 5-4-2: Robot Design
- 5-4-3: Mechanism Design I
- 5-4-4: Mechanism Design II
- 5-4-5: Compliant Mechanisms
- 5-5-1: Fluid-Structure Interaction I
- 5-5-2: Fluid-Structure Interaction II
- 5-6-1: Dynamics and Control in Micro/Nano Engineering I
- 5-7-1: Smart Structures and Structronic Systems I
- 5-8-1: Novel Control of Dynamic System and Design – 1
- 5-8-2: Novel Control of Dynamic System and Design – 2
- 5-8-3: Novel Control of Dynamic System and Design – 3
- 5-9-1: Multibody Dynamic Systems and Applications I
- 5-9-2: Multibody Dynamic Systems and Applications II
- 5-9-3: Multibody Dynamic Systems and Applications III
- 5-10-1: Vibrations of Continuous Systems I
- 5-10-2: Vibrations of Continuous Systems II
- 5-11-1: Mobile Robots and Unmanned Ground Vehicles I
- 5-11-2: Mobile Robots and Unmanned Ground Vehicles II
- 5-12-1: Control Theory and Applications I
- 5-13-1: Stochastic Optimization, Uncertainty and Probability
- 5-15-1: Multi-Physics Dynamics-Control & Diagnostics-Prognostics of Structures and Devices
- 5-16-1: Renewable Energy, Structural Health Monitoring I

ACKNOWLEDGMENT

TRACK ORGANIZERS

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Bogdan Epureanu, *University of Michigan, United States*

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Dumitru Caruntu, *University of Texas Rio Grande Valley, United States*
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Hong Zhou, *Texas A&M University-Kingsville, United States*
Weidong Zhu, *University of Maryland, Baltimore County, United States*

TRACK 5 DYNAMICS, VIBRATION, AND CONTROL

MONDAY, NOVEMBER 11

5-1 PLENARY PRESENTATIONS

5-1-1 Plenary Session I

Convention Center, 155E

9:45AM–10:30AM

9:45am – Data-Driven Model Reduction and Probabilistic Learning for Digital Twins

Plenary Presentation. IMECE2019-13995

Charbel Farhat, *Stanford University, Stanford, CA, United States*

5-3 NONLINEAR DYNAMICS, CONTROL, AND STOCHASTIC

5-3-3 Nonlinear Dynamics, Control, and Stochastic Mechanics III

Convention Center, 155B

10:45AM–12:30PM

Session Organizer: Amanda Saunders, *Embry-Riddle Aeronautical University, Port Orange, FL, United States*

Session Co-Organizer: Anubhab Sinha, *Indian Institute of Technology Kharagpur, Kharagpur, West Bengal, India*

10:45am – Estimating Pacejka (PAC2002) Tire Coefficients for Pneumatic Tires on Soft Soils With Application to BAJA SAE Vehicles

Technical Paper Publication. IMECE2019-10682

Amanda Saunders, *Embry-Riddle Aeronautical University, Port Orange, FL, United States*, **Darris White**, *Embry-Riddle Aeronautical University, Daytona Beach, FL, United States*, **Marc Compere**, *Embry-Riddle Aeronautical University, Daytona Beach, FL, United States*

11:06am – Estimating Traction Forces for Pneumatic Tires on Soft Soils With Application to BAJA SAE Vehicles

Technical Paper Publication. IMECE2019-10770

Amanda Saunders, *Embry-Riddle Aeronautical University, Port Orange, FL, United States*, **Darris White**, *Embry-Riddle Aeronautical University, Daytona Beach, FL, United States*

11:27am – Self-Synchronization in a Class of Motor Driven Reciprocating Mechanisms

Technical Paper Publication. IMECE2019-11092

Anubhab Sinha, *Saurabh Kumar Bharti*, **Arun Kumar Samantaray**, **Ranjan Bhattacharyya**, *Indian Institute of Technology, Kharagpur, Kharagpur, West Bengal, India*

11:48am – Local Defect Modelling and Nonlinear Dynamic Analysis for the Inter-Shaft Bearing in a Dual-Rotor System

Technical Presentation. IMECE2019-12488

Peng Gao, **Lei Hou**, **Yushu Chen**, *Harbin Institute of Technology, Harbin, Heilongjiang, China*

12:09pm – Impact Vibration of Two-Degree-of-Freedom Mass-Spring-Damper System with a Gap

Technical Presentation. IMECE2019-12629

Shota Kuramochi, **Tatsuhito Aihara**, *Hosei University, Koganei-shi, Tokyo, Japan*

5-5 FLUID-STRUCTURE INTERACTION

5-5-1 Fluid-Structure Interaction I

Convention Center, 250B

10:45AM–12:30PM

Session Organizer: Dennis Gottuso, *Framatome Ltd., Lynchburg, VA, United States*

Session Co-Organizer: Eleonora Tubaldi, *University of Arizona, Tucson, AZ, United States*

10:45am – Experiments on Nonlinear Vibrations of a Nuclear Fuel Rod Supported by Spacer Grids in Air and Submerged in Water

Technical Paper Publication. IMECE2019-10663

Marco Amabili, **Prabakaran Balasubramanian**, **Giovanni Ferrari**, **Giulio Franchini**, **Francesco Giovanniello**, *McGill University, Montreal, QC, Canada*, **Kostas Karazis**, **Brian Painter**, *Framatome Ltd., Lynchburg, VA, United States*

11:06am – Advanced Calculation Flutter Procedure Developed for Ultra-Long Last Stage Blades for Steam Turbines

Technical Paper Publication. IMECE2019-10861

Vaclav Slama, **Rudas Bartolomej**, *Doosan Skoda Power, Plzen, Czech Republic*, **Ales Macalka**, **Jiri Ira**, **Antonin Zivny**, *NUM solution, Prague, Czech Republic*

11:27am – Investigation on the Load Capacity of Hydrodynamic Thrust Bearings Using Harmonic Components

Technical Paper Publication. IMECE2019-11370

Baisong Yang, *Xi'An Jiaotong University, Shaanxi, China*, **Sheng Feng**, *Xian Jiaotong University, Zian City, Shaanxi*, **Jian Zhou**, **Lie Yu**, *Xian Jiaotong University, Xi'An, Shaanxi*

11:48am – Vibration Analysis of a Horizontal Partially Fluid-Filled Cylindrical Shell Considering Sloshing Effect of Free Surface

Technical Paper Publication. IMECE2019-12263

Luyan Pan, **Xiang Zhu**, **Tianyun Li**, **Yueyang Han**, **Xiaotian Liang**, *Huazhong University of Science and Technology, Wuhan, Hubei Province, China*

12:09pm – Wheel Slip Regulation for Heavy Commercial Road Vehicles Using Model Predictive Control Subsumed With Auto-Regressive Time-Series Modelling

Technical Paper Publication. IMECE2019-12070

Pavel Vijay Gaurkar, **Akhil Challa**, **Shankar Coimbatore Subramanian**, *Indian Institute of Technology Madras, Chennai, Tamilnadu, India*, **Gunasekaran Vivekanandan**, **Sriram Sivaram**, *Madras Engineering Industries Pvt. Ltd., Chennai, Tamilnadu, India*

5-8 NOVEL CONTROL OF DYNAMIC SYSTEM AND DESIGN

5-8-1 Novel Control of Dynamic System and Design-1

Convention Center, 155A 10:45AM–12:30PM

Session Organizer: C. Steve Suh, *Texas A&M University, College Station, TX, United States*

10:45am – Stabilizing Ship Motion With a Dual System Inertial Disk

Technical Paper Publication. IMECE2019-10250
Torstein R. Storaas, Kasper Virkesdal, *Western Norway University of Applied Sciences, Bergen, Norway*, Gitle Seim Brekke, *Western Norway University of Applied Sciences, Odda, Norway*, Thorstein R. Rykkje, Thomas Impelluso, *Western Norway University of Applied Sciences, Bergen, Norge, Norway*

11:06am – Period-1 Motions in a Periodically Forced, Nonlinear, Machine-Tool System

Technical Paper Publication. IMECE2019-10771
Siyuan Xing, Albert Luo, *Southern Illinois University, Edwardsville, IL, United States*

11:27am – Period-1 Motions to Chaos With Varying Excitation Frequency in a Parametrically Driven Pendulum

Technical Paper Publication. IMECE2019-10772
Yu Guo, *Midwest State University, Wichita Falls, TX, United States*, Albert Luo, *Southern Illinois University, Edwardsville, IL, United States*

11:48am – A Novel Nonlinear Time-Frequency Control Strategy for Underactuated Mechanical System

Technical Paper Publication. IMECE2019-10778
Zilong Zhang, C. Steve Suh, *Texas A&M University, College Station, TX, United States*

12:09pm – Decentralized Multi-Robot Motion Planning Applicable to Dynamic Environment

Technical Paper Publication. IMECE2019-10788
Bin Wu, C Steve Suh, *Texas A&M University, College Station, TX, United States*

5-9 MULTIBODY DYNAMIC SYSTEMS AND APPLICATIONS

5-9-1 Multibody Dynamic Systems and Applications I

Convention Center, 250A 10:45AM–12:30PM

Session Organizer: Hidenori Murakami, *University of California, San Diego, La Jolla, CA, United States*

10:45am – Dynamic Response and Analytical Approach on a Double Catalyst Muffler System Mounting on a Table

Technical Paper Publication. IMECE2019-10130
Gyoko Oh, *Tokyo Roki Co., Ltd., Sagami, Japan*, Masahiro Akei, *Yanmar Co., Ltd., Nagahama, Shiga, Japan*

11:06am – Performance Analysis and Parametric Studies of Nose Landing Gear Shimmy Dampers

Technical Paper Publication. IMECE2019-10167
Mohsen Rahmani, Kamran Behdinan, *University of Toronto, Toronto, ON, Canada*

11:27am – Avoidance of Lateral Rotordynamic Instability in Turbomachinery

Technical Presentation. IMECE2019-10290
Justin Hollingsworth, Chris Kulhanek, Hector Delgado, *Southwest Research Institute, San Antonio, TX, United States*

11:48am – Design and Modeling of Semi Compliant Prosthetic Knee Joint

Technical Paper Publication. IMECE2019-10334
Trevor Warnix, Hongkuan Lin, M. Loraine Lowder, Coskun Tekes, Ayse Tekes, *Kennesaw State University, Marietta, GA, United States*

12:09pm – Modeling a Knuckle-Boom Crane Control to Reduce Pendulum Motion Using the Moving Frame Method

Technical Paper Publication. IMECE2019-10436
Maren Eriksen Eia, Elise Mari Vigre, Thorstein R. Rykkje, *Western Norway University of Applied Sciences, Bergen, Norway*

5-15 MULTI-PHYSICS DYNAMICS-CONTROL & DIAGNOSTICS-PROGNOSTICS OF STRUCTURES AND DEVICES

5-15-1 Multi-Physics Dynamics-Control & Diagnostics-Prognostics of Structures and Devices

Convention Center, 355C 10:45AM–12:30PM

10:45am – Dynamics of a Torsional Magnetic Spring Oscillator

Technical Presentation. IMECE2019-10668
Ali Kanj, John Kulikowski, Rhinithaa P. Thanalakshme, Gaurav Bahl, Sameh Tawfick, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

11:06am – The Interaction Problem Between a Crack and a Wedge Disclination Dipole With Irwin Plastic Zone Correction

Technical Paper Publication. IMECE2019-10852
Meigen Cao, *North China University of Technology, Beijing, China*, Mu Fan, *Nanjing University of Aeronautics and Astronautics, Nanjing, Jiangsu, China*, Hequn Min, *SEU, Nanjing, China*

11:27am – A Simple Control Strategy for Increasing the Soft Bending Actuator Performance by Using a Pressure Boost

Technical Paper Publication. IMECE2019-11410
Brian Alphonse Pinto, Lars Schiller, Arthur Seibel, *Hamburg University of Technology, Hamburg, Germany*

11:48am – Fuel Evaporative System Leak Detection Model for Production 2019 Ford Hybrid Electric Vehicles

Technical Presentation. IMECE2019-12925
Vikrant Chiddarwar, *Siemens PLM, Farmington Hills, MI, United States*, De-Shiou Chen, *For Dearborn, MI, United States*

12:09pm – Forming Ensembles of Transient Dynamics Signals to Detect Damage in Complex Structures: Combining Laser Vibrometry and POD Transform Tools
Technical Presentation. IMECE2019-13927

Ioannis Georgiou, *National Technical University of Athens, Athens, Greece*

5-3 NONLINEAR DYNAMICS, CONTROL, AND STOCHASTIC

5-3-1 Nonlinear Dynamics, Control, and Stochastic Mechanics I

Convention Center, 155B **2:00PM–3:45PM**

Session Organizer: Dumitru Caruntu, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

Session Co-Organizers: Carlos Borrás Pinilla, *Universidad Industrial de Santander, Bucaramanga, Colombia*, Vincent Kulke, *TU Braunschweig, Braunschweig, Lower Saxony, Germany*

2:00pm – Numerical Investigation of an Academic Mistuned Bladed Disk Dynamics Accounting for Blade/Casing Contacts

Technical Paper Publication. IMECE2019-10300
Jeanne Joachim, Florence Nyssen, Alain Batailly,
Polytechnique Montréal, Montreal, QC, Canada

2:21pm – Neural Network Based Fault Tolerant Control for a Semi-Active Suspension

Technical Paper Publication. IMECE2019-11516
Carlos Borrás Pinilla, Sergio Alberto Rueda Villanoba,
Universidad Industrial de Santander, Bucaramanga, Colombia

2:42pm – Semi-Analytical Approach for Derivation of an Equivalent Modal Friction-Damping Ratio and Its Application in a Self-Excited Drilling System

Technical Paper Publication. IMECE2019-10576
Vincent Kulke, Georg-Peter Ostermeyer, *TU Braunschweig, Braunschweig, Lower Saxony, Germany*, **Mathias Tergeist, Andreas Hohl**, *Baker Hughes, a GE company, Celle, Lower Saxony, Germany*

3:03pm – Amplitude-Frequency Response for Superharmonic Resonance of Fourth Order of Electrostatically Actuated MEMS Cantilever Resonators

Technical Paper Publication. IMECE2019-11198
Dumitru Caruntu, Christopher I. Reyes, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

3:24pm – Edge States in Nonlinear Model of Valve Spring

Technical Paper Publication. IMECE2019-11218
Majdi Gzal, Oleg Gendelman, *Technion, Israel Institute of Technology, Haifa, Israel*

5-8 NOVEL CONTROL OF DYNAMIC SYSTEM AND DESIGN

5-8-2 Novel Control of Dynamic System and Design-2

Convention Center, 250C **2:00PM–3:45PM**

Session Organizer: C Steve Suh, *Texas A&M University, College Station, TX, United States*

2:00pm – A Strategy for Controlling Wake-Induced Vibrations Involving Two Tandem Circular Cylinders
Technical Presentation. IMECE2019-10797

Xu Sun, *China University of Petroleum-Beijing, Beijing, China*, **C. Steve Suh**, *Texas A&M University, College Station, TX, United States*, **Yixin Zhang**, *China University of Petroleum-Beijing, Beijing, China*, **Bo Yu**, *Beijing Institute of Petrochemical Technology, Beijing, China*

2:21pm – An Adaptive Integral Sliding Mode Control for the Sleeve Angle of a Novel Rotary Valve and Its Experimental Study

Technical Paper Publication. IMECE2019-10810
Muzhi Zhu, *Nanjing Institute of Technology, Nanjing City, China*, **Shengdun Zhao**, *XiAn Jiaotong University, Xian, China*, **Dafei Bao**, *Jiangsu Mingzhu Testing Machinery Co. Ltd., Yangzhou, China*

2:42pm – MoVE: A Mobility Virtual Environment for Autonomous Vehicle Testing

Technical Paper Publication. IMECE2019-10936
Marc Compere, Garrett Holden, Otto Legon, Roberto Martinez Cruz, *Embry-Riddle Aeronautical University, Daytona Beach, FL, United States*

3:03pm – On an Independent Period-1 Motion in a Flexible Rotor System

Technical Paper Publication. IMECE2019-10983
Yeyin Xu, Albert Luo, *Southern Illinois University, Edwardsville, IL, United States*

3:24pm – Periodic Motions With Grazing in a Discontinuous Dynamical System With Two Circular Boundaries

Technical Paper Publication. IMECE2019-11489
Siyu Guo, *Southern Illinois University Edwardsville, Peoria, IL, United States*, **Albert Luo**, *Southern Illinois University, Edwardsville, IL, United States*

5-9 MULTIBODY DYNAMIC SYSTEMS AND APPLICATIONS

5-9-2 Multibody Dynamic Systems and Applications II

Convention Center, 250A 2:00PM–3:45PM

Session Organizer: Ayse Tekes, *Kennesaw State University, Marietta, GA, United States*

2:00pm – Influence of Pocket Wear on the Dynamic Characteristics of High-Speed Ball Bearing Cage

Technical Paper Publication. IMECE2019-10498

Hui Li, *Xi'an Jiaotong University, Shaanxi, China*, Li Chen, *Xi'an Jiaotong University, Xi'an*, Li Yuan, Qi Shemiao, *Xi'an Jiaotong University, Shaanxi, China*, Yi Liu, Heng Liu, *Xi'an Jiaotong University, Xi'an, China*

2:21pm – Contact Analysis of Gear Trains Using Linear Complementarity Based Compliant Contact Model

Technical Paper Publication. IMECE2019-10701

Mangesh Pathak, Sourav Rakshit, *Indian Institute of Technology, Madras, Chennai, Tamil Nadu, India*

2:42pm – Developing of a Simscape Multibody Contact Library for Gothic Arc Ball Screws: A Three-Dimensional Model for Internal Sphere/Grooves Interactions

Technical Paper Publication. IMECE2019-10709

Antonio C. Bertolino, Giovanni Jacazio, Stefano Mauro, Massimo Sorli, *Politecnico di Torino, Torino, Italy*

3:03pm – Dynamic Modeling and Analysis for a Planar Three Degrees-of-Freedom Manipulator Under Prescribed Mount Motion

Technical Paper Publication. IMECE2019-10781

Takeyuki Ono, Ryosuke Eto, Junya Yamakawa, *The National Defense Academy, Yokosuka, Kanagawa, Japan*, Hidenori Murakami, *University of California, San Diego, La Jolla, CA, United States*

3:24pm – Research on Dynamic Characteristics of Complex Gap Combined Rotor of Large Generator

Technical Paper Publication. IMECE2019-10835

Li Yuan, Li Chen, Hui Li, Qi Shemiao, *Xi'an JiaoTong University, Shaanxi, China*, Yi Liu, Heng Liu, *Xi'an Jiaotong University, Xi'an, China*

5-10 VIBRATIONS OF CONTINUOUS SYSTEMS

5-10-2 Vibrations of Continuous Systems II

Convention Center, 250B 2:00PM–3:45PM

Session Organizer: Pezhman Hassanpour Asl, *Loyola Marymount University, Los Angeles, CA, United States*

Session Co-Organizer: Xiaolei Song, *Temple University, Philadelphia, PA, United States*

2:00pm – Vibration of Beam-Type Resonant Biosensors With Time-Varying Mass Density

Technical Paper Publication. IMECE2019-11924

Pezhman Hassanpour Asl, *Loyola Marymount University, Los Angeles, CA, United States*

2:21pm – Higher-Order Vibrations Modes of Extension and Torsion in a Bar

Technical Presentation. IMECE2019-12087

Longtao Xie, Chunlei Bian, Yangyang Zhang, Aibing Zhang, Ji Wang, *Ningbo University, Ningbo, Zhejiang, China*

2:42pm – Generation of Harmonic Travelling Waves on Thin Circular Plates

Technical Presentation. IMECE2019-12372

Aman Kumar, Anirvan DasGupta, *Indian Institute of Technology Kharagpur, Kharagpur, India*

3:03pm – Vibration of Irregular Shaped Plates With Clamped Boundary

Technical Presentation. IMECE2019-12567

Abhijit Ghosh, Anirvan DasGupta, *Indian Institute of Technology Kharagpur, Kharagpur, West Bengal, India*

3:24pm – Bistable Clamped-Clamped Beams: Free Vibration and Sound Radiation

Technical Presentation. IMECE2019-13434

Xiaolei Song, Haijun Liu, *Temple University, Philadelphia, PA, United States*

5-3 NONLINEAR DYNAMICS, CONTROL, AND STOCHASTIC

5-3-2 Nonlinear Dynamics, Control, and Stochastic Mechanics II

Convention Center, 155B 4:00PM–5:45PM

Session Organizer: Carlos Borrás Pinilla, *Universidad Industrial de Santander- UIS, Bucaramanga, Colombia*

Session Co-Organizer: Pratyaya Chakraborty, *Indian Institute of Technology, Kharagpur, Kharagpur, West Bengal, India*

4:00pm – Dynamic Parameters and Friction Model Identification of an Industrial Hybrid Robot

Technical Paper Publication. IMECE2019-10916

Binbin Zhang, Liping Wang, Jun Wu, *Tsinghua University, Beijing, China*

4:21pm – Elimination of Sommerfeld Effect in Non-Ideal Systems Using Dry Friction

Technical Paper Publication. IMECE2019-11172

Pratyaya Chakraborty, Goutam Chakraborty, Ranjan Bhattacharyya, *Indian Institute of Technology, Kharagpur, Kharagpur, West Bengal, India***4:42pm – Modelling, System Identification, and Position Control Based on LQR Formulation for an Electro-Hydraulic Servo System**

Technical Paper Publication. IMECE2019-11505

Carlos Borrás Pinilla, José Luis Sarmiento, Ruben Guiza, *Universidad Industrial de Santander, Bucaramanga, Colombia***5:03pm – Investigations on Acoustic and Electro-Elastic Nonlinearities in Contactless Ultrasound Acoustic Energy Transfer Systems**

Technical Presentation. IMECE2019-13693

Vamsi Chandra Meesala, Aarushi Bhargava, *Virginia Tech, Blacksburg, VA, United States*, Muhammad Hajj, *Stevens Institute of Technology, Hoboken, NJ, United States*, Shima Shahab, *Virginia Tech, Blacksburg, VA, United States***5:24pm – Nonlinear Dynamic Analysis of an Asymmetric Ball Bearing Rotor System**

Technical Paper Publication. IMECE2019-12218

Dogancan Bahan, *Roketsan, Ankara, Turkey*, Ender Cigeroglu, *Middle East Technical University, Ankara, Turkey***5-8 NOVEL CONTROL OF DYNAMIC SYSTEM AND DESIGN****5-8-3 Novel Control of Dynamic System and Design – 3**

Convention Center, 254B

4:00PM–5:45PM

4:00pm – Rapid Motion Control and Design of a Tricopter Style Hovering Ground Robot

Technical Paper Publication. IMECE2019-11848

Justin Simko, Akin Tatoglu, *University of Hartford, West Hartford, CT, United States***4:21pm – On the Global Dynamics of Complex Networks**

Technical Paper Publication. IMECE2019-11879

Chun-Lin Yang, C. Steve Suh, *Texas A&M University, College Station, TX, United States***4:42pm – Analysis for Rutting Prediction of Asphalt Pavement Under Virtual Rail Vehicle**

Technical Presentation. IMECE2019-12417

Jimin Zhang, Chengping Wang, *Tongji University, Shanghai, China***5:03pm – Dynamic Brake Force Distribution for Heavy Commercial Road Vehicles Using Wheel Slip Regulation**

Technical Paper Publication. IMECE2019-12082

Akhil Challa, Devika K B, Shankar Coimbatore Subramanian, *Indian Institute of Technology Madras, Chennai, Tamilnadu, India*, Gunasekaran Vivekanandan, Sriram Sivaram, *Madras Engineering Industries Pvt. Ltd., Chennai, Tamilnadu, India***5-9 MULTIBODY DYNAMIC SYSTEMS AND APPLICATIONS****5-9-3 Multibody Dynamic Systems and Applications III**

Convention Center, 250A

4:00PM–5:45PM

Session Organizer: Shawn Duan, *Saint Martin's University, Lacey, WA, United States***4:00pm – Dynamic Simulation of Planetary Gearbox With Tooth Root Crack Based on a Rigid-Flexible Coupled Model**

Technical Paper Publication. IMECE2019-11012

Jianchuan Dai, Hang Niu, Chenggang Hou, Xiaodong Zhang, *Xi'an Jiaotong University, Xi'an, China***4:21pm – Ride Index for Metro Coaches: Experimental Evaluation and Vehicle Dynamics Results**

Technical Paper Publication. IMECE2019-11128

Sudhir Kumar Singh, Hrishikesh Gajanan Danawe, Vikranth Racherla, *Indian Institute of Technology Kharagpur, Kharagpur, India*, Sanjay R Singh, Arun Prasad, *Bharat Earth Movers Limited, Bengaluru, India***4:42pm – Coupled Flexural and Torsional Vibration Analysis of Composite Beams**

Technical Paper Publication. IMECE2019-11301

Ehsan Sarfaraz, Jeremiah O. Afolabi, Hamid R. Hamidzadeh, *Tennessee State University, Nashville, TN, United States***5:03pm – Analysis and Design of Twin Gyroscopes for Ocean-Wave Energy Converters and Ship Roll-Stabilizers**

Technical Paper Publication. IMECE2019-11435

Hidenori Murakami, *University of California, San Diego, La Jolla, CA, United States*, Takeyuki Ono, *The National Defense Academy, Yokosuka, Kanagawa, Japan***5:24pm – Implementation of an Integrated Sequential Procedure for Computer Simulation of Dynamics of Multibody Molecular Structures in Polymers and Biopolymers**

Technical Paper Publication. IMECE2019-11752

Akara Hay, Shawn Duan, *Saint Martin's University, Lacey, WA, United States*

5-10 VIBRATIONS OF CONTINUOUS SYSTEMS

5-10-1 Vibrations of Continuous Systems I

Convention Center, 250B

4:00PM–5:45PM

Session Organizer: Dumitru Caruntu, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

Session Co-Organizers: Peng Guan, *University of Tennessee, Knoxville, Knoxville, TN, United States*, Abhijeet D. Chodankar, *Florida International University, Miami, FL, United States*

4:00pm – Electrostatically Actuated MEMS Circular Plate Resonators: Frequency Response of Superharmonic Resonance of Third Order

Technical Paper Publication. IMECE2019-11207

Julio Beatriz, Dumitru Caruntu, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

4:21pm – Transverse Vibrations of Annular Spinning Disk Subjected to Out-of-Plane Loads and Uniform In-Plane Follower Edge Forces

Technical Paper Publication. IMECE2019-11054

Peng Guan, Meng Peng, Hans Desmidt, Wei Yao, *University of Tennessee, Knoxville, Knoxville, TN, United States*

4:42pm – Effects of Axial Compression Load, Borehole Clearance, and Contact Force Using Axial-Lateral Fluid Coupled Drill String Vibration Model

Technical Paper Publication. IMECE2019-10783

Abhijeet D. Chodankar, *Florida International University, Miami, FL, United States*, **Abdenmour Seibi,** *University of Louisiana at Lafayette, Lafayette, LA, United States*

5:03pm – Three Dimensional Dynamic Model Development and Validation for Stranded Cables

Technical Paper Publication. IMECE2019-11504

Mohammad Hadi Jalali, Richard McKercher, Geoff Rideout, *Memorial University, St. John's, NL, Canada*

5:24pm – High Frequency Shape Memory Alloy Actuators

Poster Presentation. IMECE2019-11506

Scott Kennedy, Morgan C. Price, Michael E. Zabala, Edmon Perkins, *Auburn University, Auburn, AL, United States*

TUESDAY, NOVEMBER 12

5-1 PLENARY PRESENTATIONS**5-1-2 Plenary Session II**

Convention Center, 155F

9:45AM–10:30AM

9:45am – The Interplay of Nonlinearity and Noise in Tiny Resonators

Plenary Presentation. IMECE2019-13996

Steven Shaw, *Florida Institute of Technology, Melbourne, FL, United States***5-5 FLUID-STRUCTURE INTERACTION****5-5-2 Fluid-Structure Interaction II**

Convention Center, 260

10:45AM–12:30PM

Session Organizer: Kostas Karazis, *Framatome Inc., Lynchburg, VA, United States***10:45am – LASCADE: Flutter Investigation in Compressor Linear Cascade**

Poster Presentation. IMECE2019-13265

Mihai Cimpaueru, Robert Kielb, *Duke University, Durham, NC, United States***11:06am – Flapping Wing Energetics and the Effect of Fluid-Structure Bidirectionality**

Technical Presentation. IMECE2019-13292

Mark Jankauski, *Montana State University, Bozeman, MT, United States***11:27am – Experimental Validation of the Effects of Air Cavity in Acoustic Pressure Sensors**

Technical Presentation. IMECE2019-13430

Qian Dong, Haijun Liu, Xiaolei Song, *Temple University, Philadelphia, PA, United States***11:48am – Lateral Load Transfer due to Sloshing Cargo in Partially Filled Containers**

Poster Paper Publication. IMECE2019-10030

Frank Otremba, Jose Antonio Romero Navarrete, *Federal Institute for Materials Research and Testing, Berlin, Germany***12:09pm – A Magnetic and Shape Memory Alloy Actuated Gripper for Surgical Applications**

Poster Paper Publication. IMECE2019-10791

Ian Cooke, Brendon Declerck, Jesse Hallett, Tyler Miller, Alexis Mitchell, Reza Rashidi, *State University of New York, Alfred State College, Alfred, NY, United States***5-12 CONTROL THEORY AND APPLICATIONS****5-12-1 Control Theory and Applications I**

Convention Center, 355D

10:45AM–12:30PM

Session Organizer: Aican Sahinkaya, *Cleveland State University, Cleveland, OH, United States***10:45am – Cancelling Gyroscopic Effects in AMB Systems With Flexible Rotors via Modal Feedback**

Technical Paper Publication. IMECE2019-10515

Aican Sahinkaya, Jerzy T. Sawicki, *Cleveland State University, Cleveland, OH, United States***11:06am – Data-Driven Feedforward Tuning Approach for LPV Motion Systems**

Technical Paper Publication. IMECE2019-11203

Weicai Huang, Kaiming Yang, Yu Zhu, Sen Lu, *Tsinghua University, Beijing, China***11:27am – Modeling and Control of a Spherical Inverted Pendulum With Actuator Saturation**

Technical Paper Publication. IMECE2019-11401

Geovani Bondo, *Prairie View A&M University, Prairie View, TX, United States*, Chengzhi Yuan, *University of Rhode Island, Kingston, RI, United States*, Chang Duan, *Prairie View A&M University, Prairie View, TX, United States***11:48am – Control Design Strategies for Semi-Active Suspension System**

Technical Paper Publication. IMECE2019-11450

Jessica Gissella Maradey Lazaro, Helio Esteban Villegas, Brajan Ruiz, Andres Aldana, *Universidad Autonoma de Bucaramanga, Bucaramanga, Colombia***12:09pm – Design and Start-Up of an Automatic Paint Mixer**

Technical Paper Publication. IMECE2019-11557

Jessica Gissella Maradey Lazaro, Kevin Caceres, *Universidad Autonoma de Bucaramanga, Bucaramanga, Colombia*, Gianina Garrido, *Servicio Nacional de Aprendizaje, Bucaramanga, Colombia*

5-16 RENEWABLE ENERGY, STRUCTURAL HEALTH MONITORING, AND DISTRIBUTED STRUCTURAL SYSTEMS

5-16-1 Renewable Energy, Structural Health Monitoring I

Convention Center, 355C 10:45AM–12:30PM

Session Organizer: Weidong Zhu, *University of Maryland, Baltimore County, Baltimore, MD, United States*

10:45am – A New Incremental Harmonic Balance Method With Two Time Scales for Quasi-Periodic Motions of an Axially Moving Beam With Internal Resonance Under Single-Tone External Excitation

Technical Paper Publication. IMECE2019-12153
Jianliang Huang, *Sun Yat-Sen University, Guangzhou, China*,
Weidong Zhu, *University of Maryland, Baltimore County, Baltimore, MD, United States*

11:06am – Analysis on Time-Frequency Decomposition of Non-Stationary Signal Based on Improved Matching Pursuit

Technical Presentation. IMECE2019-12673
Shuangxi Guo, *Institute of Mechanics, Chinese Academy of Sciences, Beijing, China*, **Yiqin Fu**, *Institute of Mechanics, Chinese Academy of Sciences, Tianjin University, Beijing, China*, **Yilun Li**, *Sino-French Engineering School, Beihang University, Beijing, China*, **Hongwei Song**, **Weimin Chen**, *Institute of Mechanics, Chinese Academy of Sciences, Beijing, China*

11:27am – Experimental Investigation of Vibration Damping Behavior of Magneto-Mechanical Coated AISI321 Stainless-Steel

Technical Paper Publication. IMECE2019-11312
Hafiz Muhammad Ashraf, *University of Engineering and Technology, Taxila, Rawalpindi, Pakistan*, **Farhan Ali**, *National University of Sciences and Technology, Islamabad, Islamabad, Pakistan*

11:48am – Design of Bolted Preload Electromechanical Impedance Monitoring Device for CubeSat

Technical Paper Publication. IMECE2019-12216
Zi Han Zhang, **Jia Cheng Li**, **Fei Du**, **Chao Xu**, *Northwestern Polytechnical University, Xi'an, China*

12:09pm – Controlling Out-of-Plane Shear Wave Propagation With Broadband Cloaking

Technical Paper Publication. IMECE2019-12156
Mao Liu, *Harbin Institute of Technology, Harbin, China, China*,
Weidong Zhu, *University of Maryland, Baltimore County, Baltimore, MD, United States*

5-4 DESIGN AND CONTROL OF ROBOTS, MECHANISMS AND STRUCTURES

5-4-1 Robot Control

Convention Center, 260 2:00PM–3:45PM

Session Organizer: Ho-Hoon Lee, *Southeastern Louisiana University, Hammond, LA, United States*

Session Co-Organizer: Ahmad Bataineh, *Jordan University of Science and Technology, Irbid, Jordan*

2:00pm – Dynamic Simulation and Control of a Roller Conveyor

Technical Paper Publication. IMECE2019-11709
Bradford Range, *Acorn Product Development, Roswell, GA, United States*

2:21pm – Control Simulations for a Stewart Platform Compensator Mounted on Moving Base

Technical Paper Publication. IMECE2019-10780
Takeyuki Ono, **Ryosuke Eto**, **Junya Yamakawa**, *The National Defense Academy, Yokosuka, Kanagawa, Japan*, **Hidenori Murakami**, *University of California, San Diego, La Jolla, CA, United States*

2:42pm – Robust Control-Oriented Modeling of a Feedback-Linearized Powered Pediatric Lower-Limb Orthosis

Technical Paper Publication. IMECE2019-10503
Curt A. Laubscher, **Jerzy T. Sawicki**, *Cleveland State University, Cleveland, OH, United States*

3:03pm – Using EMG Signals to Remotely Control a 3D Industrial Robotic Arm

Technical Paper Publication. IMECE2019-10234
Wafa Batayneh, **Ahmad Bataineh**, **Samer Abandeh**,
Mohammad Al-Jarrah, **Mohammad Banisaeed**, **Bara'ah Alzo'ubei**, *Jordan University of Science and Technology, Irbid, Jordan*

3:24pm – Control Design of a Mobile Robot in the Environment of Obstacles Based on a Rounded V-Shape Lyapunov Function

Technical Paper Publication. IMECE2019-10989
Ho-Hoon Lee, *Southeastern Louisiana University, Hammond, LA, United States*

5-7 SMART STRUCTURES AND STRUCTRONIC SYSTEMS: SENSING, ENERGY GENERATION AND CONTROL

5-7-1 Smart Structures and Structronic Systems I

Convention Center, 259

2:00PM–3:45PM

Session Organizer: Hua Li, *ZheJiang University, HangZhou, China*

Session Co-Organizers: Hiroshi Hosaka, *University of Tokyo, Kashiwa-City, Japan*, Hornsen (HS) Tzou, *University of Kentucky, Lexington, KY, United States*

2:00pm – Improving Power and Frequency Bandwidth of a Magnetic Spring Based Vibration Energy Harvester Using FR4 Spring-Guided Magnet

Technical Paper Publication. IMECE2019-10174

Ghufran Aldawood, Hieu Nguyen, Hamzeh Bardaweel, *Louisiana Tech, Ruston, LA, United States*

2:21pm – Fundamental Study on Friction-Driven Gyroscopic Power Generator Works Under Arbitrary Vibration

Technical Paper Publication. IMECE2019-10474

Aya Watanabe, Ryousuke Yuyama, Hiroshi Hosaka, *University of Tokyo, Kashiwa-City, Japan*, **Akira Yamashita,** *Seigi Mold Co., Ltd., Shiroy-City, Chiba Prefecture, Japan*

2:42pm – A Novel Design of a Large-Stroke Shape Memory Alloy Linear Actuator

Technical Paper Publication. IMECE2019-10831

Fei Yang, Jian Wang, *Harbin Institute of Technology, Harbin, China*, **Miaoling Han,** *Beijing Satellite Manufacturing Factory, Beijing, China*, **Yifan Lu, Honghao Yue, Miao Wu,** *Harbin Institute of Technology, Harbin, China*

3:03pm – Research on Actuation Properties of Shape Memory Alloy Wire-Based Flow Effector Actuator

Technical Paper Publication. IMECE2019-10869

Miao Wu, *Harbin Institute of Technology, Harbin, China*, **Lianmei Wu,** *Beijing Institute of Electronic System Engineering, Beijing, China*, **Fei Yang, Honghao Yue, Hongying Yu, Yifan Lu, Jian Wang, Gang Wang,** *Harbin Institute of Technology, Harbin, China*

3:24pm – Development of Small-Sized Motor-Driven Gyroscopic Power Generator Works Under Low-Frequency Vibration

Technical Paper Publication. IMECE2019-11115

Akio Toyoshima, *University of Tokyo, Kashiwa-shi, Chiba-ken, Japan*, **Hiroshi Hosaka,** *University of Tokyo, Kashiwa-City, Japan*, **Akira Yamashita,** *Seigi Mold Co., Ltd., Shiroy-City, Chiba Prefecture, Japan*

5-11 MOBILE ROBOTS AND UNMANNED GROUND VEHICLES

5-11-1 Mobile Robots and Unmanned Ground Vehicles I

Convention Center, 355C

2:00PM–3:45PM

Session Organizer: Renato Vidoni, *Free University of Bozen-Bolzano, Bolzano, Italy*

2:00pm – Design and Control of a Variable Geometry Hybrid Wheel-Leg

Poster Paper Publication. IMECE2019-10189

Jonivan Artates, *California State Polytechnic University, Irvine, CA, United States*, **Behnam Bahr,** *California State Polytechnic University, Pomona, CA, United States*

2:21pm – Steering Options for Maneuvering a Particle on a Surface

Technical Paper Publication. IMECE2019-10241

Michael Hennessey, *University of St. Thomas, Saint Paul, MN, United States*, **Derek Olson,** *Northrop Grumman, Northridge, CA, United States*, **Cheri Shakiban,** *University of St. Thomas, St. Paul, MN, United States*

2:42pm – Production and Analytics of a Multi-Linked Robotic System

Technical Paper Publication. IMECE2019-10434

Thorstein R. Rykkje, Eystein Gulbrandsen, *Western Norway University of Applied Sciences, Bergen, Norge, Norway*, **Andreas Fosså Hettervik,** *Western Norway University of Applied Sciences, Hundvåg, Norway*, **Morten Kvalvik,** *Western Norway University of Applied Sciences, Sandnes, Sandnes, Norway*, **Daniel Gangstad, Torgeir Oliver Tislevoll,** *Western Norway University of Applied Sciences, Bergen, Norway*, **Stefan Aasebø,** *Western Norway University of Applied Sciences, Hauglandshella, Hordaland, Norway*, **Daniel Vatle Osberg,** *Western Norway University of Applied Science, Indre Arna, Norway*

3:03pm – Stability Measures and Criteria for Autonomous Mobile Robotic Platforms: Analysis, Comparison and Numerical Evaluation

Technical Paper Publication. IMECE2019-10569

Kaveh Nazem Tahmasebi, Roberto Belotti, Karl von Ellenrieder, Renato Vidoni, *Free University of Bozen-Bolzano, Bolzano, Italy*

3:24pm – Coordinated Motion Planning of Legged Mobile Manipulator for Tracking the Given End-Effector's Trajectory

Technical Paper Publication. IMECE2019-11170

Kondalarao Bhavanibhatla, Sulthan S F, Dilip Kumar Pratihari, *Indian Institute of Technology, Kharagpur, Kharagpur, West Bengal, India*

5-2 GENERAL

5-2-1 General Dynamics, Vibration and Control I

Convention Center, 259 4:00PM–5:45PM

Session Organizer: Zhibin Lin, *North Dakota State University, Fargo, ND, United States*

Session Co-Organizer: Xiangqing Tangpong, *North Dakota State University, Fargo, ND, United States*

4:00pm – Nonlinear Design of a Passive Vibration Isolator: Influence of Multi-Axial Stiffness

Technical Paper Publication. IMECE2019-10021

Sudhir Kaul, *Western Carolina University, Cullowhee, NC, United States*

4:21pm – Fatigue Prediction and Correlation for Single and Multiple Degree of Freedom Systems Using a Closed Form Methodology

Technical Presentation. IMECE2019-10109

Tuan Nguyen, *Raytheon, Tustin, CA, United States*

4:42pm – A Framework for Spatial 3D Collision Models: Theory and Numerical Validation

Technical Paper Publication. IMECE2019-10249

Terje Sværen, Bård Inge Nygård, Thomas Impelluso, *Western Norway University of Applied Sciences, Bergen, Norway*

5:03pm – A Quaternion-Based Sliding Mode Observer for Gyro-Bias Estimation and Attitude Reconstruction

Technical Paper Publication. IMECE2019-10464

Yuan Tian, Marc Compere, Sergey Drakunov, *Embry-Riddle Aeronautical University, Daytona Beach, FL, United States*

5:24pm – A Study of Corner Separation in a Linear Compressor Cascade Based on SBES Model

Technical Paper Publication. IMECE2019-10536

Bingxiao Lu, Jinfang Teng, Mingmin Zhu, Xiao-Qing Qiang, Wei Ma, *Shanghai Jiao Tong University, Shanghai, China*

5-4 DESIGN AND CONTROL OF ROBOTS, MECHANISMS AND STRUCTURES

5-4-2 Robot Design

Convention Center, 260 4:00PM–5:45PM

Session Organizer: Ming Huang, *University of San Diego, San Diego, CA, United States*

Session Co-Organizer: Sebastian Roa Prada, *Universidad Autónoma de Bucaramanga, Floridablanca, Santander, Colombia*

4:00pm – Theoretical, Experimental, and Numerical Analyses for Painlevé Paradox of Two-Link Robotic Manipulator System

Technical Paper Publication. IMECE2019-10789

Sai Zhang, Yunian Shen, Jiongcan Yang, *Nanjing University of Science and Technology, Nanjing, Jiangsu, China*

4:21pm – Design, Modeling and Analysis of a Novel Reconfigurable Wheeled Robot With Elastic Actuated Mechanism

Technical Paper Publication. IMECE2019-12030

Tamer Attia, *Military Technical College, Cairo, Egypt*, **Tomonari Furukawa**, *Virginia Tech, Blacksburg, VA, United States*

4:42pm – Computer Aided Methodology for the Optimization of an Electric Motorcycle Suspension

Technical Paper Publication. IMECE2019-12160

Dany Pabón Villamizar, *Universidad Autónoma de Bucaramanga, Bucaramanga, Colombia*, **Sebastian Roa Prada**, *Universidad Autónoma de Bucaramanga, Floridablanca, Santander, Colombia*

5:03pm – On Dimension Synthesis of Hart's Inversor III Straight-Line Mechanism as a Precision Robotic End-of-Arm Tool

Technical Paper Publication. IMECE2019-11522

Ming Huang, *University of San Diego, San Diego, CA, United States*

5-6 DYNAMICS AND CONTROL IN MICRO/NANO ENGINEERING

5-6-1 Dynamics and Control in Micro/Nano Engineering I

Convention Center, 355F

4:00PM–5:45PM

Session Organizer: Dumitru Caruntu, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

Session Co-Organizers: Pezhman Hassanpour Asl, *Loyola Marymount University, Los Angeles, CA, United States*, **Louay S. Yousuf**, *San Diego State University, San Diego, CA, United States*

4:00pm – Influence of Timestep and Mesh Sizes on Numerical Simulations of Boundary Value Problem Model of Electrostatically Actuated MEMS Resonators

Technical Paper Publication. IMECE2019-11192

Julio Beatriz, Dumitru Caruntu, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

4:21pm – Investigation of Sub Synchronous Vibration of Very High Speed Turbocharger Semi-Floating Bearing System: Prediction vs Test

Technical Paper Publication. IMECE2019-11986

Prasanth R Vengala, Lokesh Chandrasekaran, Praveen Kumar Selvaraj, Subramani D A, *Turbo Energy Private Limited, Chennai, India*

4:42pm – Controlled Separation of Microspheres Using Whispering Gallery Mode Forces

Poster Presentation. IMECE2019-13112

Yuhe Chang, *Boston University, Allston, MA, United States*, **Sean Andersson**, *Boston University, Boston, MA, United States*

5:03pm – Nonlinear Dynamics Behavior of a Pear Cam With Roller Follower Mechanism

Technical Paper Publication. IMECE2019-10047

Louay S. Yousuf, *San Diego State University, San Diego, CA, United States*, Dan B. Marghitu, *Auburn University, Auburn, AL, United States*

5:24pm – Development of Contactless Torque Sensor Based on SAW Resonators

Technical Paper Publication. IMECE2019-10702

Wei Han, Xiongzhu Bu, Yihan Cao, Miaomiao Xu, *Nanjing University of Science and Technology, Nanjing, China*

5-11 MOBILE ROBOTS AND UNMANNED GROUND VEHICLES**5-11-2 Mobile Robots and Unmanned Ground Vehicles II**

Convention Center, 355C

4:00PM–5:45PM

Session Organizer: Renato Vidoni, *Free University of Bozen-Bolzano, Bolzano, Italy*

4:00pm – Position Correcting Control System for the Vacuum Cleaning Robot Considering Hose Repulsion

Technical Paper Publication. IMECE2019-11176

Takaya Tsuno, Tatsuhiko Morimoto, Matsui Hirokazu, Kenichi Yano, *Mie University, Tsu, Japan*, Toyohisa Mizuochi, Toshihiko Arima, Shigeru Fukui, *Shinagawa Furnace, Ota, Japan*

4:21pm – A Real-Time Image Matching Algorithm for Binocular Stereo Measurement System

Technical Paper Publication. IMECE2019-11185

Jianyu Duan, Lingyu Sun, Lijun Li, *Beihang University, Beijing, China*, Zongmiao Dai, Zhenkai Xiong, *Zhengzhou Electromechanical Engineering Research Institute, Zhengzhou, China*, Jinxi Wang, *Beihang University, Beijing, China*

4:42pm – A Preliminary Study of Active Stabilization for Agricultural Machines Using a Movable Mass

Technical Paper Publication. IMECE2019-11507

Marco Bietresato, Roberto Belotti, Karl von Ellenrieder, Fabrizio Mazzetto, *Free University of Bozen-Bolzano, Bolzano, Italy*

5:03pm – Design and Optimization of LIDAR Based 3D Point Cloud Parsers and Algorithms for Mobile Robotics Applications

Technical Paper Publication. IMECE2019-11882

Michael Benvenuto, Akin Tatoglu, *University of Hartford, West Hartford, CT, United States*

5:24pm – ROS Based Adjustable Resolution Compact 3D Scanner

Technical Paper Publication. IMECE2019-11892

Scott Dion, Akin Tatoglu, *University of Hartford, West Hartford, CT, United States*

WEDNESDAY, NOVEMBER 13

5-2 GENERAL

5-2-2 General Dynamics, Vibration and Control II
Convention Center, 255D 10:45AM–12:30PM

Session Organizer: Zhibin Lin, *North Dakota State University, Fargo, ND, United States*

Session Co-Organizer: Xiangqing Tangpong, *North Dakota State University, Fargo, ND, United States*

10:45am – Analysis of the Effect by Applying a Torque Converter to the Electric Vehicle

Technical Presentation. IMECE2019-10997
Seongeun Park, Jaeheon Lee, Seokjoon Kim, *Hyundai Motor Company, Hwaseong-si, Gyeonggi-do, Korea (Republic)*

11:06am – Vibration Correction With Kalman Filtering Based Data Fusion for Absolute Gravimeters

Technical Paper Publication. IMECE2019-11008
Yi Wen, Kang Wu, Zhenxing Li, Jiamin Yao, Meiyang Guo, Lijun Wang, *Tsinghua University, Beijing, China*

11:27am – Influence of Vibration Characteristics of Agricultural Tire on Transfer Characteristics of Lug Excitation Force and Shaft Force

Technical Paper Publication. IMECE2019-11055
Katsuhide Fujita, *National Institute of Technology, Ube College, Ube, Japan,* **Takashi Saito,** *Yamaguchi University, Ube, Yamaguchi, Japan,* **Mitsugu Kaneko,** *Yanmar Co., Ltd., Maibara, Japan*

11:48am – Robust Weed Recognition Through Color Based Image Segmentation and Convolution Neural Network Based Classification

Technical Paper Publication. IMECE2019-11077
M. Nazmuzzaman Khan, Sohel Anwar, *Indiana University Purdue University Indianapolis, Indianapolis, IN, United States*

12:09pm – Design of Metallic Support for Electronic Devices Installed on the Interstage 2/3 of Vega-C Launcher

Technical Paper Publication. IMECE2019-11150
Francesco Di Caprio, Domenico Cristillo, GiovanGiuseppe Giusto, *CIRA SCpA, Capua, Italy,* **Antonio Zallo,** *Avio S.p.a., Colleferro, Italy*

5-4 DESIGN AND CONTROL OF ROBOTS, MECHANISMS AND STRUCTURES

5-4-3 Mechanism Design I
Convention Center, 255E 10:45AM–12:30PM

Session Organizer: Ayse Tekes, *Kennesaw State University, Marietta, GA, United States*

Session Co-Organizer: Kiwon Sohn, *University of Hartford, West Hartford, CT, United States*

10:45am – Upper Body Development of Full-Sized Humanoid, HART, for Vehicle-Driving Task

Technical Paper Publication. IMECE2019-10192
Kiwon Sohn, Mark Markiewicz, *University of Hartford, West Hartford, CT, United States*

11:06am – A Novel Framework of Lightweight Optimization Design of a Prototype Wafer Stage With Control Verification

Technical Paper Publication. IMECE2019-10896
Yujie Li, Ming Zhang, Yu Zhu, Xin Li, Leijie Wang, *Tsinghua University, Beijing, China*

11:27am – Integrated Optimization of Structure and Control in Ultra-Precision Motion Systems

Technical Paper Publication. IMECE2019-11206
Jing Wang, Ming Zhang, Yu Zhu, Xin Li, Leijie Wang, *Tsinghua University, Beijing, China*

11:48am – Designing a Robotic Mechanism for Cleaning Trench Drains

Technical Paper Publication. IMECE2019-11762
ADITHYA KAUSHIK, Janet Dong, Ce Gao, Hazem Elzarka, *University of Cincinnati, Cincinnati, OH, United States*

12:09pm – Design and Development of Flexible Systems Load Deflection Tester

Technical Paper Publication. IMECE2019-10769
Ayse Tekes, Mohammed Mayeed, Kevin McFall, *Kennesaw State University, Marietta, GA, United States*

5-13 STOCHASTIC OPTIMIZATION, UNCERTAINTY AND PROBABILITY

5-13-1 Stochastic Optimization, Uncertainty and Probability
Convention Center, 155B 10:45AM–12:30PM**10:45am – Tensor Random Fields in Mechanics**

Technical Presentation. IMECE2019-11072
Martin Ostoja-Starzewski, *University of Illinois Urbana, Urbana, IL, United States*

11:06am – Uncertainty Quantification in Presence of Real, Limited Data via Super-Ellipsoidal Calculus: General Theory

Technical Presentation. IMECE2019-12145
Isaac Elishakoff, *Florida Atlantic University, Boca Raton, FL, United States*

11:27am – An Advanced Edge-Detection Method for Noncontact Structural Displacement Monitoring
Technical Presentation. IMECE2019-12796
 Xin Bai, Mijia Yang, *North Dakota State University, Fargo, ND, United States*

11:48am – Drive-by Bridge Damage Identification Through Virtual Simulations
Technical Presentation. IMECE2019-12797
 Mijia Yang, Chang Liu, *North Dakota State University, Fargo, ND, United States*

12:09pm – Design of Dynamic Plant Model and Model-Based Controller for Hot Blast Stove
Technical Presentation. IMECE2019-13333
 Jaeyoung Cho, *Seoul National University, Seoul, Korea (Republic)*, Kwanghwa Kim, Changyong Oh, Hyundeok Kim, Yootaek Jeon, *Hyundai Steel, Dangjin-si, Korea (Republic)*, Han Ho Song, *Seoul National University, Seoul, Korea (Republic)*

5-2 GENERAL

5-2-3 General Dynamics, Vibration and Control III Convention Center, 255D 2:00PM–3:45PM

Session Organizer: Zhibin Lin, *North Dakota State University, Fargo, ND, United States*

Session Co-Organizer: Xiangqing Tangpong, *North Dakota State University, Fargo, ND, United States*

2:00pm – Simultaneous and Iterative Estimation of Vehicle Ride Model States and Parameters
Technical Paper Publication. IMECE2019-11260
 Lakshmi S, Krishna Kumar Ramarathnam, *Indian Institute of Technology Madras, Chennai, TamilNadu, India*

2:21pm – Soot Mass Estimation From Electrical Capacitance Tomography Imaging for a Diesel Particulate Filter
Technical Paper Publication. IMECE2019-11295
 Salah E.K. Hassan, Sohel Anwar, *Indiana University Purdue University Indianapolis, Indianapolis, IN, United States*

2:42pm – Effect of Silicone Damping on Work Vibration in CNC Milling Process
Technical Paper Publication. IMECE2019-11346
 Ahm Rahman, Issam Abu-Mahfouz, Scott Carbaugh, *Penn State Harrisburg, Middletown, PA, United States*

3:03pm – Combining FEA and Field Measurement Techniques for Dynamic Machinery Foundation Design
Technical Paper Publication. IMECE2019-11846
 Seth Cunningham, Benjamin A. White, Nathan Poerner, *Southwest Research Institute, San Antonio, TX, United States*

3:24pm – Autonomous Detection of PV Panels Using a Drone
Technical Paper Publication. IMECE2019-12080
 Hesham Ismail, *DEWA, Dubai, United Arab Emir.*, Rufaidah Chikte, Akash Bandyopadhyay, *Amity University, Dubai, Dubai, United Arab Emir.*, Nawal Al Jasmi, *DEWA, Dubai, Dubai, United Arab Emir.*

5-4 DESIGN AND CONTROL OF ROBOTS, MECHANISMS AND STRUCTURES

5-4-4 Mechanism Design II

Convention Center, 255E

2:00PM–3:45PM

Session Organizer: Hong Zhou, *Texas A&M University-Kingsville, Kingsville, TX, United States*

Session Co-Organizer: Kiwon Sohn, *University of Hartford, West Hartford, CT, United States*

2:00pm – Miniature Humanoid Upgrade for Material Handling Tasks in Humanoid Challenge
Technical Paper Publication. IMECE2019-10193
 Kiwon Sohn, *University of Hartford, West Hartford, CT, United States*, Jeongkyu Lee, *University of Bridgeport, Bridgeport, CT, United States*, Kevin Huang, *Trinity College, Hartford, CT, United States*

2:21pm – Design, Modeling, and Development of a Compliant Dual Resonator-Isolator
Technical Paper Publication. IMECE2019-10299
 Boris Jerkovic, Abram Rowell, Nathan Ellis, Ayse Tekes, *Kennesaw State University, Marietta, GA, United States*

2:42pm – An Experimental Investigation of Electrorheological Fluid Damper Recoil System Used in Heavy Duty Application
Technical Paper Publication. IMECE2019-10424
 Santosh Patil, *Rajarambapu Institute of Technology Rajaramnagar, Sangli, Maharashtra, India*, S. Krishna, *MSRIT, Bangalore, Maharashtra, India*, Sanjaykumar Gawade, R.G. Desavale, *Rajarambapu Institute of Technology Rajaramnagar, Sangli, Maharashtra, India*

3:03pm – Flow Control and Separation Delay in Morphing Wing Aircraft Using Traveling Wave Actuation
Poster Presentation. IMECE2019-13830
 Anthony Olivett, Mostafa Tavakkoli Anbarani, M. Amin Karami, *State University of New York at Buffalo, Buffalo, NY, United States*

3:24pm – Designing and Analyzing Savonius Wind Turbines
Technical Paper Publication. IMECE2019-10761
 Varun Manne, Hong Zhou, *Texas A&M University-Kingsville, Kingsville, TX, United States*

5-2 GENERAL

5-2-4 General Dynamics, Vibration and Control IV Convention Center, 255D 4:00PM–5:45PM

Session Organizer: Zhibin Lin, *North Dakota State University, Fargo, ND, United States*

Session Co-Organizer: Xiangqing Tangpong, *North Dakota State University, Fargo, ND, United States*

4:00pm – Structural Dynamic Stress Analysis by Hybrid Methods

Technical Paper Publication. IMECE2019-12179
Jakerson Gevinski, *Federal Institute of Rio Grande do Sul, Erechim, Rio Grande do Sul, Brazil*

4:21pm – Modal and Harmonic Analysis of Girth Gear With Dual Mesh Pinions by Using Finite Element Method

Technical Paper Publication. IMECE2019-12198
Venkatesan Venkataraman, *FLSmidth Pvt. Ltd., Kelambakkam, Tamil Nadu, India,* **Malarmohan Keppanan,** *Guindy - Anna University, Chennai, Tamil Nadu, India,* **Vinoth Dhanasekaran,** *FLSmidth Pvt. Ltd., Kelambakkam, Tamil Nadu, India*

4:42pm – Vibration Performance of Axially Graded Polymeric Viscoelastic Beams

Technical Paper Publication. IMECE2019-12214
Mariona Heras Segura, Kumar Singh, Fazeel Khan, *Miami University, Oxford, OH, United States*

5:03pm – The Vibration and Modal Power Flow Analysis of a Functionally Graded Material Beam With an Open Crack

Technical Paper Publication. IMECE2019-12265
Xiaotian Liang, Tianyun Li, *Huazhong University of Science and Technology, Wuhan, Hubei Province, China,* **Xing Heng,** *Luoyang Institute of Electro-Optical Equipment, Luoyang, China,* **Xiaofang Hu,** *China Ship Development and Design Center, Wuhan, China,* **Xiang Zhu,** *Huazhong University of Science and Technology, Wuhan, China*

5:24pm – Control Co-Design: Achieving New Functionality and Performance Via Integrated Physical and Control System Design

Technical Presentation. IMECE2019-13707
James Allison, *University of Illinois at Urbana-Champaign, Urbana, IL, United States,* **Dan Herber,** *Colorado State University, Fort Collins, CO, United States*

5-4 DESIGN AND CONTROL OF ROBOTS, MECHANISMS AND STRUCTURES

5-4-5 Compliant Mechanisms Convention Center, 255E 4:00PM–5:45PM

Session Organizer: Hong Zhou, *Texas A&M University-Kingsville, Kingsville, TX, United States*

Session Co-Organizer: Ayse Tekes, *Kennesaw State University, Marietta, GA, United States*

4:00pm – Design and Analysis of a Monolithic Compliant Dwell Mechanism

Technical Paper Publication. IMECE2019-10067
Hongkuan Lin, Ayse Tekes, *Kennesaw State University, Marietta, GA, United States*

4:21pm – Dynamic Characterization and Modeling of Flexure Based Planar Mechanism

Technical Paper Publication. IMECE2019-10291
Trevor Warnix, Ayse Tekes, Kevin McFall, Coskun Tekes, *Kennesaw State University, Marietta, GA, United States*

4:42pm – Optimal Design for Deployable Structures Using Origami Tessellations

Technical Paper Publication. IMECE2019-11062
Carolina Cardona, Andres Tovar, Sohel Anwar, *Indiana University-Purdue University Indianapolis, Indianapolis, IN, United States*

5:03pm – Dynamic Modelling of an Elephant Trunk Like Flexible Bionic Manipulator

Technical Paper Publication. IMECE2019-11113
Mrunal Kanti Mishra, Arun Kumar Samantaray, Goutam Chakraborty, Aditya Jain, *Indian Institute of Technology Kharagpur, Kharagpur, West Bengal, India,* **Pushparaj Mani Pathak,** *Indian Institute of Technology, Roorkee, Roorkee, Uttarakhand, India,* **Rochdi Merzouki,** *Université de Lille, Lille, France*

5:24pm – Synthesis of Flexure Based Translational Springs

Technical Paper Publication. IMECE2019-10763
Abhijit Chattopadhyay, Hong Zhou, *Texas A&M University-Kingsville, Kingsville, TX, United States*

TRACK 6 ENERGY

- 6-1-1: Modelling of Energy-Related Components**
- 6-1-2: Experimental Analysis on Energy-Related Materials and Components**
- 6-1-3: Energy-Related Scenarios and Theoretical Studies**
- 6-2-1: Thermodynamics of Thermal and Cooling Processes**
- 6-2-2: Energy and Exergy Analysis of Power Cycles**
- 6-2-3: Chemical Thermodynamic Processes**
- 6-3-1: Thermoconomics**
- 6-4-1: Energy Harvesting Devices**
- 6-4-2: Stirling Engines and Flywheel Batteries**
- 6-4-3: Advanced Power Cycles and Chemical Processes**
- 6-4-4: Design and Analysis of Energy Systems – 1**
- 6-4-5: Design and Analysis of Energy Systems – 2**
- 6-5-1 Energy Systems Components – 1**
- 6-5-2: Energy Systems Components – 2**
- 6-6-1: Low temperature Energy Conversion Systems**
- 6-7-1: Thermal Energy Storage I**
- 6-7-2: Thermal Energy Storage II**
- 6-7-3: Thermal Energy Storage III**
- 6-8-1: Environmental Aspects of Energy Systems**
- 6-9-1: Performance Evaluations of Envelops and Materials of Buildings and HVAC Systems**
- 6-9-2: Innovations in HVAC Systems**
- 6-9-3: Control and Optimization of Energy Systems for Buildings**
- 6-10-1: Renewable Energy 1**
- 6-10-2: Renewable Energy 2**
- 6-10-3: Renewable Energy 3**
- 6-10-4: Renewable Energy 4**
- 6-11-1: Lithium Batteries and Beyond**
- 6-11-2: Modeling of Lithium Batteries**
- 6-11-3: Electrochemical Systems – Materials and Optimization**
- 6-12-1: Fuel Cells and Electrolyzers**
- 6-12-2: PEM Fuel Cells**
- 6-14-1: Nuclear Power Plants: Design, Analysis, and Safety – I**
- 6-14-2: Nuclear Power Plants: Design, Analysis, and Safety – II**
- 6-16-1: Biomass Technologies and Conversion for Bioenergy**
- 6-16-2: Biomass Technologies and Conversion for Biofuel**
- 6-19-1: Plenary Session I**
- 6-19-2: Plenary Session II**

ACKNOWLEDGMENT

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TRACK 6 ENERGY

MONDAY, NOVEMBER 11

6-19 PLENARY SESSIONS

6-19-1 Plenary Session I

Convention Center, 255F

9:45AM–10:30AM

9:45am – Battery State Estimation: A technology Where the Mechanical, Thermal, Electrical and Chemical Engineering Disciplines Merge

Plenary Presentation. IMECE2019-13997

Anna Stefanopoulou, *University of Michigan, Ann Arbor, MI, United States*

6-1 ENERGY-RELATED MULTIDISCIPLINARY

6-1-1 Modelling of Energy-Related Components

Convention Center, 258

10:45AM–12:30PM

Session Organizer: Ahmed Elatar, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*

Session Co-Organizer: Mahmoud Elsharafi, *Midwestern State University, Wichita Falls, TX, United States*

10:45am – Modelling of Gruppo Aturia Submersible Centrifugal Pump Impeller Using Computational Fluid Dynamics

Technical Presentation. IMECE2019-10072

Kingsley Okechukwu Ikebudu, *Sunday Ifeanyi Chukwu Iwenofu, Chukwuemeka Odumegwu Ojukwu University, Nigeria, Uli, Anambra, Nigeria*, Peter Chukwuma Okoye, *Federal Polytechnic, Owerri, Imo, Nigeria*, A.U. Iwuoha, *Imo State University, Owerri, Imo, Nigeria*, Kingsley A. Azodo, *Federal Polytechnic, Owerri, Imo, Nigeria*

11:06am – Simulation Model Uncertainty Quantification and Model Calibration for Natural Gas Compressor Units

Technical Paper Publication. IMECE2019-11227

Tingting Wei, Dengji Zhou, Qinbo Yao, Huisheng Zhang, Zhenhua Lu, *Shanghai Jiao Tong University, Shanghai, China*

11:27am – Modeling of Pressure Exchanger for Energy Recovery on Trans Critical CO₂ Refrigeration Cycle

Technical Paper Publication. IMECE2019-11616

Ahmed Elatar, Kashif Nawaz, Brian Fricke, Vishaldeep Sharma, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*

11:48am – Modeling of Li-Si Battery Materials through Spatial Decomposition Neural Network Force Fields (SNNFFs)

Technical Presentation. IMECE2019-13124

Alejandro Rodriguez, Ming Hu, *University of South Carolina, Columbia, SC, United States*

12:09pm – Recycling Li-Ion Batteries: Robotic Disassembly of Electric Vehicle Battery Systems

Technical Paper Publication. IMECE2019-11949

Ian Kay, Roja Esmaeeli, Seyed Reza Hashemi, Ajay Mahajan, Siamak Farhad, *University of Akron, Akron, OH, United States*

6-3 THERMOECONOMICS

6-3-1 Thermoeconomics

Convention Center, 257

10:45AM–12:30PM

Session Organizer: Hamidreza Shabgard, *University of Oklahoma, Norman, OK, United States*

Session Co-Organizer: Vittorio Verda, *Dip Energetica Politech, Torino, Italy*

10:45am – A Process Plant for Producing Rocket Fuel From Lunar Ice

Technical Paper Publication. IMECE2019-10270

Peter Carrato, *Bechtel Corp., Reston, VA, United States*, Jack Demitz, *engNoveX, Wilmington, DE, United States*, Robert Mueller, *NASA, Kennedy Space Center, FL, United States*, John Gulen, *Bechtel Infrastructure & Power, Inc., Reston, VA, United States*, August Benz, *Bechtel Corp., Reston, VA, United States*

11:06am – Exergoeconomic Analysis for Combined Heat and Power (CHP) Plants Using Supercritical CO₂ Closed Power Cycle

Technical Presentation. IMECE2019-10590

Tatiana Morosuk, Mohamed Noaman, Mohamad Alshurbaji, George Tsatsaronis, *Technical University Berlin, Berlin, Germany*

11:27am – Conventional and Advanced Exergoeconomic Analysis in a Nitric Acid Production Plant

Technical Paper Publication. IMECE2019-10642

Juan Fajardo, Ana Buelvas, *Universidad Tecnológica de Bolívar, Cartagena, Colombia*, Harold Valle, *University of Puerto Rico, Mayaguez, PR, United States*

11:48am – Pinch Optimization of C3MR LNG Plant using Genetic Algorithm

Technical Presentation. IMECE2019-10850

Tatiana Morosuk, Yahya Naja, Eko Primabudi, George Tsatsaronis, *Technical University Berlin, Berlin, Germany*

12:09pm – Thermoeconomic Analysis of a Novel Zero Liquid-Discharge Eutectic-Freeze Desalination System

Technical Presentation. IMECE2019-12662

Hamidreza Shabgard, Ramkumar Parthasarathy, Jie Cai, *University of Oklahoma, Norman, OK, United States*

6-1 ENERGY-RELATED MULTIDISCIPLINARY

6-1-2 Experimental Analysis on Energy-Related Materials and Components

Convention Center, 258 **2:00PM–3:45PM**

Session Organizer: Mahmoud Elsharafi, *Midwestern State University, Wichita Falls, TX, United States*

Session Co-Organizer: Kamau Wright, *University of Hartford, West Hartford, CT, United States*

2:00pm – Experimental Investigation of a Membrane Distillation System Using Solar Evacuated Tubes

Technical Paper Publication. IMECE2019-11486
Ahmad Bamasag, Talal Alqahtani, Shahnawaz Sinha,
Arizona State University, Tempe, AZ, United States, Patrick
Phelan, Arizona State University, Scottsdale, AZ, United States

2:21pm – Plasma Decomposition of Carbon Dioxide: Simulations and Experiments

Technical Paper Publication. IMECE2019-12059
Kamau Wright, Robert Galvez, *University of Hartford, West*
Hartford, CT, United States

2:42pm – Recycling Lithium-Ion Battery: Mechanical Separation of Mixed Cathode Active Materials

Technical Paper Publication. IMECE2019-10755
Hammad Al-Shammari, Roja Esmaeeli, Haniph
Aliniagerdroudbari, *University of Akron, Akron, OH, United*
States, Muapper Alhadri, University of Akron, Cuyahoga Falls,
OH, United States, Seyed Reza Hashemi, University of Akron,
Akron, OH, United States, Hadis Zarrin, Ryerson University,
Toronto, ON, Canada, Siamak Farhad, University of Akron,
Akron, OH, United States

3:03pm – Preformed Particle Gels (PPGs) Compressibility Measurements in the Reservoirs Channels

Technical Paper Publication. IMECE2019-10043
Mahmoud Elsharafi, *Midwestern State University, Wichita*
Falls, TX, United States

3:24pm – Nanoparticles EOR Aluminum Oxide (Al₂O₃) Used as a Spontaneous Imbibition Test for Sandstone Core

Technical Paper Publication. IMECE2019-10283
Mahmoud Elsharafi, *Midwestern State University, Wichita*
Falls, TX, United States, Mohammed Samba, Moataz Yusef,
Hafsa Hassan, Hamed Burkan, Abdelkareem Eschweido,
Mahjouba Munayr, *Sebha University, Sebha, Libyan Arab*
Jamahiriya

6-5 ENERGY SYSTEMS COMPONENTS

6-5-1 Energy Systems Components – 1

Convention Center, 259 **2:00PM–3:45PM**

Session Organizer: Roberto Capata, *University of Rome,*
Rome, Italy

2:00pm – Optimal Configuration Selection Through Experimental Tests on Branched Heat Exchanger With R134 Organic Fluid

Technical Paper Publication. IMECE2019-10039
Roberto Capata, Alfonso Calabria, *University of Rome,*
Rome, Italy

2:21pm – Steam Turbine Axial Exhaust Diffuser Investigation Using a Test Rig and Its Numerical Model

Technical Paper Publication. IMECE2019-10267
Robert Kalista, *Doosan Skoda Power, Pilsen, Czech Republic,*
Lukas Mrozek, *University of West Bohemia, Pilsen, Czech*
Republic, Vaclav Slama, Kamil Sedlak, Doosan Skoda Power,
Pilsen, Czech Republic

2:42pm – Influence of Oil Volume Upon Operation and Performance of Screw Machines With High Built-In Volume Ratio

Technical Paper Publication. IMECE2019-10481
Nikola Stosic, *City University London, London, United*
Kingdom

3:03pm – The Design and Analysis of a New Solar-Module Automated Cleaner

Technical Paper Publication. IMECE2019-10808
Oscar Martin-Garcia, *Saint Martin's University, Yelm, WA,*
United States, Brianna M. Huhmann, Saint Martin's University,
Puyallup, WA, United States, Alec Dryden, Shawn Duan, Saint
Martin's University, Lacey, WA, United States

3:24pm – Latest Status of the Rimrock, AZ WINDGRABBER(R) Prototype Field Test Unit

Technical Presentation. IMECE2019-13039
Brett C. Krippene, *BCK Consulting, LLC, Rimrock, AZ, United*
States, Jeffrey A Rogers, Czero, Fort Collins, CO, United
States, Navid Goudarzi, University of North Carolina at
Charlotte, Charlotte, NC, United States

6-1 ENERGY-RELATED MULTIDISCIPLINARY

6-1-3 Energy-Related Scenarios and Theoretical Studies

Convention Center, 258 **4:00PM–5:45PM**

Session Organizer: Andrea Lazzaretto, *University of Padua, Padova, Italy*

4:00pm – Achieving Climate Control With Renewable Energy

Technical Paper Publication. IMECE2019-10751
Drew Bower, Michael Bielski, Evan Mangan, Daniel Schell, Kasra Ghahremani, David Gee, *Gannon University, Erie, PA, United States*

4:21pm – Violations of the Second Law of Thermodynamics

Technical Presentation. IMECE2019-11070
Martin Ostoja-Starzewski, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

4:42pm – A Biomass Supply Chain Optimization Framework With Linear Approximation of Biomass Yield Distributions for Improved Land Use

Technical Paper Publication. IMECE2019-11399
Nathanial Cooper, Anna Panteli, Nilay Shah, *Imperial College London, London, United Kingdom*

5:03pm – Quantifying the Energy Usage of the Texas Residential Sector With 100% Electrified Space Heating

Technical Presentation. IMECE2019-13615
Philip White, *Webber Energy Group, Austin, TX, United States,*
Joshua Rhodes, Michael Webber, *University of Texas at Austin, Austin, TX, United States*

6-5 ENERGY SYSTEMS COMPONENTS

6-5-2 Energy Systems Components – 2

Convention Center, 259 **4:00PM–5:45PM**

Session Organizer: Roberto Capata, *University of Rome, Rome, Italy*

4:00pm – Experimental and Numerical Investigations of Pressure Loss and 3-D Flow Separations in a Linear Compressor Cascade

Technical Paper Publication. IMECE2019-10686
Saeed A. El-Shahat, *Xi'an Jiaotong University, Xi'an, Shaanxi, China,*
Hesham M. El-Batsh, Ali M.A. Attia, *Benha University, Benha, Qalyobiya, Egypt,*
Guojun Li, Lei Fu, *Xi'an Jiaotong University, Xi'an, Shaanxi, China*

4:21pm – Comparative Energy and Exergy Analysis of Proposed Gas Turbine Cycle With Simple Gas Turbine Cycle at Same Operational Cost

Technical Paper Publication. IMECE2019-10949
Mohammad Khan, Ibrahim Alarifi, Iskander Tlili, *Majmaah University, Majmaah, Riyadh, Saudi Arabia*

4:42pm – Stirling Engine Robust Foil Regenerator Efficiency

Technical Paper Publication. IMECE2019-11382
Koji Yanaga, Yuan Gao, Ruijie Li, Songgang Qiu, *West Virginia University, Morgantown, WV, United States*

5:03pm – Axial Flow Turbine Aerodynamic Shape Design Optimization

Technical Presentation. IMECE2019-12706
Nader Elqussas, *Military Technical College, Cairo, Egypt*

5:24pm – Steam Generation for EHOR Using PTC System Modeled in SAM

Technical Paper Publication. IMECE2019-10332
Yusef Gharbia, Mohamed Fayed, *American University of the Middle East, Eqaila, Kuwait,*
Mohammed Anany, *Arab Academy for Science, Technology & Maritime Transport, Alexandria, Egypt*

TUESDAY, NOVEMBER 12

6-19 PLENARY SESSIONS

6-19-2 Plenary Session II

Convention Center, 255B

9:45AM–10:30AM

9:45am – Solar Combined Heating, Cooling, and Power Systems Based on Hybrid PV-Thermal Technology

Plenary Presentation. IMECE2019-13998

Christos Markides, Imperial College London, London, United Kingdom

6-2 FUNDAMENTALS AND APPLICATIONS OF THERMODYNAMICS

6-2-1 Thermodynamics of Thermal and Cooling Processes

Convention Center, 155A

10:45AM–12:30PM

Session Organizer: Michail Nitsas, National Technical University of Athens, Zografou, Greece

Session Co-Organizer: Irene Koronaki, National Technical University of Athens, Zografou, Attiki, Greece

10:45am – Computational Analysis of Cryogenic Stirling Refrigerator

Technical Paper Publication. IMECE2019-10076

George-Rafael Domenikos, Panagiotis Bitsikas, Emmanouil Rogdakos, National Technical University of Athens, Athens, Greece

11:06am – Thermodynamic Modelling of Superfluid Stirling Cryocoolers

Technical Paper Publication. IMECE2019-10077

George-Rafael Domenikos, Panagiotis Bitsikas, Emmanouil Rogdakos, National Technical University of Athens, Athens, Greece

11:27am – Human-Powered Desalination Unit

Technical Paper Publication. IMECE2019-12046

Andrew Williamson, Khaled Sallam, Oklahoma State University, Tulsa, OK, United States

11:48am – Development of the Control and Acquisition System for a Natural-Gas Spark-Ignition Engine Test Bench

Technical Paper Publication. IMECE2019-11485

Jinlong Liu, West Virginia University, Morgantown, WV, United States, Lorenzo Gasbarro, Università degli Studi di Perugia, Perugia, Italy, Christopher Ulishney, Cosmin Dumitrescu, West Virginia University, Morgantown, WV, United States, Luca Ambrogio, Università degli Studi di Perugia, Perugia, Italy, Michele Battistoni, University of Perugia, Perugia, Italy

12:09pm – Multi-Parametric Thermodynamic Analysis of a Solar Cooling System in Terms of Thermal Energy Production and Cooling

Technical Presentation. IMECE2019-10725

Michail Nitsas, Irene Koronaki, National Technical University of Athens, Zografou, Greece

6-4 DESIGN AND ANALYSIS OF ENERGY CONVERSION SYSTEMS

6-4-1 Energy Harvesting Devices

Convention Center, 155B

10:45AM–12:30PM

Session Organizer: Mohammadsadegh Saadatzi, University of South Carolina, Columbia, SC, United States

Session Co-Organizer: Roberto Carapellucci, University of L'Aquila, L'Aquila, Italy

10:45am – High Voltage Energy Harvesting From Embedded PVDF Harvester Inspired From Metamaterial Design

Technical Paper Publication. IMECE2019-10749

Mohammadsadegh Saadatzi, University of South Carolina, Columbia, SC, United States, Mohammad Nasser Saadatzi, University of Louisville, Louisville, KY, United States, Sourav Banerjee, University of South Carolina, Columbia, SC, United States

11:06am – Theoretical Model for Piezoelectric Energy Harvesting Device Based on Composite Granular Chain of Spheres

Technical Paper Publication. IMECE2019-10824

Bin Wu, Shuo Yang, Xiucheng Liu, Heying Wang, Ting Xiao, Cunfu He, Beijing University of Technology, Beijing, China

11:27am – Maximizing Energy Harvesting of Photovoltaic Panel Full Tracking Optimization

Technical Paper Publication. IMECE2019-11285

Ahmed Abdelmaksoud, Hesham A. Hegazi, Cairo University, Giza, Giza, Egypt, Mohamed El-Morsi, American University In Cairo, Cairo, Egypt, Sayed M. Metwalli, Cairo University, Cairo, Egypt

11:48am – Modelling and Experimental Validation of a Controllable Energy Harvester for Pressure Regulation

Technical Paper Publication. IMECE2019-11514

Youngmok Ko, Shi Miao Yu, Amy M. Bilton, University of Toronto, Toronto, ON, Canada

12:09pm – Self-Powering Gyms: A Case Study on Energy Harvesting From a Static Bicycle

Technical Paper Publication. IMECE2019-11972

Mustafa Ihsan, Vimal Viswanathan, San Jose State University, San Jose, CA, United States

6-16 CMS-BIOFUELS PRODUCTION, CONVERSION, AND SIMULATION

6-16-1 Biomass Technologies and Conversion for Bioenergy

Convention Center, 250A

10:45AM–12:30PM

Session Organizer: Mehdi Esmailpour, *Marshall University, Huntington, WV, United States*

Session Co-Organizer: Omid Askari, *Mississippi State University, Mississippi State, MS, United States*

10:45am – Performance of an Integrated Mild/Partial Gasification Combined (IMPGC) Cycle With Carbon Capture in Comparison With Other Power Systems
Technical Paper Publication. IMECE2019-10279

Henry A. Long, III, *University of New Orleans, Metairie, LA, United States*, **Ting Wang**, *University of New Orleans, New Orleans, LA, United States*

11:06am – Development of a New Stoichiometric Equilibrium-Based Model for Wood Chips and Mixed Paper Waste Gasification by ASPEN Plus

Technical Paper Publication. IMECE2019-10586

Sahar Safarianbana, *University of Iceland, Reykjavik, Iceland*, **Runar Unnthorsson**, *University of Iceland, Faculty of Engineering, Mechanical Engineering and Computer Science, Reykjavik, Iceland*, **Christiaan Richter**, *University of Iceland, Reykjavik, Iceland*

11:27am – Flame Stability in Inverse Coaxial Injector Using Repetitive Nanosecond Pulsed Plasma

Technical Paper Publication. IMECE2019-10991

Saeid Zare, **Hao Wei Lo**, *Mississippi State University, Mississippi State, MS, United States*, **Shrabanti Roy**, *Mississippi State University, Starkville, MS, United States*, **Omid Askari**, *Mississippi State University, Mississippi State, MS, United States*

11:48am – Evolution of Gaseous Species during Corn Straw and Lignite Co-Pyrolysis at Different Temperatures

Technical Presentation. IMECE2019-13402

Xiaohan Ren, **Jian Liu**, **Zheng Cui**, **Yu Liu**, *Shandong University, Jinan, China*, **Lei Zhang**, *Harbin Institute of Technology, Harbin, China*, **Yiannis Levendis**, *Northeastern University, Boston, MA, United States*

6-2 FUNDAMENTALS AND APPLICATIONS OF THERMODYNAMICS

6-2-2 Energy and Exergy Analysis of Power Cycles

Convention Center, 155A

2:00PM–3:45PM

Session Organizer: Michail Nitsas, *National Technical University of Athens, Zografou, Greece*

Session Co-Organizer: Irene Koronaki, *National Technical University of Athens, Zografou, Attiki, Greece*

2:00pm – Maximum Work Production From a Heated Gas in a Cylinder With Piston With Generalized Convective Heat Transfer Law

Technical Presentation. IMECE2019-10115

Lingen Chen, **Kang Ma**, **Huijun Feng**, **Shaojun Xia**, *Naval University of Engineering, Wuhan, China*

2:21pm – Exergy Analyses of a Solar-Biogas Hybrid Micro Gas Turbine for Power Generation

Technical Paper Publication. IMECE2019-11357

Saad Alshahrani, *King Khalid University, Abha, Saudi Arabia*, **Abraham Engeda**, *Michigan State University, East Lansing, MI, United States*

2:42pm – Estimating the Efficiency of a Stirling Engine: Analytical and Experimental Approaches

Technical Paper Publication. IMECE2019-11947

Erhan Ilksoy, *Kennesaw State University, Roswell, GA, United States*, **Chong Tian**, *Clemson University, Clemson, SC, United States*

3:03pm – Determination of the Optimal Range of the Compressor Inlet Air Temperature in a Power Plant With Stig Cycle Through of Advanced Exergetic Analysis

Technical Paper Publication. IMECE2019-10410

Juan Fajardo, **Deybis Barreto**, **Javier Campillo**, *Universidad Tecnológica de Bolívar, Cartagena, Colombia*

3:24pm – First and Second Law Analysis of Geothermal Energy Conversion Systems: A Parametric Study

Technical Presentation. IMECE2019-10736

Michail Nitsas, **Irene Koronaki**, *National Technical University of Athens, Zografou, Greece*

6-4 DESIGN AND ANALYSIS OF ENERGY CONVERSION SYSTEMS

6-4-2 Stirling Engines and Flywheel Batteries

Convention Center, 155B 2:00PM–3:45PM

Session Organizer: Ruijie Li, *West Virginia University, Morgantown, WV, United States*

Session Co-Organizers: Hamidreza Shabgard, *University of Oklahoma, Norman, OK, United States*, Roberto Carapellucci, *University of L'Aquila, L'Aquila, Italy*

2:00pm – Design of a Free Piston Stirling Engine Power Generator

Technical Paper Publication. IMECE2019-10403
Ruijie Li, Yuan Gao, Koji Yanaga, Songgang Qiu, *West Virginia University, Morgantown, WV, United States*

2:21pm – Research on Flywheel Battery With Flux Switching Permanent Magnet Motor and Its Application on Servo Press

Technical Paper Publication. IMECE2019-11044
Chen Liu, Shengdun Zhao, Peng Dong, Peng Zhang, *Xi'an Jiaotong University, Xi'an, Shaanxi, China*

2:42pm – Influence of Heater and Cooler Shape on Beta-Type Stirling Engine

Technical Paper Publication. IMECE2019-11046
Ahmed Abuelyamen, Rached Ben-Mansour, *King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia*

3:03pm – CFD Simulation of an Alfa-Stirling Engine to Study the Geometrical Parameters on the Engine Performance

Technical Paper Publication. IMECE2019-11542
Ana C. Ferreira, Senhorinha Teixeira, Ricardo Oliveira, Jose Teixeira, *University of Minho, Guimarães, Portugal*

3:24pm – Design of a Free Piston Stirling Engine Power Generator

Technical Presentation. IMECE2019-13939
Ruijie Li, Yuan Gao, Koji Yanaga, Songgang Qiu, *West Virginia University, Morgantown, WV, United States*

6-7 THERMAL ENERGY STORAGE

6-7-1 Thermal Energy Storage I

Convention Center, 250A 2:00PM–3:45PM

Session Organizer: D. Yogi Goswami, *University of South Florida, Tampa, FL, United States*

Session Co-Organizer: Kelly Osterman, *University of South Florida, Seminole, FL, United States*

2:00pm – Numerical Investigation of Combined Sensible/Latent Heat Thermal Energy Storage With Supercritical Carbon Dioxide as Heat Transfer Fluid at 650°C

Technical Paper Publication. IMECE2019-10606
Kelly Osterman, *University of South Florida, Seminole, FL, United States*, Diego Guillen, D. Yogi Goswami, *University of South Florida, Tampa, FL, United States*

2:21pm – Study of Heating and Cooling Rate of Cobalt Oxide-Based TCES System Using Experimental Redox Kinetics Analysis

Technical Paper Publication. IMECE2019-10734
Nasser Vahedi, Carlos Romero, Mark A. Snyder, Alparslan Oztekin, *Lehigh University, Bethlehem, PA, United States*

2:42pm – Split Flow Modified Packed Bed Reactor for Cobalt Oxide Based High-Temperature TCES Systems

Technical Paper Publication. IMECE2019-10740
Nasser Vahedi, Alparslan Oztekin, *Lehigh University, Bethlehem, PA, United States*

3:03pm – Thermal Energy Grid Storage (TEGS) Using Multi-Junction Photovoltaics (MPV) “Sun-in-a-Box”: Techno-Economics, Liquid Containment, and Pumping

Technical Presentation. IMECE2019-12667
Caleb Amy, Colin Kelsall, Mehdi Pishahang, Henry Asegun, *Massachusetts Institute of Technology, Cambridge, MA, United States*

6-2 FUNDAMENTALS AND APPLICATIONS OF THERMODYNAMICS

6-2-3 Chemical Thermodynamic Processes

Convention Center, 155A 4:00PM–5:45PM

Session Organizer: Michail Nitsas, *National Technical University of Athens, Zografou, Greece*

Session Co-Organizer: Irene Koronaki, *National Technical University of Athens, Zografou, Attiki, Greece*

4:00pm – Activity Coefficient of Different Salt Solutions for Reverse Electrodialysis Application

Technical Paper Publication. IMECE2019-10739
Arash Emdadi, *University of Arkansas, Fayetteville, AR, United States*, Simin Emdadi, *Tabriz University, Tabriz, East Azerbaijan, Islamic Republic of Iran*, Mansour Zenouzi, *Wentworth Institute of Tech, Boston, MA, United States*, Gregory Kowalski, *Northeastern University, Boston, MA, United States*

4:21pm – Rate Controlled Constrained-Equilibrium Simulation of Ethanol Combustion Using SVD Derived Constraints

Technical Paper Publication. IMECE2019-10994
Shrabanti Roy, *Mississippi State University, Starkville, MS, United States*, Fatemeh Hadi, *Tennessee State University, Nashville, TN, United States*, Omid Askari, *Mississippi State University, Mississippi State, MS, United States*

4:42pm – Power Optimization of Linear Mass Transfer Law Continuous and Discrete Imperfect Chemical Engine Systems

Technical Presentation. IMECE2019-10116
Shaojun Xia, Lingen Chen, Huijun Feng, *Naval University of Engineering, Wuhan, China*

5:03pm – A Holistic Approach to Design of Systems and Processes

Technical Paper Publication. IMECE2019-11079

Shyam Sundar Hemamalini, *Coimbatore Institute of Technology, Coimbatore, Tamilnadu, India*, **Zeenathul Farida Abdulgani**, *Francis Xavier Engineering College, Tirunelveli, Tamilnadu, India*, **A.S. Krishnan**, *Coimbatore Institute of Technology, Coimbatore, India*

5:24pm – Thermodynamic Evaluation of the Dynamic Performance of a Solar-Assisted ORC

Technical Presentation. IMECE2019-10738

Michail Nitsas, **Irene Koronaki**, **George Mastorakis**, *National Technical University of Athens, Zografou, Greece*

6-4 DESIGN AND ANALYSIS OF ENERGY CONVERSION SYSTEMS

6-4-3 Advanced Power Cycles and Chemical Processes

Convention Center, 155B

4:00PM–5:45PM

Session Organizer: Tatiana Morosuk, *Technical University Berlin, Berlin, Germany*

Session Co-Organizer: Roberto Carapellucci, *University of L'Aquila, L'Aquila, Italy*

4:00pm – Energetic and Exergetic Performance Comparison of an Ejector Refrigeration System Using Modern Low GWP Refrigerants

Technical Paper Publication. IMECE2019-10542

Aggrey Mwesigye, **Seth B. Dworkin**, *Ryerson University, Toronto, ON, Canada*

4:21pm – Comparative Exergoenvironmental Analysis of Methanol Synthesis Loop Configurations

Technical Presentation. IMECE2019-10587

Tatiana Morosuk, **Timo Blumberg**, *Technical University Berlin, Berlin, Germany*, **Young Duk Lee**, *Korea Institute of Machinery and Materials, Daejeon, Korea (Republic)*, **George Tsatsaronis**, *Technical University Berlin, Berlin, Germany*

4:42pm – Analysis of Planar-Cavity Receiver Reactor for Solar Thermochemical Dry-Reforming

Technical Paper Publication. IMECE2019-10637

Jeffrey Gifford, **Patrick Davenport**, *National Renewable Energy Laboratory, Golden, CO, United States*, **Zhiwen Ma**, *National Renewable Energy Laboratory, Lakewood, CO, United States*, **Janna Martinek**, **Craig Turchi**, *National Renewable Energy Laboratory, Golden, CO, United States*, **Jeffrey G. Weissman**, *Precision Combustion, Inc., North Haven, CT, United States*

5:03pm – Near-Zero CO₂ Emissions Power Plant Based on High Temperature Fuel Cells

Technical Paper Publication. IMECE2019-10848

Roberto Carapellucci, **Roberto Cipollone**, **Davide Di Battista**, *University of L'Aquila, L'Aquila, Italy*

5:24pm – Performance Analysis of a Novel Parallel Turbine Reheat Cycle for High Speed Vehicles

Technical Paper Publication. IMECE2019-11149

Jingchuan Sun, **Guoqiang Xu**, **Jie Wen**, **Bensi Dong**, **Laihe Zhuang**, **Qihang Liu**, *Beihang University, Beijing, China*

6-7 THERMAL ENERGY STORAGE

6-7-2 Thermal Energy Storage II

Convention Center, 250A

4:00PM–5:45PM

Session Organizer: Sanjiv Sinha, *University of Illinois at Urbana-Champaign, Champaign, IL, United States*

Session Co-Organizer: Arpit Dwivedi, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

4:00pm – A New Composite Phase Change Material for Thermal Energy Storage

Technical Paper Publication. IMECE2019-10457

Che-Fu Su, **Xinrui Xiang**, **Hamed Esmaeilzadeh**, **Jirui Wang**, **Edward Fratto**, **Majid Charmchi**, **Zhiyoung Gu**, **Hongwei Sun**, *University of Massachusetts Lowell, Lowell, MA, United States*

4:21pm – Parametric Study of Split Flow Cylindrical Packed Bed Reactor for High-Temperature Thermochemical Energy Storage Using Cobalt Oxide Redox Reaction

Technical Paper Publication. IMECE2019-10956

Nasser Vahedi, **Alparslan Oztekin**, *Lehigh University, Bethlehem, PA, United States*

4:42pm – Numerical Analysis of Charging Process of a Shell and Tube Latent Heat Thermal Energy Storage System With PCM Embedded in Highly Conductive Porous Material

Technical Paper Publication. IMECE2019-11414

Mahboobe Mahdavi, **Saeed Tiari**, **Carley Sawyer**, *Gannon University, Erie, PA, United States*

5:03pm – CaO/Ca(OH)₂ as High Temperature High Energy Density Heat Storage System

Technical Presentation. IMECE2019-11731

Arpit Dwivedi, **Manjunath C. Rajagopal**, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*, **Sanjiv Sinha**, *University of Illinois at Urbana-Champaign, Champaign, IL, United States*

WEDNESDAY, NOVEMBER 13

6-6 LOW-TEMPERATURE ENERGY CONVERSION SYSTEMS

**6-6-1 Low temperature Energy Conversion Systems
Convention Center, 250C 10:45AM-12:30PM**

Session Organizer: Andrea Lazzaretto, *University of Padua, Padova, Italy*

Session Co-Organizer: Piero Danieli, Gianluca Carraro, *University of Padua, Padova, Italy*

10:45am – Exergy-Based Comparison of a Multi-Generation CO₂ System Driven by Waste Heat

Technical Presentation. IMECE2019-10588
Tatiana Morosuk, Jing Luo, George Tsatsaronis, *Technical University Berlin, Berlin, Germany*

11:06am – Exergy-Based and Economic Evaluation of Cryogenics-Based Energy Storage

Technical Presentation. IMECE2019-10712
Tatiana Morosuk, Sarah Hamdy, Jimena Incer, George Tsatsaronis, *Technical University Berlin, Berlin, Germany*

11:27am – A Detachable Thermoelectric Generator as a Power Source for a 3G Camera Network Using a Steam Pipe as a Heat Source

Technical Paper Publication. IMECE2019-12250
Robert Dell, Ashish Pokharel, Michael Thomas Petralia, *Center for Innovation and Applied Technology, The Cooper Union, New York, NY, United States*, Gudmundur Gislason, *Arvirikinn Ehf., Selfoss, Iceland*, Runar Unnthorsson, *University of Iceland, Reykjavik, Iceland*

11:48am – Open Field Heating of Green Roofs and Small Arable Land Plots Using Waste Steam and Hot Water From Geothermal, Municipal and COGEN Sources to Enhance Plant Growth

Technical Paper Publication. IMECE2019-12252
Robert Dell, Ashish Pokharel, Michael Thomas Petralia, *Center for Innovation and Applied Technology, The Cooper Union, New York, NY, United States*, Runar Unnthorsson, *University of Iceland, Reykjavik, Iceland*

12:09pm – Thermoelectric Generator-Based System for Energizing Low-Power Communication and Geolocation Electronics

Technical Paper Publication. IMECE2019-12254
Mamdouh Eldaly, Ashish Pokharel, Michael Thomas Petralia, *Center for Innovation and Applied Technology, The Cooper Union, New York, NY, United States*, Runar Unnthorsson, *University of Iceland, Reykjavik, Iceland*, Robert Dell, *Center for Innovation and Applied Technology, The Cooper Union, New York, NY, United States*

6-11 ELECTROCHEMICAL ENERGY CONVERSION AND STORAGE

6-11-1 Lithium Batteries and Beyond

Convention Center, 250D 10:45AM-12:30PM

Session Organizer: Conner Fear, *Purdue University, Lafayette, IN, United States*

10:45am – Ambient Temperature Effect on Performance of a Lithium-Ion Polymer Battery Cell for 12-Voltage Applications

Technical Paper Publication. IMECE2019-10369
Yiqun Liu, Y. Gene Liao, Ming-Chia Lai, *Wayne State University, Detroit, MI, United States*

11:06am – Long Life Fully Reversible Lithium-CO₂ Battery

Technical Presentation. IMECE2019-11804
Alireza Ahmadiparidari, *University of Illinois at Chicago, Chicago, IL, United States*, Larry A Curtiss, *Argonne National Lab, Argonne, IL, United States*, Amin Salehi-Khojin, *University of Illinois at Chicago, Chicago, IL, United States*

11:27am – Effect of Thermal Gradient on Lithium Plating in Li-Ion Cells

Technical Presentation. IMECE2019-12131
Conner Fear, *Purdue University, Lafayette, IN, United States*, Aashutosh N. Mistry, *Purdue University, West Lafayette, IN, United States*, Rachel E. Carter, *National Research Council/Naval Research Laboratory, Washington, DC, United States*, Corey Love, *U.S. Naval Research Laboratory, Washington, DC, United States*, Partha P. Mukherjee, *Purdue University, West Lafayette, IN, United States*

11:48am – Internal Short Circuit in Single-Cell Li-Ion Batteries and Local Strain Assessment

Technical Presentation. IMECE2019-12871
Sanket Mundhe, Golam M. Newaz, Leela Arava, *Wayne State University, Detroit, MI, United States*, Min Zhu, Omar Faruque, Saeed Barbat, *Ford Motor Company, Dearborn, MI, United States*

12:09pm – Synchrotron X-Rays: A Versatile Probe for Studying All-Solid-State Batteries

Technical Presentation. IMECE2019-13323
Marm Dixit, Kelsey B. Hatzell, *Vanderbilt University, Nashville, TN, United States*

6-16 CMS-BIOFUELS PRODUCTION, CONVERSION, AND SIMULATION

6-16-2 Biomass Technologies and Conversion for Biofuel

Convention Center, 250B

10:45AM–12:30PM

Session Organizer: Omid Askari, *Mississippi State University, Mississippi State, MS, United States*

Session Co-Organizer: Seyed Allameh, *Northern Kentucky University, Newport, KY, United States*

10:45am – Experimental Investigation of Combustion Behavior of Biodiesel-Water Emulsion

Technical Paper Publication. IMECE2019-10917

Gurjap Singh, Nicholas Hentges, Damion Johnson, Albert Ratner, *University of Iowa, Iowa City, IA, United States*

11:06am – Detailed Chemical Mechanism Generation for Combustion of Ethanol-Air Mixture

Technical Paper Publication. IMECE2019-10996

Shrabanti Roy, *Mississippi State University, Starkville, MS, United States*, **Fatemeh Hadi,** *Tennessee State University, Nashville, TN, United States*, **Omid Askari,** *Mississippi State University, Mississippi State, MS, United States*

11:27am – Influence of Acyl Acceptor Blends on the Ester Yield and Fuel Properties of Cottonseed Oil Biodiesel

Technical Paper Publication. IMECE2019-11122

Preeti Nain, Manu Jindal, *Thapar University, Patiala, India*, **Sunil Kumar Mahla,** *IKG Punjab Technical University, Hoshiarpur, India*, **Bhupendra Singh Chauhan,** *Lovely Professional University, Phagwara, Punjab, India*, **Haeng Muk Cho,** *Kongju National University, Cheonan, Korea (Republic)*

11:48am – Combustion of Biomass Based Pellets With Pyrolysis Bio-Oils

Technical Paper Publication. IMECE2019-11593

Joana Carvalho, *University of Minho, Guimarães, Portugal*, **Maria M Gonçalves,** *Universidade Nova de Lisboa, Caparica, Portugal*, **Diogo Couto, Manuel Eduardo Ferreira, Jorge Araujo, Jose Teixeira, Candida Vilarinho,** *University of Minho, Guimarães, Portugal*

6-4 DESIGN AND ANALYSIS OF ENERGY CONVERSION SYSTEMS

6-4-4 Design and Analysis of Energy Systems – 1

Convention Center, 250B

2:00PM–3:45PM

Session Organizer: Jinlong Liu, *West Virginia University, Morgantown, WV, United States*

Session Co-Organizers: Roberto Carapellucci, *University of L'Aquila, L'Aquila, Italy*, Chen Liu, *Xi'an University of Technology, Xi'an, Shaanxi, China*

2:00pm – Power Electronics Sliding Mode Control Design for Photovoltaic Energy Conversion Systems

Technical Paper Publication. IMECE2019-10110

Mehmetcan Gursoy, Andy Lozowski, Xin Wang, *Southern Illinois University Edwardsville, Edwardsville, IL, United States*

2:21pm – Conversion of a Heavy-Duty Diesel Engine to Natural-Gas Spark-Ignition Operation: Test Bench Development

Technical Paper Publication. IMECE2019-10728

Jinlong Liu, Cosmin Dumitrescu, Hemanth Bommisetty, Christopher Ulishney, *West Virginia University, Morgantown, WV, United States*

2:42pm – Experimental Setup of Combustion Visualization Inside a Heavy-Duty Diesel Engine Converted to Natural-Gas Spark-Ignition Operation

Technical Paper Publication. IMECE2019-10735

Vishnu Padmanaban, Jinlong Liu, Cosmin Dumitrescu, *West Virginia University, Morgantown, WV, United States*

3:03pm – Design and Analysis of an Innovative Portable Water-Cooled Thermoelectric Generator Apparatus

Technical Paper Publication. IMECE2019-10804

Eric Coday, Jordan Parker, Randall Johnson, Shawn Duan, *Saint Martin's University, Lacey, WA, United States*

3:24pm – An Experimental Study of the Combustion Process in a Natural-Gas Spark-Ignition Engine

Technical Paper Publication. IMECE2019-11637

Jinlong Liu, Cosmin Dumitrescu, Hemanth Bommisetty, *West Virginia University, Morgantown, WV, United States*

6-7 THERMAL ENERGY STORAGE

6-7-3 Thermal Energy Storage III

Convention Center, 250C

2:00PM–3:45PM

Session Organizer: Ethan Languri, *Tennessee Technological University, Cookeville, TN, United States*

Session Co-Organizer: Vinit Prabhu, *Tennessee Technological University, Cookeville, TN, United States*

2:00pm – Investigations on the Effect of Flow Disturbances on Heat Transfer and Pressure Drop: An Energy Storage Perspective

Technical Paper Publication. IMECE2019-10951

R.S. Shriram, A. Manikandan, J. Raj Kumar, P.J.

Kummareashvar, A.S. Krishnan, *Coimbatore Institute of Technology, Coimbatore, Tamilnadu, India*

2:21pm – Inverse Optimization of Design Parameters in a Hybrid Solar Pond System With External Heat Addition

Technical Paper Publication. IMECE2019-11117

Abhishek Kumar, Ranjan Das, *Indian Institute of Technology Ropar, Rupnagar, Punjab, India*

2:42pm – Analysis of Flow Through Packed Bed of Spheres Containing Phase Change Materials for Thermal Energy Storage Applications

Technical Paper Publication. IMECE2019-12185

Vinit Prabhu, Ethan Languri, *Tennessee Technological University, Cookeville, TN, United States*, Kashif Nawaz, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*

3:03pm – Modeling and Simulation of Thermal Energy Storage for Solar Energy Utilization

Technical Paper Publication. IMECE2019-10326

Fadi Alnaimat, Bobby Mathew, Abdel Hamid Ismail Mourad, Salah Addin Al Omari, *United Arab Emirates University, Al Ain, United Arab Emir.*

6-11 ELECTROCHEMICAL ENERGY CONVERSION AND STORAGE

6-11-2 Modeling of Lithium Batteries

Convention Center, 250D

2:00PM–3:45PM

Session Organizer: Ankit Verma, *Purdue University, West Lafayette, IN, United States*

2:00pm – An Investigation of Temperature Measurement Granularity Towards Improving Li-Ion Battery Management System Design

Technical Paper Publication. IMECE2019-11874

Mehrdad Zandigohar, Nima Lotfi, *Southern Illinois University Edwardsville, Edwardsville, IL, United States*

2:21pm – Predictive Modeling for Electric Vehicle Li-ion Battery Safety

Technical Presentation. IMECE2019-12469

Sergiy Kalnaus, Hsin Wang, Thomas R. Watkins, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*, Abhishek Kumar, *Northeastern University, Boston, MA, United States*, Srdjan Simunovic, Gabriel M. Veith, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*, Abhijit Sengupta, *National Highway Traffic Safety Administration, Washington, DC, United States*

2:42pm – Electrochemistry-Mechanics Coupling in All-Solid-State Batteries

Technical Presentation. IMECE2019-12638

Ankit Verma, Partha P. Mukherjee, *Purdue University, West Lafayette, IN, United States*

3:03pm – Computational Simulation of Discharge Behavior of Li-ion Pouch Cell

Technical Presentation. IMECE2019-13092

Maher Almohammedali, Leela Arava, Golam M. Newaz, *Wayne State University, Detroit, MI, United States*

3:24pm – Mechanical Failure Analysis of Single Electrode Particles Bonded to Solid Electrolytes in All-Solid-State Li-Ion Batteries

Technical Presentation. IMECE2019-13293

Hosop Shin, *Indiana University-Purdue University Indianapolis, Indianapolis, IN, United States*, Sangwoo Han, *Seres EV, Santa Clara, CA, United States*

6-4 DESIGN AND ANALYSIS OF ENERGY CONVERSION SYSTEMS

6-4-5 Design and Analysis of Energy Systems – 2

Convention Center, 250B

4:00PM–5:45PM

Session Organizer: George Tsatsaronis, *Technical University Berlin, Berlin, Germany*

Session Co-Organizers: Stefan Bruche, *Technische Universität Berlin, Berlin, Germany*, Roberto Carapellucci, *University of L'Aquila, L'Aquila, Italy*

4:00pm – Dual Gyroscope Wave Energy Converter

Technical Paper Publication. IMECE2019-10266

Håkon Bakke Korsvik, *Western Norway University of Applied Sciences, Stord, Hordaland, Norway*, Even Rognsvåg, *Western Norway University of Applied Sciences, Laksevåg, Norway*, Tore Tomren, Joakim Nyland, Thomas Impelluso, *Western Norway University of Applied Sciences, Bergen, Norge, Norway*

4:21pm – A Study of Fast Charging of Li-Ion Battery With Pulsed Current

Technical Paper Publication. IMECE2019-10375

Yu Liu, Meng Xu, Zhibang Xu, Xia Wang, *Oakland University, Rochester, MI, United States*

4:42pm – Comprehensive Energy Balance Analysis of Photon-Enhanced Thermionic Emission for Concentrated Solar Power Generation

Technical Presentation. IMECE2019-10671

A.N.M. Taufiq Elahi, *University of Utah, Salt Lake City, UT, United States*, Mohammad Ghashami, *University of Nebraska-Lincoln, Lincoln, NE, United States*, Devon Jensen, *ACT, Salt Lake City, UT, United States*, Keunhan Park, *University of Utah, Salt Lake City, UT, United States*

5:03pm – A Multi-Stage Optimization Approach for Energy Supply Systems With Discrete Design Decisions

Technical Paper Publication. IMECE2019-11519

Stefan Bruche, George Tsatsaronis, *Technische Universität Berlin, Berlin, Germany*

5:24pm – High Surface Area Reverse Electrowetting Mechanoelectrical Transduction

Technical Presentation. IMECE2019-11831

Pashupati Adhikari, Russell Reid, *University of North Texas, Denton, TX, United States*

6-8 ENVIRONMENTAL ASPECTS OF ENERGY SYSTEMS

6-8-1 Environmental Aspects of Energy Systems

Convention Center, 250C

4:00PM–5:45PM

Session Organizer: Diego Guillen, *Universidad del Norte, Barranquilla, Colombia*

Session Co-Organizer: Elisa Guelpa, *Politecnico di Torino, Torino, Italy*

4:00pm – Integration and Optimization of Supercritical Carbon Dioxide Brayton Cycle and Goswami Cycle

Technical Paper Publication. IMECE2019-11852

Diego Guillen, *Universidad del Norte, Barranquilla, Colombia*, Martina Leveni, *Universita' degli studi Niccolo' Cusano, Rome, Italy*, Giampaolo Manfrida, *University of Florence, Florence, Italy*, Marco Sanjuan, *Universidad del Norte, Barranquilla, Atlantico, Colombia*

4:21pm – Fugitive Methane Emissions: Development of a Mobile High-Volume Sampling System

Technical Paper Publication. IMECE2019-11891

Hadyan Ramadhan, Amir Sharafian, Walter Mérida, *University of British Columbia, Vancouver, BC, Canada*

4:42pm – Activated Carbon Solar Enabled Purification of Produced Water

Technical Presentation. IMECE2019-12545

Ashreet Mishra, *Purdue University Northwest, Hammond, IN, United States*, A. G. Agwu Nnanna, *Purdue University Calumet, Hammond, IN, United States*, Harvey Abramowitz, David Okposio, *Purdue University Northwest, Hammond, IN, United States*

5:03pm – Uncertainty and Sensitivity Analysis of Greenhouse Gas Emissions at a Campus Level

Technical Presentation. IMECE2019-13871

Zahra Ghaemi, Amanda Smith, *University of Utah, Salt Lake City, UT, United States*

6-11 ELECTROCHEMICAL ENERGY CONVERSION AND STORAGE

6-11-3 Electrochemical Systems – Materials and Optimization

Convention Center, 250D

4:00PM–5:45PM

Session Organizer: Humberto Gomez, *Universidad del Norte, Barranquilla, Atlantico, Colombia*

4:00pm – Experimental Study on Effects of Operational Parameters on a Single-Cell Test-Bed Vanadium Redox Flow Battery

Technical Paper Publication. IMECE2019-10998

Rabiul Islam, *Automated Conveyors Systems Inc., West Memphis, AR, United States*, Kwangkook Jeong, *Arkansas State University, State University, AR, United States*

4:21pm – New Intelligent Battery Management System for Drones

Technical Paper Publication. IMECE2019-10479

Seyed Reza Hashemi, Roja Esmaeeli, Haniph Aliniagerdroudbari, *University of Akron, Akron, OH, United States*, Muapper Alhadri, *University of Akron, Cuyahoga Falls, OH, United States*, Hammad Al-Shammari, Ajay Mahajan, Siamak Farhad, *University of Akron, Akron, OH, United States*

4:42pm – Polyquinone Composites With Graphene and Cellulose Nanocrystals for Electrochemical Energy Storage

Technical Presentation. IMECE2019-11725

Danny Illera Perozo, Victor M. Fontalvo, Humberto Gomez, *Universidad del Norte, Barranquilla, Atlantico, Colombia*

5:03pm – Optimization of Mg Scraps Hydrolysis for Hydrogen Generation Using HCl: Experimental and Simulation

Technical Paper Publication. IMECE2019-10580

Rokhsareh Akbarzadeh, Joshua Adeniran, Peter Oviroh, Qusai Ibrahim, Tien-Chien Jen, *University of Johannesburg, Johannesburg, South Africa*

THURSDAY, NOVEMBER 14

6-9 ENERGY SYSTEMS FOR BUILDINGS

6-9-1 Performance Evaluations of Envelopes and Materials of Buildings and HVAC Systems

Convention Center, 155F 8:15AM–10:00AM

Session Organizer: Rang Tu, *University of Science and Technology Beijing, Beijing, China*

8:15am – Measured Performance of a Variable Transmission Glazing System

Technical Paper Publication. IMECE2019-10222
Ali Al-Dossary, Heather Dillon, Jordan Farina, University of Portland, Portland, OR, United States

8:36am – Heating Conservation Methods and Economy Analysis of Winter Heating in Rural Residential Buildings in Southeast China: A Case Study

Technical Paper Publication. IMECE2019-10310
Rang Tu, Mengdan Liu, Lanbin Liu, University of Science and Technology Beijing, Beijing, China

8:57am – 3D Flow Simulations of Fan Enclosure Concepts for a Novel Heat and Moisture Exchanger

Technical Paper Publication. IMECE2019-10768
Justin Costa-Greger, University of Nebraska-Lincoln, Lincoln, NE, United States, Hailei Wang, Utah State University, Logan, UT, United States

9:18am – Measuring the Effect of Local Commercial Roofing Samples on the Thermal Behavior of a Social Interest Dwelling Located in Different Climates in Ecuador

Technical Paper Publication. IMECE2019-11472
Jaqueline Litardo, Escuela Superior Politecnica del Litoral, Guayaquil, Guayas, Ecuador, José Macías, Instituto de Investigación Geológico y Energetico, Guayaquil, Guayas, Ecuador, Ruben Hidalgo-León, María Gabriela Cando, Guillermo Soriano, Escuela Superior Politecnica Del Litoral, Guayaquil, Guayas, Ecuador

9:39am – The Thermal Effective Ventilation System of Active Buildings Using Phase Change Material

Technical Presentation. IMECE2019-13054
Sarng Woo Karng, Sungho Choi, Jin Su Park, Korea Institute of Science and Technology, Seoul, Korea (Republic), Han Seo Ko, Sungkyunkwan University, Suwon-Si, Gyeonggi-Do,

6-10 RENEWABLE ENERGY

6-10-1 Renewable Energy 1

Convention Center, 155D 8:15AM–10:00AM

Session Organizer: Jim Kuo, *California State University, Los Angeles, Los Angeles, CA, United States*

Session Co-Organizer: He Shen, *California State University, Los Angeles, Los Angeles, CA, United States*

8:15am – Computational Fluid Dynamics Modeling of a Heat Pipe Evacuated Tube Solar Collector Integrated With Phase Change Material

Technical Paper Publication. IMECE2019-10252
Vivek Pawar, Sarvenaz Sobhansarbandi, University of Missouri-Kansas City, Kansas City, MO, United States

8:36am – Analysis of Droplet Sliding/Rolling on Hydrophobic Surface in Relation to Self-Cleaning Application

Technical Paper Publication. IMECE2019-10720
Ghassan Abdelmajid, Bekir Sami Yilbas, Abdullah Al-Sharafi, Nasser Alaqeeli, King Fahd University of Petroleum & Minerals, Dhahran, Dhahran, Saudi Arabia

8:57am – Synthesis and Deposition of Rutile TiO₂ for Dye-Sensitized Solar Cell Applications

Technical Paper Publication. IMECE2019-11035
Blen Teferi, Udo Schnupf, Bradley University, Peoria, IL, United States, Kazuhiro Manseki, Takashi Sugiura, Gifu University, Gifu, Japan, Saeid Vafaei, Bradley University, Peoria, IL, United States

9:18am – Evaluation of Performance and Early Degradation of a 180.8 kWp Rooftop on Grid Connected Photovoltaic System in a Colombian Tropical Region Environment

Technical Paper Publication. IMECE2019-11316
Cinthia Audivet Duran, Promigas S.A. E.S.P., Barranquilla, Colombia, Elena Romero, Universidad del Norte, Barranquilla, Atlantico, Colombia, Jesus Garcia, Horacio Pinzon, Promigas S.A. E.S.P., Barranquilla, Colombia, Ana Fonseca, Antonio Bula, Universidad del Norte, Barranquilla, Colombia, Marco Sanjuan, Promigas S.A. E.S.P., Barranquilla, Colombia

9:39am – Novel Machine Learning Approach in Design of Photovoltaics

Technical Presentation. IMECE2019-13273
Mine Kaya, Shima Hajimirza, Texas A&M University, College Station, TX, United States

6-12 FUEL CELL SYSTEMS DESIGN AND APPLICATIONS

6-12-1 Fuel Cells and Electrolyzers

Convention Center, 155E

8:15AM–10:00AM

Session Organizer: Ankit Verma, *Purdue University, West Lafayette, IN, United States*

8:15am – High-Power Fuel Cell Systems Fueled by Recycled Aluminum

Technical Paper Publication. IMECE2019-10478

Peter Godart, Jason Fischman, Douglas Hart, *Massachusetts Institute of Technology, Cambridge, MA, United States*

8:36am – Study on Model Evolution Method Based on the Hybrid Modeling Technology With Support Vector Machine for a SOFC-GT System

Technical Paper Publication. IMECE2019-11946

Jinwei Chen, Shengnan Sun, Yao Chen, Huisheng Zhang, Zhenhua Lu, *Shanghai Jiao Tong University, Shanghai, China*

8:57am – An Evaluation of High Temperature Water Splitting Systems Using Protonic Ceramic Electrolyzers

Technical Presentation. IMECE2019-13747

Amogh Thatte, Robert Braun, *Colorado School of Mines, Golden, CO, United States*

9:18am – Modeling High Efficiency, SOFC/Internal Combustion Engine Hybrid Systems for Distributed Generation Applications

Technical Presentation. IMECE2019-13781

David Wahlstrom, Robert Braun, Mayur Mundhwa, *Colorado School of Mines, Golden, CO, United States*, **Evan Reznicek,** *Colorado School of Mines, Denver, CO, United States*

6-9 ENERGY SYSTEMS FOR BUILDINGS

6-9-2 Innovations in HVAC Systems

Convention Center, 155F

10:15AM–12:00PM

Session Organizer: Hohyun Lee, *Santa Clara University, Santa Clara, CA, United States*

10:15am – Investigate the Potential Peak Energy Reduction of Integrated M-Cycle Evaporative Cooling With HVAC in Hot and Dry Climate

Technical Paper Publication. IMECE2019-10402

Fahad Almeahadi, *King Saud University, Beavercreek, OH, United States*, **Ahmad Aljabr,** *Majmaah University, Al-Majmaah, Saudi Arabia*

10:36am – Applying Static Fault Detection and Diagnosis Methods to Transient Air Conditioning Data Using an Equilibrium Prediction

Technical Paper Publication. IMECE2019-11579

Austin Rogers, *Pacific Northwest National Laboratory, Richland, WA, United States*, **Fangzhou Guo, Bryan Rasmussen,** *Texas A&M University, College Station, TX, United States*

10:57am – Energy and Economic Analysis of a Novel Hybrid Photovoltaic-Thermoelectric System for Building Cooling Applications

Technical Paper Publication. IMECE2019-11644

Mohadeseh Seyednezhad, Hamidreza Najafi, *Florida Institute of Technology, Melbourne, FL, United States*

11:18am – An Approach to Bringing Automated Fault Detection and Diagnosis (AFDD) Tools for HVAC&R Into the Mainstream

Technical Paper Publication. IMECE2019-11941

Annika Hacker, *University of New Haven, Woodbridge, CT, United States*, **Ravi Gorthala,** *University of New Haven, West Haven, CT, United States*, **Amy Thompson,** *University of Connecticut, Storrs, CT, United States*

11:39am – Transient Thermal Performance and Ground Temperature Variation for a Heat Pump System Using High Thermal Conductivity Energy Piles

Technical Paper Publication. IMECE2019-12005

Aggrey Mwesigye, Hiep V. Nguyen, Reza Daneshazarian, *Ryerson University, Toronto, ON, Canada*, **Ayman M. Bayomy,** *Ryerson University, Deep River, ON, Canada*, **Pedram Atefrad, Seth B. Dworkin,** *Ryerson University, Toronto, ON, Canada*

6-10 RENEWABLE ENERGY

6-10-2 Renewable Energy 2

Convention Center, 155D

10:15AM–12:00PM

Session Organizer: Jim Kuo, *California State University, Los Angeles, Los Angeles, CA, United States*

Session Co-Organizer: Navid Goudarzi, *University of North Carolina Charlotte, Charlotte, NC, United States*

10:15am – Optimization of Fixed PV Panel “Tilt” Angles for Maximal Energy Harvest Considering Year-Around Sky Coverage Conditions

Technical Paper Publication. IMECE2019-10391

Ammar Gwasha, Yasir Alfulayyih, *University of Arizona, Tucson, AZ, United States*, **Peiwen Li,** *University of Arizona, Oro Valley, AZ, United States*

10:36am – Estimates of Area, Output, and Levelized Energy Cost of Solar Energy Schemes in Saudi Arabia

Technical Paper Publication. IMECE2019-10967

Abdullah Alabdulkarem, Mohannad Abdulghani, *King Saud University, Riyadh, Saudi Arabia*

10:57am – A Decision Support Tool for Distributed Solar and Storage Investments: A Case Study in Austin, TX

Technical Paper Publication. IMECE2019-11068

Arkasama Bandyopadhyay, Julia P. Conger, Michael Webber, Benjamin D. Leibowicz, *University of Texas at Austin, Austin, TX, United States*

11:18am – Wind Effects on Power Generation of Solar Farm in California

Technical Paper Publication. IMECE2019-11859

Ni Li, A. Fatahi, D. Lee, Jim Y. Kuo, He Shen, *Califor University, Los Angeles, Los Angeles, CA, United States*

6-12 FUEL CELL SYSTEMS DESIGN AND APPLICATIONS

6-12-2 PEM Fuel Cells

Convention Center, 155E

10:15AM–12:00PM

Session Organizer: Humberto Gomez, *Universidad del Norte, Barranquilla, Atlantico, Colombia*

10:15am – PEM Fuel Cell Electrodes Surface Defects Impact on the System Performance

Technical Presentation. IMECE2019-11875

Victor M. Fontalvo, Danny Illera Perozo, Marco Sanjuan, Humberto Gomez, *Universidad del Norte, Barranquilla, Colombia*

10:36am – A 5-cm² PEM Fuel Cell Gas Diffusion Layer Experimental Study and Scanning Electron Microscopy Visualization

Technical Paper Publication. IMECE2019-12018

Jose Montoya Segnini, *Purdue University, West Lafayette, IN, United States, Gerardo Carbajal,* *Florida Polytechnic University, Lakeland, FL, United States*

10:57am – Understanding Heat and Water Management in PEM Fuel Cells

Technical Presentation. IMECE2019-12436

Lalit Pant, Adam Weber, *Lawrence Berkeley National Laboratory, Berkeley, CA, United States*

11:18am – Development of the Ejector Driven Reactant PEM Fuel Cell System for Underwater Power Applications

Technical Presentation. IMECE2019-12757

Robert C. Utz, Thomas I. Valdez, Robert K. Wynne, Andrew J. Leanna, Robert K. Sievers, *Teledyne Energy Systems, Hunt Valley, MD, United States*

6-9 ENERGY SYSTEMS FOR BUILDINGS

6-9-3 Control and Optimization of Energy Systems for Buildings

Convention Center, 155F

2:00PM–3:45PM

Session Organizer: Yoshiharu Amano, *Waseda University, Shinjuku-ku, Tokyo, Japan*

2:00pm – Emergent Behavior in a Population of Thermostatically Controlled Loads With Peer-to-Peer Communication

Technical Paper Publication. IMECE2019-10456

Ryan Schwartz, *CTA Architects, Boise, ID, United States, John Gardner,* *Boise State University, Boise, ID, United States*

2:21pm – Stability Analysis of Demand Response Systems Utilizing Locally Communicating Thermostatically Controlled Loads

Technical Paper Publication. IMECE2019-10522

Jason Kuwada, John Gardner, *Boise State University, Boise, ID, United States*

2:42pm – Design Resilience of Demand Response Systems Utilizing Locally Communicating Thermostatically Controlled Loads

Technical Paper Publication. IMECE2019-10523

Jason Kuwada, Hoda Mehrpouyan, John Gardner, *Boise State University, Boise, ID, United States*

3:03pm – Residential Heating System Control for Future Electric Power Grid Services Using Minimal Measurements

Technical Paper Publication. IMECE2019-12026

Michael Brambley, Jianming Lian, *Pacific Northwest National Laboratory, Richland, WA, United States*

3:24pm – The Impact of Increased Plug-in Electric Vehicles on the US Commercial Building Sector and Electrical Grid

Technical Presentation. IMECE2019-13783

Dongsu Kim, Heejin Cho, Pedro Mago, *Mississippi State University, Mississippi State, MS, United States*

6-10 RENEWABLE ENERGY

6-10-3 Renewable Energy 3

Convention Center, 155D

2:00PM–3:45PM

Session Organizer: Christopher Depcik, *University of Kansas, Lawrence, KS, United States*

Session Co-Organizer: Jim Kuo, *California State University, Los Angeles, Los Angeles, CA, United States*

2:00pm – A Capacity Planning Model for Microgrids in Rural India

Technical Paper Publication. IMECE2019-11707

Arkasama Bandyopadhyay, Katrina Ramirez-Meyers, Enakshi D. Wikramanayake, Benjamin D. Leibowicz, Michael Webber, Vaibhav Bahadur, *University of Texas at Austin, Austin, TX, United States*

2:21pm – How to Get There From Here: Evolving the California Electric Grid to Zero Emissions

Technical Presentation. IMECE2019-12445

Alireza Saeedmanesh, Maryam Asghari, Jacob Brouwer, *University of California, Irvine, Irvine, CA, United States*

2:42pm – Alternatives to Electricity Systems for Total Decarbonization of Humanity's Energy Industry

Technical Presentation. IMECE2019-12572

William Leighty, *The Leighty Foundation, Juneau, AK, United States*

3:03pm – Evaluation of Solar Augmentation Effectiveness in a Hybrid Concentrated Solar Power / Fossil Fuel Power Plant

Technical Presentation. IMECE2019-13550

Aaron T. Bame, Joseph Furner, *Brigham Young University, Provo, UT, United States, Ian Hoag,* *PacifiCorp, Salt Lake City, UT, United States, Kasra Mohammadi, Kody Powell,* *University of Utah, Salt Lake City, UT, United States, Brian D. Iverson,* *Brigham Young University, Provo, UT, United States*

6-14 NUCLEAR POWER PLANTS: DESIGN, ANALYSIS, AND SAFETY

6-14-1 Nuclear Power Plants: Design, Analysis, and Safety – I

Convention Center, 155E **2:00PM–3:45PM**

Session Organizer: Alexander Vasiliev, *Nuclear Safety Institute (IBRAE), Moscow, Russia*

Session Co-Organizer: Jovica Riznic, *Canadian Nuclear Safety Commission, Ottawa, ON, Canada*

2:00pm – Nuclear Fusion Detection Methods for Use With IEC Machines

Technical Paper Publication. IMECE2019-10221
Sam Pasmann, Jordan Farina, Heather Dillon, *University of Portland, Portland, OR, United States*

2:21pm – Coordinated Control of a NHR-200II-Based Nuclear Cogeneration Plant for Balancing the Renewables

Technical Paper Publication. IMECE2019-10372
Zhe Dong, Miao Liu, Bowen Li, Di Jiang, Xiaojin Huang, *Tsinghua University, Beijing*

2:42pm – High-Temperature Oxidation Modeling of New Perspective Accident Tolerant Fuel Claddings

Technical Paper Publication. IMECE2019-10513
Alexander Vasiliev, *Nuclear Safety Institute (IBRAE), Moscow, Russia*

3:03pm – Sensitivity of Thermal Transport in Uranium Dioxide to Fission Gas

Technical Paper Publication. IMECE2019-11025
Katherine Mitchell, Hunter Horner, *Kennesaw State University, Marietta, GA, United States*, Alex Resnick, *Kennesaw State University, Duluth, GA, United States*, Jungkyu Park, Eduardo Farfan, Tien Yee, Andrew Hummel, *Kennesaw State University, Marietta, GA, United States*

3:24pm – Numerical Study of Particle Transport and Deposition in a Horizontal Channel Using a Lagrangian-Based Modelling Approach

Technical Paper Publication. IMECE2019-11800
byunghee choi, Daniel Orea, Thien Nguyen, N.K. Anand, Yassin Hassan, *Texas A&M University, College Station, TX, United States*, Piyush Sabharwall, *Idaho National Laboratory, Idaho Falls, ID, United States*

6-10 RENEWABLE ENERGY

6-10-4 Renewable Energy 4

Convention Center, 155D **4:00PM–5:45PM**

Session Organizer: Christopher Depcik, *University of Kansas, Lawrence, KS, United States*

Session Co-Organizer: Jim Kuo, *California State University, Los Angeles, Los Angeles, CA, United States*

4:00pm – Analysis of a Vertical-Axis Spherical Turbine for Energy Harvesting in Urban Water Supply Systems

Technical Paper Publication. IMECE2019-10643
Adriana Valencia, Hugo Jativa Cervantes, Eduardo Castillo, Oguier A. Garavitto, Guillermo Soriano, Livingston D. Castro, *Escuela Superior Politécnica del Litoral, Guayaquil, Guayas, Ecuador*

4:21pm – A Preliminary Study of the Effects of Micro-Encapsulated Phase Change Materials Intermixed With Grout in Vertical Borehole Heat Exchangers

Technical Paper Publication. IMECE2019-10909
Ahmad Aljabr, *Majmaah University, Al-Majmaah, Saudi Arabia*, Andrew Chiasson, Abinesh Selvacanabady, *University of Dayton, Dayton, OH, United States*, Ali Sulaiman Alsagri, *Qassim University, Saudi Arabia, Buraydah, Qassim, Saudi Arabia*

4:42pm – The Potential of Solar Cooling Using a Medium Concentration Photovoltaic-Thermal System

Technical Paper Publication. IMECE2019-11016
Bahy Abdel-Mesih, *Appalachian State University, Boone, NC, United States*

5:03pm – How Variations in Downstream Computational Fluid Dynamics Turbulence Studies Can Be Impacted When Employing Commonly Used Initial Set-Up Configuration Parameters for Airfoils

Technical Paper Publication. IMECE2019-11257
Hussein Al-Qarishey, Robert Fletcher, *Lawrence Technological University, Southfield, MI, United States*

5:24pm – A Feasibility Study of Wind Farm Yaw Angle Optimization

Technical Paper Publication. IMECE2019-12075
Jim Kuo, Ni Li, He Shen, *California State University, Los Angeles, Los Angeles, CA, United States*

6-14 NUCLEAR POWER PLANTS: DESIGN, ANALYSIS, AND SAFETY

6-14-2 Nuclear Power Plants: Design, Analysis, and Safety – II

Convention Center, 155E 4:00PM–5:45PM

Session Organizer: Grant Hawkes, *Idaho National Laboratory, Idaho Falls, ID, United States*

Session Co-Organizer: Hakan Ozaltun, *Idaho National Laboratory, Idaho Falls, ID, United States*

4:00pm – Hierarchical Control for Thermal Power of the Multi-Modular High Temperature Gas-Cooled Reactor

Technical Paper Publication. IMECE2019-10489

Di Jiang, Zhe Dong, Miao Liu, Xiaojin Huang, Bowen Li, *Tsinghua University, Beijing, Beijing, China*

4:21pm – Thermal Transport in Actinide Oxide Fuels With Interstitial Defects

Technical Paper Publication. IMECE2019-11027

Katherine Mitchell, Hunter Horner, *Kennesaw State University, Marietta, GA, United States,* **Alex Resnick,** *Kennesaw State University, Duluth, GA, United States,* **Jungkyu Park, Eduardo Farfan, Tien Yee, Andrew Hummel,** *Kennesaw State University, Marietta, GA, United States*

4:40pm – Experimental Study of Surrogate Particle Transport and Deposition in a Square Channel Using Particle Tracking Technique

Technical Paper Publication. IMECE2019-11811

Daniel Orea, Thien Nguyen, Rodolfo Vaghetto, N.K. Anand, Yassin Hassan, *Texas A&M University, College Station, TX, United States,* **Piyush Sabharwall,** *Idaho National Laboratory, Idaho Falls, ID, United States*

5:00pm – Thermal Model Predictions of Gas Mixtures in the AGR-5/6/7 Experiment

Technical Presentation. IMECE2019-12821

Grant Hawkes, *Idaho National Laboratory, Idaho Falls, ID, United States*

5:20pm – Dynamic Behavior of a Monolithic Fuel Plate Subjected to Flow-Induced Excitation Forces

Technical Presentation. IMECE2019-13773

Hee Seok Roh, *Argonne National Laboratory, Lemont, IL, United States,* **Hakan Ozaltun,** *Idaho National Laboratory, Idaho Falls, ID, United States*

5:40pm – Effects of Plate Curvature on Thermo-Mechanical Performance of U-10Mo Monolithic Fuel Plates

Technical Paper Publication. IMECE2019-11547

Hakan Ozaltun, *Idaho National Laboratory, Idaho Falls, ID, United States,* **Hee Seok Roh, Walid Mohamed,** *Argonne National Laboratory, Lemont, IL, United States*

TRACK 7 ENGINEERING EDUCATION

- 7-1-1: Curriculum Innovations, Pedagogy and Learning Methodologies – I**
- 7-1-2: Curriculum Innovations, Pedagogy and Learning Methodologies – II**
- 7-3-1: Engineering Accreditation, Data Collection, Assessment and ABET Methodologies – II**
- 7-4-1: Systems Engineering and Sustainable Engineering Education**
- 7-5-1: Applied Mechanics, Dynamic Systems and Control Engineering**
- 7-6-1: Fluid Mechanics, Heat Transfer, Experiments and Energy Systems**
- 7-7-1: Problem Solving in Engineering Education, Research and Practice**
- 7-9-1: K-12 STEM, RET – University, School and Industry Alliance**
- 7-10-1: Teaching Laboratories, Machine Shop Experiences, and Technology-Aided Learning – I**
- 7-10-2: Teaching Laboratories, Machine Shop Experiences, and Technology-Aided Learning – II**
- 7-12-1: Engineering Research Innovation and REU**
- 7-13-1: Plenary Session**

ACKNOWLEDGMENT

TRACK ORGANIZERS

Salim Azzouz, *Midwestern State University, United States*

Subha Kumpaty, *Milwaukee School of Engineering, United States*

TOPIC ORGANIZERS

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Mohammad Mahinfalah, *Milwaukee School of Engineering, United States*

Wael Mokhtar, *Grand Valley State University, United States*

Vito Moreno, *University of Connecticut, United States*

SESSION ORGANIZERS

Salim Azzouz, *Midwestern State University, United States*

Emine Foust, *York College, United States*

Nazmul Islam, *University of Texas Rio Grande Valley, United States*

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Mohammad Mahinfalah, *Milwaukee School of Engineering, United States*

Wael Mokhtar, *Grand Valley State University, United States*

Vito Moreno, *University of Connecticut, United States*

TRACK 7 ENGINEERING EDUCATION MONDAY, NOVEMBER 11

7-13 PLENARY SESSION

7-13-1 Plenary Session

Convention Center, 155F 9:45AM–10:30AM

9:45am – Role of Lean Education in Preparing Future Workforce: Closing the Academic and Professional Gap Plenary Presentation. IMECE2019-13999

Anabela Alves, *University of Minho, Guimarães, Portugal*

7-1 CURRICULUM INNOVATIONS, PEDAGOGY AND LEARNING METHODOLOGIES

7-1-1 Curriculum Innovations, Pedagogy and Learning Methodologies – I

Convention Center, 250D 10:45AM–12:30PM

Session Organizer: Nazmul Islam, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

10:45am – The Use of Qualitative Data Analysis for the Evaluation of Design Ethnography Training Among Undergraduate Engineering Students

Technical Paper Publication. IMECE2019-10494

Heather Lai, *SUNY New Paltz, New Paltz, NY, United States,*

Tara Eaton, *Atrium Health, Charlotte, NC, United States*

11:06am – Improving Students' Learning and Performance Using Mock Tests in Engineering Classes

Technical Paper Publication. IMECE2019-11372

Mohammad Hossan, *University of Central Oklahoma, Edmond, OK, United States,* Nazmul Islam, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

11:27am – Positive Intelligence Education for Unleashing Student Potential

Technical Paper Publication. IMECE2019-12032

Pawan Tyagi, *University of the District of Columbia, Washington, DC, United States*

11:48am – Co-development of Interdisciplinary Engineering Innovation in Health Course by Engineering and Team Science Faculty to Accelerate Health Innovation from Bench to Bedside

Technical Presentation. IMECE2019-12649

Soyoung Kang, Erin Blakeney, Nicole Summerside, Brenda Zierler, Laurel Barchet, Katrina Henrikson, Jennifer Sprecher, Eric Seibel, Jonathan T.C. Liu, Jonathan Posner, *University of Washington, Seattle, WA, United States*

7-10 TEACHING LABORATORIES, MACHINE SHOP EXPERIENCES, AND TECHNOLOGY-AIDED LECTURING

7-10-1 Teaching Laboratories, Machine Shop Experiences, and Technology-Aided Learning – I

Convention Center, 260 10:45AM–12:30PM

Session Organizer: Salim Azzouz, *Midwestern State University, Wichita Falls, TX, United States*

10:45am – Using a Heat Pump Experiment With Automated Data Acquisition to Augment Hands-On Learning Technical Paper Publication. IMECE2019-10098

Kevin Anderson, *California State Polytech University, Pomona, CA, United States*

11:06am – Development of a Virtual Lab in Assistance of a Fluid Mechanics Laboratory Instruction

Technical Paper Publication. IMECE2019-10540

Yitong Zhao, Elbon Flanagan, Hamza Abbasi, Kayla Black, *California State Polytechnic University Pomona, Pomona, CA, United States,* Xin Wang, *Wuxi Institute of Technology, Wuxi, Jiangsu, China,* Andres Cardona, *California State Polytechnic University Pomona, Pomona, CA, United States*

11:27am – Data Collection and Analysis Using a Wind Turbine and a Photovoltaic Solar Panel

Technical Paper Publication. IMECE2019-11751

Salim Azzouz, *Midwestern State University, Wichita Falls, TX, United States,* Blevins Johnny, *Tower Extrusions, Ltd., Olney, TX, United States,* Makenzie Johnson, *Plumbing Heating Cooling Contractors of Texas, Wichita Falls, TX, United States,* Clarke O'Connor, *Nchetachukwu Anih, Melanie Ronoh, Ernuel Tonge, Cykelle Semper, Midwestern State University, Wichita Falls, TX, United States,* Tyler Thomas, *Hilti, Plano, TX, United States*

11:48am – Virtual Reality Laboratory: Green Robotic Ultrasonic Welding

Technical Paper Publication. IMECE2019-11912

Richard Y. Chiou, Michael Mauk, Irina Ciobanescu Husanu, *Drexel University, Philadelphia, PA, United States,* Bill Tseng, *University of Texas at El Paso, El Paso, TX, United States,* Sowrirajan Sowmithran, *Drexel University, Philadelphia, PA, United States*

7-1 CURRICULUM INNOVATIONS, PEDAGOGY, AND LEARNING METHODOLOGIES

7-1-2 Curriculum Innovations, Pedagogy, and Learning Methodologies – II

Convention Center, 250D 2:00PM–3:45PM

Session Organizer: Amir Karimi, *University of Texas, San Antonio, TX, United States*

2:00pm – Beautiful Music in the Classroom: Marimba as a Lab Experiment for Teaching Vibration Measurement

Technical Paper Publication. IMECE2019-11038
Mathew Schaefer, *Milwaukee School of Engineering, Milwaukee, WI, United States*

2:21pm – Dependence of Measuring Instrument Eccentricity and Tilt Error on the Four Mathematical Methods of Circularity Form Errors

Technical Paper Publication. IMECE2019-11954
Chittaranjan Sahay, *University of Hartford, Bloomfield, CT, United States*, **Suhash Ghosh**, *University of Hartford, West Hartford, CT, United States*, **Poorna Pruthvi Chandra Malempati**, *University of Hartford, Hartford, CT, United States*, **Swetabh Singh**, *Farmington High School, Farmington, CT, United States*

2:42pm – Interactive Educational Testbed for Statics and Mechanics of Materials

Technical Presentation. IMECE2019-12965
Qingchang Liu, **Zhelong He**, **Mengtian Yin**, **Allen Lang**, **Baoxing Xu**, **Jason Kerrigan**, **Marek-Jerzy Pindera**, *University of Virginia, Charlottesville, VA, United States*

3:03pm – Using the Concept Warehouse to Develop Concept Questions in Statics

Technical Presentation. IMECE2019-13584
Brian Self, *California Polytechnic State University, San Luis Obispo, CA, United States*, **Christopher Papadopolous**, *University of Puerto Rico, Mayagüez, Mayaguez, PR, United States*, **Milo Koretsky**, *Oregon State University, Corvallis, OR, United States*, **Michael Prince**, *Bucknell University, Lewisburg, PA, United States*, **Joan Dannenhoffer**, *Syracuse University, Syracuse, NY, United States*

7-6 FLUID MECHANICS, HEAT TRANSFER, EXPERIMENTS, AND ENERGY SYSTEMS

7-6-1 Fluid Mechanics, Heat Transfer, Experiments, and Energy Systems

Convention Center, 250E 2:00PM–3:45PM

Session Organizer: Wael Mokhtar, *Grand Valley State University, Grand Rapids, MI, United States*

2:00pm – Verification and Validation of a Homogeneous Reaction Kinetics Model Using a Detailed H₂-O₂ Reaction Mechanism Versus Chemkin and Cantera

Technical Paper Publication. IMECE2019-10028
Shah Saud Alam, **Christopher Depcik**, *University of Kansas, Lawrence, KS, United States*

2:21pm – Important Educational Factors for Computational Fluid Dynamics When Teaching New Users How to Apply Commonly Employed Initial Set-Up Configuration Parameters for Airfoils

Technical Paper Publication. IMECE2019-11264
Hussein Al-Qarishey, **Robert Fletcher**, *Lawrence Technological University, Southfield, MI, United States*

2:42pm – Survey of Computational Fluid Dynamics Software for Rotational Purposes

Technical Paper Publication. IMECE2019-11447
Savannah B. Bell, **Andrew C. Blair**, **Lauren N. Wagner**, *Western Kentucky University, Bowling Green, KY, United States*, **Vincent Zou**, *Stanley Black & Decker, Inc., Towson, MD, United States*, **Ali R. Buendia**, **Farhad Ashrafzadeh**, *Western Kentucky University, Bowling Green, KY, United States*

3:03pm – Lean Equations for Thick-Walled Cylinders

Technical Presentation. IMECE2019-12374
James D. Neef, *Northrop Grumman Systems Corporation, Sunnyvale, CA, United States*

3:24pm – Undergraduate Experiential Learning Experience Through Industrial Sponsored Capstone Project on Thermal-Fluids Science

Technical Presentation. IMECE2019-12437
Jiajun Xu, *University of the District of Columbia, Washington, DC, United States*

7-10 TEACHING LABORATORIES, MACHINE SHOP EXPERIENCES, AND TECHNOLOGY-AIDED LECTURING

7-10-2 Teaching Laboratories, Machine Shop Experiences, and Technology-Aided Learning – II

Convention Center, 260 2:00PM–3:45PM

Session Organizer: Salim Azzouz, *Midwestern State University, Wichita Falls, TX, United States*

2:00pm – Different Methods of Programming for Mechanical Engineering Students: A Case Study

Technical Paper Publication. IMECE2019-11424
Mingli Han, **Chang Duan**, *Prairie View A&M University, View, TX, United States*

2:21pm – Demonstration of Bauschinger’s Effect and Sand Heap Analogy in Elastic Plastic Torsion

Technical Paper Publication. IMECE2019-11494
Somnath Chattopadhyay, *Cleveland State University, Cleveland, OH, United States*

2:42pm – An Enhanced Hybrid Model for Teaching Mechanics of Structures Courses

Technical Paper Publication. IMECE2019-11813
Miguel X. Rodriguez-Paz, Jorge A. Gonzalez-Mendivil, J. Asuncion Zarate-Garcia, *Israel Zamora-Hernández, ITESM, Puebla, Mexico*

3:03pm – Experiences of Teaching Mechatronic System Modeling for Twelve Years

Technical Presentation. IMECE2019-12412
Shuvra Das, *University of Detroit, Detroit, MI, United States*

7-3 ENGINEERING ACCREDITATION, DATA COLLECTION, ASSESSMENT, AND ABET

7-3-1 Engineering Accreditation, Data Collection, Assessment, and ABET

Convention Center, 250D **4:00PM–5:45PM**

Session Organizer: Amir Karimi, *University of Texas, San Antonio, TX, United States*

4:00pm – Advantages and Challenges in Employing Peer Evaluation for Assigning Grades to Team Projects

Technical Presentation. IMECE2019-10812
Amir Karimi, *University of Texas, San Antonio, TX, United States*

4:21pm – Student Success at Cal Poly Pomona: Technology-Assisted, Peer-Mentoring Model

Technical Presentation. IMECE2019-11394
Zahra Sotoudeh, Lily Gossage, Katherine Nava, *California State Polytechnic University, Pomona, Chino Hills, CA, United States*, Arturo Salazar, *California State Polytechnic University, Pomona, Ontario, CA, United States*

4:42pm – Current Trends of Mechanical Engineering Undergraduate Curricula in California

Technical Paper Publication. IMECE2019-11511
Chean Chin Ngo, Sang June Oh, *California State University, Fullerton, Fullerton, CA, United States*

5:03pm – An Examination of Instructor Initiated Drop Policy

Technical Presentation. IMECE2019-13877
Amir Karimi, *University of Texas, San Antonio, TX, United States*

5:24pm – Kahoot! Games in a Graduate Fluid Dynamics Course

Poster Presentation. IMECE2019-12983
John Palmore Jr., *Virginia Tech, Blacksburg, VA, United States*

7-12 ENGINEERING RESEARCH INNOVATION AND RESEARCH EXPERIENCES FOR UNDERGRADUATES

7-12-1 Engineering Research Innovation and REU Convention Center, 260 4:00PM–5:45PM

Session Organizer: Emine Foust, *York College, Jacobus, PA, United States*

4:00pm – Multidisciplinary Problem Based Learning: Venipuncture Practice Arm Research

Technical Paper Publication. IMECE2019-11978
Phuong Doan, Connie Gomez, *San Jacinto College, Houston, TX, United States*

4:21pm – Student Mobility Programs: Effect on the Intercultural Competences and Employment of Energy Engineering Students

Technical Presentation. IMECE2019-10925
Tatiana Morosuk, Sara Al Ahmad, George Tsatsaronis, *Technical University Berlin, Berlin, Germany*

4:42pm – Development of an Interactive Program Interface for Learning Finite Element Analysis in Various Engineering Courses

Technical Presentation. IMECE2019-13403
Sung-hwan Joo, *Grand Valley State University, Grand Rapids, MI, United States*

5:03pm – Leveraging Independent Studies to Enhance Undergraduate Research Experience at a Primary Undergraduate Institute

Technical Presentation. IMECE2019-13780
Sanjivan Manoharan, *Grand Valley State University, Grand Rapids, MI, United States*

5:24pm – Elementary Matrix of Units

Technical Presentation. IMECE2019-11605
Joseph Ufnal, *Advanced Power & Energy Corp, Gardner, MA, United States*

TUESDAY, NOVEMBER 12

7-4 SYSTEMS ENGINEERING AND SUSTAINABLE ENGINEERING EDUCATION

7-4-1 Systems Engineering and Sustainable Engineering Education

Convention Center, 250B 10:45AM–12:30PM

Session Organizer: Subha Kumpaty, *Milwaukee School of Engineering, Milwaukee, WI, United States*

10:45am – Kinnikinnic River Trash Collector Design

Technical Paper Publication. IMECE2019-10467
Samantha Felhofer, Kaleigh Kraft, Reilly Flynn, Amanda Mudlaff, Brett Samuelson, Subha Kumpaty, *Milwaukee School of Engineering, Milwaukee, WI, United States*

11:06am – The Role of Higher Education Institutions Regarding Climate Change: The Case of Escuela Superior Politécnica del Litoral and its Carbon Footprint in Ecuador

Technical Paper Publication. IMECE2019-10676
Nancy Paulina Criollo, Angel D. Ramirez, Daniel Salas, Rafael Andrade, *Escuela Superior Politecnica Del Litoral, Guayaquil, Guayas, Ecuador*

11:27am – The Efficacy of Spreadsheet Modelling as an Alternative Means of Teaching Process Simulation

Technical Paper Publication. IMECE2019-11926
Aaron Armstrong, Subha Kumpaty, *Milwaukee School of Engineering, Milwaukee, WI, United States*

11:48am – Effect of Measuring Instrument Eccentricity and Tilt Error on Circularity Form Error

Technical Paper Publication. IMECE2019-11937
Chittaranjan Sahay, *University of Hartford, Bloomfield, CT, United States*, Suhash Ghosh, Poorna Pruthvi Chandra Malempati, *University of Hartford, West Hartford, CT, United States*

12:09pm – Experiential Learning in STEM at the University of the District of Columbia (UDC) Through the Implementation of UDC Firebird Rover for the NASA Human Exploration Rover Challenge

Poster Presentation. IMECE2019-12438
Jiajun Xu, *University of the District of Columbia, Washington, DC, United States*

7-7 PROBLEM SOLVING IN ENGINEERING EDUCATION, RESEARCH, AND PRACTICE

7-7-1 Problem Solving in Engineering Education, Research, and Practice

Convention Center, 250C 10:45AM–12:30PM

Session Organizer: Vito Moreno, *University of Connecticut, Storrs, CT, United States*

10:45am – Teaching Capstone Thermal Systems Design Using ANSYS ICEPAK Based Projects

Technical Paper Publication. IMECE2019-10099
Kevin Anderson, *California State Polytech University, Pomona, CA, United States*

11:06am – Explicit Evaluation of Design Readiness for Student Refinement of Conceptual Design

Technical Paper Publication. IMECE2019-10217
Kenji Iino, *Sydrose Lp, San Jose, CA, United States*, Masayuki Nakao, *University of Tokyo, Bunkyo-ku, Tokyo, Japan*

11:27am – Introduction of Prevention Engineering Into the Mechanical Engineering Curriculum

Technical Paper Publication. IMECE2019-10469
Zbigniew Bzymek, *University of Connecticut, Storrs, CT, United States*, Eliot Brown, *E. O. Smith/UConn, Storrs, CT, United States*

11:48am – Climbing Bloom's Taxonomy With Jupyter Notebooks: Experiences in Mechanical Engineering

Technical Paper Publication. IMECE2019-10615
Bryan Weber, *University of Connecticut, Storrs, CT, United States*

12:09pm – Introducing Sensor and Signal Processing Technologies With Hands-On Experiments and Software Designing Platform to Students in the Undergraduate Mechanical Engineering Program

Technical Paper Publication. IMECE2019-10624
Na Zhu, *University of Michigan - Flint, Flint, MI, United States*

7-5 APPLIED MECHANICS, DYNAMIC SYSTEMS, AND CONTROL ENGINEERING

7-5-1 Applied Mechanics, Dynamic Systems, and Control Engineering

Convention Center, 250B 2:00PM–3:45PM

Session Organizer: Mohammad Mahinfalah, *Milwaukee School of Engineering, Milwaukee, WI, United States*

2:00pm – Design, Development and Implementation of Vibratory Mechanisms to Be Utilized in Dynamics and Vibrations Courses

Technical Paper Publication. IMECE2019-10235
Yoseph Woldemariam, Martin Garcia, Tris Utschig, Ayse Tekes, *Kennesaw State University, Marietta, GA, United States*

2:21pm – Modelling the Motion of a 2-Arm ROV

Technical Paper Publication. IMECE2019-10282
Marius Saure, Sondre Iversen, Andreas Snekkevik, *Western Norway University of Applied Sciences, Bergen, Hordaland, Norway*, Rose Gebhardt, Zhiyang Chen, *Cooper Union, New York, NY, United States*, Christopher Mignano, *Cooper Union, Staten Island, NY, United States*, Dirk M. Luchtenburg, *Cooper Union, New York, NY, United States*, Thomas Impelluso, *Western Norway University of Applied Sciences, Bergen, Norway*

2:42pm – Modelling Buoy Motion at Sea

Technical Paper Publication. IMECE2019-10437
Thorstein R. Rykkje, Tord Tørressen, Håvard Løkkebø, *Western Norway University of Applied Sciences, Bergen, Norge, Norway*

3:03pm – Implementation of Multi-Scale Characterization and Visualization on Enhancement of Solid Mechanics Education

Technical Paper Publication. IMECE2019-10747
Jingyu Wang, *University of Oklahoma, Norman, OK, United States*, Nyree Mason, Firas Akasheh, *Tuskegee University, Tuskegee, AL, United States*, Gul Kremer, *Iowa State University, Ames, IA, United States*, Zahed Siddique, Yingtao Liu, *University of Oklahoma, Norman, OK, United States*

3:24pm – Dissipating Earthquake Energy Through Friction Undergrad Expo. IMECE2019-13943

Myrto Kampouris, Pedro Silva, George Washington University, Washington, DC, United States, Olivia Lee, St. Paul's High School, N/A, NH, United States

7-9 PRE-COLLEGE (K-12) STEM, RET – UNIVERSITY, SCHOOL, AND INDUSTRY ALLIANCE

7-9-1 K-12 STEM, RET – University, School, and Industry Alliance

Convention Center, 250B 4:00PM–5:45PM

Session Organizer: Emine Foust, *York College, Jacobus, PA, United States*

Session Co-Organizer: Subha Kumpaty, *Milwaukee School of Engineering, Milwaukee, WI, United States*

4:00pm – Inspiring Engineering in the K12: Biomimicry as a Bridge Between Math and Biology

Technical Paper Publication. IMECE2019-10248
Fredrik Sanne, *Western Norway University of Applied Sciences, Bergen, Hordaland, Norway*, Inge Risheim, *St. Paul School, Bergen, Norway*, Thomas Impelluso, *Western Norway University of Applied Sciences, Bergen, Norway*

4:21pm – A Model Science-Based Learning STEM Program

Technical Paper Publication. IMECE2019-10352
Benjamin Cieslinski, Mohamed Gharib, Brady Creel, Tala Katbeh, *Texas A&M University at Qatar, Doha, Al-Dawha, Qatar*

4:42pm – A Minimalistic and Historically-Based STEM Learning Approach

Technical Paper Publication. IMECE2019-10465
Joseph Marlowe, John Smith, Dravin Thomas, Subha Kumpaty, *Milwaukee School of Engineering, Milwaukee, WI, United States*

5:03pm – A Model Engineering-Based STEM Learning Program

Technical Paper Publication. IMECE2019-10360
Mohamed Gharib, Benjamin Cieslinski, Brady Creel, Tala Katbeh, *Texas A&M University at Qatar, Doha, Qatar*

5:24pm – STEM Outreach Programs in the Department of Defense: How the Navy is Partnering With K-12 and Post Secondary Educators to Promote STEM in the Classroom and Beyond

Technical Presentation. IMECE2019-12451
Paige George, *NSWC PCD, Panama City, FL, United States*

TRACK 8 FLUIDS ENGINEERING

- 8-1-1: 7th Symposium on Electric, Magnetic and Thermal Phenomena in Micro and Nano-Scale Systems**
- 8-2-1: 6th Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids – I**
- 8-2-2: 26th Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids – II**
- 8-2-3: 26th Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids – III**
- 8-3-1: 25th Symposium on Fundamental Issues and Perspectives in Fluid Mechanics – I**
- 8-3-2: 25th Symposium on Fundamental Issues and Perspectives in Fluid Mechanics – II**
- 8-3-3: 25th Symposium on Fundamental Issues and Perspectives in Fluid Mechanics – III**
- 8-4-1: Symposium on CFD Applications for Optimization and Controls – I**
- 8-4-2: Symposium on CFD Applications for Optimization and Controls – II**
- 8-4-3: Symposium on CFD Applications for Optimization and Controls – III**
- 8-5-1: EFD/CFD Choice: A Dilemma for Industries**
- 8-6-1: Microfluidics and Nanofluidics in Bioengineering Applications I**
- 8-6-2: Multiphase Flows**
- 8-6-3: Fundamentals and Applications in Micro/Nanofluidics I**
- 8-6-4: Fundamentals and Applications in Micro/Nanofluidics II**
- 8-7-1: 15th Forum on Recent Developments in Multiphase**
- 8-9-1: Industrial Flows I**
- 8-9-2: Industrial Flows II**
- 8-9-3: Industrial Flows III**
- 8-9-4: Industrial Flows and Fluid Measurement & Instrumentation**
- 8-11-1: 19th International Symposium on Measurement and Modeling of Environmental Flows and Wind Turbine Aerodynamics and Control**
- 8-12-1: 12th Forum on Fluid Measurements and Instrumentation**
- 8-13-1: Plenary Session I**
- 8-13-2: Plenary Session II**
- 8-14-1: Young Engineers Paper (YEP) Contest**

ACKNOWLEDGMENT

TRACK ORGANIZERS

Judith Bamberger, *Pacific Northwest National Lab, United States*
 Zhongquan Zheng, *Utah State University, United States*

TOPIC ORGANIZERS

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SESSION ORGANIZERS

Kevin Anderson, *California State Polytech University, United States*
 George Chamoun, *Eastman, United States*

David Davis, *NASA Glenn Research Center, United States*
 F. Javier Diez-Garias, *Rutgers, The State University of New Jersey, United States*
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 S.A. Sherif, *University of Florida, United States*
 Hua Tan, *Washington State University-Vancouver, United States*
 Alexandrina Untaroiu, *Virginia Tech, United States*
 Jie Xu, *University of Illinois at Chicago, United States*
 Ravinder Yerram, *GE Power, United States*

TRACK 8 FLUIDS ENGINEERING TUESDAY, NOVEMBER 12

8-9 28TH SYMPOSIUM ON INDUSTRIAL FLOWS

8-9-1 Industrial Flows I

Convention Center, 250D 10:45AM–12:30PM

Session Organizer: Alexandrina Untaroiu, *Virginia Tech, Charlottesville, VA, United States*

Session Co-Organizer: Ravinder Yerram, *GE Power, Houston, TX, United States*

10:45am – CFD Study of Particle and Compressible Flow Interaction for a Twin Wire Arc Spraying System

Technical Paper Publication. IMECE2019-10101
Raymond Faull, Nicole Wagner, Kevin Anderson, *California State Polytech University, Pomona, CA, United States*

11:06am – Micro Hydrokinetic Turbine Operating in the Vicinity of a Free Surface: Multiphase Large Eddy Simulations

Technical Paper Publication. IMECE2019-10899
Bashar Attiya, Muhannad Altimemy, *Lehigh University, Bethlehem, PA, United States*, **Cosan Daskiran,** *Center for Natural Resources, Newark, NJ, United States*, **I-Han Liu,** *Lehigh University, Naperville, IL, United States*, **Alparslan Oztekin,** *Lehigh University, Bethlehem, PA, United States*

11:27am – Enhancing the Performance of Centrifugal Pump by Adding Cylindrical Disks at Inlet Suction

Technical Paper Publication. IMECE2019-11433
Linda Sadik, *Lawrence Technological University, Southfield, MI, United States*, **Badih Jawad,** *Lawrence Technological University, Dearborn Heights, MI, United States*, **Munther Hermez, Liping Liu,** *Lawrence Technological University, Southfield, MI, United States*

11:48am – Design of a Turbopiston Pump Guided by Computational Analysis

Technical Paper Publication. IMECE2019-10636
Ting Wang, *University of New Orleans, New Orleans, LA, United States*, **Patrick Rousset,** *Power Engineering, Inc., Elmwood, LA, United States*

12:09pm – Fluid Flow Characteristics of a Co-Flow Fluidic Slot Jet Thrust Augmentation Propulsion System

Technical Presentation. IMECE2019-13953
Brian Garrett, Kareem Ahmed, *University of Central Florida, Orlando, FL, United States*

8-9 28TH SYMPOSIUM ON INDUSTRIAL FLOWS

8-9-2 Industrial Flows II

Convention Center, 250D 2:00PM–3:45PM

Session Organizer: Kevin Anderson, *California State Polytech University, Pomona, CA, United States*

Session Co-Organizer: Gen Fu, *Virginia Tech, Blacksburg, VA, United States*

2:00pm – Adaptation of an Existing Impeller Design to Large Bore Requirements: Aerodynamic Considerations Technical Paper Publication. IMECE2019-11265

Vishal Jariwala, Louis Larosiliere, *Elliott Group, Jeannette, PA, United States*

2:21pm – Effects of Spraying Parameters on the Paint Transfer Efficiency in Air Spray

Technical Paper Publication. IMECE2019-11896
Simin Zhang, Guolei Wang, Xingjie Liu, Xiaotong Hua, Zhiliang Chen, Ken Chen, *Tsinghua University, Beijing, Beijing, China*

2:42pm – Inclined Injection of Under Expanded Supersonic Gas Jet

Technical Paper Publication. IMECE2019-12020
Alex Sheridan, *Oklahoma State University, Tulsa, OK, United States*, **Shubham Srivastava,** *Rheem Manufacturing, Montgomery, AL, United States*, **Michael Henneke,** *John Zink Hamworthy Combustion, Tulsa, OK, United States*, **Muhammad S. Raza, Khaled Sallam,** *Oklahoma State University, Tulsa, OK, United States*

3:03pm – The Effect of the Embedded Spacers on the Performance of Direct Contact Membrane Distillation System Operating With Different Inlet Feed Temperature Technical Paper Publication. IMECE2019-10723

Anas M. Alwatban, Ahmed Alshwairekh, Umar Alqsair, Robert M. Krysko, Abdullah A. Alghafis, Alparslan Oztekin, *Lehigh University, Bethlehem, PA, United States*

3:24pm – Gas Fuel Variability Using Buffer Volume in Aero-derivative Gas Turbines

Technical Paper Publication. IMECE2019-11090
Ravinder YERRAM, Balakrishnan Ponnuraj, *GE Power, Houston, TX, United States*

8-14 YOUNG ENGINEERS PAPER (YEP) CONTEST

8-14-1 Young Engineers Paper (YEP) Contest

Convention Center, 250C 2:00PM–3:45PM

2:00pm – Analysis of Labyrinth Seal Flow Patterns to Improve Bulk Flow Code Predictions

Technical Paper Publication. IMECE2019-10972
Nathaniel Gibbons, Cori Watson-Kassa, Christopher Goyne, Houston G. Wood, *University of Virginia, Charlottesville, VA, United States*

2:21pm – Three-Dimensional Velocity Field Measurements in Rugged Terrain Using Magnetic Resonance Velocimetry
Technical Paper Publication. IMECE2019-11729

Daniel Chung, *United States Military Academy, West Point, NY, United States*

2:42pm – Cavitation Number as a Function of Disk Cavitator Radius: A Numerical Analysis of Natural Supercavitation

Technical Paper Publication. IMECE2019-12492

Reid Prichard, *Liberty University, Lynchburg, VA, United States*, **Wayne Strasser**, *Eastman Chemical Co, Kingsport, TN, United States*, **Thomas Eldredge**, *Liberty University, Lynchburg, VA, United States*

8-7 15TH FORUM ON RECENT DEVELOPMENTS IN MULTIPHASE FLOW

8-7-1 15th Forum on Recent Developments in Multiphase Flow

Convention Center, 250C

4:00PM–5:45PM

4:00pm – Direct Pressure Measurement and Flow Visualization of Cavitation in a Converging-Diverging Nozzle

Technical Paper Publication. IMECE2019-12236

Benjamin Gallman, B. Terry Beck, Mohammad Hosni, *Kansas State University, Manhattan, KS, United States*

4:21pm – Simulation of Viscous Fingering in Microchannels With Hybrid-Patterned Surface Using Lattice Boltzmann Method

Technical Paper Publication. IMECE2019-10876

Margulan Tursynkhan, Bagdagul Dauyeshova, Desmond Adair, *Nazarbayev University, Astana, Astana, Kazakhstan*, **Ernesto Monaco**, *Engineering Software Steyr, Steyr, Austria*, **Luis Rojas-Solorzano**, *Nazarbayev University, Astana, Kazakhstan*

4:42pm – Lattice Boltzmann Modelling of Contact Angle and Hysteresis Under Homogeneous and Heterogeneous Dynamic Wetting Regime

Technical Paper Publication. IMECE2019-10921

Nursultan Zhumatay, Bagdagul Dauyeshova, Desmond Adair, *Nazarbayev University, Astana, Kazakhstan*, **Ernesto Monaco**, *Engineering Software Steyr, Steyr, Austria*, **Luis Rojas-Solorzano**, *Nazarbayev University, Astana, Kazakhstan*

5:03pm – Multi-Fluid Approach to Model Cross-Stream Migration of Hard Spheres in a Dilute Suspension

Technical Presentation. IMECE2019-13372

Nilanka I.K. Ekanayake, Joseph D. Berry, Anthony D. Stickland, David E. Dunstan, *University of Melbourne, Parkville, VIC, Australia*, **Steven K. Dower, Ineke L. Muir**, *CSL Limited, Parkville, VIC, Australia*, **Dalton J.E. Harvie**, *University of Melbourne, Parkville, Australia*

5:24pm – Experimental Analysis of Chamber Volume Effect on Bubble Formation From Hydrophobic Orifice Substrates
Technical Presentation. IMECE2019-10670

Omkar Gokhale, *University of Cincinnati, Cincinnati, OH, United States*, **Milind A. Jog**, *University of Cincinnati, Mason, OH, United States*, **Raj M. Manglik**, *University of Cincinnati, Cincinnati, OH, United States*

8-9 28TH SYMPOSIUM ON INDUSTRIAL FLOWS

8-9-3 Industrial Flows III

Convention Center, 250D

4:00PM–5:45PM

Session Organizer: Gen Fu, *Virginia Tech, Blacksburg, VA, United States*

Session Co-Organizers: Ravinder Yerram, *GE Power, Houston, TX, United States*, George Chamoun, *Eastman, Gray, TN, United States*

4:00pm – Numerical CFD / FSI Study of Teflon and Dacron for Use in the Femoral Artery Graft Procedure

Technical Paper Publication. IMECE2019-10100

Sukwinder Sandhu, Kevin Anderson, *California State Polytech University, Pomona, CA, United States*

4:21pm – Verification of CFD Prediction Accuracy of Flow Turbulence Induced Vibration Loadings Around a Pipe Bend

Technical Paper Publication. IMECE2019-10200

Xidong Hu, Shaoxiang Qian, Kota Matsuura, Shunji Kataoka, *JGC Corporation, Yokohama, Kanagawa, Japan*

4:42pm – An Assessment of the Validity of Quasi-Steady Analysis of Pressure Relief Valves

Technical Paper Publication. IMECE2019-10607

Christopher Doyle, William Dempster, *University of Strathclyde, Glasgow, Scotland, United Kingdom*, **Steven Taggart**, *Broady Flow Control Ltd., Kingston Upon Hull, East Yorkshire, England, United Kingdom*

5:03pm – The Effect of Mixing Promotors on Sweeping Gas Membrane Distillation System Performance

Technical Paper Publication. IMECE2019-10727

Umar Alqsair, Anas M. Alwatban, Ahmed Alshwairekh, Robert M. Krysko, Abdullah A. Alghafis, Alparslan Oztekin, *Lehigh University, Bethlehem, PA, United States*

5:24pm – Analysis of Spherical PIG Dynamics for an Automated Launching System

Technical Presentation. IMECE2019-12889

Aarthi Sekaran, *Texas A&M University, Galveston, TX, United States*, **Will Stratton**, *WeldFit, Houston, TX, United States*

WEDNESDAY, NOVEMBER 13

8-13 FLUIDS ENGINEERING PLENARIES**8-13-1 Plenary Session I**

Convention Center, 155D

8:45AM–9:30AM

8:45am – Using Uncertainty Quantification With HPC to Reconcile Models and Measurements

Plenary Presentation. IMECE2019-14000

Philip Smith, *University of Utah, Salt Lake City, UT, United States***8-13-2 Plenary Session II**

9:45AM–10:30AM

9:45am – The Smallest Fluids Technologies for the Largest Fluids Challenge: Microfluidics for Energy and the Environment

Plenary Presentation. IMECE2019-14001

David Sinton, *University of Toronto, Toronto, ON, Canada***8-9 28TH SYMPOSIUM ON INDUSTRIAL FLOWS****8-9-4 Industrial Flows and Fluid Measurement & Instrumentation**

Convention Center, 250F

10:45AM–12:30PM

Session Organizer: Ravinder Yerram, *GE Power, Houston, TX, United States*Session Co-Organizer: Alexandrina Untaroiu, *Virginia Tech, Charlottesville, VA, United States***10:45am – The Effect of Crosswind Velocity on the Spray Drift of Flat Fan Nozzle**

Technical Paper Publication. IMECE2019-12049

Saqib Raza, Khaled Sallam, *Oklahoma State University, Tulsa, OK, United States*, Scott Post, *Lincoln Agritech, Christchurch, New Zealand***11:06am – Experimental Investigation of Water Emulsion Fuel Stability**

Technical Paper Publication. IMECE2019-10258

Gurjap Singh, *University of Iowa, Iowa City, IA, United States*, Elio Lopes, *Universiade do Estado de Santa Catarina, Santa Catarina, Brazil*, Nicholas Hentges, Albert Ratner, *University of Iowa, Iowa City, IA, United States***11:27am – Effect of Phase Change Material on Temperature in a Room Fitted With a Windcatcher**

Technical Paper Publication. IMECE2019-10553

Peter Abdo, B. Phuoc Huynh, Ali Braytee, Rahil Taghipour, *University of Technology Sydney, Sydney, Australia***11:48am – Improving the Performance of Centrifugal Pumps in Serial and Parallel Configurations Using Digital Twins**

Technical Paper Publication. IMECE2019-12038

Andrés L. Carrillo Peña, Jeffer S. Eugenio Barroso, Alberto A. Martinez Vesga, *Universidad Autónoma de Bucaramanga, Bucaramanga, Colombia*, Sebastian Roa Prada, *Universidad Autónoma de Bucaramanga, Floridablanca, Santander, Colombia*, Victor A. Ardila Acuña, *Universidad Autónoma de Bucaramanga, Bucaramanga, Santander, Colombia***12:09pm – Hydrodynamic Coefficients for an Extraterrestrial Submarine**

Technical Paper Publication. IMECE2019-10257

Hani Alhasni, Ona Thornquist, Shafquat Tanvirul Islam, *New York University, Brooklyn, NY, United States*, Peter Garrison, *Aerologic, Los Angeles, CA, United States*, Iskender Sahin, *New York University, Brooklyn, NY, United States***8-11 19TH INTERNATIONAL SYMPOSIUM ON MEASUREMENT AND MODELING OF ENVIRONMENTAL FLOWS AND WIND TURBINE AERODYNAMICS AND CONTROL****8-11-1 19th International Symposium on Measurement and Modeling of Environmental Flows and Wind Turbine Aerodynamics and Control**

Convention Center, 250E

10:45AM–12:30PM

Session Organizer: S.A. Sherif, *University of Florida, Gainesville, FL, United States*Session Co-Organizers: Kashif Nawaz, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*, Majid Rashidi, *Cleveland State University, Pepper Pike, OH, United States*, Jinkook Lee, *Eaton, Concord, OH, United States*, Jaikrishnan Kadambi, *Case Western Reserve University, Richmond Heights, OH, United States*, Upendra Rohatgi, *Brookhaven National Laboratory, Upton, NY, United States***10:45am – Analytical and Numerical Modeling of Soil Cutting and Transportation During Auger Drilling Operation**

Technical Paper Publication. IMECE2019-10311

Mohamed Ahmed Aboelftooh Abdeldayem, Mohamed Hussien Mabrouk, Mootaz Abo-Elnor, *Military Technical College, Cairo, Egypt***11:06am – An Interpolation-Based Boundary Scheme for the Finite Volume Discrete Boltzmann Method on Unstructured Grids**

Technical Presentation. IMECE2019-11732

Leitao Chen, Laura Schaefer, *Rice University, Houston, TX, United States*, Hamid Sadat, *University of North University, Denton, TX, United States*

11:27am – Detailed Three-Dimensional Velocity Field Measurements of a Complex Internal Cooling Flow Within a Gas Turbine Vane

Technical Paper Publication. IMECE2019-11764
Michael Benson, David Helmer, Bret Van Poppel, U.S. Military Academy, West Point, NY, United States, **Christopher Elkins**, Stanford University, Stanford, CA, United States, **Benjamin Duhaime, David Bindon, Mattias Cooper, Robert Woodings**, U.S. Military Academy, West Point, NY, United States

11:48am – Wind Energy Harnessing System for Low and High Wind Speeds

Technical Paper Publication. IMECE2019-11995
Majid Rashidi, Cleveland State University, Pepper Pike, OH, United States, **Jaikrishnan Kadambi**, Case Western Reserve University, Richmond Heights, OH, United States, **Renjie Ke**, Case Western Reserve University, Cleveland, OH, United States

12:09pm – Improved Prediction of Energy Generation From Vertical-Axis Wind Turbines Operating in Realistic Unsteady Wind Conditions

Technical Presentation. IMECE2019-13738
Omid Atlaschian, Meredith Metzger, University of Utah, Salt Lake City, UT, United States

8-2 26TH SYMPOSIUM ON FLUID MECHANICS AND RHEOLOGY OF NONLINEAR MATERIALS AND COMPLEX FLUIDS

8-2-1 26th Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids – I

Convention Center, 250E 2:00PM–3:45PM

2:00pm – Secondary Flows in Eccentric-Annular Tubes

Technical Paper Publication. IMECE2019-11548
Mario Letelier, University of Chile, Santiago, Santiago, Chile, **Dennis Siginer**, Botswana International University of Science and Technology, Palapye, Botswana, **Diego Almendra, Juan Stockle**, Universidad de Santiago de Chile, Santiago, Chile

2:21pm – Monte Carlo Simulations of Magnetic Spheroidal Particles on a 2D Plane for Elucidation of Phase Change in Particle Aggregates

Technical Presentation. IMECE2019-12755
Seiya Suzuki, Shouhei Wada, Akira Satoh, Muneo Futamura, Akita Prefectural University, Yurihonjo, Akita, Japan

2:42pm – A New Approach to the Numerical Modeling of the Viscoelastic Rayleigh-Benard Convection

Technical Paper Publication. IMECE2019-11675
Xin Zheng, M'Hamed Boutaous, Shihe Xin, CNRS, INSA-Lyon, Université Claude Bernard Lyon 1, Villeurbanne, Rhone, France, **Dennis Siginer**, Botswana International University of Science and Technology, Palapye, Botswana, **Fouad Hagani, Ronnie Knikker**, INSA de Lyon, Villeurbanne, France

3:03pm – Modification of Turbulent Boundary Layer in the Homogeneous Concentration of Polymer Solution

Technical Presentation. IMECE2019-13905
Yasaman Farsiani, Brian Elbing, Oklahoma State University, Stillwater, OK, United States

3:24pm – Prediction of Transversal Flow in Non-Circular Tubes With a Higher Order Constitutive Equation

Technical Paper Publication. IMECE2019-12062
Mario Letelier, University of Chile, Santiago, Santiago, Chile, **Dennis Siginer**, Botswana International University of Science and Technology, Palapye, Botswana, **Paola Merino, Juan Stockle**, Universidad de Santiago de Chile, Santiago, Chile

8-12 12TH FORUM ON FLUID MEASUREMENTS AND INSTRUMENTATION

8-12-1 12th Forum on Fluid Measurements and Instrumentation

Convention Center, 250F 2:00PM–3:45PM

2:00pm – Convergence of PIV Measurements at the Inlet of a Turbocharger Compressor

Technical Paper Publication. IMECE2019-10461
Deb Banerjee, Ahmet Selamet, Ricky Dehner, Ohio State University, Columbus, OH, United States, **Keith Miazgowicz**, Ford Motor Company, Dearborn, MI, United States

2:21pm – Magnetic-Based Particle Tracking in a Dense Granular Shear Flow

Technical Paper Publication. IMECE2019-10652
Xingtian Tao, Huixuan Wu, University of Kansas, Lawrence, KS, United States

2:42pm – Experimental Characterization of a Novel Piezoelectric Fan

Technical Paper Publication. IMECE2019-11039
Jingru Benner, Eric Shilyuk, Jarrod Coletta, Mehdi Mortazavi, Anthony Santamaria, Western New England University, Springfield, MA, United States, **Shun Su, Tony Nguyen**, Bimitech Inc., San Jose, CA, United States

3:03pm – Development of 3-D Printed Optically Clear Rigid Anatomical Vessels for Particle Image Velocimetry Analysis in Cardiovascular Flow

Technical Paper Publication. IMECE2019-11649
Nicholas Stanley, Ashley Ciero, William Timms, Rodward Hewlin, University of North Carolina at Charlotte, Charlotte, NC, United States

3:24pm – Evaluation of Pressure Field From PIV Data Using Machine Learning

Technical Presentation. IMECE2019-10841
Manan Basu, Tript Sharma, Sushrut Kumar, Rajkumar Singh, Delhi Technological University, Delhi, India

8-1 17TH SYMPOSIUM ON ELECTRIC, MAGNETIC AND THERMAL PHENOMENA IN MICRO AND NANO-SCALE SYSTEMS

8-1-1 17th Symposium on Electric, Magnetic and Thermal Phenomena in Micro and Nano-Scale Systems

Convention Center, 250F

4:00PM–5:45PM

4:00pm – Comparing Electrowettability and Surfactants as Tools for Wettability Enhancement on a Hydrophobic Surface

Technical Paper Publication. IMECE2019-10483

Manojkumar Lokanathan, Vaibhav Bahadur, *University of Texas at Austin, Austin, TX, United States*, Himanshu Sharma, *Indian Institute of Technology, Kanpur, West Bengal, India*, Mostafa Shabaka, *Penn State, State College, PA, United States*, Kishore Mohanty, *University of Texas at Austin, Austin, TX, United States*

4:21pm – Analysis of the Torque Characteristics of an Electromagnetic Eddy Current Brake

Technical Presentation. IMECE2019-10044

Jimin Zhang, Qiao Ren, Peng Zhang, Jitong Zhang, Hechao Zhou, *Tongji University, Shanghai, China*

4:42pm – A Novel Ferrofluid-Based Valve-Less Pump

Technical Paper Publication. IMECE2019-10790

Trevor Michelson, Joshua Rudnick, Joshua Baxter, Reza Rashidi, *State University of New York, Alfred State College, Alfred, NY, United States*

8-2 26TH SYMPOSIUM ON FLUID MECHANICS AND RHEOLOGY OF NONLINEAR MATERIALS AND COMPLEX FLUIDS

8-2-2 26th Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids – II

Convention Center, 250E

4:00PM–5:45PM

4:00pm – Analysis of a Stokes Flow Past a Cube (Friction and Diffusion Coefficients for Brownian Dynamics Simulations)

Technical Paper Publication. IMECE2019-10549

Kazuya Okada, Akira Satoh, *Akita Prefectural University, Yuri-Honjo, Japan*

4:21pm – Brownian Dynamics Simulations of the Motion of Spherical Particles in a Rotating Magnetic Field

Technical Presentation. IMECE2019-10550

Seiya Suzuki, Akira Satoh, Muneo Futamura, *Akita Prefectural University, Yuri-honjo, Akita, Japan*

4:42pm – Continuous Relaxation Spectra and Its Reduced-Dimensionality Descriptions for Engineering Design With Linear Viscoelasticity

Technical Presentation. IMECE2019-13370

Yong Hoon Lee, R.E. Corman, Randy H. Ewoldt, James Allison, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

5:03pm – Flow Enhancement of Highly Viscous Liquids in Conduits by Initiating Velocity Slip at the Limit of Lubrication at Walls

Technical Presentation. IMECE2019-13465

Martin Azese, *Otterbein University, Westerville, OH, United States*

THURSDAY, NOVEMBER 14

8-2 26TH SYMPOSIUM ON FLUID MECHANICS AND RHEOLOGY OF NONLINEAR MATERIALS AND COMPLEX FLUIDS

8-2-3 26th Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids – III

Convention Center, 255C 8:15AM–10:00AM

8:15am – Implications of Non-Bingham Rheology

Technical Paper Publication. IMECE2019-11841
Leonard Pease, Judith Bamberger, Michael Minette, *Pacific Northwest National Laboratory, Richland, WA, United States*

8:36am – Natural Convection in Yield Stress Fluids From a Confined Horizontal Plate

Technical Paper Publication. IMECE2019-11258
Swati Patel, *Indian Institute of Technology Ropar, Rupnagar, Punjab, India*, A H Raja, *Indian Oil Corporation Ltd., Bijapur, Karnataka, India*, R.P. Chhabra, *Indian Institute of Technology Ropar, Rupnagar, Punjab, India*

8:57am – Effect of Impingement Surface Velocity on Slot Jet and Slot Jet Reattachment Nozzles' Flow Field

Technical Paper Publication. IMECE2019-11404
Milad Farzad, Jamal Yagoobi, *Worcester Polytechnic Institute, Worcester, MA, United States*

9:18am – Experimental Study on the Mechanism of a Microjet Arising in an Electro-Conjugate Fluid

Technical Presentation. IMECE2019-10683
Shuntaro Shindo, Naoki Ogasawara, Akira Satoh, Muneo Futamura, *Akita Prefectural University, Yuri-honjo, Akita, Japan*

8-5 PANEL: CFD/EFD CHOICE? – A DILEMMA FOR INDUSTRIES

8-5-1 EFD/CFD Choice? A Dilemma for Industries

Convention Center, 255B 8:15AM–10:00AM

8:15am – CFD and EFD in the Design Process of Fans and Blowers

Panel Presentation. IMECE2019-11761
Philipp Epple, *University of Applied Sciences Coburg, Nurnberg, Bavaria, Germany*

8:36am – Thoughts on Effective Use of CFD and EFD

Panel Presentation. IMECE2019-13990
Barton L. Smith, *Utah State University, Logan, UT, United States*

8:57am – Basic Information for Industrial Customers on Experimental Fluid Dynamic (EFD) Techniques

Plenary Presentation. IMECE2019-12280
Stamatios Pothos, *TSI Incorp, Shoreview, MN, United States*

8-6 MICROFLUIDICS 2019 - FLUID ENGINEERING IN MICRO- AND NANOSYSTEMS

8-6-1 Microfluidics and Nanofluidics in Bioengineering Applications I

Convention Center, 259 8:15AM–10:00AM

Session Organizer: Sanjin Ryu, *University of Nebraska-Lincoln, Lincoln, NE, United States*

Session Co-Organizer: Jie Xu, *University of Illinois at Chicago, Chicago, IL, United States*

8:15am – Enhancing the Cell Viability in High Throughput Deterministic Lateral Displacement Separation of Circulating Tumor Cells

Technical Paper Publication. IMECE2019-10209
Arian Aghilinejad, *University of Southern California, Los Angeles, Los Angeles, CA, United States*, Christopher Landry, George Cha, Xiaolin Chen, *Washington State University Vancouver, Vancouver, WA, United States*

8:36am – Acoustofluidic Micromixer on Lab-on-a-Foil Devices

Technical Presentation. IMECE2019-10533
Yang Lin, Yuan Gao, Mengren Wu, Jie Xu, *University of Illinois at Chicago, Chicago, IL, United States*

8:57am – Microfluidic Analysis of Platelet Activation Mechanism

Technical Presentation. IMECE2019-11989
Carlos Palou, Mohammad Hossan, Aseer Intisar, Naveen Thirunilath, *University of Central Oklahoma, Edmond, OK, United States*

9:18am – Mathematical Modeling of Thrombus Formation in a Microchannel Network

Poster Presentation. IMECE2019-11979
Carlos Palou, Maria Kunnel, Morshed Khandaker, Mohammad Hossan, *University of Central Oklahoma, Edmond, OK, United States*

8-3 25TH SYMPOSIUM ON FUNDAMENTAL ISSUES AND PERSPECTIVES IN FLUID MECHANICS

8-3-1 25th Symposium on Fundamental Issues and Perspectives in Fluid Mechanics – I

Convention Center, 255C 10:15AM–12:00PM

Session Organizer: F. Javier Diez-Garias, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*

Session Co-Organizer: Haibo Dong, *University of Virginia, Charlottesville, VA, United States*

10:15am – Investigating the Flowfield Physics Within Compressible Turbulent Boundary Layers

Technical Paper Publication. IMECE2019-10079
Frederick Ferguson, Dehua Feng, Yang Gao, *North Carolina Agricultural and Technical State University, United States*

10:36am – Design of a High Speed Internal Gear Pump to Increase the Power Density of Electro Hydraulic Actuators (EHA) in Mobile Applications

Technical Paper Publication. IMECE2019-10351
Tobias Pietrzyk, David Roth, Georg Jacobs, Katharina Schmitz, RWTH Aachen University, Aachen, NRW, Germany

10:57am – Assessment of Eddy-Viscosity Turbulence Models on Flow in a Wheelhouse

Technical Paper Publication. IMECE2019-10453
Kaloki Nabutola, Sandra Boetcher, Embry-Riddle Aeronautical University, Daytona Beach, FL, United States

11:18am – Drag Reduction of Ground Vehicles Using Air-Injected Wheel Deflectors

Technical Paper Publication. IMECE2019-10454
Kaloki Nabutola, Sandra Boetcher, Embry-Riddle Aeronautical University, Daytona Beach, FL, United States

11:39am – Influence of Corner Radius on Flow Past Square Cylinder With Tandem Arrangements

Technical Paper Publication. IMECE2019-12222
Sajjad Miran, University of Gujrat, Gujrat, Pakistan, Furqan Ahmad, Dhofar University, Salalah, Dhofar, Oman, Waseem Arif, University of Gujrat, Gujrat, Pakistan, Kamran Nazir, National University of Technology, Islamabad, Pakistan

8-4 SYMPOSIUM ON CFD APPLICATIONS FOR OPTIMIZATION AND CONTROLS

8-4-1 Symposium on CFD Applications for Optimization and Controls – I

Convention Center, 255B **10:15AM–12:00PM**

10:15am – CFD Analysis of Reversed Installation on Flow Measurements by a Plate Orifice

Technical Paper Publication. IMECE2019-10620
Dezhi Zheng, Halliburton, Houston, TX, United States, Haibo Ma, Purdue University, Highland, IN, United States, Armin Silaen, Chenn Zhou, Purdue University Northwest, Hammond, IN, United States

10:36am – Vortex Generator Designs to Improve Flow for a Vehicle Side-View Mirror

Technical Paper Publication. IMECE2019-10669
Zulong Dong, Lawrence Technological University, Southfield, MI, United States, Badih Jawad, Lawrence Technological University, Dearborn Heights, MI, United States, Liping Liu, Hossam Metwally, Lawrence Technological University, Southfield, MI, United States

10:57am – Numerical Analysis of Breakwater Design for Sediment Transportation Under Coastal Wave Actions

Technical Presentation. IMECE2019-11434
Hairui Wang, Ning Zhang, McNeese State University, Lake Charles, LA, United States

11:18am – Investigation of Cross-Wind Effects on Ship-Helo Dynamic Interface

Technical Presentation. IMECE2019-13020
Shrish Shukla, Sidh Nath Singh, Sawan Suman, Indian Institute of Technology Delhi, Delhi, India, R. Vijayakumar, Indian Institute of Technology Madras, Madras, India

11:39am – Predicting the Distribution of Drugs Delivered Using Needleless Liquid Jet Injectors

Technical Presentation. IMECE2019-13103
Siamak Mirfendereski, Fariba Aghabaglou, Ali Tamayol, Jae Sung Park, University of Nebraska-Lincoln, Lincoln, NE, United States

8-6 MICROFLUIDICS 2019 – FLUID ENGINEERING IN MICRO- AND NANOSYSTEMS

8-6-2 Multiphase Flows

Convention Center, 259 **10:15AM–12:00PM**

Session Organizer: Sanjin Ryu, University of Nebraska-Lincoln, Lincoln, NE, United States

Session Co-Organizer: Hua Tan, Washington State University Vancouver, Vancouver, WA, United States

10:15am – Dynamics of Compound Droplet Passing Through a Conical CTC Microfilter

Technical Paper Publication. IMECE2019-10519
Pengliang Chang, Mohammad Abul Hashem, Xiaolin Chen, Hua Tan, Washington State University Vancouver, Vancouver, WA, United States

10:36am – Influence of Lateral Restraint on Thermocapillary Migration of Wetting Droplets

Technical Paper Publication. IMECE2019-11270
Kalichetty Srinivasa Sagar, Dwaraknath K G, Arvind Pattamatta, Thirumalachari Sundararajan, Indian Institute of Technology Madras, Chennai, Tamilnadu, India

10:57am – Jet Initiation After Drop Impact on Micropatterned Hydrophilic Surfaces

Technical Paper Publication. IMECE2019-11500
anayet Siddique, Feng Zhao, Washington State University Vancouver, Vancouver, WA, United States, Mark Weislogel, Portland State University, Portland, OR, United States, Hua Tan, Washington State University Vancouver, Vancouver, WA, United States

11:18am – Controllable Spreading of Microliter-Sized Liquid Droplets Using Ultrasonic Vibration

Technical Presentation. IMECE2019-11966
Matthew Trapuzzano, University of South Florida, Tampa, FL, United States, Nathan Crane, Brigham Young University, Provo, UT, United States, Rasim Guldiken, Andres Tejada-Martinez, University of South Florida, Tampa, FL, United States

8-3 25TH SYMPOSIUM ON FUNDAMENTAL ISSUES AND PERSPECTIVES IN FLUID MECHANICS

8-3-2 25th Symposium on Fundamental Issues and Perspectives in Fluid Mechanics – II

Convention Center, 258 2:00PM–3:45PM

Session Organizer: S.A. Sherif, *University of Florida, Gainesville, FL, United States*

Session Co-Organizer: David Davis, *NASA Glenn Research Center, Cleveland, OH, United States*

2:00pm – Finite Element Method for Fluid Flow in 3D Domains Containing Moving Interfaces

Technical Paper Publication. IMECE2019-10016
A.K.M. Monayem Mazumder, *Saginaw Valley State University, Saginaw, MI, United States*

2:21pm – A DNS Study on Roughness-Induced Transition in Oscillating Pipe Flow by Employing Overset Methodology

Technical Paper Publication. IMECE2019-12300
Ali A. Abdulrasool, Yongho Lee, *Embry-Riddle Aeronautical University, Daytona Beach, FL, United States*

2:42pm – Fully Transient Model of a Hydraulic Accumulator

Technical Paper Publication. IMECE2019-11343
Filipp Kratschun, Andris Rambaks, Katharina Schmitz, *RWTH Aachen University, Aachen, NRW, Germany*

3:03pm – Application of a Hybrid RANS-LES Method to Free Shear Layers

Technical Paper Publication. IMECE2019-10618
Pietro Catalano, *Italian Aerospace Research Center, Capua, Italy*

3:24pm – A Numerical Study of Laminar and Intermittently Turbulent Boundary Layer on an Oscillating Flat Plate Using Pseudo-Compressible RANS Model

Technical Presentation. IMECE2019-12727
Shivank Srivastava, Brandon M. Taravella, Kazim Akyuzlu, *University of New Orleans, New Orleans, LA, United States*

8-4 SYMPOSIUM ON CFD APPLICATIONS FOR OPTIMIZATION AND CONTROLS

8-4-2 Symposium on CFD Applications for Optimization and Controls – II

Convention Center, 255B 2:00PM–3:45PM

2:00pm – A Natural Evolution Based Numerical Optimisation Framework to Develop and Enhance Airfoil-Slat Arrangement

Technical Paper Publication. IMECE2019-10846
Sushrut Kumar, *Delhi Technological University, Delhi, India*,
Priyam Gupta, *Delhi Technological University, Noida, Uttar Pradesh, India*,
Rajkumar Singh, *Delhi Technological University, Delhi, India*

2:21pm – Investigation of Conduit Flow Past Corrugated Structures Using Large Eddy Simulations

Technical Paper Publication. IMECE2019-11273
Sushrut Kumar, Ujjwal Suri, Paras Sachdeva, Rajkumar Singh, *Delhi Technological University, Delhi, India*

2:42pm – Computational Evaluation of a Novel Aerodynamic Road Vehicle Design and Drag Reduction Using Vortex Generators

Technical Paper Publication. IMECE2019-11319
B.B. Arora, Ujjwal Suri, Utkarsh Garg, *Delhi Technological University, New Delhi, Delhi, India*,
Shraman Das, *Delhi Technological University, Noida, Uttar Pradesh, India*,
Sushrut Kumar, *Delhi Technological University, New Delhi, Delhi, India*

3:03pm – Modeling and Analysis of Noise Barrier Shape Effects on Highway Automobiles Emission Dispersion

Technical Paper Publication. IMECE2019-11355
Shaoguang Wang, Xiuling Wang, *Purdue University Northwest, Hammond, IN, United States*

3:24pm – Numerical Verification of the Thermodynamic Determination of the Hydraulic Efficiency of Radial Fans

Technical Paper Publication. IMECE2019-11417
Philipp Epple, Manuel Fritsche, *Coburg University of Applied Sciences, Coburg, Bavaria, Germany*,
Felix Reinker, Stefan aus der Wiesche, *Münster University of Applied Sciences, Steinfurt, Germany*

8-6 MICROFLUIDICS 2019 – FLUID ENGINEERING IN MICRO- AND NANOSYSTEMS

8-6-3 Fundamentals and Applications in Micro/Nanofluidics I

Convention Center, 259 2:00PM–3:45PM

Session Organizer: Sanjin Ryu, *University of Nebraska-Lincoln, Lincoln, NE, United States*

Session Co-Organizer: Brian D. Iverson, *Brigham Young University, Provo, UT, United States*

2:00pm – Pressure Drop in Circular Two-Phase Pipe Flow as Influenced by the Angle of Inclination

Technical Paper Publication. IMECE2019-11352
Bethany Worl, Samuel Nielson, Xiuling Wang, *Purdue University Northwest, Hammond, IN, United States*

2:21pm – Thermal Gradient Gas Chromatography System for Narrowing and Improving Peak Shapes

Technical Presentation. IMECE2019-13730
Brian D. Iverson, *Brigham Young University, Provo, UT, United States*,
Samuel Avila, *Brigham Young University, Orem, UT, United States*

2:42pm – Optofluidic Waveguide Using Oil-Impregnated Nanoporous Surfaces as Cladding Layers

Technical Presentation. IMECE2019-13285
Kaustubh Asawa, Santosh Kumar, Yuping Huang, Chang-Hwan Choi, *Stevens Institute of T United States*

3:03pm – A Selective PDMS Bonding Technique Using Microcontact Printing for the Fabrication of High-Density Microvalve Arrays

Plenary Presentation. IMECE2019-13393

Zachary Estlack, *University of Utah, Salt Lake City, UT, United States*, Md Enayet Razu, Beau Compton, *Texas Tech University, Lubbock, TX, United States*, Jungkyu Kim, *University of Utah, Salt Lake City, UT, United States*

8-3 25TH SYMPOSIUM ON FUNDAMENTAL ISSUES AND PERSPECTIVES IN FLUID MECHANICS

8-3-3 25th Symposium on Fundamental Issues and Perspectives in Fluid Mechanics – III

Convention Center, 155F 4:00PM–5:45PM

Session Organizer: David Davis, *NASA Glenn Research Center, Cleveland, OH, United States*

Session Co-Organizer: Khaled Hammad, *Central Connecticut State University, Avon, CT, United States*

4:00pm – 2D and 3D Stability of Cavity Flows in High Mach Number Regimes

Technical Paper Publication. IMECE2019-10828

Parshwanath Doshi, Rajesh Ranjan, *Ohio State University, Columbus, OH, United States*, Datta Gaitonde, *Ohio State University, Hilliard, OH, United States*

4:21pm – An Experimental and Numerical Study of Boundary Layer on an Oscillating Flat Plate

Technical Presentation. IMECE2019-12726

Kazim Akyuzlu, Brandon M. Taravella, Jonathan R. Eastridge, Shivank Srivastava, *University of New Orleans, New Orleans, LA, United States*

4:42pm – Arbitrary Lagrangian Eulerian Method for Fluid Flow in 2D Domains Containing Moving Objects

Technical Presentation. IMECE2019-13041

A.K.M. Monayem Mazumder, *Saginaw Valley State University, Saginaw, MI, United States*

5:03pm – The Impact of Inflow Velocity Profile and Inertia on Suddenly Expanding Viscoplastic Flows

Technical Presentation. IMECE2019-13460

Khaled Hammad, *Central Connecticut State University, Avon, CT, United States*

8-4 SYMPOSIUM ON CFD APPLICATIONS FOR OPTIMIZATION AND CONTROLS

8-4-3 Symposium on CFD Applications for Optimization and Controls – III

Convention Center, 255B

4:00PM–5:45PM

4:00pm – CFD Modeling of the Hydrogen Fast Filling Process for Type 3 Cylinders and Cylinders Lined With Phase Change Material

Technical Paper Publication. IMECE2019-11449

Mirosław Liszka, Alex Fridlyand, *Gas Technology Institute, Des Plaines, IL, United States*, Ambalavanan Jayaraman, Michael Bonnema, *TDA Research, Inc., Wheat Ridge, CO, United States*, Chakravarthy Sishtla, *Gas Technology Institute, Des Plaines, IL, United States*

4:21pm – Numerical and Experimental Study of an FSAE Intake Manifold

Technical Paper Publication. IMECE2019-11462

Christian Dunn, Luis Enriquez, Joel Godinez, Matthew Moore, Xiuling Wang, Chenn Zhou, *Purdue University Northwest, Hammond, IN, United States*

4:42pm – Analysis of a Double Inlet Gerotor Pump: A Dynamic Multi-Phase CFD Approach Accounting for the Fluid Compressibility and Temperature Dependent Properties

Technical Paper Publication. IMECE2019-11482

Massimo Milani, Luca Montorsi, Stefano Terzi, Gabriele Storchi, *University of Modena and Reggio Emilia, Reggio Emilia, Italy*, Andrea Lucchi, *Dana Motion System Italia srl, Reggio Emilia, Italy*

5:03pm – Numerical Investigation of the Euler Turbomachinery Equation and Analysis of the Impact of the Impeller Design on the Fan Performance by an Optimization Study

Technical Paper Publication. IMECE2019-11572

Manuel Fritsche, *Coburg University of Applied Sciences, Coburg, Bavaria, Germany*, Philipp Epple, *University of Applied Sciences Coburg, Nurnberg, Bavaria, Germany*, Stefan Gast, *Coburg University of Applied Sciences, Coburg, Bavaria, Germany*, Antonio Delgado, *Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany*

5:24pm – CFD Analysis of Flow Structures in a Mixing Chamber

Technical Paper Publication. IMECE2019-11747

Silvio Cândido, Jose Pascoa Marques, António Tomé, *Universidade da Beira Interior, Covilhã, Portugal*, António Amorim, *Universidade de Lisboa, Lisboa, Portugal*, Stefan K. Weber, *CERN, Geneva, Switzerland*

8-6 MICROFLUIDICS 2019 – FLUID ENGINEERING IN MICRO- AND NANOSYSTEMS

8-6-4 Fundamentals and Applications in Micro/Nanofluidics II

Convention Center, 259

4:00PM–5:45PM

4:00pm – Wettability Gradients on Graphene to Drive Bubble Motion

Technical Paper Publication. IMECE2019-10886

Hongyang Yu, Yu Zhao, Jingjie Sha, Yunfei Chen, *Southeast University, Nanjing, China*

4:21pm – Internal Fluidity of a Droplet Pinned to the Hydrophobic Surfaces of a Confined Microchannel

Technical Presentation. IMECE2019-12378

Guang Yang, *Shanghai Jiao Tong University, Shanghai, China*,
Alexandros Terzis, *University of Stuttgart, Stuttgart, Germany*,
Jingyi Wu, *Shanghai Jiao Tong University, Shanghai, China*

4:42pm – Nano Scale Layered Structures for Filtration and Separation

Technical Presentation. IMECE2019-12368

Brian Richardson, *Imagine TF, LLC, Campbell, CA, United States*

5:03pm – A Graphene-integrated Microfluidic Platform for Probing Electrical Activities of Retina

Technical Presentation. IMECE2019-13565

Alberto Esteban Linares, Yuchen Zhang, Matthew Fitzgerald, Thayer Walmsley, Yaqiong Xu, Deyu Li, *Vanderbilt University, Nashville, TN, United States*

5:24pm – Acoustofluidic Micropump on Lab-on-a-Foil Devices

Technical Presentation. IMECE2019-10535

Yang Lin, Yuan Gao, Mengren Wu, Weiqi Zhao, Jie Xu, *University of Illinois at Chicago, Chicago, IL, United States*

TRACK 9 HEAT TRANSFER AND THERMAL ENGINEERING

- 9-2-1: K6-2 Numerical Analysis and Performance Assessment of Energy Systems
- 9-4-1: K6-4 Heat Transfer in Solar Power Systems
- 9-5-1: K6-1 Simulation and Validation Methods of Mixed Convection and Conjugate Heat Transfer Analyses in Annular or Ducting Systems
- 9-6-1: K6-6 Radiative Heat Transfer of Energy Systems
- 9-7-1: K6-7 Heat Transfer in Passive Thermal Control Systems
- 9-9-1: K6-9 Two Phase Transport in Energy Systems and Non-Equilibrium and Dynamic Energy Systems
- 9-10-1: K6-10 Panel on the Key Role of Heat Transfer Analysis in Energy Systems Research
- 9-14-1: K6-14 Radiation Properties
- 9-18-1: K8-1 Fundamentals of Boiling, Evaporation, and Condensation Including Micro/Nano-Scale Effects I
- 9-15-1: K7-1 Spatially Resolved Thermophysical Property Measurements
- 9-16-1: K7-2 Thermophysical Properties of Next-Generation Thermal Storage Materials
- 9-18-2: K8-1 Fundamentals of Boiling, Evaporation, and Condensation including Micro/Nano-Scale Effects II
- 9-19-1: K8-2 Fundamentals of Single Phase Convection I
- 9-19-2: K8-2 Fundamentals of Single Phase Convection II
- 9-20-1: Fundamentals of Electron and Phonon Nonequilibrium Transport (joint with K-9)
- 9-23-1: Panel: Engaging With the Heat Transfer Division (HTD) and Technical Committees
- 9-24-1: K9-1 Thermal Transport Across Hard/Soft Interfaces
- 9-25-1: K9-2 Thermal Transport in 2D and Anisotropic Materials – I
- 9-25-2: K9-2 Thermal Transport in 2D and Anisotropic Materials – II
- 9-25-3: K9-2 Thermal transport in 2D and anisotropic materials – III
- 9-26-1: K9-3 Thermal Transport in Metamaterials
- 9-29-1: K9-6 Nanoscale Modeling and Simulation – I
- 9-29-2: K9-6 Nanoscale Modeling and Simulation – II
- 9-30-1: K9-7 Nanoscale Thermal Radiation
- 9-30-2: K9-7 Nanoscale Thermal Radiation
- 9-31-1: K9-8 Nanoscale Materials for Thermal Energy Systems
- 9-32-1: K10-1 Single Phase Heat Transfer Equipment
- 9-35-1: K10-4 Heat Exchangers
- 9-36-1: K10-5 Advances in Heat Exchangers Design and Analysis – I
- 9-36-2: K10-5 Advances in Heat Exchangers Design and Analysis – II
- 9-39-1: K11-1 CMS – Combustion Processes – I
- 9-39-2: K11-1 CMS – Combustion Processes – II
- 9-41-1: K11-3 CMS – Applied Combustion
- 9-43-1: K13-1 Heat Transfer in MultiPhase Systems – I
- 9-43-2: K13-1 Heat Transfer in MultiPhase Systems – II
- 9-45-1: Condensation
- 9-46-1: K14-1 Gas Turbine Heat Transfer and Cooling
- 9-49-1: K15-3 Transport Phenomena in Additive Manufacturing
- 9-51-1: K16-1: Heat Transfer in Electronic Equipment I
- 9-51-2: K16-1: Heat Transfer in Electronic Equipment II
- 9-53-1: K18-1 Thermal Transport Under High Temperature and/or Pressure Conditions
- 9-57-1: K19-1 Heat and Mass Transfer in the Natural and Built Environment
- 9-59-1: Advances in Water and Wastewater Processing and Water Desalination Technologies
- 9-63-1: K20-2 Applications of Computational Heat Transfer
- 9-64-1: K20-3 Methods and Algorithms in Computational Heat Transfer
- 9-66-1: K21-1 Panel on Recent Advancements and Discussions in Heat Transfer and Thermal Science Education
- 9-69-1: Plenary Session I
- 9-69-2: Plenary Session II

ACKNOWLEDGMENT

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 Anil Yuksel, *IBM Corporation, United States*
 Jianan Zhang, *University of Missouri, United States*
 Bo Zhao, *Stanford University, United States*

TRACK 9 HEAT TRANSFER AND THERMAL ENGINEERING

MONDAY, NOVEMBER 11

9-23 PANEL: ENGAGING WITH THE HEAT TRANSFER DIVISION (HTD) AND TECHNICAL COMMITTEES

9-23-1 Panel: Engaging with the Heat Transfer Division (HTD) and Technical Committees
Convention Center, 250F 10:45AM-12:30PM

Session Organizer: Kevin Dowding, Sandia, Albuquerque, NM, United States

Session Co-Organizers: Raj M. Manglik, University of Cincinnati, Cincinnati, OH, United States, John Maulbetsch, Maulbetsch Consulting, Menlo Park, CA, United States, Satwindar Sadhal, University of Southern California, Los Angeles, CA, United States, Brent Webb, Brigham Young University, Provo, UT, United States, Sandra Boetcher, Embry-Riddle Aeronautical University, Daytona Beach, FL, United States

10:45am – Open Forum: Heat Transfer Division Activities and Engagement Within ASME

Panel Presentation. IMECE2019-13957

Kevin Dowding, Sandia National Laboratories, Albuquerque, NM, United States, **Raj M. Manglik**, University of Cincinnati, Cincinnati, OH, United States

9-32 K10-1 SINGLE PHASE HEAT TRANSFER EQUIPMENT

9-32-1 K10-1 Single Phase Heat Transfer Equipment
Convention Center, 355F 10:45AM-12:30PM

Session Organizer: Sandra Boetcher, Embry-Riddle Aeronautical University, Daytona Beach, FL, United States

Session Co-Organizers: Subramanyaravi Annapragada, United Technologies Research, East Hartford, CT, United States, Gongnan Xie, Northwestern Polytechnical University, Xi'an, China

10:45am – Control of Cold Plate Temperature in a Pumped Two Phase Flow

Technical Paper Publication. IMECE2019-10651

Alok Sinha, Pennsylvania State University, University Park, PA, United States, **Larry Byrd**, AFRL/RQQM, Wright-Patterson AFB, OH, United States

11:06am – The Highly Turbulent Flow and Heat Transfer in Semi-Closed Rotating Disc Cavity

Technical Paper Publication. IMECE2019-11096

Guohu Luo, Zhenqiang Yao, Shengde Wang, Hong Shen, Shanghai Jiao Tong University, Shanghai, China

11:27am – Improving Temperature Probe Calibration Accuracy in Constant Temperature Baths With a Novel Data Processing Method

Technical Paper Publication. IMECE2019-11374

Mustafa Koz, Thomas Visalli, Carrier Corporation, Syracuse, NY, United States

11:48am – Characterizing and Correlating Swirl Flow Behavior and Heat Transfer in Wavy Plate-Fin Cores

Technical Presentation. IMECE2019-13717

Dantong Shi, University of Cincinnati, Cincinnati, OH, United States, **Milind A. Jog**, University of Cincinnati, Mason, OH, United States, **Raj M. Manglik**, University of Cincinnati, Cincinnati, OH, United States

12:09pm – Air Flow Heat Transfer and Pressure Drop in Offset-Strip-Fin Cores: Development of Rationalized Correlations

Technical Presentation. IMECE2019-13754

Kuan-Ting Lin, University of Cincinnati, Cincinnati, OH, United States, **Milind A. Jog**, University of Cincinnati, Mason, OH, United States, **Raj M. Manglik**, University of Cincinnati, Cincinnati, OH, United States

9-43 K13-1 HEAT TRANSFER IN MULTIPHASE SYSTEMS

9-43-1 K13-1 Heat Transfer in MultiPhase Systems – I
Convention Center, 250E 10:45AM-12:30PM

Session Organizer: Abhijit Mukherjee, California State University, Northridge, Northridge, CA, United States

Session Co-Organizer: Scott Thompson, Kansas State University, Manhattan, KS, United States, Vinod Srinivasan, University of Minnesota, Minneapolis, MN, United States

10:45am – Gas Phase Temperature Mapping of Evaporating Water Microdroplets

Technical Presentation. IMECE2019-10628

Mohamed Mousa, University of Illinois at Urbana-Champaign, Urbana, IL, United States, **Daniel Orejon**, University of Edinburgh, Edinburgh, United Kingdom, **Nenad Miljkovic**, University of Illinois at Urbana-Champaign, Urbana, IL, United States

11:06am – Singular Perturbation Solution for a Two-Phase Stefan Problem in Outward Solidification

Technical Paper Publication. IMECE2019-11033

Minghan Xu, Saad Akhtar, Mahmoud Alzoubi, Agus P. Sasmito, McGill University, Montreal, QC, Canada

11:27am – Verification and Validation of Droplet Freezing for Convective Boundary Condition Using Matched Asymptotic Perturbation Method and Computational Fluid Dynamics

Technical Paper Publication. IMECE2019-12081

Saad Akhtar, Minghan Xu, Agus P. Sasmito, McGill University, Montreal, QC, Canada

11:48am – An Investigation of Heat Transfer and the Effect of Turbulence Modification in Gas-Solids Flows

Technical Presentation. IMECE2019-11902

Kyle Hassan, David R. Hanson, Penn State University, State College, PA, United States, Robert Kunz, Penn State University, University Park, PA, United States, Michael P Manahan, Penn State University, State College, PA, United States

12:09pm – The Influence of Micro Pin-Fin Heights on Flow Boiling in Microchannels

Technical Presentation. IMECE2019-12922

Jiaqi Tang, Dongyan Xu, Chinese University of Hong Kong, New Territories, Hong Kong, Hong Kong

9-20 K8-3 FUNDAMENTALS OF ELECTRON AND PHONON NONEQUILIBRIUM TRANSPORT (JOINT WITH K-9)

9-20-1 Fundamentals of Electron and Phonon Nonequilibrium Transport (joint with K-9)

Convention Center, 254B

2:00PM–3:45PM

Session Organizer: Xiulin Ruan, Purdue University, West Lafayette, IN, United States

Session Co-Organizers: Amitabh Narain, Michigan Tech University, Houghton, MI, United States, Diana-Andra Borca-Tasciuc, Rensselaer Polytech Institute, Troy, NY, United States

2:00pm – Large Impact of Electron-Phonon Interaction on Heat Transport of Silicon at Room Temperature

Invited Presentation. IMECE2019-13586

Jiawei Zhou, Doug Shin, Ke Chen, Ryan Duncan, Alexei Maznev, Keith Nelson, Gang Chen, Massachusetts Institute of Technology, Cambridge, MA, United States

2:42pm – Heat Transfer Induced by Electron Tunneling Between Two Metal Plates

Technical Paper Publication. IMECE2019-11365

Bojing Yao, Liang Pan, Purdue University, West Lafayette, IN, United States

3:03pm – A Comprehensive First-principles Analysis of Phonon Thermal Conductivity and Electron-phonon Coupling in Different Metals

Technical Presentation. IMECE2019-12753

Zhen Tong, Shouhang Li, Shanghai Jiao Tong University, Shanghai, China, Xiulin Ruan, Purdue University, West Lafayette, IN, United States, Hua Bao, Shanghai Jiao Tong University, Shanghai

3:24pm – Theoretical Predictions of Force-Induced Acoustic Phonon Transport Between a Silicon Tip and a Platinum Surface Separated by Single-Digit Nanometer Vacuum Gaps

Technical Presentation. IMECE2019-13468

Takuro Tokunaga, Amun Jarzembski, Keunhan Park, Mathieu Francoeur, University of Utah, Salt Lake City, UT, United States

9-35 K10-4 HEAT EXCHANGERS

9-35-1 K10-4 Heat Exchangers

Convention Center, 355F

2:00PM–3:45PM

Session Organizer: Sandra Boetcher, Embry-Riddle Aeronautical University, Daytona Beach, FL, United States

Session Co-Organizer: Subramanyaravi Annapragada, United Technologies Research, East Hartford, CT, United States, Gongnan Xie, Northwestern Polytechnical University, Xi'an, China

2:00pm – Prediction of Oscillatory Heat Transfer Coefficient in Heat Exchangers of Thermo-Acoustic Systems

Technical Paper Publication. IMECE2019-11329

Mosa Georgina Kristen Machesa, Lagouge Tartibu, Francis Kunzi Tekweme, Modestus Okechukwu Okwu, University of Johannesburg, Johannesburg, Gauteng, South Africa

2:21pm – Numerical Investigation on a Flat-Tube Heat Exchanger in Metal Foam

Technical Paper Publication. IMECE2019-11650

Bernardo Buonomo, Furio Cascetta, Anna di Pasqua, Piera Ginetti, Oronzio Manca, Università Della Campania "Luigi Vanvitelli", Aversa, Caserta, Italy

2:42pm – Centrifugal Compressor Performance Prediction Using Gaussian Process Regression and Artificial Neural Networks

Technical Paper Publication. IMECE2019-11936

Pau Cutrina Vilalta, University of Colorado, Colorado Springs, Ribes de Freser, Girona, Spain, Hui Wan, University of Colorado, Colorado Springs, Colorado Springs, CO, United States, Soumya S. Patnaik, Air Force Research Laboratory, Wright-Patterson AFB, OH, United States

3:03pm – Modified Twisted Tape Inserts: Significance of Geometric Non-Dimensional Parameters

Technical Presentation. IMECE2019-12459

Kalpana Gupta, Raj Kumar Singh, Delhi Technological University, Delhi, India, Mandar Vinayak Tendolkar, Veermata Jeejabai Technological Institute, Mumbai, India

3:24pm – Performance of Metal Foam Heat Exchanger Under Frosting Operating Conditions

Technical Presentation. IMECE2019-13366

Kashif Nawaz, Ahmed Elatar, Brian Fricke, Oak Ridge National Laboratory, Oak Ridge, TN, United States

9-43 K13-1 HEAT TRANSFER IN MULTIPHASE SYSTEMS

9-43-2 K13-1 Heat Transfer in MultiPhase Systems – II

Convention Center, 250F 2:00PM–3:45PM

Session Organizer: Abhijit Mukherjee, *California State University Northridge, Northridge, CA, United States*

Session Co-Organizers: Scott Thompson, *Kansas State University, Manhattan, KS, United States*, Vinod Srinivasan, *University of Minnesota, Minneapolis, MN, United States*

2:00pm – Enhancement of Drying Rate of Moist Porous Media With Electrohydrodynamically Assisted Slot Jet Reattachment Nozzle: A Numerical Study

Technical Paper Publication. IMECE2019-10123
Mengqiao Yang, Jamal Yagoobi, Burt Tilley, *Worcester Polytechnic Institute, Worcester, MA, United States*

2:21pm – Numerical Analysis on Evaporation Assisted Convective Cooling: Effect of Surface Morphology

Technical Paper Publication. IMECE2019-11065
Sudipta Saha, Amitav Tikadar, Jamil Khan, Tanvir Farouk, *University of South Carolina, Columbia, SC, United States*

2:42pm – Adaptive Mesh Refinement of the Solidification Front in Continuous Caster Simulations

Technical Paper Publication. IMECE2019-11347
Matthew Moore, Xiang Zhou, *Purdue University Northwest, Hammond, IN, United States*, Haibo Ma, *Purdue University, Highland, IN, United States*, Armin Silaen, Chenn Zhou, *Purdue University Northwest, Hammond, IN, United States*

3:03pm – Eulerian-Eulerian Modeling of Thermal Transport in Homogeneous Bubbly Flow

Technical Presentation. IMECE2019-13362
Deify Law, *California State University, Fresno, Fresno, CA, United States*

9-63 K20-2 APPLICATIONS OF COMPUTATIONAL HEAT TRANSFER

9-63-1 K20-2 Applications of Computational Heat Transfer

Convention Center, 251A 2:00PM–3:45PM

Session Organizer: John Tencer, *Sandia National Laboratories, Albuquerque, NM, United States*

Session Co-Organizers: Samuel Subia, *Sandia National Laboratories, Albuquerque, NM, United States*, Xiuling Wang, *Purdue University Northwest, Hammond, IN, United States*

2:00pm – Numerical Study on Mixed Convection Heat Transfer Enhancement in a Long Horizontal Channel Using Periodically Distributed Rotating Blades

Technical Paper Publication. IMECE2019-10150
Mahmudul Islam, Shahriar Alam, Md. Shajedul Hoque Thakur, Mohammad Nasim Hasan, *Bangladesh University of Engineering & Technology, Dhaka, Bangladesh*, M. Ruhul Amin, *Montana State University, Bozeman, MT, United States*

2:21pm – Numerical Comparisons of Heat Transfer From a Single Jet Emanating From a Slot Nozzle Impinging on an Isothermal Plate

Technical Paper Publication. IMECE2019-10154
Cristian Tibabisco, Salvador Vargas-Díaz, *Universidad Libre, Bogotá, Bogotá, Colombia*, Samir Salamah, *General Electric, Schenectady, NY, United States*

2:42pm – Simulation and Validation of a Two-Phase Pumped Loop Cooling System

Technical Paper Publication. IMECE2019-10272
Thomas C. Magee, Kristen M. Hines, Mike A. Dumesh, Andrew D. Meekins, Michael M. Bridges, *Johns Hopkins University, Laurel, MD, United States*

3:03pm – Modeling and Simulation of the Cooling and Heating Processes of Onions

Technical Paper Publication. IMECE2019-11428
Akililu G. Georges, Doug Britton, *Georgia Institute of Technology, Atlanta, GA, United States*

3:24pm – Turbulent Transport Phenomena Under Impinging Annular Jet

Technical Presentation. IMECE2019-12645
Himadri Chattopadhyay, Prasun Dutta, *Jadavpur University, Kolkata, India*

9-36 K10-5 ADVANCES IN HEAT EXCHANGERS DESIGN AND ANALYSIS

9-36-1 K10-5 Advances in Heat Exchangers Design and Analysis – I

Convention Center, 355F 4:00PM–5:45PM

Session Organizer: Sandra Boetcher, *Embry Riddle Aeronautical University, Daytona Beach, FL, United States*

Session Co-Organizers: Subramanyaravi Annapragada, *United Technologies Research, East Hartford, CT, United States*, Gongnan Xie, *Northwestern Polytechnical University, Xi'an, China*

4:00pm – Numerical Analysis for Performance Evaluation of Round Tubes Inserted With Corrugated Twisted Tape

Technical Paper Publication. IMECE2019-10432
Kalpana Gupta, Rajkumar Singh, Naman Choudhary, Subham Mukhopadhyay, *Delhi Technological University, New Delhi, India*

4:21pm – Investigation of the Effects of Simultaneous Internal Flow Boiling and External Condensation on the Heat Transfer Performance

Technical Paper Publication. IMECE2019-10697
M.M. Kabir, Sangsoo Lee, *Texas A&M University-Kingsville, Kingsville, TX, United States*

4:42pm – Design and Characterization of High Thermal Conductivity Pipes From Roll-to-Roll Processed Hybrid Copper-Polymer Strips for Waste Heat Recovery
 Technical Presentation. IMECE2019-11421
 Manjunath C. Rajagopal, Yuquan Meng, Ho Chan Chang, Timothy Man, Gowtham Kuntumalla, Sreenath Sundar, Hanyang Zhao, Srinivasa Salapaka, Chenhui Shao, Placid Ferreira, Nenad Miljkovic, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*, Sanjiv Sinha, *University of Illinois at Urbana-Champaign, Champaign, IL, United States*

5:03pm – Heat Transfer Characterization of 3D Printable Architected Heat Sinks
 Technical Paper Publication. IMECE2019-11523
 Mohamed Ali, Oraib Al-Ketan, Mohamad Khalil, Kamran Khan, Rashid Abu Al-Rub, Alya Alhammadi, *Khalifa University, Abu Dhabi, United Arab Emir.*

5:24pm – Effect of Nozzle-to-Surface Distance on Thermal Performance of Enhanced Surfaces in a Spray Cooling System
 Technical Presentation. IMECE2019-11847
 Azzam Salman, Nabeel Abdulrazzaq, Amitav Tikadar, Saad K. Oudah, Jamil Khan, *University of South Carolina, Columbia, SC, United States*

9-41 K11-3 CMS - APPLIED COMBUSTION

9-41-1 K11-3 CMS – Applied Combustion
 Convention Center, 355E **4:00PM–5:45PM**

Session Organizer: Kris Jorgensen, *A. O. Smith, Corporate Technology Center, Milwaukee, WI, United States*

Session Co-Organizer: Albert Ratner, *University of Iowa, Iowa City, IA, United States*

4:00pm – Adaptive Wiebe Function Parameters for a Port-Fuel Injected Hydrogen-Fueled Engine
 Technical Paper Publication. IMECE2019-10031
 Shah Saud Alam, Christopher Depcik, *University of Kansas, Lawrence, KS, United States*

4:21pm – A Numerical Investigation of the Effects of Structural Properties on the Performance of a Two-Section Porous Medium Burner
 Technical Paper Publication. IMECE2019-10229
 Peyman Rahimi Borujerdi, *University of Alabama in Huntsville, Huntsville, AL, United States*, Hadi Akbari, *Pacific Green Technologies, Vancouver, BC, Canada*

4:42pm – Optimizing Pulse Combustion Parameters in Carbon Anode Baking Furnaces for Aluminum Production
 Technical Paper Publication. IMECE2019-10500
 Abdul Raouf Tajik, *Khalifa University, Abu Dhabi, United Arab Emir.*, Tariq Shamim, *University of Michigan Flint, Flint, MI, United States*, Ahmed Ghoniem, *Massachusetts Institute of Technology, Cambridge, MA, United States*, Rashid Abu Al-Rub, *Khalifa University, Abu Dhabi, United Arab Emir.*

5:03pm – Influence of Blending Hydrogen and Biogas Into Natural Gas on the Combustion Performance of a Tankless Water Heater
 Technical Paper Publication. IMECE2019-10792
 Yan Zhao, David Morales, Vincent McDonell, *University of California, Irvine, Irvine, CA, United States*

5:24pm – Gas Turbine Combustor Liner Wall Heat Load Characterization for Different Gaseous Fuels
 Technical Paper Publication. IMECE2019-11283
 Kishore Ranganath Ramakrishnan, Shoaib Ahmed, *North Carolina State University, Raleigh, NC, United States*, Benjamin Wahls, *North Carolina State University, Williamsburg, VA, United States*, Prashant Singh, Maria A. Aleman, Kenneth Granlund, Srinath Ekkad, *North Carolina State University, Raleigh, NC, United States*, Federico Liberatore, Yin-hsiang Ho, *Solar Turbines Inc., San Diego, CA, United States*

9-45 K13-3 CONDENSATION

9-45-1 Condensation
 Convention Center, 250E **4:00PM–5:45PM**

Session Organizer: Scott Thompson, *Kansas State University, Manhattan, KS, United States*

Session Co-Organizers: Abhijit Mukherjee, *California State University Northridge, Northridge, CA, United States*, Xiaoming He, *Fischell Department of Bioengineering, College Park, MD, United States*, Rafael Davalos, *Virginia Tech, Blacksburg, VA, United States*

4:00pm – Phenomenon of Fog Formation and Flow Characteristics of Droplet-Vapor-Gas Mixture in a Cooler-Condenser
 Technical Paper Publication. IMECE2019-10260
 Hongfang Gu, Qiwei Guo, Changsong Li, Qing Zhou, *Xi'an Jiaotong University, Xi an, China*

4:21pm – Numerical Investigation of the Dropwise Condensation Process in Top of the Line Corrosion
 Technical Paper Publication. IMECE2019-10359
 Ibrahim Mohamed, *American University of the Middle East, Equila, Kuwait, Kuwait*, Harvey Thompson, Richard Barker, *Leeds University, Leeds, United Kingdom*

4:42pm – Micro-Nanoengineered Surfaces for Enhanced Water Harvesting
 Technical Presentation. IMECE2019-10613
 George Popovic, *University of Illinois at Urbana-Champaign, Burlingame, CA, United States*, Soumyadip Sett, Kalyan Boyina, Kazi Fazle Rabbi, Stephen Bosch, Majid Linjawi, Nenad Miljkovic, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

5:03pm – Electrochemically Etched Durable Superhydrophobic Surfaces
 Technical Presentation. IMECE2019-12017
 Kazi Fazle Rabbi, Soumyadip Sett, Matthew Wu, Kalyan Boyina, Arya Nallanthighall, Nenad Miljkovic, *University of*

9-64 K20-3 METHODS AND ALGORITHMS IN COMPUTATIONAL HEAT TRANSFER

9-64-1 K20-3 Methods and Algorithms in Computational Heat Transfer

Convention Center, 250F 4:00PM–5:45PM

Session Organizer: Cheng-xian Lin, *Florida International University, Miami, FL, United States*

Session Co-Organizers: John Tencer, *Sandia National Laboratories, Albuquerque, NM, United States*, M. Ruhul Amin, *Montana State University, Bozeman, MT, United States*

4:00pm – Development of an Arbitrary Adaptive Volumetric Heat Source Model for Keyhole Mode Laser Welding Process

Technical Paper Publication. IMECE2019-10152
Swarup Bag, *Indian Institute of Technology, Guwahatti, India*,
M. Ruhul Amin, *Montana State University, Bozeman, MT, United States*

4:21pm – Three-Dimensional Transient Heat Conduction Equation Solution for Accurate Quantification of Heat Transfer Coefficient in Transient Liquid Crystal Experiments

Technical Paper Publication. IMECE2019-10760
Shoaib Ahmed, Prashant Singh, Srinath Ekkad, *North Carolina State University, Raleigh, NC, United States*

4:42pm – A Study on the Fluid Flow and Heat Transfer for a Porous Architected Heat Sink Using the Idea of CFD Modelling

Technical Paper Publication. IMECE2019-11498
Mohamed Ali, Oraib Al-Ketan, Nada Baobaid, Kamran Khan, Rashid Abu Al-Rub, *Khalifa University, Abu Dhabi, United Arab Emir.*

5:03pm – Performance Improvements of Krylov Subspace Methods in Numerical Heat Transfer and Fluid Flow Simulations

Technical Paper Publication. IMECE2019-12174
Matthew Blomquist, Abhijit Mukherjee, *California State University Northridge, Northridge, CA, United States*

5:24pm – Investigating Effects of Different Flue-Wall Deformation Modes on the Performance of Anode Baking Furnaces for Aluminum Electrolysis

Technical Paper Publication. IMECE2019-10507
Abdul Raouf Tajik, Mouna Zaidani, *Khalifa University, Abu Dhabi, United Arab Emir.*, **Tariq Shamim**, *University of Michigan Flint, Flint, MI, United States*, **Rashid Abu Al-Rub**, *Khalifa University, Abu Dhabi, United Arab Emir.*

9-66 K21-1 PANEL ON RECENT ADVANCEMENTS AND DISCUSSIONS IN HEAT TRANSFER AND THERMAL SCIENCE EDUCATION

9-66-1 K21-1 Panel on Recent Advancements and Discussions in Heat Transfer and Thermal Science Education

Convention Center, 251A 4:00PM–5:45PM

4:00pm – Recent Advancements and Discussions in Heat Transfer and Thermal Science Education

Panel Presentation. IMECE2019-13973
Kevin Anderson, *California State Polytech University, Pomona, CA, United States*

4:21pm – Recent Advancements and Discussions in Heat Transfer and Thermal Science Education

Panel Presentation. IMECE2019-13974
Patrick Oosthuizen, *Queen's University, Kingston, ON, Canada*

4:42pm – Panel on Recent Advancements and Discussions in Heat Transfer and Thermal Science Education

Panel Presentation. IMECE2019-13947
Michael Pate, *Texas A&M University, College Station, TX, United States*, **Kevin Anderson**, *California State Polytech University, Pomona, CA, United States*, **Mohamed Elkhmri**, *Queen's University, Kingston, ON, Canada*

5:03pm – Panel on Recent Advancements and Discussions in Heat Transfer and Thermal Science Education

Panel Presentation. IMECE2019-13948
Sandip Mazumder, *Ohio State University, Columbus, OH, United States*

TUESDAY, NOVEMBER 12

9-69 PLENARY SESSIONS**9-69-1 Plenary Session I**

Convention Center, 255C

9:45AM–10:30AM

9:45am – Using Additive Manufacturing to Advance Designs in Convective Cooling

Plenary Presentation. IMECE2019-14002

Karen Thole, Pennsylvania State University, University Park, PA, United States

9-6 K6-6 RADIATIVE HEAT TRANSFER AND RADIATIVE PROPERTIES OF ENERGY SYSTEMS**9-6-1 K6-6 Radiative Heat Transfer of Energy Systems**

Convention Center, 250E

10:45AM–12:30PM

Session Organizer: Brian D. Iverson, Brigham Young University, Provo, UT, United States

Session Co-Organizer: Matthew Jones, Brigham Young University, Provo, UT, United States, Anil Yuksel, IBM Corporation, Austin, TX, United States

10:45am – Enhanced Plasmonic Behavior of Metal Nanoparticles Surrounded With Dielectric Shell

Technical Paper Publication. IMECE2019-11994

Anil Yuksel, IBM Corporation, Austin, TX, United States, Michael Cullinan, Edward T. Yu, University of Texas at Austin, Austin, TX, United States, Jayathi Murthy, University of California, Los Angeles, Los Angeles, CA, United States

11:06am – Radiative Heat Transfer in Highly Porous Fibrous Ceramic Insulation

Technical Presentation. IMECE2019-11792

David Curran, Jason Porter, Colorado School of Mines, Golden, CO, United States

11:27am – Application of a Variance Reduction Technique to Surface-to-Surface Monte Carlo Radiation Exchange Calculations

Technical Presentation. IMECE2019-12991

Sandip Mazumder, Ohio State University, Columbus, OH, United States

11:48am – Comparison of Robustness of Discrete Transfer and Discrete Ordinate Radiation Calculations on Computationally Efficient Dimensionally Adaptive Meshes

Technical Presentation. IMECE2019-13537

Todd Williams, Brigham Young University, Orem, UT, United States, Bradley R. Adams, Brigham Young University, Provo, UT, United States

12:09pm – Low Cost Combustion Diagnostics for Biomass Cookstoves

Technical Presentation. IMECE2019-13654

Jacob Thomas, Brady Hales, Matthew Jones, Randy Lewis, Brigham Young University, Provo, UT, United States

9-25 K9-2 THERMAL TRANSPORT IN 2D AND ANISOTROPIC MATERIALS**9-25-1 K9-2 Thermal Transport in 2D and Anisotropic Materials**

Convention Center, 254B

10:45AM–12:30PM

Session Organizer: Michael Pettes, Los Alamos National Laboratory, Los Alamos, NM, United States

Session Co-Organizer: Jun Liu, North Carolina State University, Raleigh, NC, United States

10:45am – Studying Thermal Transport in Graphene Nanomesh by Optimizing the Pore Arrangement via Genetic Algorithm

Technical Presentation. IMECE2019-10688

Han Wei, Hua Bao, Shanghai Jiao Tong University, Shanghai, China, Xiulin Ruan, Purdue University, West Lafayette, IN, United States

11:06am – Heat Transfer Interface to Graphitic Foam

Technical Paper Publication. IMECE2019-10691

Fang-Ming Lin, Raymond Yee, San Jose State University, San Jose, CA, United States, Eric Anderssen, Lawrence Berkeley National Laboratory, Berkeley, CA, United States

11:27am – Effects of Electron-Phonon Interactions on Thermal Transport in Quasi-1D NbSe₃ Nanowires

Technical Presentation. IMECE2019-13606

Zhiliang Pan, Yi Tao, Vanderbilt University, Nashville, TN, United States, Lin Yang, Lawrence Berkeley National Laboratory, Berkeley, CA, United States, Deyu Li, Vanderbilt University, Nashville, TN, United States

11:48am – Rheological Characterization of Graphene-Water Nanofluids and Hysteresis Phenomenon

Technical Presentation. IMECE2019-11230

Cayan Demirkir, Hakan Erturk, Bogazici University, Istanbul, Turkey

12:09pm – Thermal Transport Mechanism in Functionalized Monolayer Ti₃C₂T_z MXenes

Technical Presentation. IMECE2019-11692

Hamed Gholivand, Amin Salehi-Khojin, Fatemeh Khalili-Araghi, University of Illinois at Chicago, Chicago, IL, United States

12:30pm – Interfacial Thermal Transport in Atomically Thin Ti₃C₂T_z MXene-Based Electronic Devices

Technical Presentation. IMECE2019-11719

Zahra Hemmat, Amin Salehi-Khojin, University of Illinois at Chicago, Chicago, IL, United States

12:51pm – Intrinsic Low Thermal Conductivity and Phonon Renormalization due to Strong Anharmonicity of Single-Crystal Tin Selenide

Technical Presentation. IMECE2019-13535

Joonsang Kang, Huan Wu, Man Li, Yongjie Hu, University of California, Los Angeles, Los Angeles, CA, United States

9-36 K10-5 ADVANCES IN HEAT EXCHANGERS DESIGN AND ANALYSIS

9-36-2 K10-5 Advances in Heat Exchangers Design and Analysis – II

Convention Center, 250F 10:45AM–12:30PM

Session Organizer: Sandra Boetcher, *Embry-Riddle Aeronautical University, Daytona Beach, FL, United States*

Session Co-Organizers: Subramanyaravi Annapragada, *United Technologies Research, East Hartford, CT, United States*, Gongnan Xie, *Northwestern Polytechnical University, Xi'an, China*

10:45am – Genetic Algorithm Based Topology Optimization of Heat Exchanger Fins Used in Aerospace Applications

Technical Paper Publication. IMECE2019-10617

Bashir Mekki, *Penn State University, University Park, PA, United States*, **Joshua Langer**, *Naval Air Systems Command, Lakehurst, NJ, United States*, **Stephen Lynch**, *Penn State University, University Park, PA, United States*

11:06am – Measurement Errors and Uncertainty Estimation of an Experimental Set Up Using a 2D PIV Technique

Technical Paper Publication. IMECE2019-11652

Flavia Barbosa, **Carlos A.P. Costa**, **Senhorinha Teixeira**, **Jose Teixeira**, *University of Minho, Guimarães, Portugal*

11:27am – Numerical and Experimental Analysis of Twisted Tape Insert in Circular Tube

Technical Paper Publication. IMECE2019-10203

Vaishali Chandratre, *KJ's Trinity College of Engineering and Research, Pune, Maharashtra, India*, **A.A. Keste**, *M.E.S. College of Engineering, Pune, Pune, Maharashtra, India*, **N.K. Sane**, *Walchand College of Engineering, Sangali, Sangali, Maharashtra, India*

11:48am – Rational Design of Soft Heat Exchangers for Enhanced Personal, Robotic, and Wearable Electronics Cooling

Technical Presentation. IMECE2019-12527

Praveen Kotagama, **Akshay Phadnis**, **Kenneth C. Manning**, **Konrad Rykaczewski**, *Arizona State University, Tempe, AZ, United States*

12:09pm – Additively Manufactured Liquid Cooling Minichannels Integrated With Static Mixers

Technical Presentation. IMECE2019-13030

Beomjin Kwon, *Arizona State University, Tempe, AZ, United States*, **Leon Liebenberg**, **Anthony Jacobi**, **William King**, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

9-7 K6-7 HEAT TRANSFER IN PASSIVE THERMAL CONTROL SYSTEMS

9-7-1 K6-7 Heat Transfer in Passive Thermal Control Systems

Convention Center, 250E

2:00PM–3:45PM

Session Organizer: Rydge Mulford, *University of Dayton, Dayton, OH, United States*

Session Co-Organizer: Matthew Jones, *Brigham Young University, Provo, UT, United States*

2:00pm – Design of Nanoparticle Doped Window Glasses for Improved Energy Efficiency

Technical Presentation. IMECE2019-11611

Cagatay Haratoka, **Hakan Erturk**, *Bogazici University, Istanbul, Turkey*, **M. Pinar Menguc**, *Ozyegin University, Cekmekoy, Istanbul, Turkey*

2:21pm – Curvature Change Analysis of SMART Fibers Used for Temperature Adaptive Insulation

Technical Paper Publication. IMECE2019-11620

Cameron Ripa, **Andrew Latulippe**, **Hongwei Sun**, *University of Massachusetts Lowell, Lowell, MA, United States*, **Stephen Fossey**, **Christopher Drew**, *U.S. Army Combat Capabilities Development Command - Soldier Center, Natick, MA, United States*

2:42pm – Operation of a Heat Pipe With Multiple Heat Loads Under Reflux Mode

Technical Presentation. IMECE2019-12491

Jentung Ku, *NASA, Greenbelt, MD, United States*

3:03pm – Cryothermal Vacuum Measurement of Thermochromic Variable Emissivity Coatings for Spacecraft Thermal Management

Technical Presentation. IMECE2019-12558

Sydney Taylor, **Neal Boman**, **Jeremy Chao**, **Liping Wang**, *Arizona State University, Tempe, AZ, United States*

3:24pm – Augmenting the Turn-Down Ratio of a Re-Deployable Radiator Using Electrochromic Surfaces

Technical Presentation. IMECE2019-13845

Rydge Mulford, *University of Dayton, Dayton, OH, United States*, **Matthew Jones**, *Brigham Young University, Provo, UT, United States*, **Brian D. Iverson**, *Brigham Young University, Provo, UT, United States*

9-25 K9-2 THERMAL TRANSPORT IN 2D AND ANISOTROPIC MATERIALS

9-25-2 K9-2 Thermal Transport in 2D and Anisotropic Materials – II

Convention Center, 254B 2:00PM–3:45PM

Session Organizer: Michael Pettes, *Los Alamos National Laboratory, Los Alamos, NM, United States*

Session Co-Organizer: Jun Liu, *North Carolina State University, Raleigh, NC, United States*

2:00pm – A Convenient and Reliable Method of Manufacturing Inclined Bulk Graphite for Measuring Thermal Conductivity With TDTR

Technical Paper Publication. IMECE2019-10572
Yu Zhao, Hongyang Yu, Jingjie Sha, Yunfei Chen, *Southeast University, Nanjing, China*

2:21pm – Super Compliant and Soft (CH₃NH₃)₃Bi₂I₉ Crystal with Ultralow Thermal Conductivity

Technical Presentation. IMECE2019-12963
Hao Ma, Chen Li, *Cornell University, Ithaca, NY, United States*, Yunwei Ma, *Virginia Tech, Blacksburg, NY, United States*, Heng Wang, *Illinois Institute of Technology, Chicago, IL, United States*, Zachary W. Rouse, *Cornell University, Ithaca, NY, United States*, Zhuolei Zhang, *Lawrence Berkeley National Laboratories, Berkeley, CA, United States*, Carla Slebodnick, *Virginia Tech, Blacksburg, VA, United States*, Ahmet Alatas, *Argonne National Laboratory, Argonne, IL, United States*, Shefford Baker, *Cornell University, Ithaca, NY, United States*, Jeffrey J. Urban, *Lawrence Berkeley National Laboratories, Berkeley, CA, United States*, Zhiting Tian, *Cornell University, Ithaca, NY, United States*

2:42pm – Three-Dimensional Anisotropic Thermal Transport in Tellurene Thin Films

Technical Presentation. IMECE2019-12964
Shouyuan Huang, Mauricio Segovia, *Purdue University, West Lafayette, IN, United States*, Xiaolong Yang, *Shenzhen University, Shenzhen, China*, Yee Rui Koh, *Birck Nanotechnology Center, West Lafayette, IN, United States*, Yixiu Wang, Wenzhuo Wu, Ali Shakouri, Xiulin Ruan, Xianfan Xu, Peide D. Ye, *Purdue University, West Lafayette, IN, United States*

3:03pm – On the Importance of Using Exact Full Phonon Dispersions for Predicting Interfacial Thermal Conductance of Layered Materials using Diffuse Mismatch Model

Technical Presentation. IMECE2019-13011
Harish Subramanyan, Kyunghoon Kim, Jun Liu, *North Carolina State University, Raleigh, NC, United States*

3:24pm – Disorder Enhanced Thermal Conductivity Anisotropy in Two-Dimensional Materials and van der Waals Heterostructures

Technical Presentation. IMECE2019-13012
Kyunghoon Kim, Jixiong He, Jun Liu, *North Carolina State University, Raleigh, NC, United States*

3:45pm – Revisiting Phonon-Phonon Scattering in Single-Layer Graphene

Technical Presentation. IMECE2019-13409
Xiaokun Gu, *Shanghai Jiao Tong University, Shanghai, China*, Zheyong Fan, *Aalto University, Aalto, Finland*, Hua Bao, Changying Zhao, *Shanghai Jiao Tong University, Shanghai, China*

4:06pm – The Effect of Organic Chain Length and Binding Chemistry on Thermal Transport in 2D Hybrid Perovskite Crystals

Technical Presentation. IMECE2019-13705
Md. Abu Jafar Rasel, Joseph Feser, *University of Delaware, Newark, DE, United States*

9-39 K11-1 CMS – COMBUSTION PROCESSES

9-39-1 K11-1 CMS – Combustion Processes – I

Convention Center, 250F 2:00PM–3:45PM

Session Organizer: Omid Askari, *Mississippi State University, Mississippi State, MS, United States*

Session Co-Organizers: Albert Ratner, *University of Iowa, Iowa City, IA, United States*, Jianan Zhang, *University of Missouri, Columbia, MO, United States*

2:00pm – A Review on Techniques to Improve Performance and Reduce Emissions of Diesel Engine Running With Higher Viscous Fuels (HVF's)

Technical Paper Publication. IMECE2019-10120
Saiful Bari, Shekh Hossain, *University of South Australia, Adelaide, SA, Australia*, Idris Saad, *Universiti Teknologi, Shah Alam, Malaysia*

2:21pm – Effects of Gravity Level on Morphology of Laminar Double Flames

Technical Paper Publication. IMECE2019-11051
Tao Chen, Yu Cheng Liu, *Tsinghua University, Beijing, China*

2:42pm – Evolution of Liquid and Gas Phase Functional Groups During the Distillation Process of an Aviation Fuel

Technical Paper Publication. IMECE2019-11118
Lei Luo, Shuqing Chen, Yu Cheng Liu, *Tsinghua University, Beijing, China*

3:03pm – Concurrent-Flow Flame Spread Over a Thin Solid in a Narrow Confined Space in Microgravity

Technical Paper Publication. IMECE2019-11908
YanJun Li, Ya-Ting Liao, *Case Western Reserve University, Cleveland, OH, United States*, Paul Ferkul, *Universities Space Research Association, Cleveland, OH, United States*

3:24pm – Turbulent Mixing Behind Detonation Propagation Into Sharp and Diffuse Reactive-Inert Gas Interfaces

Technical Presentation. IMECE2019-13263
Brian Maxwell, Mohnish Peswani, *Case Western Reserve University, Cleveland, OH, United States*, Josué Melguizo-Gavilanes, *Centre National de la Recherche Scientifique, Futuroscope-Chasseneuil, La Vienne, France*

9-9 K6-9 TWO PHASE TRANSPORT IN ENERGY SYSTEMS AND NON-EQUILIBRIUM AND DYNAMIC ENERGY SYSTEMS

9-9-1 K6-9 Two Phase Transport in Energy Systems and Non-Equilibrium and Dynamic Energy Systems
Convention Center, 250E 4:00PM–5:45PM

Session Organizer: David Pratt, *Wright Patterson, Miamisburg, OH, United States*

Session Co-Organizers: Rydge Mulford, *University of Dayton, Dayton, OH, United States*, Mitra Sexton, *Knolls Atomic Power Lab, Clifton Park, NY, United States*

4:00pm – Evaluate the Performance of Vertical and Horizontal Liquefied Natural Gas Storage Tanks by Using a Non-Equilibrium Resistance-Capacitance Model

Technical Paper Publication. IMECE2019-11877
Zhihao Wang, Amir Sharafian, Walter Mérida, University of British Columbia, Vancouver, BC, Canada

4:21pm – Methane Emissions Reduction in Liquefied Natural Gas Off-Loading Process in Refueling Stations

Technical Paper Publication. IMECE2019-11885
Amir Sharafian, Paul Blomerus, Walter Mérida, University of British Columbia, Vancouver, BC, Canada

4:42pm – Grounded Electrode Size Effect on Forced Convection Enhancement by a Single Stage EHD Gas Pump

Technical Paper Publication. IMECE2019-10015
A.K.M. Monayem Mazumder, Saginaw Valley State University, Saginaw, MI, United States

5:03pm – A Compact Integrated Thermosyphon Heat Sink for Power Electronics Cooling

Technical Paper Publication. IMECE2019-11777
Ahmed Elkholy, Roger Kempers, York University, Toronto, ON, Canada

5:24pm – Development of a Protective Water Blade in the Nozzle of an Advanced Thermal Plasma Micro-Reactor

Technical Presentation. IMECE2019-13375
Florent Lemont, Michael Marchand, François Rousset, François Rousset, Aldo Russello, CEA, Bagnols sur Cèze, France

9-39 K11-1 CMS - COMBUSTION PROCESSES

9-39-2 K11-1 CMS – Combustion Processes – II
Convention Center, 250F 4:00PM–5:45PM

Session Organizer: Omid Askari, *Mississippi State University, Mississippi State, MS, United States*

Session Co-Organizer: Albert Ratner, *University of Iowa, Iowa City, IA, United States*, Jianan Zhang, *University of Missouri, Columbia, MO, United States*

4:00pm – Experimental Study of Partial Fuel Substitution With Hydroxy and Energy Recovery in Low Displacement Compression Ignition Engines

Technical Paper Publication. IMECE2019-10122
Jorge Duarte, Universidad del Atlántico, Barranquilla, Colombia, Ricardo Stand, Sphere Energy, Barranquilla, Colombia, Marley Vanegas, Natalia Duarte Forero, Brando Hernandez, Universidad del Atlántico, Barranquilla, Colombia

4:21pm – Numerical Analysis of Detonability Assessment in a Natural Gas-Air Fueled Rotating Detonation Engine

Technical Paper Publication. IMECE2019-11728
Pankaj Saha, Peter Strakey, Donald Ferguson, Arnab Roy, National Energy Technology Laboratory, Morgantown, WV, United States

4:42pm – Numerical Simulations and Validation of Engine Performance Parameter in Direct Injection Spark Ignition (DISI) Engines Using Chemical Kinetics

Technical Presentation. IMECE2019-12826
Muzammil Arshad, University of Wisconsin-Platteville, Platteville, WI, United States

5:03pm – Internal Circulation and the Vaporization of Droplets in Convective Flow

Technical Presentation. IMECE2019-12984
John Palmore Jr, Virginia Tech, Blacksburg, VA, United States

WEDNESDAY, NOVEMBER 13

9-69 PLENARY SESSIONS

9-69-2 Plenary Session II

Convention Center, 155E

9:45AM–10:30AM

9:45am – Nanowarming for Regenerative Medicine

Plenary Presentation. IMECE2019-14003

John Bischof, *University of Minnesota, Minneapolis, MN, United States*

9-14 K6-14 RADIATION HEAT TRANSFER AND RADIATION PROPERTIES

9-14-1 K6-14 Radiation Properties

Convention Center, 251B

10:45AM–12:30PM

Session Organizer: Brian D. Iverson, *Brigham Young University, Provo, UT, United States*

Session Co-Organizer: Matthew Jones, *Brigham Young University, Provo, UT, United States*

10:45am – Optical Characterization of Nanoparticle Aggregates Using Machine Learning

Technical Presentation. IMECE2019-11595

Atay Kaan Ozbek, Hakan Erturk, *Bogazici University, Istanbul, Turkey*

11:06am – Determination of Spectral Radiative Properties of Particle Beds Used for Thermal Energy Storage in Concentrated Solar Power Application

Technical Presentation. IMECE2019-12744

Chuyang Chen, *Georgia Institute of Technology, Smyrna, GA, United States*, Peter Loutzenhiser, Devesh Ranjan, Zhuomin Zhang, *Georgia Institute of Technology, Atlanta, GA, United States*

11:27am – Measurement of Spectral Absorption Coefficients for Additive Manufacturing Materials

Technical Presentation. IMECE2019-13640

Nicholas Wallace, Matthew Jones, Nathan Crane, *Brigham Young University, Provo, UT, United States*

11:48am – Conditions for Equivalence of Apparent Total Directional Absorptivity and Emissivity for Surfaces Representing Cavities

Technical Presentation. IMECE2019-13745

Ernest T. Lee, *Brigham Young University, Provo, UT, United States*, Rydge Mulford, *University of Dayton, Dayton, OH, United States*, Matthew Jones, Brian D. Iverson, *Brigham Young University, Provo, UT, United States*

12:09pm – System for Measuring Directional Radiative Properties of Surfaces Representing Cavities in the Visible and Infrared Regions

Technical Presentation. IMECE2019-13778

Kyle S. Meaker, *Brigham Young University, Provo, UT, United States*, Rydge Mulford, *University of Dayton, Dayton, OH, United States*, Ernest T. Lee, Matthew Jones, Brian D. Iverson, *Brigham Young University, Provo, UT, United States*

9-26 K9-3 THERMAL TRANSPORT IN METAMATERIALS

9-26-1 K9-3 Thermal Transport in Metamaterials

Convention Center, 250A

10:45AM–12:30PM

10:45am – Tuning Thermoelectricity in Molecular Junctions via Quantum Interference

Technical Presentation. IMECE2019-10462

Ruijiao Miao, *Lawrence Berkeley National Laboratory, Berkeley, CA, United States*

11:06am – An Experimental Investigation of the Contribution of Different Carbonaceous Nanomaterials to Thermal Conductance of Thermal Interface Materials

Technical Paper Publication. IMECE2019-11553

Prashant Singh, *North Carolina State University, Raleigh, NC, United States*, Seul-Yi Lee, Roop Mahajan, *Virginia Tech, Blacksburg, VA, United States*

11:27am – Phonon transport in Si/Ge(001) and PbTe/PbSe(001) Superlattices

Technical Presentation. IMECE2019-13290

Yang Li, Youping Chen, *University of Florida, Gainesville, FL, United States*

11:48am – Optimization of Radom Multilayer Structure Through Physics-Informed Machine Learning

Technical Presentation. IMECE2019-13723

Pranay Chakraborty, Tengfei Ma, Lei Cao, Yan Wang, *University of Nevada, Reno, Reno, NV, United States*

12:09pm – The Effect of Dimensionality on Phonon Localization

Technical Presentation. IMECE2019-13787

Tengfei Ma, Lei Cao, Yan Wang, *University of Nevada, Reno, Reno, NV, United States*

9-46 K14-1 GAS TURBINE HEAT TRANSFER AND COOLING

9-46-1 K14-1 Gas Turbine Heat Transfer and Cooling

Convention Center, 251C

10:45AM–12:30PM

Session Organizer: Stephen Lynch, *Penn State University, University Park, PA, United States*

Session Co-Organizer: John Blanton, *Classic Engineering, LLC, Simpsonville, SC, United States*, Lamyaa El-Gabry, *Princeton University, Princeton, NJ, United States*

10:45am – Impingement Heat Transfer of Various Lobe-Shaped Nozzles

Technical Paper Publication. IMECE2019-10660

Sanskar Panse, Srivatsan Madhavan, Prashant Singh, Srinath Ekkad, *North Carolina State University, Raleigh, NC, United States*

11:06am – Irregular Shape Optimization for the Film Cooling Nozzle of Gas Turbines Using Numerical Optimization Tool

Technical Paper Publication. IMECE2019-10974
Mohammad Alshehaby, *American University in Cairo, Cairo, Cairo, Egypt*, **Lamyaa El-Gabry**, *Princeton University, Princeton, NJ, United States*

11:27am – Flow and Heat Transfer Analysis of a Transitional Boundary Layer in a Linear Turbine Cascade

Technical Presentation. IMECE2019-13500
Yousef Kanani, *Illinois Institute of Technology, Oak Park, IL, United States*, **Sumanta Acharya**, *Illinois Institute of Technology, Chicago, IL, United States*

11:48am – Relative Casing Motion Effect on Turbine Squealer Tip Cooling Performance at Tight Tip Clearance

Technical Paper Publication. IMECE2019-11237
Diwei Zhu, *Shanghai Jiao Tong University, Shanghai, Shanghai, China*, **Qiang Zhang**, *City University London, London, United Kingdom*, **Shaopeng Lu**, **Jinfang Teng**, *Shanghai Jiao Tong University, Shanghai, China*

9-10 K6-10 PANEL ON THE KEY ROLE OF HEAT TRANSFER ANALYSIS IN ENERGY SYSTEMS RESEARCH

9-10-1 K6-10 Panel on the Key Role of Heat Transfer Analysis in Energy Systems Research
Convention Center, 251B 2:00PM–3:45PM

2:00pm – The Key Role of Heat Transfer Analysis in Energy Systems Research

Panel Presentation. IMECE2019-13969
Alexander Rattner, *Penn State University, University Park, PA, United States*

2:21pm – The Key Role of Heat Transfer Analysis in Energy Systems Research

Panel Presentation. IMECE2019-13970
S.A. Sherif, *University of Florida, Gainesville, FL, United States*

2:42pm – The Key Role of Heat Transfer Analysis in Energy Systems Research

Panel Presentation. IMECE2019-13971
Peiwen Li, *University of Arizona, Oro Valley, AZ, United States*

3:03pm – The Key Role of Heat Transfer Analysis in Energy Systems Research

Panel Presentation. IMECE2019-13972
Srinath Ekkad, *North Carolina State University, Raleigh, NC, United States*

9-19 K8-2 FUNDAMENTALS OF SINGLE PHASE CONVECTION

9-19-1 K8-2 Fundamentals of Single Phase Convection I

Convention Center, 251C 2:00PM–3:45PM

Session Organizer: *Diana-Andra Borca-Tasciuc, Rensselaer Polytech Institute, Troy, NY, United States*

Session Co-Organizer: *Chris Kobus, Oakland University, Rochester, MI, United States*

2:00pm – A Correlation for Laminar, Transitional, and Turbulent Flow in a Flat Plate Boundary Layer

Invited Presentation. IMECE2019-12812
John Lienhard, *Massachusetts Institute of Technology, Cambridge, MA, United States*

2:42pm – Effect of Pore Density on Jet Impingement Onto Thin Metal Foams Under Intermediate Crossflow Scheme

Technical Paper Publication. IMECE2019-10748
Srivatsan Madhavan, **Vivek Subramaniam Sambamurthy**, **Prashant Singh**, **Srinath Ekkad**, *North Carolina State University, Raleigh, NC, United States*

3:03pm – Effect of Thermal Boundary Condition on Forced Convection From Circular Cylinders

Technical Presentation. IMECE2019-12956
Mohamed Abdelhady, **David Wood**, *University of Calgary, Calgary, AB, Canada*

3:24pm – Shape Factors for Heat Conduction Inside and Outside Two-Dimensional Bodies

Technical Presentation. IMECE2019-12813
John Lienhard, *Massachusetts Institute of Technology, Cambridge, MA, United States*

9-29 K9-6 NANOSCALE MODELING AND SIMULATION

9-29-1 K9-6 Nanoscale Modeling and Simulation – I
Convention Center, 250A 2:00PM–3:45PM

Session Organizer: *Yan Wang, University of Nevada, Reno, Reno, NV, United States*

Session Co-Organizers: *Brian D. Iverson, Brigham Young University, Provo, UT, United States*, *Tianli Feng, Oak Ridge National Laboratory, Oak Ridge, TN, United States*

2:00pm – Internal Heat Diffusion of Single-Walled Carbon Nanotubes on Collision and Bundling

Technical Presentation. IMECE2019-10276
Heeyuen Koh, *Korea Institute of Science and Technology, Seoul, Korea (Republic)*, **Shohei Chiashi**, **Junichiro Shiomi**, **Shigeo Maruyama**, *University of Tokyo, Tokyo, Japan*

2:21pm – Nano Sized Bubble Formation, Growth and Collapse in Liquid Water by Central Heating: A Molecular Dynamics Simulation

Technical Paper Publication. IMECE2019-11794
Muhammad Rubayat Bin Shahadat, *Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh*, **A.K.M. Monjur Morshed**, *Bangladesh University of Engineering & Technology, Dhaka, Bangladesh*, **Amitav Tikadar**, *University of South Carolina, Columbia, SC, United States*, **Titan C. Paul**, *University of South Carolina Aiken, Lexington, SC, United States*, **Jamil Khan**, *University of South Carolina, Columbia, SC, United States*

2:42pm – Development of New Neural Network Force Fields With First-Principles Level Accuracy and Application to Thermal Transport

Technical Presentation. IMECE2019-12842
Alejandro Rodriguez, *Guangzhao Qin, Ming Hu*, *University of South Carolina, Columbia, SC, United States*

3:03pm – Spatial Correlation of Thermally Generated Electromagnetic Fields in Layered Media

Technical Presentation. IMECE2019-12958
Vahid Hatamipour, *Mathieu Francoeur*, *University of Utah, Salt Lake City, UT, United States*

3:24pm – Spatial Decomposition Neural Network Force Fields With First-Principles Level Accuracy and Application to Thermal Transport

Technical Presentation. IMECE2019-13120
Alejandro Rodriguez, *Guangzhao Qin, Ming Hu*, *University of South Carolina, Columbia, SC, United States*

9-2 K6-2 NUMERICAL ANALYSIS AND PERFORMANCE ASSESSMENT OF ENERGY SYSTEMS

9-2-1 K6-2 Numerical Analysis and Performance Assessment of Energy Systems

Convention Center, 155B 4:00PM–5:45PM

Session Organizer: *Mitra Sexton, Knolls Atomic Power Lab, Clifton Park, NY, United States*

Session Co-Organizer: *Matthew Jones, Brigham Young University, Provo, UT, United States*

4:00pm – Thermo-Mechanical Modeling of Rotating Composite Shafts

Technical Presentation. IMECE2019-10161
Enayat Mahajerin, *Saginaw Valley State University, Saginaw, MI, United States*, **Amir Khalilollahi**, *Penn State-Erie, Erie, PA, United States*, **Gary Burgess**, *Michigan State University, East Lansing, MI, United States*

4:21pm – CFD Study of Generation Process and Stability of a Fire Whirl in Large-Scale Fires

Technical Paper Publication. IMECE2019-10173
Koyu Satoh, *Domingos Viegas, Claudia Pinto*, *University of Coimbra, Coimbra, Portugal*, **Ran Tu**, *HuaXiao University, Xiamen, China*

4:42pm – Numerical Analysis of the Performance of an Adjustable Thermoacoustically-Driven Thermo-Acoustic Refrigerator

Technical Paper Publication. IMECE2019-11182
Adam Christopher Alcock, *Serge Balonji, Lagouge Tartibu*, *University of Johannesburg, Johannesburg, Gauteng, South Africa*

5:03pm – A Simple Immersed Boundary Method for Modeling Forced Convection Heat Transfer

Technical Paper Publication. IMECE2019-10236
Guangfa Yao, *Numersolution, LLC, Mason, OH, United States*

5:24pm – Thermal-Hydraulics Simulation of a Printed Circuit Heat Exchanger

Technical Presentation. IMECE2019-12772
Qingzi Zhu, *Bamdad Barari, Xu Tan, Mehdi Pishahang, Caleb Amy, Colin Kelsall, Henry Asegun*, *Massachusetts Institute of Technology, Cambridge, MA, United States*

9-19 K8-2 FUNDAMENTALS OF SINGLE PHASE CONVECTION

9-19-2 K8-2 Fundamentals of Single Phase Convection II

Convention Center, 251C 4:00PM–5:45PM

Session Organizer: *Diana-Andra Borca-Tasciuc, Rensselaer Polytech Institute, Troy, NY, United States*

Session Co-Organizer: *Chris Kobus, Oakland University, Rochester, MI, United States*

4:00pm – Experimental Investigation of the Effects of Nanofluids on Forced Convective Heat Transfer Along a Microchannel

Technical Presentation. IMECE2019-10799
Jonathan Yeager, *Peter Daluga, Saeid Vafaei*, *Bradley University, Peoria, IL, United States*

4:21pm – Effect of Metal Foam Thickness and Pore Density on Array Jet Impingement Heat Transfer

Technical Paper Publication. IMECE2019-11591
Prashant Singh, *North Carolina State University, Raleigh, NC, United States*, **Mingyang Zhang**, *Roop Mahajan*, *Virginia Tech, Blacksburg, VA, United States*

4:42pm – A Numerical Study of Natural Convective Heat Transfer From Two-Sided Inclined Square Plates Having a Finite Thickness

Technical Paper Publication. IMECE2019-11864
Rafiq Manna, *Patrick Oosthuizen*, *Queen's University, Kingston, ON, Canada*

5:03pm – Investigation of Heat Transfer Characteristics of Supercritical Carbon Dioxide at Microchannels

Technical Paper Publication. IMECE2019-10470
Mostafa Asadzadeh, *Anatoly Parahovnik, Stephen Adeoye, Yoav Peles*, *University of Central Florida, Orlando, FL, United States*

9-29 K9-6 NANOSCALE MODELING AND SIMULATION

9-29-2 K9-6 Nanoscale Modeling and Simulation – II
Convention Center, 250A **4:00PM–5:45PM**

Session Organizer: Yan Wang, *University of Nevada, Reno, Reno, NV, United States*

Session Co-Organizers: Brian D. Iverson, *Brigham Young University, Provo, UT, United States*, Tianli Feng, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*

4:00pm – Impact of Beta-Ga₂O₃/Al₂O₃ Lattice Mismatch on Interface Structure and Thermal Transport

Technical Presentation. IMECE2019-13448

Jinchen Han, Henry Aller, Alan McGaughey, *Carnegie Mellon University, Pittsburgh, PA, United States*

4:21pm – Thermal Transport in Crystalline Si With Vacancies and Amorphous Si

Technical Presentation. IMECE2019-13625

Amirreza Hashemi, Hasan Babaei, Ruiqiang Guo, Sangyeop Lee, *University of Pittsburgh, Pittsburgh, PA, United States*

4:42pm – Mie Scattering of Phonons by Point Defects in IV-VI Semiconductors GeTe and PbTe

Technical Presentation. IMECE2019-13641

Ruiqiang Guo, Sangyeop Lee, *University of Pittsburgh, Pittsburgh, PA, United States*

5:03pm – Predicting Thermal Conductivity of Silicon in Different Phases Using a Neural Network Interatomic Potential

Technical Presentation. IMECE2019-13650

Ruiyang Li, Eungkyu Lee, Tengfei Luo, *University of Notre Dame, Notre Dame, IN, United States*

5:24pm – Engineering Heat Transport in Nanoparticle-in-Alloy Composites: The Role of Mie Scattering

Technical Presentation. IMECE2019-13709

Joseph Feser, *University of Delaware, Newark, DE, United States*

THURSDAY, NOVEMBER 14

9-4 K6-4 HEAT TRANSFER IN SOLAR POWER SYSTEMS**9-4-1 K6-4 Heat Transfer in Solar Power Systems**
Convention Center, 255F 8:15AM–10:00AM**Session Organizer:** Nesrin Ozalp, *University of Minnesota Duluth, Duluth, MN, United States***Session Co-Organizer:** Sophia Haussener, *Lawrence Berkeley National Laboratory, Berkeley, CA, United States***8:15am – Peltier Cooling for Low Concentration Photovoltaic Cells: Numerical Modeling and Feasibility Study****Technical Paper Publication. IMECE2019-11656**
Anuj Pant, Sourabh Dhole, Hamidreza Najafi, Florida Institute of Technology, Melbourne, FL, United States**8:36am – Computational Simulation and Analysis of Major Control Parameters of Time-Dependent PV/T Collectors****Technical Paper Publication. IMECE2019-12184**
Jimeng Shi, Florida International University, Weston, FL, United States, Cheng-xian Lin, Florida International University, Miami, FL, United States**8:57am – Development of Metrology for the High-Temperature Characterization of Solar-Thermal Receivers****Technical Presentation. IMECE2019-13130**
Riley Crist, Mathieu Francoeur, Keunhan Park, Sameer Rao, University of Utah, Salt Lake City, UT, United States**9:18am – Population Balance Modeling for Thermochemical Reduction of Ceria Particles in Falling Particle Solar Reactors****Technical Presentation. IMECE2019-13286**
Eylul Simsek, University of California, Los Angeles, Los Angeles, CA, United States, Michael Welte, Bucher Unipektin AG, Niederweningen, Switzerland, Aldo Steinfeld, ETH Zurich, Zurich, Switzerland, Laurent Pilon, University of California, Los Angeles, Los Angeles, CA, United States**9:39am – Synchrotron X-ray Tomography Thermal Conductivity Analysis of Packed Bed Particle-to-sCO₂ Heat Exchangers****Technical Presentation. IMECE2019-13306**
Yanjie Zheng, Marm Dixit, Vanderbilt University, Nashville, TN, United States, Yousuf Bootwala, Marta Hatzell, Georgia Institute of Technology, Atlanta, GA, United States, Kelsey B. Hatzell, Vanderbilt University, Nashville, TN, United States**9-18 K8-1 FUNDAMENTALS OF BOILING, EVAPORATION, AND CONDENSATION INCLUDING MICRO/NANO-SCALE EFFECTS****9-18-1 K8-1 Fundamentals of Boiling, Evaporation, and Condensation Including Micro/Nano-Scale Effects I**
Convention Center, 257 8:15AM–10:00AM**Session Organizer:** Amitabh Narain, *Michigan Technological University, Houghton, MI, United States***Session Co-Organizers:** Vaibhav Bahadur, *University of Texas at Austin, Austin, TX, United States, Ming-Chang Lu, National Chiao Tung University, Hsinchu, Taiwan, Navdeep Singh Dhillon, California State University Long Beach, Long Beach, CA, United States***8:15am – Piezo-Induced Shear-Mode Resonant Acoustic Excitations of Meshed Boiling-Surfaces Leading to Enhanced Flow-Boiling Operations for Next Generation Heat-Sinks****Technical Presentation. IMECE2019-12432**
Amitabh Narain, Divya Pandya, Michigan Technological University, Houghton, MI, United States, Soroush Sepahyar, Michigan Technological University, Hancock, MI, United States, Patcharapol Gorgitrattanakul, Michigan Technological University, Houghton, MI, United States, Vibhu Vivek, Vivek Technologies LLC, Santa Clara, MI, United States**8:36am – Enhanced Refrigerant-Side Heat Transfer of R134a in Etched Aluminum Tubes****Technical Presentation. IMECE2019-10371**
Nithin Vinod Upot, Allison J. Mahvi, Nenad Miljkovic, University of Illinois at Urbana-Champaign, Urbana, IL, United States**8:57am – Study of Two-Dimensional Flow-Boiling Morphological Characteristics in the Micro Gap With Surface Wettability on Hot Spot****Technical Paper Publication. IMECE2019-11015**
Anwarul Karim, Jong-Hoon Kim, Washington State University Vancouver, Vancouver, WA, United States**9:18am – Using Soft Coatings to Augment Phase Change Heat Transfer****Technical Presentation. IMECE2019-12525**
Konrad Rykaczewski, Akshay Phadnis, Arizona State University, Tempe, AZ, United States**9:39am – Prediction of Thermal Conductance at Liquid-Gas Interfaces Using Molecular Dynamics Simulations****Technical Presentation. IMECE2019-12219**
Zhi Liang, California State University, Fresno, Clovis, CA, United States, Eric Bird, California State University, Fresno, Fresno, CA, United States

9-24 K9-1 THERMAL TRANSPORT ACROSS HARD/SOFT INTERFACES

9-24-1 K9-1 Thermal Transport Across Hard/Soft Interfaces

Convention Center, 355B

8:15AM–10:00AM

8:15am – Thermal Contact Resistance at the Skin and (Hard) Electronics Interface

Technical Presentation. IMECE2019-12524

Konrad Rykaczewski, Arizona State University, Tempe, AZ, United States

8:36am – Thermal Response at Graphene Oxide-Water Interfaces for Mechanical Loads Sensing and Modes Differentiation

Technical Presentation. IMECE2019-12940

Yuan Gao, Yue Zhang, University of Virginia, Charlottesville, VA, United States

8:57am – Thermal Transport in Semicrystalline Polyethylene by Molecular Dynamics Simulation

Technical Presentation. IMECE2019-13013

Jixiong He, Kyunghoon Kim, Jun Liu, North Carolina State University, Raleigh, NC, United States

9:18am – Investigation of Highly Anisotropic Thermal Boundary Resistance Across 2D van der Waals Materials

Technical Presentation. IMECE2019-13548

Man Li, Joonsang Kang, Huu Duy Nguyen, Yongjie Hu, University of California, Los Angeles, Los Angeles, CA, United States

9:39am – Engineering Heat Conduction in Hydrogel via Intermolecular Interaction

Technical Presentation. IMECE2019-13587

Jiawei Zhou, Hongxia Zeng, Buxuan Li, Massachusetts Institute of Technology, Cambridge, MA, United States, Yanfei Xu, University of Massachusetts Amherst, Amherst, MA, United States, Gang Chen, Massachusetts Institute of Technology, Cambridge, MA, United States

9-57 K19-1 HEAT AND MASS TRANSFER IN THE NATURAL AND BUILT ENVIRONMENT

9-57-1 K19-1 Heat and Mass Transfer in the Natural and Built Environment

Convention Center, 255E

8:15AM–10:00AM

Session Organizer: Kashif Nawaz, Oak Ridge National Laboratory, Oak Ridge, TN, United States

Session Co-Organizers: Cheng-xian Lin, Florida International University, Miami, FL, United States, Jingru Benner, Western New England University, Springfield, MA, United States

8:15am – Solar Perforated Panels Installed on a Window With Different Perforation Ratios: Energy and Illuminance Analyses

Technical Paper Publication. IMECE2019-10017

Esam Alawadhi, Kuwait University, Safat, Kuwait

8:36am – Evaluating the Effect of Number of Spans on Heat Transfer in Greenhouses

Technical Paper Publication. IMECE2019-11420

Sunita Kruger, University of Johannesburg, Johannesburg, Gauteng, South Africa, Leon Pretorius, University of Pretoria, Pretoria, Gauteng, South Africa

8:57am – Net-Zero Water (NZW) Reuse Desiccant Assisted Evaporative Cooling System for Data Centers

Technical Paper Publication. IMECE2019-11870

David Okposio, Purdue University Northwest, Hammond, IN, United States, A.G. Agwu Nnanna, Purdue University Calumet, Hammond, IN, United States, Harvey Abramowitz, Purdue University Northwest, Hammond, IN, United States

9:18am – On the Development of a Thermal Comfort Control for Classrooms Conditioned by Split-Type Systems

Technical Paper Publication. IMECE2019-11426

Anastacio Silva Junior, Instituto Federal de Santa Catarina, Florianópolis, Brazil, Nathan Mendes, PUC-Pr, Curitiba, Brazil, Rogério Vilain, Instituto Federal de Santa Catarina, São José, Brazil, Marcelo Pereira, Instituto Federal de Santa Catarina, Florianópolis, Brazil, Katia Cordeiro Mendonça, CESI-LINEACT, La Rochelle, France

9:39am – Effects of Indoor Environmental Variables on Thermal Sensation Prediction: An Experimental Analysis

Technical Presentation. IMECE2019-13545

Jermy Thomas, Amanda Smith, University of Utah, Salt Lake City, UT, United States

9-18 K8-1 FUNDAMENTALS OF BOILING, EVAPORATION, AND CONDENSATION INCLUDING MICRO/NANO-SCALE EFFECTS

9-18-2 K8-1 Fundamentals of Boiling, Evaporation, and Condensation Including Micro/Nano-Scale Effects II

Convention Center, 257

10:15AM–12:00PM

Session Organizer: Amitabh Narain, Michigan Tech University, Houghton, MI, United States

Session Co-Organizers: Vaibhav Bahadur, University of Texas at Austin, Austin, TX, United States, Navdeep Singh Dhillon, California State University Long Beach, Long Beach, CA, United States, Ming-Chang Lu, National Chiao Tung University, Hsinchu, Taiwan

10:15am – Enhanced Condensation Heat Transfer on the Three-Dimensional Hybrid Surfaces

Technical Presentation. IMECE2019-10689

Ching-Wen Lo, National Chiao Tung University, Hsinchu, Taiwan, Yu-Cheng Chu, Ming-Han Yan, National Chiao Tung University, Hsinchu, Taiwan, Ming-Chang Lu, National Chiao Tung University, Hsinchu, Taiwan

10:36am – Heat Transfer Characteristics of a Train of Droplets Impinging Over a Hot Surface: From Film Evaporation to Leidenfrost Point

Technical Paper Publication. IMECE2019-11212
Ganesh Guggilla, *Indian Institute of Technology, Madras, Chennai, India*, **Arvind Pattamatta**, *IIT Madras, Chennai, India*, **Ramesh Narayanaswamy**, *Curtin University, Perth, Australia*

10:57am – Thermal Patterns and Internal Flow Mechanisms in Evaporating Inverted Sessile Drops of Pure Water

Technical Paper Publication. IMECE2019-11256
Tejaswi Josyula, **Chandan Manghnani**, **Pallab Sinha Mahapatra**, **Arvind Pattamatta**, *Indian Institute of Technology Madras, Chennai, India*

11:18am – Curvature Dependence of the Mass Accommodation Coefficient

Technical Presentation. IMECE2019-13809
Paul Barclay, **Jennifer Lukes**, *University of Pennsylvania, Philadelphia, PA, United States*

11:39am – Investigation of Flashing Flow in a Siphon to Extract Condensate in Paper Dryer Application

Technical Paper Publication. IMECE2019-10318
Hamed Abdul Majeed, **Ting Wang**, *University of New Orleans, New Orleans, LA, United States*

9-30 K9-7 NANOSCALE THERMAL RADIATION

9-30-1 K9-7 Nanoscale Thermal Radiation
Convention Center, 255E 10:15AM–12:00PM

Session Organizer: Liping Wang, *Arizona State University, Tempe, AZ, United States*

Session Co-Organizer: Bo Zhao, *Stanford University, Stanford, CA, United States*

10:15am – Super-Planckian Radiative Heat Flux Between Metallic Surfaces With Near-Field and Thin-Film Effects

Technical Presentation. IMECE2019-12553
Payam Sabbaghi, **Linshuang Long**, **Xiaoyan Ying**, **Christian Messner**, **Liping Wang**, *Arizona State University, Tempe, AZ, United States*

10:36am – Comparison of Three Modeling Approaches for Far- and Near-Field Thermophotovoltaic Systems

Technical Presentation. IMECE2019-12610
Dudong Feng, **Eric J. Tervo**, **Shannon K. Yee**, **Zhuomin Zhang**, *Georgia Institute of Technology, Atlanta, GA, United States*

10:57am – Self-Sustaining Thermophotonic Circuits

Technical Presentation. IMECE2019-12708
Bo Zhao, **Siddharth Buddhiraju**, **Parthiban Santhanam**, **Kaifeng Chen**, **Shanhui Fan**, *Stanford University, Stanford, CA, United States*

11:18am – Near-Complete Violation of Kirchhoff's Law of Thermal Radiation with a 0.3-Tesla Magnetic Field

Technical Presentation. IMECE2019-12709
Bo Zhao, **Yu Shi**, **Jiahui Wang**, **Zhexin Zhao**, **Nathan Zhao**, **Shanhui Fan**, *Stanford University, Stanford, CA, United States*

11:39am – System Green's Function Approach to the Thermal Discrete Dipole Approximation

Technical Presentation. IMECE2019-12887
Lindsay Walter, *University of Utah, Salt Lake City, UT, United States*, **Zhuomin Zhang**, **Baratunde Cola**, *Georgia Institute of Technology, Atlanta, GA, United States*, **Mathieu Francoeur**, *University of Utah, Salt Lake City, UT, United States*, **Eric J. Tervo**, *Georgia Institute of Technology, Atlanta, GA, United States*

9-15 K7-1 SPATIALLY RESOLVED THERMOPHYSICAL PROPERTY MEASUREMENTS

9-15-1 K7-1 Spatially Resolved Thermophysical Property Measurements
Convention Center, 255C 2:00PM–3:45PM

Session Organizer: Troy Munro, *Brigham Young University, Provo, UT, United States*

Session Co-Organizer: Keunhan Park, *University of Utah, Salt Lake City, UT, United States*

2:00pm – Development of Thermally Isolated, High Stiffness Micro-Calorimeter for Sub-nW Heat Transfer Measurement

Technical Presentation. IMECE2019-10175
Cedric Shaskey, **Amun Jarzembki**, **Jacob Crossley**, **Keunhan Park**, *University of Utah, Salt Lake City, UT, United States*

2:21pm – Multiplexed Thermal Properties Mapping by Thermoreflectance Imaging via Adaptive Heating Pattern and Modeling

Technical Presentation. IMECE2019-10977
Qiye Zheng, **Sumanjeet Kaur**, **Ravi Prasher**, *Lawrence Berkeley National Laboratory, Berkeley, CA, United States*, **Chris Dames**, *University of California, Berkeley, Berkeley, CA, United States*

2:42pm – Applying Photothermal Radiometry on Thermal Transport Property Characterization of Nuclear Fuel Surrogates

Technical Presentation. IMECE2019-12258
Zilong Hua, **Robert Schley**, **Austin Fleming**, **Colby Jensen**, **Zain Karriem**, **David Hurley**, *Idaho National Laboratory, Idaho Falls, ID, United States*

3:03pm – Thermal Properties of Thin Film Uranium Oxides and Thorium Oxides

Technical Paper Publication. IMECE2019-11699
Aaron Thorum, **Logan Page**, **Troy Munro**, **David Allred**, *Brigham Young University, Provo, UT, United States*, **Zilong Hua**, **David Hurley**, *Idaho National Laboratory Falls, ID, United States*

3:24pm – Observation of Second Sound in Graphite up to 150K**Technical Presentation. IMECE2019-13355**

Samuel Huberman, Ryan Duncan, Ke Chen, *Massachusetts Institute of Technology, Cambridge, Bai Song*, *Peking University, Beijing, China*, **Vazrik Chiloyan**, *Massachusetts Institute of Technology, Watertown, MA, United States*, **Zhiwei Ding, Alexei Maznev, Gang Chen, Keith Nelson**, *Massachusetts Institute of Technology, Cambridge, MA, United States*

9-30 K9-7 NANOSCALE THERMAL RADIATION**9-30-2 K9-7 Nanoscale Thermal Radiation****Convention Center, 255E****2:00PM–3:45PM**

Session Organizer: Liping Wang, *Arizona State University, Tempe, AZ, United States*

Session Co-Organizer: Bo Zhao, *Stanford University, Stanford, CA, United States*

2:00pm – A Near-Field Radiative Heat Transfer Device**Technical Presentation. IMECE2019-12911**

John Desutter, *University of Utah, Salt Lake City, UT, United States*, **Lei Tang**, *University of California, Berkeley, Berkeley, CA, United States*, **Mathieu Francoeur**, *University of Utah, Salt Lake City, UT, United States*

2:21pm – Coupled Surface Phonon- and Plasmon-Polaritons Mediated Near-Field Radiative Heat Transfer**Technical Presentation. IMECE2019-13031**

Lei Tang, *University of California, Berkeley, Berkeley, CA, United States*, **John Desutter, Mathieu Francoeur**, *University of Utah, Salt Lake City, UT, United States*

2:42pm – Modeling Nonequilibrium Combined Charge and Radiation Transport in Near-Field Semiconductor Devices**Technical Presentation. IMECE2019-13270**

Eric J. Tervo, Dudong Feng, *Georgia Institute of Technology, Atlanta, GA, United States*, **Will Callahan, Eric Toberer**, *Colorado School of Mines, Golden, CO, United States*, **Shannon K. Yee**, *Georgia Institute of Technology, Atlanta, GA, United States*, **Andrew Ferguson**, *National Renewable Energy Laboratory, Golden, CO, United States*, **Zhuomin Zhang**, *Georgia Institute of Technology, Atlanta, GA, United States*

3:03pm – Natural Hyperbolic Materials for Near-Field Radiative Heat Transfer**Technical Presentation. IMECE2019-13400**

Hakan Salihoglu, Xianfan Xu, *Purdue University, West Lafayette, IN, United States*

3:24pm – Extreme Near-Field Heat Transfer Between Gold Surfaces**Technical Presentation. IMECE2019-13470**

Takuro Tokunaga, Amun Jarzembki, Keunhan Park, Mathieu Francoeur, *University of Utah, Salt Lake City, UT, United States*

9-49 K15-3 TRANSPORT PHENOMENA IN ADDITIVE MANUFACTURING**9-49-1 K15-3 Transport Phenomena in Additive Manufacturing****Convention Center, 257****2:00PM–3:45PM**

Session Organizer: Heng Pan, *Missouri University of Science and Technology, Rolla, MO, United States*

Session Co-Organizer: Ying Sun, *Drexel University, Philadelphia, PA, United States*

2:00pm – Controlling Evaporation Induced Self-Assembly of Polymeric Nanoparticles: A VOF-DPD Study**Technical Paper Publication. IMECE2019-11953**

Raihan Tayeb, Yuwen Zhang, *University of Missouri, Columbia, MO, United States*

2:21pm – Use of Diffusion in Functional Parts Made by Projection Micro-Stereolithography**Technical Presentation. IMECE2019-11386**

Jin Cui, Qiming Chen, Justin Weibel, Liang Pan, *Purdue University, West Lafayette, IN, United States*

2:42pm – Fabrication of 3D Microstructures by Laser Direct Synthesis and Patterning**Technical Presentation. IMECE2019-11083**

Ming-Tsang Lee, Cheng-An Chen, *National Tsing Hua University, Hsinchu, Taiwan*

3:03pm – Multiscale Modeling of Microstructure Evolution During Laser Direct Deposition of Ceramics**Technical Presentation. IMECE2019-11050**

Xiangyang Dong, *Missouri S&T, Rolla, MO, United States*

3:24pm – Transport Phenomena in Femtosecond Laser Based Micro/Nanoscale Additive Manufacturing With Metal Nanoparticles**Technical Presentation. IMECE2019-12276**

Chinmoy Kumar Podder, Heng Pan, *Missouri University of Science and Technology, Rolla, MO, United States*

9-51 K16-1: HEAT TRANSFER IN ELECTRONIC EQUIPMENT**9-51-1 K16-1: Heat Transfer in Electronic Equipment I****Convention Center, 255D 2:00PM–3:45PM**

Session Organizer: Seungbae Park, *Binghamton University, Binghamton, NY, United States*

Session Co-Organizers: Hendrik P.J. De Bock, *GE Global Research, Schenectady, NY, United States*, Sameer Rao, *University of Utah, Salt Lake City, UT, United States*, Koneru Ramakrishna, *Thermal Consultant, Austin, TX, United States*

2:00pm – Near Critical Carbon Dioxide Characteristics of Heat Transfer Processes in Microchannels**Technical Paper Publication. IMECE2019-10045**

Anatoly Parahovnik, Mostafa Asadzadeh, Yoav Peles, *University of Central Florida, Orlando, FL, United States*

2:21pm – Experimental Study of Forced Convection Heat Transfer and Flow Friction of a Water-Cooled Inter-Connected Mini-Channel Heat Sink

Technical Paper Publication. IMECE2019-11624
Amitav Tikadar, Saad K. Oudah, Nabeel Abdulrazzaq, University of South Carolina, Columbia, SC, United States, Titan Paul, University of South Carolina Aiken, Aiken, SC, United States, Jamil Khan, University of South Carolina, Columbia, SC, United States

2:42pm – Experimental Study of the Incidence of Changing a Synthetic Jet Orifice in Heat Transfer Using a Taguchi Method Approach

Technical Presentation. IMECE2019-10324
Sebastian Cano, Gustavo Cordova, Christian Narvaez, Universidad de las Fuerzas Armadas ESPE, Quito, Quito, Ecuador, Luis Segura, Universidad de las Fuerzas Armadas ESPE, Pichincha, Ecuador, Luis Carrion, Universidad de las Fuerzas Armadas ESPE, Quito, Quito, Ecuador

3:03pm – Forced Convection Heat Transfer in Nanofluids: Experimental Data and Theoretical Correlations

Technical Presentation. IMECE2019-13229
Peter Daluga, Jonathan Yeager, Saeid Vafaei, Bradley University, Peoria, IL, United States

9-59 K19-3 ADVANCES IN WATER AND WASTEWATER PROCESSING AND WATER DESALINATION TECHNOLOGIES

9-59-1 Advances in Water and Wastewater Processing and Water Desalination Technologies
Convention Center, 255F 2:00PM–3:45PM

Session Organizer: Cheng-xian Lin, *Florida International University, Miami, FL, United States*

Session Co-Organizer: S.A. Sherif, *University of Florida, Gainesville, FL, United States, Jingru Benner, Western New England University, Springfield, MA, United States, Kashif Nawaz, Oak Ridge National Laboratory, Oak Ridge, TN, United States*

2:00pm – Membrane Fouling Mitigation in Water Filtration Using Piezoelectrics

Technical Paper Publication. IMECE2019-11313
Aronu Obinna, Purdue Water Institute, Hammond, IN, United States, Harvey Abramowitz, Purdue University Northwest, Hammond, IN, United States, A.G. Agwu Nnanna, Purdue University Calumet, Hammond, IN, United States

2:21pm – Experimental Investigation of Spiral Wound Module Under Pressure Retarded Osmosis Process

Technical Paper Publication. IMECE2019-11786
Mostafa Elsharqawy, Luis Vives, University of Guelph, Guelph, ON, Canada, Edgar Quiñones Bolaños, University of Cartagena, Bolívar, Cartagena, Colombia

2:42pm – Sustainable Waste Water Treatment Using Solar Energy by Heat Localization Through Porous Media

Technical Paper Publication. IMECE2019-12189
Divya Jaladi, Ethan Languri, Tennessee Technological University, Cookeville, TN, United States, Bob Piras, Consultant, Cookeville, TN, United States

3:03pm – Assessment and Characterization of Hybrid Mesoporous Material MCM With Titanium Dioxide for Water Treatment

Technical Paper Publication. IMECE2019-12272
Jiajun Xu, University of the District of Columbia, Washington, DC, United States

3:24pm – An Evaluation of the Effects of Team Projects and Augmented Reality on Student Learning in Sustainable Building Science

Technical Paper Publication. IMECE2019-11982
Cheng-xian Lin, Nipesh Pradhananga, Shahin Vassigh, Florida International University, Miami, FL, United States

9-5 K6-5 THERMAL MANAGEMENT OF BATTERY SYSTEMS

9-5-1 K6-1 Simulation and Validation Methods of Mixed Convection and Conjugate Heat Transfer Analyses in Annular or Ducting Systems

Convention Center, 257 4:00PM–5:45PM

Session Organizer: Mitra Sexton, *Knolls Atomic Power Lab, Clifton Park, NY, United States*

Session Co-Organizers: Matthew Jones, *Brigham Young University, Provo, UT, United States, Alexander Rattner, Pennsylvania State University, University Park, PA, United States*

4:00pm – Numerical Investigation on Thermal and Fluid Dynamic Behaviors of a Thermoelectric Generator in an Exhaust Automotive Line With Aluminum Foam

Technical Paper Publication. IMECE2019-11575
Bernardo Buonomo, Anna di Pasqua, Davide Ercole, Oronzio Manca, Sergio Nardini, Università degli Studi della Campania “Luigi Vanvitelli”, Aversa, Caserta, Italy

4:21pm – Experimental Demonstration of Energy Harvesting From the Sky Using the Negative Illumination Effect of a Semiconductor Photodiode

Technical Presentation. IMECE2019-12710
Masashi Ono, Parthiban Santhanam, Wei Li, Bo Zhao, Shanhui Fan, Stanford University, Stanford, CA, United States

4:42pm – Analysis of Thermal Issues in Batteries for Electrified Vehicles

Technical Presentation. IMECE2019-12834
Bengt Sunden, Lund University, Lund, Sweden

5:03pm – Effect of Potential Window on Heat Generation at Activated Carbon Electrodes in Neat or Diluted Ionic Liquid Electrolytes

Technical Presentation. IMECE2019-13086

Laurent Pilon, Obaidallah Munteshari, Arie Borenstein, Arie Borenstein, Ryan H. DeBlock, Jonathan Lau, Grace Whang, Yucheng Chen, Ampol Likitchatchawankuna, Richard Kaner, Bruce Dunn, *University of California, Los Angeles, Los Angeles, CA, United States*

5:24pm – Effect of Temperature on Heat Generation Rate in Electric Double Layer Capacitors With Ionic Liquid Electrolyte

Technical Presentation. IMECE2019-13919

Ampol Likitchatchawankuna, Jonathan Lau, Obaidallah Munteshari, Bruce Dunn, Laurent Pilon, *University of California, Los Angeles, Los Angeles, CA, United States*

9-16 K7-2 THERMOPHYSICAL PROPERTIES OF NEXT-GENERATION THERMAL STORAGE MATERIALS

9-16-1 K7-2 Thermophysical Properties of Next-Generation Thermal Storage Materials

Convention Center, 255C

4:00PM–5:45PM

Session Organizer: Nicholas Roberts, *Utah State University, Logan, UT, United States*

Session Co-Organizer: Ronald Warzoha, *U.S. Naval Academy, Severna Park, MD, United States*

4:00pm – Thermal Imaging Technique to Minimize the Wastage of Fruits

Technical Paper Publication. IMECE2019-10034

Sathish Gurupatham, Carson Wiles, *Kennesaw State University, Marietta, GA, United States*

4:21pm – Nanoparticles Shape Effect on Thermal Conductivity of Nanofluids: A Molecular Dynamics Study

Technical Paper Publication. IMECE2019-11781

Md. Rakibul Hasan Roni, A.K.M. Monjur Morshed, *Bangladesh University of Engineering & Technology, Dhaka, Bangladesh*, Amitav Tikadar, *University of South Carolina, Columbia, SC, United States*, Titan C. Paul, *University of South Carolina Aiken, Lexington, SC, United States*, Jamil Khan, *University of South Carolina, Columbia, SC, United States*

4:42pm – Heat Transfer Characteristics of Various Gun Barrels Under Different Operating Conditions

Technical Paper Publication. IMECE2019-12083

Mohamed Gadalla, Muhammad Jasim, Omar Ahmad, *American University of Sharjah, Sharjah, United Arab Emir.*

5:03pm – Experimental Study of the Effect of Nanoparticle Concentration on Thermo-Physical Properties of Molten Salt Nanofluids

Technical Paper Publication. IMECE2019-12166

Hani Tiznobaik, *Tarleton State University, Stephenville, TX, United States*, Donghyun Shin, *Central Michigan University, Mt. Pleasant, MI, United States*

9-31 K9-8 NANOSCALE MATERIALS FOR THERMAL ENERGY SYSTEMS

9-31-1 K9-8 Nanoscale Materials for Thermal Energy Systems

Convention Center, 255E

4:00PM–5:45PM

Session Organizer: Renkun Chen, *University of California, San Diego, La Jolla, CA, United States*

Session Co-Organizer: Yongjie Hu, *University of California, Los Angeles, Los Angeles, CA, United States*

4:00pm – An Experimental Study of the Viscosity of Titanium Oxide and Aluminum Oxide Composite Nanofluids

Technical Paper Publication. IMECE2019-11183

Luke Ajuka, Moradeyo Odunfa, Miracle Oyewola, *University of Ibadan, Ibadan, Nigeria*

4:21pm – Nanostructure Controlled Thermal Radiation for Thermal Management and Energy Harvesting

Technical Presentation. IMECE2019-12916

Wei Li, Shanhui Fan, *Stanford University, Stanford, CA, United States*

4:42pm – Graphene Nanopetals for Ultrafast Solar-Thermal Energy Conversion and Efficient Desalination

Technical Presentation. IMECE2019-13099

Guoping Xiong, *University of Nevada, Reno, Reno, NV, United States*

5:03pm – Thin Film Boiling Heat Transfer Through Nanoporous Membranes

Technical Presentation. IMECE2019-13437

Qingyang Wang, Renkun Chen, *University of California, San Diego, La Jolla, CA, United States*

5:24pm – Solution-Processable Colloidal Nanocrystal Inks for Printing Flexible Thermoelectrics With Ultrahigh Performances at Low-Medium Temperatures

Technical Presentation. IMECE2019-13855

Yanliang Zhang, *University of Notre Dame, Notre Dame, IN, United States*

9-51 K16-1: HEAT TRANSFER IN ELECTRONIC EQUIPMENT

9-51-2 K16-1: Heat Transfer in Electronic Equipment II

Convention Center, 251E

4:00PM–5:45PM

4:00pm – Investigation of Heat Transfer Properties of Nanofluids Using Michelson Interferometry

Technical Presentation. IMECE2019-10078

Edison George, Binoy Baby, *St. Joseph's College of Engineering and Technology, Kerala, Yes, India*

4:21pm – High Performance Thermal Interface Materials Based on Micro-Additive-Enhanced Liquid Metal Pastes and Soft Composites

Technical Presentation. IMECE2019-12526

Konrad Rykaczewski, Robert Y. Wang, Matthew Ralphs, Wilson Kong, Aastha Uppal, *Arizona State University, AZ, United States*

4:42pm – Constructal Equivalent Thermal Resistance Minimization for Tau-Shaped Fin

Technical Presentation. IMECE2019-10117

Huijun Feng, Lingen Chen, Shaojun Xia, *Naval University of Engineering, Wuhan, China*

5:03pm – Flow and Heat Transfer Characteristics for a Flow Over Double Semi-Circular Cylinders

Technical Presentation. IMECE2019-13101

Sultan Alshareef, Timothy Ameal, Todd Harman, *University of Utah, Salt Lake City, UT, United States*

9-53 K18-1 THERMAL TRANSPORT UNDER HIGH TEMPERATURE AND/OR PRESSURE CONDITIONS

9-53-1 K18-1 Thermal Transport Under High Temperature and/or Pressure Conditions

Convention Center, 255D

4:00PM–5:45PM

Session Organizer: Zhiguo Qu, *Xi'an Jiaotong University, Xi'an, Shaanxi, China*

Session Co-Organizer: Xinwei Wang, *Iowa State University, Ames, IA, United States*

4:00pm – Borehole Temperature Modelling in High Temperature Drilling Environment Based on Heat Transfer Laws

Technical Paper Publication. IMECE2019-10085

Abhijeet D. Chodankar, Cheng-xian Lin, *Florida International University, Miami, FL, United States*

4:21pm – Simultaneous Measurement of Specific Heat and Thermal Conductivity in Extreme Environment

Technical Presentation. IMECE2019-12210

Xianghai Meng, Jung-Fu Lin, Yaguo Wang, *University of Texas at Austin, Austin, TX, United States*

4:42pm – Experimental Evaluation of Microclimate Cooling Garments Under Controlled Ambient Conditions

Technical Paper Publication. IMECE2019-10679

Mammadbaghir Baghirzade, Samuel BurnsHongwei Sun, Margaret SobkowiczKline, Stephen Johnston, John Hunter Mack, *University of Massachusetts Lowell, Lowell, MA, United States*

5:03pm – Leidenfrost Phenomenon and Its Impact on Sessile Drop Evaporation for Different Liquids and Surfaces

Technical Paper Publication. IMECE2019-11000

Pranzal Ahmed, *Bangladesh University of Engineering and Technology, Dhaka, Bangladesh*, M. Ruhul Amin, *Montana State University, Bozeman, MT, United States*, Mohammad Ali, *Bangladesh University of Engineering and Technology, Dhaka, Bangladesh*

TRACK 10 ADVANCED MATERIALS: DESIGN, PROCESSING, CHARACTERIZATION, AND APPLICATIONS

- | | | | |
|----------|--|----------|--|
| 10-1-1: | In-Situ Techniques in Experimental Mechanics | 10-19-1: | Design of Engineered Materials and Components for Additive Manufacturing: Spatial Programming and 3D Design |
| 10-2-1: | Multiscale Modeling for Materials Design – I | 10-19-2: | Design of Engineered Materials and Components for Additive Manufacturing: Meso-, Micro- and Nano-Architecture |
| 10-2-2: | Multiscale Modeling for Materials Design – II | 10-20-1: | ONR, NIST, ARO |
| 10-4-1: | Active Mechanical Metamaterials | 10-20-2: | NSF, DARPA, AFOSR |
| 10-4-2: | Anomalous Physical Properties of Mechanical Metamaterials | 10-20-3: | Center Directors |
| 10-4-3: | Multiphysics Behavior of Mechanical Metamaterials | 10-20-4: | Center Director and Panel Discussion |
| 10-4-4: | Reconfigurable Mechanical Metamaterials | 10-23-1: | Nanoengineered, Nano Modified, Hierarchical, Multi-Scale Materials and Structures – I |
| 10-4-5: | Dynamical and Transient Phenomena in Mechanical Metamaterials | 10-23-2: | Nanoengineered, Nano Modified, Hierarchical, Multi-Scale Materials and Structures – II |
| 10-5-1: | Multifunctional and Micro/Nano-Structured Materials: Modeling and Characterization (III) | 10-24-1 | Fracture and Damage: Nano- to Macro-Scale – I |
| 10-9-1: | Modeling, Simulation, and Design of Multifunctional Materials – I: Multiscale and Multiphysical Phenomena | 10-24-2: | Fracture and Damage: Nano- to Macro-Scale – II |
| 10-9-2: | Modeling, Simulation, and Design of Multifunctional Materials – II: Metamaterials and Lattice Structures | 10-25-1: | Material Processing of Flexible Electronics, Sensors, and Devices – I |
| 10-9-3: | Modeling, Simulation, and Design of Multifunctional Materials – III: Composites and Engineering Materials | 10-25-2: | Material Processing of Flexible Electronics, Sensors, and Devices – II |
| 10-10-1: | Multifunctional Composite Materials and Structures – I | 10-26-1: | Materials Processing and Characterization – I |
| 10-10-2: | Multifunctional Composite Materials and Structures – II | 10-26-2: | Materials Processing and Characterization – II |
| 10-10-3: | Multifunctional Composite Materials and Structures – III | 10-26-3: | Materials Processing and Characterization – III |
| 10-10-4: | Multifunctional Composite Materials and Structures – IV | 10-26-4: | Materials Processing and Characterization – IV |
| 10-10-5: | Multifunctional Composite Materials and Structures – V | 10-26-5: | Materials Processing and Characterization – V |
| 10-11-1: | Multifunctional Nanomaterials | 10-26-6: | Materials Processing and Characterization – VI |
| 10-12-1: | Mechanics in Manufacturing of Multifunctional Materials and Structure | 10-27-1: | Phase Transformations in Materials Processing – I |
| 10-13-1: | Bioinspired Materials, Processes and Applications | 10-27-2: | Phase Transformations in Materials Processing – II |
| 10-14-1: | Soft Robotics and Soft Machines – I | 10-27-3: | Phase Transformations in Materials Processing – III |
| 10-14-2: | Soft Robotics and Soft Machines – II | 10-29-1: | Recent Developments in Tribology – I |
| 10-15-1: | Lithium-Ion Battery Safety Under Abusive Conditions | 10-30-1: | Nanomaterials for Energy I |
| 10-17-1: | Constitutive Modeling of the Mechanical Behavior and Performance of Electronic, Photonic, MEMS, and NEMS Materials, Assemblies, Packages, Modules, and Systems – I | 10-29-2: | Recent Developments in Tribology – II |
| 10-17-2: | Constitutive Modeling of the Mechanical Behavior and Performance of Electronic, Photonic, MEMS, and NEMS Materials, Assemblies, Packages, Modules, and Systems – II | 10-31-1: | Plenary Session I |
| | | 10-31-2: | Plenary Session II |

ACKNOWLEDGMENT

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TRACK 10 ADVANCED MATERIALS: DESIGN, PROCESSING, CHARACTERIZATION, AND APPLICATIONS

TUESDAY, NOVEMBER 12

10-31 PLENARY SESSIONS

10-31-1 Plenary Session I

Convention Center, 255F 9:45AM–10:30AM

9:45am – Integrated Soft Materials

Plenary Presentation. IMECE2019-14004

Zhigang Suo, *Harvard University, Cambridge, MA, United States*

10-4 MECHANICAL METAMATERIALS

10-4-1 Active Mechanical Metamaterials

Convention Center, 251C 10:45AM–12:30PM

Session Organizer: Eduard Karpov, *University of Illinois at Chicago, Chicago, IL, United States*

Session Co-Organizer: Yaning Li, *University of New Hampshire, Durham, NH, United States*

10:45am – Design and Fabrication of Active Mechanical Metamaterials Using Shape Memory Polymers

Technical Presentation. IMECE2019-13666

H. Jerry Qi, *Georgia Institute of Technology, Atlanta, GA, United States*

11:06am – Design and Fabrication of Active Mechanical Metamaterials Using Shape Memory Polymers II

Technical Presentation. IMECE2019-13668

H. Jerry Qi, *Georgia Institute of Technology, Atlanta, GA, United States*

11:27am – Lightweight and Ultra-Strong Pyrolytic Carbon Nanolattices

Technical Presentation. IMECE2019-12113

Xuan Zhang, Xiaoyan Li, *Tsinghua University, Beijing, China*

11:48am – Topological Refinement of Bimode Structures for Extremal Mechanical Properties

Technical Presentation. IMECE2019-13249

Zhiming Cui, Jaehyung Ju, *Shanghai Jiao Tong University, Shanghai, China*

12:09pm – Design and Additive Manufacturing of a Metamaterial With Tunable Effective Stiffness

Technical Presentation. IMECE2019-13457

Azadeh Sheidaei, *Iowa State University, Ames, IA, United States*, Mohammad Reza Hajighasemi, Majid Baniassadi, *University of Tehran, Tehran, Islamic Republic of Iran*, Mohammad Saber Hashemi, *Iowa State University, Ames, IA, United States*

10-10 MULTIFUNCTIONAL COMPOSITE MATERIALS AND STRUCTURES

10-10-1 Multifunctional Composite Materials and Structures – I

Convention Center, 251B 10:45AM–12:30PM

10:45am – Design of a Composite Encapsulation for Concentrated Photovoltaic Systems With Improved Performance

Technical Paper Publication. IMECE2019-11720

Kabeer Raza, Syed Sohail Akhtar, *King Fahad University of Petroleum and Minerals, Dhahran, Saudi Arabia*, Abul Fazal M. Arif, *McMaster University, Mississauga, ON, Canada*, Abbas Saeed Hakeem, *King Fahd University of Petroleum and Minerals, Dhahran, Gujrat, Pakistan*

11:06am – Smart Material for Seismic Damping for Variable Weather Conditions

Technical Presentation. IMECE2019-11957

Pnina Ari-Gur, Xiaoyun Shao, Hezha Sadreddin, *Western Michigan University, Kalamazoo, MI, United States*, Jiansong Zhang, *Purdue University, West Lafayette, IN, United States*

11:27am – Benchmark Analysis for Electromechanical Static Responses for Laminated Piezoelectric Bimorph Energy Harvester Composed of Composite Beam Substrates

Technical Presentation. IMECE2019-12569

Bablu Kumar Jha, *Indian Institute of Technology Kharagpur, Kharagpur, INDIA*

11:48am – Magneto-Electro-Mechanical Properties of Giant Magnetostrictive Particulates in a Polarized Electroactive Polymer Matrix

Technical Presentation. IMECE2019-13546

Scott Newacheck, George Youssef, *San Diego State University, San Diego, CA, United States*

12:09pm – Strain-Mediated Magnetolectric Composites for Wireless Energy Transfer

Technical Presentation. IMECE2019-13776

Scott Newacheck, George Youssef, *San Diego State University, San Diego, CA, United States*

10-20 PERSPECTIVES FROM DIVISION DIRECTORS, PROGRAM MANAGERS, AND CENTER LEADERSHIP ON MATERIALS BY DESIGN CHALLENGES

10-20-1 ONR, NIST, ARO

Convention Center, 251D

10:45AM–12:30PM

Session Organizer: Natasha Vermaak, *Lehigh University, Bethlehem, PA, United States*

Session Co-Organizer: Andrew Gaynor, *Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD, United States*

10:45am – Design of Engineering Materials, Observations From the ONR

Technical Presentation. IMECE2019-13109

Jule Christodoulou, *Naval Materials S&T Division, Arlington, VA, United States*

11:27am – New Approaches to Materials Discovery and Design

Technical Presentation. IMECE2019-13456

Mark VanLandingham, *National Institute of Standards and Technology, Gaithersburg, MD, United States*

12:09pm – Opportunities and Trends in the Materials Design Program at ARO

Technical Presentation. IMECE2019-13386

Evan Runnerstrom, *Army Research Lab, RTP, NC, United States*

10-26 MATERIALS PROCESSING AND CHARACTERIZATION

10-26-1 Materials Processing and Characterization – I

Convention Center, 251A

10:45AM–12:30PM

Session Organizer: Ram Mohan, *North Carolina Agricultural and Technical State University, Greensboro, NC, United States*

10:45am – Ultrasonic Casting of Off-Eutectic Tin Bismuth Solder Alloy for Mechanical Property Testing

Technical Paper Publication. IMECE2019-10051

Laura Smith, Jeffrey Jennings, *Harris Corporation, Melbourne, FL, United States*

11:06am – Enhancing the Frictional Behaviour of H-BN Reinforced Nanocomposites Through Laser Shock Peening

Technical Paper Publication. IMECE2019-10162

Joel J. M. Anthony Xavier, *Vellore Institute of Technology, Vellore, India*

11:27am – Mechanical Properties of 3D Printed Fiber Reinforced Thermoplastic

Technical Paper Publication. IMECE2019-10303

Seyed Hamid Sanei, Zachary Lash, Joshua Servey, Frank Gardone, Chetan Nikhare, *Pennsylvania State University, Erie, PA, United States*

11:48am – Fabrication and Characterization of the Recycling of Composite Palm Materials, Shell, Leaves, and Branches in Saudi Arabia

Technical Paper Publication. IMECE2019-10308

Ibrahim Alarifi, Khaled Alhummidy G. Almotery, Waleed Saeed M Alsaiani, Yazeed Abdulrahman Y. Alyoussef, Mohammad Farraj M. Alsahli, Meshal Mohammed O. Alharbi, Tarek M.A.A. El-Bagory, *Majmaah University, Majmaah, Riyadh, Saudi Arabia*

12:09pm – Investigations on the Thermal and Dynamic-Mechanical Properties of Rattan Cane Fibre (Calamus Deeratus) Filled Epoxy Composites

Technical Paper Publication. IMECE2019-10313

Osita Obiukwu, *Federal University of Technology Owerri, Owerri, Imo, Nigeria*

10-4 MECHANICAL METAMATERIALS

10-4-2 Anomalous Physical Properties of Mechanical Metamaterials

Convention Center, 251C

2:00PM–3:45PM

Session Organizer: Jie Yin, *North Carolina State University, Raleigh, NC, United States*

Session Co-Organizer: Lifeng Wang, *Stony Brook University, Stony Brook, NY, United States*

2:00pm – Axial-Shear Coupling and Dual Poisson's Ratio of Undulated Tetra-Chiral and Tetra-Achiral Lattices

Technical Presentation. IMECE2019-13069

Zhihao Yuan, Jaehyung Ju, *Shanghai Jiao Tong University, Shanghai, China*

2:21pm – A Twist-Coupling Mechanism for Kirigami-Inspired Volumetric Structures With Bistability

Technical Presentation. IMECE2019-13186

Max Cioban, Hiromi Yasuda, *University of Pennsylvania, Philadelphia, PA, United States*, **Christopher X. Hong**, *Penn Medicine, Philadelphia, PA, United States*, **Jordan R. Raney**, *University of Pennsylvania, Philadelphia, PA, United States*

2:42pm – Constitutive Modeling of Chiral Mechanical Metastructures

Technical Presentation. IMECE2019-13420

Haodong Du, Liang Zhang, Bo Peng, Wenbin Yu, *Purdue University, West Lafayette, IN, United States*

3:03pm – Anomalous Strain Energy Transformation in Nonlocal Mechanical Metamaterials

Technical Presentation. IMECE2019-13235

Eduard Karpov, John T. Klein, Larry A. Danso, *University of Illinois at Chicago, Chicago, IL, United States*

10-10 MULTIFUNCTIONAL COMPOSITE MATERIALS AND STRUCTURES

10-10-2 Multifunctional Composite Materials and Structures – II

Convention Center, 251B 2:00PM–3:45PM

2:00pm – Low-Cost Manufacturing of Bioinspired Metal-Ceramic Composites Through Electrodeposition of Metal into Ceramic Scaffold

Technical Presentation. IMECE2019-12439

Majid Minary, University of Texas at Dallas, Richardson, TX, United States

2:21pm – Fracture Toughness of Bio-Inspired Helicoidal Composites by 3D Printing

Technical Presentation. IMECE2019-12447

Sha Yin, Haoyu Chen, Ruiheng Yang, Beihang University, Beijing, China

2:42pm – Dynamic Mechanical Behavior of Coelacanth-Fish-Inspired Laminated Composites

Technical Presentation. IMECE2019-12448

Sha Yin, Ruiheng Yang, Haoyu Chen, Beihang University, Beijing, China

3:03pm – Compressive Properties of Hollow Honeytube

Technical Presentation. IMECE2019-12449

Sha Yin, Huitian Wang, Beihang University, Beijing, China

3:24pm – Topological Analysis, Design, Performance Characterization, and Multifunctional Application of Non-Positive Parametric Mechanical Metamaterials

Technical Presentation. IMECE2019-12476

Hang Yang, Harbin Institute of Technology, Harbin, China

10-20 PERSPECTIVES FROM DIVISION DIRECTORS, PROGRAM MANAGERS, AND CENTER LEADERSHIP ON MATERIALS BY DESIGN CHALLENGES

10-20-2 NSF, DARPA, AFOSR

Convention Center, 251D 2:00PM–3:45PM

Session Organizer: Andrew Gaynor, Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD, United States

Session Co-Organizer: Natasha Vermaak, Lehigh University, Bethlehem, PA, United States

2:00pm – Perspective from the National Science Foundation on Materials by Design Challenges

Technical Presentation. IMECE2019-13275

Alexis Lewis, National Science Foundation, Arlington, VA, United States, Siddiq Qidwai, National Science Foundation, Alexandria, VA, United States

2:35pm – Materials by Design Perspectives From DARPA Technical Presentation. IMECE2019-13942

Jan Vandenbrande, DARPA, Arlington, VA, United States, Andrew Gaynor, Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD, United States

3:10pm – Design of Engineering Materials Challenges Through the AFOSR Lens

Technical Presentation. IMECE2019-13572

Jaimie Tiley, Air Force Office of Scientific Research, Arlington, VA, United States, Andrew Gaynor, Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD, United States

10-26 MATERIALS PROCESSING AND CHARACTERIZATION

10-26-2 Materials Processing and Characterization – II

Convention Center, 251A 2:00PM–3:45PM

Session Organizer: Raghu Prakash, Indian Institute of Technology Madras, Chennai, India

2:00pm – Mechanical and Thermal Properties of LEU-10Mo Alloy

Technical Presentation. IMECE2019-10364

Jason Schulthess, Idaho National Laboratory, Ammon, ID, United States, Craig Marshall, Michael Heighes, Idaho National Laboratory, Idaho Falls, ID, United States

2:21pm – Design and Analysis of Epoxy Based Cable Terminations for Marine Cables

Technical Paper Publication. IMECE2019-10384

Raghu Prakash, Vibhu P.G., Indian Institute of Technology Madras, Chennai, India

2:42pm – 3D Printing and Stretching Effects on Alignment Microstructure in PDMS/CNT Nanocomposites

Technical Paper Publication. IMECE2019-10512

Blake Herren, Tingting Gu, Qinggong Tang, Mrinal Saha, Yingtao Liu, University of Oklahoma, Norman, OK, United States

3:03pm – Study on Surface Roughness of Milling In-Situ TiB₂ Particle Reinforced Al Matrix Composites

Technical Paper Publication. IMECE2019-10837

Xiaofen Liu, Wenhui Wang, Yi-feng Xiong, Kunyang Lin, Zhan-fei Zhang, Northwestern Polytechnical University, Xi'an Shaanxi, China, Rui-song Jiang, Sichuan University, Chengdu, China

3:24pm – Effect of Graphene Nanoplatelets Incorporation on Microstructural and Tribological Properties of Aluminium Metal Matrix Composites

Technical Paper Publication. IMECE2019-10939

Ankit Sharma, Amrita Priyadarshini, Sujith R, Munukutla Venkata Sankara Subrahmanyam, P. Alen Thomas, Amit Kumar Gupta, Birla Institute of T - Hyderabad Campus, Hyderabad, T

10-4 MECHANICAL METAMATERIALS

10-4-3 Multiphysics Behavior of Mechanical Metamaterials

Convention Center, 251C

4:00PM–5:45PM

Session Organizer: Jaehyung Ju, *Shanghai Jiao Tong University, Shanghai, China*

Session Co-Organizer: Sung Hoon Kang, *Johns Hopkins University, Baltimore, MD, United States*

4:00pm – Invited Talk: Ferromagnetic Metamaterials and Soft Robots I

Technical Presentation. IMECE2019-12822

Xuanhe Zhao, *Massachusetts Institute of Technology, Cambridge, MA, United States*

4:21pm – Invited Talk: Ferromagnetic Metamaterials and Soft Robots II

Technical Presentation. IMECE2019-12823

Xuanhe Zhao, *Massachusetts Institute of Technology, Cambridge, MA, United States*

4:42pm – Snapping-Back Buckling of Wide Hyperelastic Columns for Energy Absorbing Architected Materials

Technical Presentation. IMECE2019-13147

Yuzhen Chen, Lihua Jin, *University of California, Los Angeles, Los Angeles, CA, United States*

5:03pm – Active Lattices With Thermally Tunable Properties

Technical Presentation. IMECE2019-13791

Jochen Mueller, Jennifer A. Lewis, Katia Bertoldi, *Harvard University, Cambridge, MA, United States*

5:24pm – Periodic Cellular Materials With Temperature- and Stress-induced Phase Transformations

Technical Presentation. IMECE2019-13818

Yunlan Zhang, Pablo Zavattieri, Mirian Velay-Lizancos, *Purdue University, West Lafayette, IN, United States*, **Nilesh Mankame**, *General Motors Research & Development, Warren, MI, United States*, **David Restrepo**, *University of Texas at San Antonio, San Antonio, TX, United States*

10-10 MULTIFUNCTIONAL COMPOSITE MATERIALS AND STRUCTURES

10-10-3 Multifunctional Composite Materials and Structures – III

Convention Center, 251B

4:00PM–5:45PM

4:00pm – Design and Synthesis of a High Performance Coating

Technical Paper Publication. IMECE2019-10433

Swarn Jha, Yan Chen, Rick Wang, *Texas A&M University, College Station, TX, United States*, **Mohamed Gharib**, *Texas A&M University at Qatar, Doha, Qatar*, **Hong Liang**, *Texas A&M University, College Station, TX, United States*

4:21pm – An Improved Predictive Model for Effective Thermal Conductivity of Polymer Composites With Non-Dilute Filler Concentrations

Technical Paper Publication. IMECE2019-10960

Kabeer Raza, Syed Sohail Akhtar, *King Fahad University of Petroleum & Minerals, Dhahran, Saudi Arabia*, **Abul Fazal M. Arif**, *McMaster University, Toronto, ON, Canada*, **Abbas Saeed Hakeem**, *King Fahd University of Petroleum & Minerals, Dhahran, Gujrat, Pakistan*

4:42pm – A New Trefftz Based Finite Element for Static Analysis of Laminated Composite Structures

Technical Paper Publication. IMECE2019-11116

Subhasankar Dwibedi, *Indian Institute of Technology Kharagpur, Baripada, Odisha, India*

5:03pm – POSS-Based Treatment of Carbon-Fiber Surface for Enhanced Durability of Composites

Technical Presentation. IMECE2019-11502

Blaze Heckert, Raman Singh, *Oklahoma State University, Tulsa, OK, United States*

5:24pm – Mechanical Strength Degradation of Carbon Fiber Polymer Matrix Composites Exposed to Constant Low-Density Direct Current

Technical Paper Publication. IMECE2019-12259

Sai Tharun Kotikalapudi, Raman Singh, *Oklahoma State University, Tulsa, OK, United States*

10-11 MULTIFUNCTIONAL NANOMATERIALS

10-11-1 Multifunctional Nanomaterials

Convention Center, 355E

4:00PM–5:45PM

4:00pm – High Thermo-Mechanical Stability in Polybenzoxazine Aerogels

Technical Paper Publication. IMECE2019-11590

Sadeq Malakooti, Guoqiang Qin, *University of Texas at Dallas, Richardson, TX, United States*, **Chandana Mandal, Chariklia Sotiriou-Leventis, Nicholas Leventis**, *Missouri University of Science & Technology, Rolla, MO, United States*, **Hongbing Lu**, *University of Texas at Dallas, Plano, TX, United States*

4:21pm – Effect of Graphene Nanoplatelet Addition on the Conductive Behavior of Solution Mixing Processed Polylactide Biopolymer Nanocomposites

Technical Paper Publication. IMECE2019-12053

Qi Zhang, Pierre Mertiny, *University of Alberta, Edmonton, AB, Canada*

4:42pm – Highly Coupled Field Enhancement in Three-Dimensional Graphene Cubes

Technical Presentation. IMECE2019-13833

Kriti Agarwal, Chunhui Dai, Jeong-Hyun Cho, *University of Minnesota, Minneapolis, MN, United States*

**5:03pm – Flame Synthesis of Tungsten and Molybdenum
Co-Doped Nanoparticles**

Technical Presentation. IMECE2019-13853

Yuqian Zhang, Zhizhong Dong, Stephen Tse, *Rutgers, The
State University of New Jersey, Piscataway, NJ, United States*

**10-26 MATERIALS PROCESSING AND
CHARACTERIZATION**

**10-26-3 Materials Processing and
Characterization – III**

Convention Center, 251A

4:00PM–5:45PM

**4:00pm – Effect of Coating Process Parameters on the
Development of Residual Stresses in Ceramic Coatings**

Technical Paper Publication. IMECE2019-11120

Ali Gadelmoula, Khaled Al-Athel, *King Fahd University of
Petroleum & Minerals, Dhahran, Saudi Arabia*

**4:21pm – Macroscale Simulation of Tensile Test Expandable
Tubular Steel Using Crystal Plasticity FEM**

Technical Paper Publication. IMECE2019-11156

Omar S. Al-Abri, *The Research Council, Al-Khouth, Oman*,
Tasneem Pervez, *Sultan Qaboos University, Al-Khouth, Oman*

**4:42pm – Numerical Investigation on Strain Properties of
Ti6Al4V Alloy Processed by Constrained Bending and
Straightening Severe Plastic Deformation**

Technical Paper Publication. IMECE2019-11163

Wambura Mwiryenyi Mwita, Esther Akinlabi, *University of
Johannesburg, Johannesburg, Guateng, South Africa*

**5:03pm – Influence of Precipitation and Dislocation Density
on Flow Stress Characteristics Under Compression
Deformation of Heat-Treated 17-4 PH Stainless Steel Alloy**

Technical Paper Publication. IMECE2019-11201

Athul Sathyanath, Anil Meena, *Indian Institute of Technology,
Madras, Chennai, India*

**5:24pm – Influence of the Applied Load on the Creep
Behaviour of Tin-Silver-Copper Solder**

Technical Paper Publication. IMECE2019-11356

Delfim Soares, Pedro Ribeiro, Pauline Capela, Daniel
Barros, Maria Cerqueira, Senhorinha Teixeira, Francisco
Macedo, Jose Teixeira, *University of Minho, Guimarães,
Portugal*

10-30 NANOMATERIALS FOR ENERGY

10-30-1 Nanomaterials for Energy I

Convention Center, 355D

4:00PM–5:45PM

Session Organizer: Michael Pettes, *Los Alamos National
Laboratory, Los Alamos, NM, United States*

Session Co-Organizers: Sajad Yazdani, *Yale University, New
Haven, CT, United States*, Pei Dong, *George Mason University,
Fairfax, VA, United States*, Arunkumar Subramanian, *University
of Illinois at Chicago, Chicago, IL, United States*

**4:00pm – Invited Presentation: Electrochemical Behaviors
of Two-Dimensional Materials for Energy Applications I**

Technical Presentation. IMECE2019-13164

Jun Lou, *Rice University, Houston, TX, United States*

**4:21pm – Two Dimensional Transition Metal
Dichalcogenides as Highly Efficient Bifunctional
Electrocatalysts for Li-Oxygen Batteries**

Technical Presentation. IMECE2019-11705

Leily Majidi, *University of Illinois at Chicago, Chicago, IL,
United States*, Larry A Curtiss, *Argonne National Laboratory,
Argonne, IL, United States*, Amin Salehi-Khojin, *University of
Illinois at Chicago, Chicago, IL, United States*

**4:42pm – Precise Control of Precursor Sticking Coefficient
on Substrates With Large Aspect Ratios in ALD**

Technical Paper Publication. IMECE2019-11152

Thokozani Kunene, Lagouge Tartibu, Tien-Chien Jen,
University of Johannesburg, Johannesburg, South Africa

**5:03pm – Dynamic Etching and Functionalization of
Germanium Nanocrystals for Tunable Photoluminescence**

Technical Presentation. IMECE2019-13922

Shuang Cui, *National Renewable Energy Laboratory, Golden,
CO, United States*

**5:24pm – Lithium Air Batteries; Challenges, and
Opportunities**

Technical Presentation. IMECE2019-11685

Amin Salehi-Khojin, *University of Illinois at Chicago, Chicago,
IL, United States*

WEDNESDAY, NOVEMBER 13

10-31 PLENARY SESSIONS

10-31-2 Plenary Session II

Convention Center, 155F

9:45AM–10:30AM

9:45am – Material and Microstructural Features That Prompt Sub-Crystalline Localization in Polycrystalline High-Performance Alloys

Plenary Presentation. IMECE2019-14005

Irene Beyerlein, Los Alamos National Laboratory, Los Alamos, NM, United States

10-4 MECHANICAL METAMATERIALS

10-4-4 Reconfigurable Mechanical Metamaterials

Convention Center, 251E

10:45AM–12:30PM

Session Organizer: Jordan R. Raney, University of Pennsylvania, Philadelphia, PA, United States

Session Co-Organizer: Yanning Li, University of New Hampshire, Durham, NH, United States

10:45am – Reconfigurable Mesostructures With Reverse Stiffness and Shape Memory Effects

Technical Presentation. IMECE2019-12798

Chao Song, Jaehyung Ju, Shanghai Jiao Tong University, Shanghai, China

11:06am – Reconfigurable Architected Materials Through Hybrid Design and Manufacturing

Technical Presentation. IMECE2019-12898

Pu Zhang, Fanghang Deng, SUNY Binghamton, Binghamton, NY, United States

11:27am – 4D Printed Reconfigurable, Deployable, and Mechanically Tunable Metamaterials

Technical Presentation. IMECE2019-13449

Chen Yang, Manish Boorugu, Daehoon Han, Howon Lee, Rutgers, The State University of New Jersey, Piscataway, NJ, United States

11:48am – Reconfigurable Architected Mechanical Metamaterial Based on the 3D Modular Kirigami

Technical Presentation. IMECE2019-13509

Yanbin Li, Jie Yin, North Carolina State University, Raleigh, NC, United States

12:09pm – Shape and Rigidity Morphing Mechanical Metamaterials

Technical Presentation. IMECE2019-13820

Michael D. Bartlett, Doh-Gyu Hwang, A.B.M. Tahidul Haque, Sean T. Frey, Iowa State University, Ames, IA, United States

10-10 MULTIFUNCTIONAL COMPOSITE MATERIALS AND STRUCTURES

10-10-4 Multifunctional Composite Materials and Structures – IV

Convention Center, 251D

10:45AM–12:30PM

10:45am – Dynamic and Static Fracture Toughness of Al/Epoxy Resin Interface

Technical Paper Publication. IMECE2019-11081

Yusaku Saito, Kosuke Sudo, Kohei Kanamori, Akio Yonezu, Chuo University, Tokyo, Japan

11:06am – Anisotropic Deformation Behavior of Porous Polymeric Membranes Under Uni-Axial and Bi-Axial Loadings

Technical Paper Publication. IMECE2019-11099

Kanako Emori, Akio Yonezu, Takumi Nagakura, Tatsuma Miura, Chuo University, Tokyo, Japan

11:27am – Experimental Investigation of Spontaneous Buckling-Driven Delamination of Thin Films on Soft Spherical Substrate

Technical Paper Publication. IMECE2019-11141

Yusaku Saito, Shuhei Yoshioka, Kanako Emori, Brenda Teoh Rui Ern, Akio Yonezu, Chuo University, Tokyo, Japan

11:48am – Large Deformation Behavior of Porous Polymer Materials With 3D Random Pore Structure: Experimental Investigation and FEM Modeling

Technical Paper Publication. IMECE2019-11143

Kanako Emori, Tatsuma Miura, Akio Yonezu, Chuo University, Tokyo, Japan

10-26 MATERIALS PROCESSING AND CHARACTERIZATION

10-26-4 Materials Processing and Characterization – IV

Convention Center, 251A

10:45AM–12:30PM

10:45am – Wear Behavior of In-Situ Mg₂Si/Al-Si Composite

Technical Paper Publication. IMECE2019-11408

Balasivanandha Prabu Shanmugavel, Vijayakumar Mohan, Anna University, Chennai, India

11:06am – Three-Dimensional Printing of Carbon Nanostructures

Technical Paper Publication. IMECE2019-11411

Alex Resnick, Kennesaw State University, Duluth, GA, United States, Jungkyu Park, Biya Haile, Eduardo Farfan, Kennesaw State University, Marietta, GA, United States

11:27am – Investigation of the Microstructure of Melt-Spun Ti₂NiCu Shape Memory Ribbons

Technical Presentation. IMECE2019-11532

Pranav Bhale, Pnina Ari-Gur, Western Michigan University, Kalamazoo, MI, United States, A.V. Irzhak, Russian Academy of Science, Moscow, Russia, V.V. Koledov, Kotel'nikov Institute of Radio Engineering and Electronics, Mos R

11:48am – Structure-Property Relationships Between Morphological Anisotropy and Mechanical, Thermal, and Dielectric Behavior in Liquid Crystal Polymers
Technical Paper Publication. IMECE2019-11608
Anthony Sullivan, Anil Saigal, Michael A. Zimmerman,
Tufts University, Medford, MA, United States

12:09pm – Effect of Annealing on the Microstructure and Mechanical Properties of Mg-9Al% Alloy Plates Processed With Symmetrical and Asymmetrical Rolling
Technical Paper Publication. IMECE2019-11612
Zhigang Xu, Honglin Zhang, Sergey Yarmolenko, North Carolina Agricultural and Technical State University, Greensboro, NC, United States, Qiuming Wei, University of North Carolina at Charlotte, Charlotte, NC, United States, Laszlo Kecskes, Johns Hopkins University, Baltimore, MD, United States, Jagannathan Sankar, North Carolina Agricultural and Technical State University, Greensboro, NC, United States

10-1 IN-SITU TECHNIQUES IN EXPERIMENTAL MECHANICS

10-1-1 In-Situ Techniques in Experimental Mechanics
Convention Center, 155B **2:00PM–3:45PM**

Session Organizer: Leslie Lamberson, Drexel University, Philadelphia, PA, United States

2:00pm – Low-Cost Measurement Technique of Poisson's Ratio of Thin, Solvent-Sensitive Polymer Membranes
Technical Paper Publication. IMECE2019-11655
Lara Dienemann, Anil Saigal, Michael A. Zimmerman,
Tufts University, Medford, MA, United States

2:21pm – Spectroscopic-Mechanical Behavior of Polymers
Technical Presentation. IMECE2019-13835
George Youssef, Nha Uyen Huynh, San Diego State University, San Diego, CA, United States

2:42pm – Ion Irradiation Induced Defects Annihilation in Nanocrystalline Gold: In-Situ TEM and Molecular Dynamics Study
Technical Presentation. IMECE2019-11509
Zahabul Islam, Pennsylvania State University, State College, PA, United States, Md. Haque, Penn State University, University Park, PA, United States

3:03pm – In Situ Experimental Characterizations for Quantitative Study of Strain-Induced Phase Transformations Under High Pressure
Technical Presentation. IMECE2019-12762
K.K. Pandey, Iowa State University, Ames, IA, United States

3:24pm – Evaluation Method of Surface-Rigidity Distribution in Elastic Body by Surface-Probing
Technical Paper Publication. IMECE2019-11816
Shohei Fujita, Atsushi Sakuma, Kyoto Institute of Technology, Kyoto, Japan

10-4 MECHANICAL METAMATERIALS

10-4-5 Dynamical and Transient Phenomena in Mechanical Metamaterials
Convention Center, 251E **2:00PM–3:45PM**

Session Organizer: Lifeng Wang, Stony Brook University, Stony Brook, NY, United States

Session Co-Organizer: Jie Yin, North Carolina State University, Raleigh, NC, United States

2:00pm – Dynamic Impact Properties of a Novel Auxetic Metamaterial
Technical Paper Publication. IMECE2019-10865
Zeyao Chen, Wang Zhe, Xian Wu, Jianwang Shao, Tongji University, Shanghai, China, Shiwei Zhou, RMIT University, Melbourne, Australia

2:21pm – Cnoidal Wave Propagation in an Elastic Metamaterial
Technical Presentation. IMECE2019-12860
Prashant Purohit, Chengyang Mo, Jaspreet Singh, Jordan R. Raney, University of Pennsylvania, Philadelphia, PA, United States

2:42pm – Transition Waves in Substrate Free Multistable Metamaterials
Technical Presentation. IMECE2019-12884
Romik Khajehtourian, Dennis M. Kochmann, ETH Zürich, Zürich, Switzerland

3:03pm – Dynamics of Soft, Multistable Metamaterials With Embedded Magnets
Technical Presentation. IMECE2019-13764
Lucia M. Korpas, Hiromi Yasuda, Jordan R. Raney, University of Pennsylvania, Philadelphia, PA, United States

10-10 MULTIFUNCTIONAL COMPOSITE MATERIALS AND STRUCTURES

10-10-5 Multifunctional Composite Materials and Structures – V
Convention Center, 251D **2:00PM–3:45PM**

2:00pm – Modeling and Simulation of a Superconductive Linear Motor
Technical Paper Publication. IMECE2019-10083
Aiman Al-Allaq, Nebojsa Jaksic, Colorado State University-Pueblo, Pueblo, CO, United States

2:21pm – Advanced Techniques for Design and Analysis of Composite Structures
Technical Presentation. IMECE2019-12340
Tim Douglas, Wasatch Composite Analysis, Park City, UT, United States

2:42pm – Manufacturing Challenges of Creating Unsaturated Polyester Syntactic Foams With Glass Fiber Reinforcements

Technical Presentation. IMECE2019-12773
Arielle Berman, Edward DiLoreto, Kyriaki Kalaitzidou,
Georgia Institute of Technology, Atlanta, GA, United States

3:03pm – A Thermographic and Energy Based Approach to Define High Cycle Fatigue Strength of Flax Fiber Reinforced Thermoset Composites

Technical Presentation. IMECE2019-12934
Md. Zahirul Islam, Chad Ulven, *North Dakota State University, Fargo, ND, United States*

10-26 MATERIALS PROCESSING AND CHARACTERIZATION

10-26-5 Materials Processing and Characterization – V

Convention Center, 251A **2:00PM–3:45PM**

2:00pm – Cold Spray Deposition of Pure Titanium Coating Onto High Strength Substrate With Ultra-High Bond Strength

Technical Paper Publication. IMECE2019-11689
Davoud Mashhadi Jafarlou, *University of Massachusetts Amherst, Amherst, MA, United States*, Gehn Ferguson, Aaron Nardi, Victor Champagne, *Army Research Laboratory, Aberdeen, MD, United States*, Ian Grosse, *University of Massachusetts Amherst, Amherst, MA, United States*

2:21pm – Effect of Sample Preparation on Volta Potential Measurements of Plastically Deformed Mg-Al Alloys

Technical Paper Publication. IMECE2019-11783
Svitlana Fialkova, Honglin Zhang, Zhigang Xu, Jagannathan Sankar, *North Carolina Agricultural and Technical State University, Greensboro, NC, United States*

2:42pm – Experimental Determination of Axial Viscoelasticity of Braided Steel Cables Through the Design of a Special Purpose Machine

Technical Paper Publication. IMECE2019-11919
Diego A. Zamora-Garcia, Luis M. Acosta-Carrion, Ma. Pilar Corona-Lira, Alejandro C. Ramirez-Reivich, *National Autonomous University of Mexico, Mexico City, Mexico*

3:03pm – Energy Absorption Characteristics of a Nested Curved Column Reinforced Elastomer Composite

Technical Paper Publication. IMECE2019-12096
Owen F. Van Valkenburgh, Thomas C. Ekstrom, Erica M. Goodman, Cameryn C. Leberte, Kevin M. Haaland, Nathan K. Yasuda, Frank J. Shih, *Seattle University, Seattle, WA, United States*

3:24pm – Evaluation and Characterization of ASS316L at Sub-Zero Temperature

Technical Paper Publication. IMECE2019-12102
Satyanarayana Kosaraju, Anil Kalluri, Swadesh Kumar Singh, *Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad, Hyderabad, Telangana, India*, Ahsan UI Haq, *VNR VJIET, Hyderaad, Telangana, India*

10-17 CONSTITUTIVE MODELING OF THE MECHANICAL BEHAVIOR AND PERFORMANCE OF ELECTRONIC, PHOTONIC, MEMS, AND NEMS MATERIALS, ASSEMBLIES, PACKAGES, MODULES, AND SYSTEMS

10-17-1 Constitutive Modeling of the Mechanical Behavior and Performance of Electronic, Photonic, MEMS, and NEMS Materials, Assemblies, Packages, Modules, and Systems – I

Convention Center, 251E **4:00PM–5:45PM**

4:00pm – Mechanical Behavior, Strength and Performance of Electronic and Photonic Materials and Structures, and the Role of Constitutive Equations

Technical Presentation. IMECE2019-10089
Ephraim Suhir, *Bell Labs, Murray Hill, NJ, United States*

4:21pm – Fracture of Beams With Random Field Properties: Fractal and Hurst Effects

Technical Presentation. IMECE2019-10538
Rossella Laudani, *University of Messina, Messina, Italy*, Martin Ostoja-Starzewski, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

4:42pm – Making a Viable IC Package Into a Reliable Product

Technical Presentation. IMECE2019-10544
Ephraim Suhir, *Bell Labs, Murray Hill, NJ, United States*

5:03pm – Effect of Interfacial Contact Forces in a Wire Rope

Technical Presentation. IMECE2019-11290
Kamesh K, *Murugappa Polytechnic, Chennai, Tamilnadu, India*, Gnanavel B K, *Rajarajeswari Nachiaapan, Vijayamirtha Rayan J, Nivedha Murali, Saveetha Engineering College, Anna University, Chennai, Tamilnadu, India*

10-20 PERSPECTIVES FROM DIVISION DIRECTORS, PROGRAM MANAGERS, AND CENTER LEADERSHIP ON MATERIALS BY DESIGN CHALLENGES

10-20-3 Center Directors

Convention Center, 251D **4:00PM–5:45PM**

Session Organizer: Andrew Gaynor, *Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD, United States*

Session Co-Organizer: Natasha Vermaak, *Lehigh University, Bethlehem, PA, United States*

4:00pm – Computational Design Optimization

Technical Presentation. IMECE2019-13861
Daniel Tortorelli, *Lawrence Livermore National Laboratory Livermore, CA, United States*

**4:35pm – New Trends in Integrated Computational
Structure-Materials Engineering for Integrated Modeling
and Design**

Technical Presentation. IMECE2019-13454

Somnath Ghosh, *Johns Hopkins University, Baltimore, MD,
United States*

**5:10pm – From Cellular Solids to Nano-Architected
Materials: The Interplay of Solid Mechanics, Topology
Optimization, Additive Manufacturing and Nano-Materials
Synthesis and Characterization**

Technical Presentation. IMECE2019-13701

Lorenzo Valdevit, *University of California, Irvine, Irvine, CA,
United States*

10-26 MATERIALS PROCESSING AND CHARACTERIZATION

**10-26-6 Materials Processing and
Characterization – VI**

Convention Center, 251A

4:00PM–5:45PM

**4:00pm – Atomistic Investigation on Mechanical Properties
of Sn-Ag-Cu Based Nanocrystalline Solder Material**

Technical Paper Publication. IMECE2019-12109

**Mohammad Motalab, Rafsan A.S.I. Subad, Ayesha Ahmed,
Pritom Bose, Ratul Paul**, *Bangladesh University of
Engineering and Technology, Dhaka, Bangladesh*, **Jeffrey C.
Suhling**, *Auburn University, Auburn University, AL, United
States*

**4:21pm – Development of a Controlled Release Fertilizer
Based on Sodium Alginate**

Technical Presentation. IMECE2019-13413

John Fisher, Sameer Rao, *University of Utah, Salt Lake City,
UT, United States*

**4:42pm – Mechanical Characterization of Tablets Prepared
by Hot Melt Extrusion**

Technical Presentation. IMECE2019-13569

Elaheh Ardalani, Golshid Keyvan, Alberto Cuitino, *Rutgers,
The State University of New Jersey, Piscataway, NJ, United
States*

**5:03pm – Lattice Strain and Texture Analysis of Superhard
Mo_{0.9}W_{1.1}BC and ReWC_{0.8} via Diamond Anvil Cell
Deformation**

Technical Presentation. IMECE2019-13854

Marcus Parry, Samantha Couper, *University of Utah, Salt
Lake City, UT, United States*, **Aria Mansouri Tehrani, Anton
Oliynyk, Jakoah Brgoch**, *University of Houston, Houston, TX,
United States*, **Lowell Miyagi, Taylor D. Sparks**, *University of
Utah, Salt Lake City, UT, United States*

**5:24pm – Circular Saw Manufacturing: Effect of
Sub-Surface Residual Stresses**

Technical Presentation. IMECE2019-13896

**Chandra Sekhar Rakurty, Lucas A. Whitmer, Mathew
Morelli**, *The M. K. Morse Company, Canton, OH, United States*

THURSDAY, NOVEMBER 14

10-9 MODELING, SIMULATION, AND DESIGN OF MULTIFUNCTIONAL MATERIALS

10-9-1 Modeling, Simulation, and Design of Multifunctional Materials – I: Multiscale and Multiphysical Phenomena

Convention Center, 155A 8:15AM–10:00AM

Session Organizer: Ling Liu, *Temple University, Philadelphia, PA, United States*

Session Co-Organizer: Zhenhai Xia, *University of North Texas, Denton, TX, United States*

8:15am – Comparison of Nanoarchitecture Model and Porous Media Model to Characterize rGO/Aramid Nanofiber Structural Electrodes in Supercapacitors

Technical Presentation. IMECE2019-12502

Sarah Aderyani, *University of Houston, Houston, TX, United States*, **Smit A. Shah**, **Micah J. Green**, **Jodie L. Lutkenhaus**, *Texas A&M University, College Station, TX, United States*, **Haleh Ardebili**, *University of Houston, Houston, TX, United States*

8:36am – Modeling and Numerical Simulation of Ferroelectric Degradation by Hydrogen Impurity

Technical Presentation. IMECE2019-12794

Cooper Gray, **Zhi Wang**, *University of St. Thomas, St. Paul, MN, United States*, **Jeong Ho You**, *University of St Thomas, Woodbury, MN, United States*

8:57am – Molecular Dynamics Simulations of Thermal Accommodation at Gas/Solid Interface

Technical Presentation. IMECE2019-12212

Lin Zhang, **Heng Ban**, *University of Pittsburgh, Pittsburgh, PA, United States*

9:18am – Multiscale Investigation of the Effect of Crack Stop Holes in Brittle Material

Technical Presentation. IMECE2019-12828
Fazle Elahi, **Md Hossain**, *University of Delaware, Newark, DE, United States*

9:39am – Experimental and Computational Investigation of the Post-Yielding Behavior of 3D Printed Polymer Lattice Structures

Technical Presentation. IMECE2019-11898
Abdalsalam Fadeel, *Wright State University, Fairborn, OH, United States*, **Ahsan Mian**, *Wright State University, Dayton, OH, United States*

10-14 SOFT ROBOTICS AND SOFT MACHINES

10-14-1 Soft Robotics and Soft Machines – I

Convention Center, 355F 8:15AM–10:00AM

Session Organizer: Jie Yin, *North Carolina State University, Raleigh, NC, United States*

8:15am – Programmable Micro-Structures for Soft Robotics Based on 4D Printing

Technical Presentation. IMECE2019-11021
Huiling Duan, **Qianying Chen**, **Tian-Yun Huang**, **Pengyu Lv**, **Jianyong Huang**, *Peking University, Beijing, China*

8:36am – Mechanical Properties of Interlocking Cell Structure for Soft Exoskeleton Suits

Technical Paper Publication. IMECE2019-11340
Dongchan Lee, *NeoSystem Co. Ltd., Seoul, Korea (Republic)*, **Chulho Yang**, *Oklahoma State University, Stillwater, OK, United States*

8:57am – Modified Nernst-Planck-Poisson Model for IPMC With Back-Relaxation Effects

Technical Paper Publication. IMECE2019-10084
Aiman Al-Allaq, **Nebojsa Jaksic**, **Bahaa Ansaf**, **Jude L. DePalma**, **Duong H. Trung**, *Colorado State University-Pueblo, Pueblo, CO, United States*

9:18am – Design of a Deformable Smart Tire Using Soft Actuator

Technical Paper Publication. IMECE2019-10400
Vidya Nandikolla, **Michael Costa**, **Nathan Boyd**, **Gilberto Rosales Jr**, *California State University Northridge, Northridge, CA, United States*

10-17 CONSTITUTIVE MODELING OF THE MECHANICAL BEHAVIOR AND PERFORMANCE OF ELECTRONIC, PHOTONIC, MEMS, AND NEMS MATERIALS, ASSEMBLIES, PACKAGES, MODULES, AND SYSTEMS

10-17-2 Constitutive Modeling of the Mechanical Behavior and Performance of Electronic, Photonic, MEMS, and NEMS Materials, Assemblies, Packages, Modules, and Systems – II

Convention Center, 155B 8:15AM–10:00AM

8:15am – Determination of Johnson-Cook Material Model Parameters of AISI 52100 Steel by Orthogonal Cutting Simulations and Compression Tests

Technical Presentation. IMECE2019-11998
M. Ömer Kayki, *ORS Bearings, Polatli, Ankara, Turkey*

8:36am – When Solder Joint Interconnections (SJIs) Reliability Is Critical?

Technical Presentation. IMECE2019-12262
Ephraim Suhir, *Bell Labs, Murray Hill, NJ, United States*

8:57am – A Review of Thermo-Hydraulic Performance of Metal Foam and Its Application as Heat Sinks for Electronics Cooling

Technical Presentation. IMECE2019-12271

Yongtong Li, *Georgia Institute of Technology, Atlanta, GA, United States*, Liang GONG, Minghai Xu, *China University of Petroleum, Qingdao, Shandong*, Yogendra Joshi, *Georgia Institute of Technology, Atlanta, GA, United States*

9:18am – Enhancing the Magnetolectric Performance of Layered Cylindrical Composites Through Non-Traditional Boundary Conditions

Technical Presentation. IMECE2019-13794

George Youssef, Scott Newacheck, Somar Nacy, *San Diego State University, San Diego, CA, United States*

10-24 FRACTURE AND DAMAGE: NANO- TO MACRO-SCALE

10-24-1 Fracture and Damage: Nano- to Macro-Scale – I

Convention Center, 255A

8:15AM–10:00AM

Session Organizer: Raghu Prakash, *Indian Institute of Technology Madras, Chennai, India*

Session Co-Organizer: Ram Mohan, *North Carolina Agricultural and Technical State University, Greensboro, NC, United States*

8:15am – Fracture Behavior of Cracked Ring Specimen at Different Crack Positions

Technical Paper Publication. IMECE2019-10298

Tarek El-Bagory, *Helwan University, Cairo, Egypt*, Abdulmohsen Alqahtani, Thamer Albulayhid, Mutlaq Alotaibi, Ibrahim Alarifi, *Majmaah University, Majmaah, Riyadh, Saudi Arabia*

8:36am – Effect of Sea-Water Environment on the Tensile and Fatigue Properties of Synthetic Yarns

Technical Paper Publication. IMECE2019-10230

Raghu Prakash, Vishnu Viswanath, *Indian Institute of Technology Madras, Chennai, India*

8:57am – Evaluate the Mechanical and Thermal Behavioural Deformation of Auxetic Composite Nano-Carbon Fibers

Technical Paper Publication. IMECE2019-10307

Ibrahim Alarifi, Mohammed Oudah E. Al-Harbi, Mohammed M. Almansour, Yousef Ali M. Alomair, Fahad Nabat B. Altulohi, M. Osman, *Majmaah University, Majmaah, Riyadh, Saudi Arabia*

9:18am – Study on Fracture Mechanism and Fatigue Life Prediction for Cutting In-Situ Tib₂/7050al Mmcs

Technical Paper Publication. IMECE2019-10901

Yi-feng Xiong, Wenhui Wang, Kunyang Lin, Xiaofen Liu, *Northwestern Polytechnical University, Xi'an, Shaanxi*, Ruisong Jiang, *Sichuan University, Chengdu, China*, Chu-quan Deng, *China Academy of Engineering Physics, Jiangyou, China*

9:39am – Effect of Patterned Inclusions on the Fracture Behavior of Ceramic Composites

Technical Presentation. IMECE2019-12537

Congjie Wei, Chenglin Wu, *Missouri University of Science and Technology, Rolla, MO, United States*, Charles Wojnar, Lawrence Livermore National Laboratory, Livermore, CA, United States

10-25 MATERIAL PROCESSING OF FLEXIBLE ELECTRONICS, SENSORS, AND DEVICES

10-25-1 Material Processing of Flexible Electronics, Sensors, and Devices – I

Convention Center, 250A

8:15AM–10:00AM

8:15am – Flexible Shape Memory Polymer In-Ear Biosensor

Technical Presentation. IMECE2019-13131

Andres Villada, Dana Stamo, Anh Nguyen, Jianliang Xiao, *University of Colorado Boulder, Boulder, CO, United States*

8:36am – Tunable Electrical Properties of Embossed, Cellulose-Based Paper for Skin-Like Sensing

Technical Presentation. IMECE2019-13379

Tongfen Liang, Xiyue Zou, Ramendra K. Pal, Jiaqi Liu, Maame Assasie, Wei-Jian Guo, Chuyang Chen, Jingjin Xie, Max Tenorio, Daniel Sullivan, Anna Root, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*, Paul Stansel, *Rutgers University, Fitchburg, MA, United States*, Anne Q. McKeown, *Rutgers, The State University of New Jersey, New Brunswick, NJ, United States*, George Weng, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*, William W. Sampson, *University of Manchester, Manchester, United Kingdom*, Assimina Pelegri, *Rutgers Rutgers, The State University of New Jersey, East Brunswick, NJ, United States*, Aaron D. Mazzeo, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*

8:57am – Stretchable Energy Devices for Soft Robotics and Wearable Electronics

Technical Presentation. IMECE2019-13804

Changyong Cao, *Michigan State University, East Lansing, MI, United States*

9:18am – Flexible Piezoelectric Energy Harvesting via Motions From a Cardiac Pacemaker Lead

Technical Presentation. IMECE2019-13897

Lin Dong, Andrew Closson, Zi Chen, John X.J., Zhang, *Dartmouth College, Hanover, NH, United States*

9:39am – Self-Healable and Recyclable Multifunctional Electronics Based on Dynamic Covalent Thermoset

Technical Presentation. IMECE2019-13920

Chuanqian Shi, Jianliang Xiao, Zhanan Zou, *University of Colorado Boulder, Boulder, CO, United States*

10-9 MODELING, SIMULATION, AND DESIGN OF MULTIFUNCTIONAL MATERIALS

10-9-2 Modeling, Simulation, and Design of Multifunctional Materials – II: Metamaterials and Lattice Structures

Convention Center, 155A 10:15AM–12:00PM

Session Organizer: Ling Liu, *Temple University, Philadelphia, PA, United States*

Session Co-Organizer: Lin Zhang, *University of Pittsburgh, Pittsburgh, PA, United States*

10:15am – Nonlinearity of Enhanced Cell Structures Having Auxetic Material Properties

Technical Paper Publication. IMECE2019-11361

Chulho Yang, *Oklahoma State University, Stillwater, OK, United States*, **Dongchan Lee**, *NeoSystem Co. Ltd., Seoul, Korea (Republic)*, **Young B. Chang**, *Oklahoma State University, Stillwater, OK, United States*

10:36am – A Finite Element Simulation Study on the Properties of a Multi-Material Based Auxetic Metamaterial

Technical Paper Publication. IMECE2019-12123

Yutai Su, **Xin Wu**, **Jing Shi**, **Jin Wang**, *University of Cincinnati, Cincinnati, OH, United States*

10:57am – Lattice Structure Design for Additive Manufacturing

Technical Presentation. IMECE2019-13385

Brad Hanks, *Pennsylvania State University, University Park, PA, United States*, **Jivtesh Khurana**, *New Delhi, India*, **Mary Frecker**, **Timothy W. Simpson**, *Pennsylvania State University, University Park, PA, United States*

11:18am – Developing Equivalent Material Models for Lattice Cell Structures Using Computational and Neural Network Approaches

Technical Presentation. IMECE2019-11628

Tahseen Alwattar, **Ahsan Mian**, *Wright State University, Dayton, OH, United States*

11:39am – Designing Lattice Structures Based on Scaling Laws Using Finite Element Analyses

Technical Presentation. IMECE2019-11646

Ahsan Mian, *Wright State University, Dayton, OH, United States*, **Hasanain Abdulhadi**, *Wright State University, Fairborn, OH, United States*

10-14 SOFT ROBOTICS AND SOFT MACHINES

10-14-2 Soft Robotics and Soft Machines – II

Convention Center, 355F 10:15AM–12:00PM

Session Organizer: Jie Yin, *North Carolina State University, Raleigh, NC, United States*

Session Co-Organizer: Yinding Chi, *North Carolina State University, Raleigh, NC, United States*

10:15am – Harnessing Bistability for High-Speed Soft Running Robots

Technical Presentation. IMECE2019-13956

Jie Yin, *North Carolina State University, Raleigh, NC, United States*

10:36am – Programmable Self-Sensing Camouflaging Soft Robot

Technical Presentation. IMECE2019-13913

Jianliang Xiao, *University of Colorado Boulder, Boulder, CO, United States*

10:57am – Shape Controllable Soft Bilayer Pneumatic Actuators and Applications

Technical Presentation. IMECE2019-13407

Yinding Chi, **Jie Yin**, *North Carolina State University, Raleigh, NC, United States*

10-20 PERSPECTIVES FROM DIVISION DIRECTORS, PROGRAM MANAGERS, AND CENTER LEADERSHIP ON MATERIALS BY DESIGN CHALLENGES

10-20-4 Center Director and Panel Discussion

Convention Center, 255F 10:15AM–12:00PM

Session Organizer: Natasha Vermaak, *Lehigh University, Bethlehem, PA, United States*

Session Co-Organizer: Andrew Gaynor, *Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD, United States*

10:15am – Integrated Materials Design for Extreme Environments

Invited Presentation. IMECE2019-13191

K.T. Ramesh, *Johns Hopkins University, Baltimore, MD, United States*

10:50am – Panel Q&A with Division Directors, Program Managers and Center Leadership focused on the Design of Engineering Materials

Invited Presentation. IMECE2019-12891

Natasha Vermaak, *Lehigh University, Bethlehem, PA, United States*, **Andrew Gaynor**, *Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD, United States*

10-23 NANOENGINEERED, NANO MODIFIED, HIERARCHICAL, MULTI-SCALE MATERIALS AND STRUCTURES

10-23-1 Nanoengineered, Nano Modified, Hierarchical, Multi-Scale Materials and Structures – I 355B **10:15AM–12:00PM**

10:15am – Innovative Hole Making Process in Woven Composite Laminates

Technical Paper Publication. IMECE2019-11441
Vishwas Jadhav, Ajit Kelkar, *North Carolina Agricultural and Technical State University, Greensboro, NC, United States*

10:36am – Mechanical Behavior of Collagen Mimetic Peptides Under Fraying Deformation via Molecular Dynamics

Technical Paper Publication. IMECE2019-11492
Atul Rawal, *Joint School of Nanoscience & Nanoengineering, Greensboro, NC, United States*, Kristen L. Rhinehardt, Ram Mohan, *North Carolina Agricultural and Technical State University, Greensboro, NC, United States*

10:57am – Development of Thermally Conductive Polymer/CNF Nanocomposite Materials via PolyJet Additive Manufacturing by Improvement of Digital Material Design

Technical Paper Publication. IMECE2019-11556
Furkan Ulu, Ravi Pratap Singh Tomar, Ram Mohan, *North Carolina Agricultural and Technical State University, Greensboro, NC, United States*

11:18am – Investigation of Process Induced Variations in PolyJet Printing With Digital Polypropylene via Homogeneous 3D Tensile Test Coupon

Technical Paper Publication. IMECE2019-11639
Ravi Pratap Singh Tomar, Furkan Ulu, Ajit Kelkar, Ram Mohan, *North Carolina Agricultural and Technical State University, Greensboro, NC, United States*

11:39am – Fabrication of Superhydrophobic Polymer Surfaces With High Robustness by Coating With Silica Nanoparticles and Templating With a Nylon Mesh

Technical Presentation. IMECE2019-12193
Xiaoxiao Zhao, Daniel Park, Michael Murphy, *Louisiana State University, Baton Rouge, LA, United States*

10-24 FRACTURE AND DAMAGE: NANO-TO MACRO-SCALE

10-24-2 Fracture and Damage: Nano- to Macro-Scale – II

Convention Center, 255A **10:15AM–12:00PM**

Session Organizer: Sridhar Santhanam, *Villanova University, Villanova, PA, United States*

Session Co-Organizer: Raghu Prakash, *Indian Institute of Technology Madras, Chennai, India*

10:15am – Evaluation of Interfacial Fatigue Strength of Hard Coating by Using Repeated Laser Shock Adhesion Test

Technical Paper Publication. IMECE2019-11145
Kohei Kanamori, Yusaku Saito, Akio Yonezu, *Chuo University, Tokyo, Japan*

10:36am – The Effect of Creep-Fatigue Interactions on Thermo-Mechanical Fatigue Life and Reliability Estimates for a Typical Gas Turbine Engine Component

Technical Paper Publication. IMECE2019-11174
Esakki S. Muthu, *Hindustan Aeronautics Limited, Bangalore, Karnataka, India*, Raghu Prakash, *Indian Institute of Technology Madras, Chennai, India*

10:57am – Contact Stress Analysis During Fretting of a Surface Modified Flat-on-Flat With Round Edge

Technical Paper Publication. IMECE2019-11222
Pankaj Dhaka, Raghu Prakash, *Indian Institute of Technology Madras, Chennai, India*

11:18am – Chemical and Morphological Damage Study on Polyurea Variants Coatings

Technical Presentation. IMECE2019-13007
Vahidreza Alizadeh, Alireza Amirkhizi, *University of Massachusetts, Lowell, Lowell, MA, United States*

10-25 MATERIAL PROCESSING OF FLEXIBLE ELECTRONICS, SENSORS, AND DEVICES

10-25-2 Material Processing of Flexible Electronics, Sensors, and Devices – II

Convention Center, 250A **10:15AM–12:00PM**

10:15am – Printing of High Conductivity Nanocrystalline Metals on Flexible Substrates for Fabrication of Functional Electronic Devices

Technical Presentation. IMECE2019-12440
Majid Minary, *University of Texas at Dallas, Richardson, TX, United States*

10:36am – Ultra-Fast Dry Dip Coating Assembly Strategy for Future Flexible Devices

Technical Presentation. IMECE2019-13153
Dong Zhou, Bo Li, *Villanova University, Villanova, PA, United States*

10:57am – Flexible Laser-Induced Graphene for Pathogen Sensing in Food and Agricultural Settings

Technical Presentation. IMECE2019-13194

Carmen L. Gomes, Cicero C. Pola, Robert Hjort, Kshama Parate, Jonathan Claussen, *Iowa State University, Ames, IA, United States*, Eric McLamore, *University of Florida, Gainesville, FL, United States*

11:18am – Aerosol Jet 3D Printing and Photonic Sintering of Functional Nanoparticle Inks for Flexible Energy Harvesters and Sensors

Technical Presentation. IMECE2019-13864

Yanliang Zhang, *University of Notre Dame, Notre Dame, IN, United States*

11:39am – Printed Graphene Circuits for In-Field Electrochemical Biosensing, Electrically Induced Stem Cell Differentiation, and Open Microfluidics

Technical Presentation. IMECE2019-13872

Jonathan Claussen, Kshama Parate, *Iowa State University, Ames, IA, United States*, John Hondred, *Iowa State University, Des Moines, IA, United States*, Bolin Chen, Lucas Hall, Nate Garland, Cicero C. Pola, Carmen L. Gomes, *Iowa State University, Ames, IA, United States*

10-27 PHASE TRANSFORMATIONS IN MATERIALS PROCESSING

10-27-1 Phase Transformations in Materials Processing – I

Convention Center, 155B

10:15AM–12:00PM

10:15am – Phase Transformations in Cu-Zr-X High-Temperature Shape Memory Alloys Studied Using Nanocalorimetry and Materials Simulations

Technical Presentation. IMECE2019-12862

Joost Vlassak, *Harvard University, Cambridge, MA, United States*

10:36am – Parameter Identification and Strain-induced Alpha-to-Omega Phase Transformation in Zr in DAC and RDAC and Different HPT Setups

Technical Presentation. IMECE2019-12737

Mehdi Kamrani, Valery I. Levitas, *Iowa State University, Ames, IA, United States*

10:57am – Scale-Free Phase Field Modeling of Multivariant Martensitic Phase Transformations

Technical Presentation. IMECE2019-12780

S.E. Esfahani, *Iowa State University, Ames, IA, United States*

11:18am – Anisotropic Phase-Field Modeling of Crack Growth in Shape Memory Ceramics: Application to Zirconia

Technical Paper Publication. IMECE2019-11695

Ehsan Moshkelgasha, Mahmood Mamivand, *Boise State University, Boise, ID, United States*

10-2 MULTISCALE MODELING FOR MATERIALS DESIGN

10-2-1 Multiscale Modeling for Materials Design – I 355B

2:00PM–3:45PM

2:00pm – PRISMS-Plasticity: An Open-Source Crystal Plasticity Finite Element Software

Technical Presentation. IMECE2019-12699

Mohammadreza Yaghoobi, Sriram Ganesan, Srihari Sundar, Aaditya Lakshmanan, Aerial Murphy-Leonard, *University of Michigan, Ann Arbor, MI, United States*, Shiva Rudraraju, *University of Wisconsin-Madison, Ann Arbor, MI, United States*, John Allison, Veera Sundararaghavan, *University of Michigan, Ann Arbor, MI, United States*

2:21pm – Thermo-Mechanical Modeling of 3D Woven Fabric Composites Using Two-Step Homogenization Approach

Technical Paper Publication. IMECE2019-10913

Nagappa Siddgonde, Anup Ghosh, *Indian Institute of Technology, Kharagpur, Kharagpur, West Bengal, India*

2:42pm – Investigating Density Functional Theory's Effectiveness in Studying Metal-Organic Frameworks Structures

Technical Paper Publication. IMECE2019-11013

Kendric Roberts, Yen-Lin Han, *Seattle University, Seattle, WA, United States*

3:03pm – Size Dependent Thermo-Mechanical Properties of 3C-SiC Nanowires

Technical Presentation. IMECE2019-12827

Fazle Elahi, Md. Hossain, *University of Delaware, Newark, DE, United States*

3:24pm – Multiscale Homogenization and Localization of Materials With Hierarchical Porous Microstructures

Technical Presentation. IMECE2019-12864

Zhelong He, Marek-Jerzy Pindera, *University of Virginia, Charlottesville, VA, United States*

10-5 MULTIFUNCTIONAL AND MICRO/NANO-STRUCTURED MATERIALS: MODELING AND CHARACTERIZATION

10-5-1 Multifunctional and Micro/Nano-Structured Materials: Modeling and Characterization (III)

Convention Center, 355F

2:00PM–3:45PM

Session Organizer: Xin-Lin Gao, *Southern Methodist University, Dallas, TX, United States*

Session Co-Organizer: Yanyu Chen, *University of Louisville, Louisville, KY, United States*

2:00pm – Optimizing Processing Conditions of P3HT: PCBM Based Bulk-Heterojunction Organic Solar Cells Using Metaheuristic Search

Technical Presentation. IMECE2019-11878

Joydeep Munshi, Ganesh Balasubramanian, *Lehigh*

2:21pm – Theory-Driven Auxetic Chiral Granular Metamaterials

Technical Presentation. IMECE2019-13626
Nima NejadSadeghi, Anil Misra, *University of Kansas, Lawrence, KS, United States*

2:42pm – Hybridized Plasmon Resonance in Self-Assembled 3D Graphene Nanostructures

Technical Presentation. IMECE2019-13837
Kriti Agarwal, Chunhui Dai, Jeong-Hyun Cho, *University of Minnesota, Minneapolis, MN, United States*

3:03pm – Electrical Characterization of Highly Conductive CNT Yarn by Graphitization and High Densification Treatment

Technical Presentation. IMECE2019-13320
Akira Itoh, Kotaro Kajiwara, *Waseda University, Shinjuku, Tokyo, Japan*, Takeshi Kizaki, *Fujikura, Sakura city, Chiba, Japan*, Atsu-shi Hosoi, Hiroyuki Kawada, *Waseda University, Shinjuku, Tokyo, Japan*

10-9 MODELING, SIMULATION, AND DESIGN OF MULTIFUNCTIONAL MATERIALS

10-9-3 Modeling, Simulation, and Design of Multifunctional Materials – III: Composites and Engineering Materials

Convention Center, 155A **2:00PM–3:45PM**

Session Organizer: Lin Zhang, *University of Pittsburgh, Pittsburgh, PA, United States*

Session Co-Organizer: Ling Liu, *Temple University, Philadelphia, PA, United States*

2:00pm – Electromagnetic Properties of Random Materials

Technical Presentation. IMECE2019-12593
Martin Ostoja-Starzewski, *University of Illinois Urbana, Urbana, IL, United States*

2:21pm – Analytical and Finite Element Based Micromechanics for Failure Theory of Composites

Technical Presentation. IMECE2019-13005
Sai Tharun Kotikalapudi, *Oklahoma State University, Tulsa, OK, United States*, Bhavani Sankar, *University of Florida, Gainesville, FL, United States*

2:42pm – A Systematic Material Design Approach to Develop Self-Lubricating Ceramic-Composite Tool Inserts for Dry Cutting Conditions

Technical Paper Publication. IMECE2019-11526
Syed Sohail Akhtar, *King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia*

3:03pm – Quantitative Characterisation of Pearlite Morphology in Hot-Rolled Carbon Steel

Technical Paper Publication. IMECE2019-10690
Vincent Musonda, Esther Akinlabi, *University of Johannesburg, Johannesburg, South Africa*

3:24pm – Analysis of Symmetric Angle-Ply Laminated Composite Skew Plates Using Hybrid Trefftz Finite Element

Technical Paper Publication. IMECE2019-11098
Subhasankar Dwibedi, *Indian Institute of Technology Kharagpur, Baripada, Odisha, India*

10-19 DESIGN OF ENGINEERED MATERIALS AND COMPONENTS FOR ADDITIVE MANUFACTURING

10-19-1 Design of Engineered Materials and Components for Additive Manufacturing: Spatial Programming and 3D Design

Convention Center, 355E **2:00PM–3:45PM**

Session Organizer: Andrew Gaynor, *Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD, United States*

Session Co-Organizer: Natasha Vermaak, *Lehigh University, Bethlehem, PA, United States*

2:00pm – Spatial Programming of Defect Distributions to Enhance Material Failure Characteristics

Technical Presentation. IMECE2019-12994
Chengyang Mo, Jordan R. Raney, *University of Pennsylvania, Philadelphia, PA, United States*

2:21pm – Transitioning Topology Optimization Algorithms From Academic Test Problem to Real World 3D Design Situations

Technical Presentation. IMECE2019-13022
Andrew Gaynor, *Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD, United States*

2:42pm – Computational Design of Compositionally Graded Alloys for Property Monotonicity

Technical Presentation. IMECE2019-13155
Tanner Kirk, Olga Eliseeva, Richard Malak, Raymundo Arroyave, Ibrahim Karaman, *Texas A&M University, College Station, TX, United States*

3:03pm – Design of 3D Printed Mechanical Metamaterials

Technical Presentation. IMECE2019-13467
Weidi Wang, Joshua Morris, Darshil Shah, Christopher Hansen, Alireza Amirkhizi, *University of Massachusetts, Lowell, Lowell, MA, United States*

3:24pm – Topology Optimization for Layered Material

Technical Presentation. IMECE2019-13801
Daniel Pepler, Craig Steeves, *University of Toronto, North York, ON, Canada*

10-27 PHASE TRANSFORMATIONS IN MATERIALS PROCESSING

10-27-2 Phase Transformations in Materials Processing – II

Convention Center, 155B 2:00PM–3:45PM

2:00pm – In Situ and Post Mortem Transmission Electron Microscopy of Rapid Solidification Microstructure Formation in Multi-Component Alloys after Laser Melting
Technical Presentation. IMECE2019-13624

Jorg Wiezorek, *University of Pittsburgh, Pittsburgh, PA, United States*, Joseph McKeown, *Lawrence Livermore National Laboratory, Livermore, CA, United States*, Vishwanadh Bathula, *University of Pittsburgh, Pittsburgh, PA, United States*

2:21pm – Effects of Scan Pattern on Grain Structure in Metal Additive Manufacturing

Technical Presentation. IMECE2019-12689
Shardul Kamat, *University of Utah, Draper, UT, United States*, Wenda Tan, *University of Utah, Salt Lake City, UT, United States*

2:42pm – Emergence of Spiral Patterns via Eutectic Crystallization

Technical Presentation. IMECE2019-12980
Ashwin Shahani, *University of Michigan, Ann Arbor, MI, United States*

3:03pm – Optimization of Heat Treatment Aging Process Parameters for 7050 and 7075 Aluminum Alloys

Technical Paper Publication. IMECE2019-12045
Sagil James, Ambarneil Roy, *California State University, Fullerton, Fullerton, CA, United States*

10-29 RECENT DEVELOPMENTS IN TRIBOLOGY

10-29-1 Recent Developments in Tribology – I

Convention Center, 250A 2:00PM–3:45PM

2:00pm – Tribological Properties of Ammonium Protic Ionic Liquids as Additives in Polyalphaolefin for Steel-Steel Contact

Technical Paper Publication. IMECE2019-10645
Hong Guo, Patricia Iglesias, *Rochester Institute of Technology, Rochester, NY, United States*

2:21pm – Assortment of Hydroforming Fluid for Extreme Pressure and Anti Wear Properties

Technical Paper Publication. IMECE2019-10163
S.P. Rudraksha, *Trinity College of Engineering and Research, Pune, Pune, Maharashtra, India*, S.H. Gawande, *M.E.S. College of Engineering, Pune, Maharashtra, India*

2:42pm – Ionic Liquid as Cutting Fluid Additive Using Minimum Quantity Lubricant (MQL) in Titanium-Ceramic Contact

Technical Paper Publication. IMECE2019-10647
Sameer Ashok Magar, Hong Guo, Patricia Iglesias, *Rochester Institute of Technology, Rochester, NY, United States*

3:03pm – Experimental Pre-Rolling Friction Determination of Corundum Balls on Silicon Wafers Using Highly Stable Pendulum

Technical Paper Publication. IMECE2019-10137
Samir Mekid, *King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia*, Igor Gilavdary, N. Riznoukaya, *Belarus National Technical University, Minsk, Minsk, Belarus*

10-2 MULTISCALE MODELING FOR MATERIALS DESIGN

10-2-2 Multiscale Modeling for Materials Design – II

355B 4:00PM–5:45PM

4:00pm – Designing Soft-Hard Tribological Composites for Multifunctional Performance at Sliding Interfaces

Technical Presentation. IMECE2019-12890
Xiu Jia, Natasha Vermaak, *Lehigh University, Bethlehem, PA, United States*

4:21pm – Soft-Hard Integration Enabled Metamaterials

Technical Presentation. IMECE2019-13541
Baoping Xu, *University of Virginia, Charlottesville, VA, United States*

4:42pm – Investigating the Mechanical Behavior of Aluminum Cerium Alloys at the Microstructural Level

Technical Presentation. IMECE2019-13683
Ryan Lane, *Virginia Tech, Christiansburg, VA, United States*, Orlando Rios, Ayyoub M. Momen, *Oak Ridge National Lab, Oak Ridge, TN, United States*, Reza Mirzaeifar, *Virginia Tech, Blacksburg, VA, United States*

5:03pm – Controlling Interfacial Adhesion Through Soft-Hard Heterogeneous Materials

Technical Presentation. IMECE2019-13824
Kevin Turner, *University of Pennsylvania, Philadelphia, PA, United States*

10-12 MECHANICS IN MANUFACTURING OF MULTIFUNCTIONAL MATERIALS AND STRUCTURE

10-12-1 Mechanics in Manufacturing of Multifunctional Materials and Structure

Convention Center, 355F 4:00PM–5:45PM

4:00pm – Bioinspired Multifunctional Materials and Devices With Self-Adaptability by Harnessing Mechanics

Technical Presentation. IMECE2019-12639
Sung Hoon Kang, *Johns Hopkins University, United States*

4:21pm – Liquid Evaporation-Assisted Self-Folding of One- and Two-Dimensional Nanomaterials

Technical Presentation. IMECE2019-12914

Qingchang Liu, Baoxing Xu, *University of Virginia, Charlottesville, VA, United States*

4:42pm – Capillary Force-Assisted Mechanical Peeling of 2D Materials

Technical Presentation. IMECE2019-12869

Yue Zhang, Baoxing Xu, *University of Virginia, Charlottesville, VA, United States*

5:03pm – Characterization of GRE Pipes Fatigue Failure Subjected to HTHP Loading Conditions

Technical Paper Publication. IMECE2019-11042

Jamil Abdo, *Frostburg State University, Frostburg, MD, United States*, Edris Hassan, *Sultan Qaboos University, Muscat, Oman*, Jan Kwak, *Qatar University, Doha, Qatar*

5:24pm – Synthesis and Mechanics of Graphene-Metal Nanocomposites

Technical Presentation. IMECE2019-12756

Sameh Tawfick, Kaihao Zhang, Mitisha Surana, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

10-13 BIOINSPIRED MATERIALS, STRUCTURES, AND APPLICATIONS

10-13-1 Bioinspired Materials, Processes, and Applications

Convention Center, 255A

4:00PM–5:45PM

Session Organizer: Seyed Allameh, *Northern Kentucky University, Newport, KY, United States*

Session Co-Organizer: Zhenhai Xia, *University of North Texas, Denton, TX, United States*

4:00pm – Combinatorial Investigation of Mechanical Properties of Biomimicked Composites

Technical Paper Publication. IMECE2019-10395

Seyed Allameh, *Northern Kentucky University, Newport, KY, United States*, Abdullah Almuzaini, Roger Miller, *Northern Kentucky University, Highland Heights, KY, United States*

4:21pm – Automatic Design in Matlab Using PDE Toolbox for Shape and Topology Optimization

Technical Paper Publication. IMECE2019-10766

Yilun Sun, Lingji Xu, Jingru Yang, *Technical University of Munich, Garching, Bayern, Germany*, Tim C. Lueth, *Technical University of Munich, Garching, Germany*

4:42pm – Numerical Study on the Interfacial Modification Effects of Soy Protein on Poly(Vinylidene Fluoride)

Technical Paper Publication. IMECE2019-11694

Zhuoyuan Zheng, Xin Chen, Yumeng Li, *University of Illinois at Urbana-Champaign, Champaign, IL, United States*

5:03pm – High-Aspect-Ratio Magnetically Tunable Nanopillar Array

Technical Presentation. IMECE2019-12165

Zhiren Luo, *North Carolina State University, Raleigh, NC, United States*, Xu Zhang, *University of Pennsylvania, Philadelphia, PA, United States*, Benjamin Evans, *Elon University, Elon, NC, United States*, Chih-Hao Chang, *North Carolina State University, Raleigh, NC, United States*

5:24pm – Plasma Etching of Sapphire Antireflection Subwavelength Nanostructures

Technical Presentation. IMECE2019-12718

Yi-An Chen, I-Te Chen, Chih-Hao Chang, *North Carolina State University, Raleigh, NC, United States*

10-15 LITHIUM-ION BATTERY SAFETY UNDER ABUSIVE CONDITIONS

10-15-1 Lithium-Ion Battery Safety Under Abusive Conditions

Convention Center, 155A

4:00PM–5:45PM

4:00pm – Mechanical-Electrochemical-Thermal Simulation of Internal Short-Circuit for Lithium-Ion Batteries

Technical Presentation. IMECE2019-10128

Honggang Li, Chao Zhang, *Northwestern Polytechnical University, Xi'an, Shaanxi, China*, Binghe Liu, Jun Xu, *Beihang University, Beijing, China*

4:21pm – Experimental and Computational Study on the Failure Behavior of Vehicle Battery Modules Subject to Wedge Cutting

Technical Paper Publication. IMECE2019-11429

Feng Zhu, *Embry-Riddle Aeronautical University, Daytona Beach, FL, United States*, Marian Bulla, *Altair Engineering GmbH, Köln, Germany*, Jianyin Lei, *Taiyuan University of Technology, Taiyuan, China*, Xianping Du, Patrick Currier, David Sypeck, *Embry-Riddle Aeronautical University, Daytona Beach, FL, United States*

4:42pm – Mechanical Behaviors and Failure Evolution of Electrodes in Lithium-Ion Batteries

Technical Presentation. IMECE2019-12410

Xudong Duan, Lubing Wang, *Beihang University, Beijing, China*

5:03pm – Effects of Temperature on Mechanical Response of Lithium Ion Batteries to External Abusive Loads

Technical Presentation. IMECE2019-13686

Mehdi Gilaki, Elham Sahraei Esfahani, *Temple University, Philadelphia, PA, United States*

5:24pm – Elliptical lithium-Ion Batteries: Transverse and Axial Loadings, Under Wet/Dry Conditions

Technical Presentation. IMECE2019-13692

Elham Sahraei Esfahani, Golriz Kermani, *Temple University, Philadelphia, PA, United States*

10-19 DESIGN OF ENGINEERED MATERIALS AND COMPONENTS FOR ADDITIVE MANUFACTURING

10-19-2 Design of Engineered Materials and Components for Additive Manufacturing: Meso-, Micro- and Nano-Architecture

Convention Center, 355E 4:00PM–5:45PM

Session Organizer: Natasha Vermaak, *Lehigh University, Bethlehem, PA, United States*

Session Co-Organizer: Andrew Gaynor, *Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD, United States*

4:00pm – 3D Printing of High-Performance Continuous Fiber/Thermosetting Composite

Technical Presentation. IMECE2019-12522
Kun Fu, *University of Delaware, Newark, DE, United States*

4:21pm – Uncertainty Quantification for Microstructure Reconstruction of Additively Manufactured Materials

Technical Presentation. IMECE2019-13032
Pinar Acar, *Virginia Tech, Blacksburg, VA, United States*,
Arulmurugan Senthilnathan, *Virginia Tech, Gainesville, FL, United States*

4:42pm – Ultra-High Energy Absorption Multifunctional Spinodal Nanoarchitectures

Technical Presentation. IMECE2019-13718
Anna Guell Izard, Jens Bauer, Cameron Crook, Vlad Turlo, Lorenzo Valdevit, *University of California, Irvine, Irvine, CA, United States*

5:03pm – Closed-Cell Nanoarchitectures at the Theoretical Limit of Stiffness and Strength

Technical Presentation. IMECE2019-13865
Cameron Crook, Anna Guell Izard, Jens Bauer, *University of California, Irvine, Irvine, CA, United States*, Cristine Santos de Oliveira, Juliana Martins de Souza e Silva, *Martin Luther University Halle-Wittenberg, Halle, Germany*, Jonathan Berger, *Nama Development, LLC, Goleta, CA, United States*, Lorenzo Valdevit, *University of California, Irvine, Irvine, CA, United States*, Jonathan Berger, *Nama Development, LLC, Santa Barbara, CA, United States*

10-23 NANOENGINEERED, NANO MODIFIED, HIERARCHICAL, MULTI-SCALE MATERIALS AND STRUCTURES

10-23-2 Nanoengineered, Nano Modified, Hierarchical, Multi-Scale Materials and Structures – II Convention Center, 255F 4:00PM–5:45PM

4:00pm – 3D Bioprinted Bone Tissue With Perfusible Vascular Networks

Technical Presentation. IMECE2019-10408
Sung Yun Hann, Haitao Cui, Lijie Grace Zhang, *George Washington University, Washington, DC, United States*

4:21pm – Enhanced Neural Stem Cell Proliferation and Differentiation on 3D Printed Gelatin-Methacrylate (GelMA) Scaffolds With Gamma-Aminobutyric Acid (GABA) Modification and Supplementation

Technical Presentation. IMECE2019-11461
Timothy Esworthy, Xuan Zhou, Haitao Cui, Se Jun Lee, Sung Yun Hann, *Lijie Grace Zhang, Washington University, Washington, DC, United States*

4:42pm – Effect of Current Density and Temperature on Template Assisted Cobalt Nanowire

Technical Paper Publication. IMECE2019-11673
Ali Imran Shiave, *University of North Carolina at Greensboro, Greensboro, NC, United States*, Ram Mohan, *North Carolina Agricultural and Technical State University, Greensboro, NC, United States*, Mahendran Samykan, *Universiti Malaysia Pahang, Kuantan, Malaysia*

5:03pm – The Mechanical Behaviours of the Anode Material Based on a Multiscale Detailed Computational Model

Technical Presentation. IMECE2019-12409
Lubing Wang, Xudong Duan, Jun Xu, *Beihang University, Beijing, China*

5:24pm – A Simultaneous Multiscale and Multiphysics Model for Si@G Based Anode Lithium-Ion Batteries

Technical Presentation. IMECE2019-12515
Binghe Liu, Jun Xu, *Beihang University, Beijing, China*

10-27 PHASE TRANSFORMATIONS IN MATERIALS PROCESSING

10-27-3 Phase Transformations in Materials Processing – III

Convention Center, 155B

4:00PM–5:45PM

4:00pm – Deformation-Induced Forward and Reverse Transformations in a Metastable High Entropy Alloy
Technical Presentation. IMECE2019-13892
Cem Tasan, Shaolou Wei, *Massachusetts Institute of Technology, Cambridge, MA, United States*

4:21pm – High-Pressure Mechanochemistry: Four-Scale Theory, In Situ Experiments, and Phenomena
Technical Presentation. IMECE2019-12749
Valery Levitas, *Iowa State University, Ames, IA, United States*

4:42pm – Spherical Gaussians: An Intuitive Method for Creating Complex Anisotropies in Interface Energies for the Phase Field Method
Technical Presentation. IMECE2019-12899
Jacob Bair, Nikhil Deshmukh, David G. Abrecht, *Pacific Northwest National Laboratory, Richland, WA, United States*

5:03pm – Strain-Induced Phase Transformations Under High Pressure: Ultrapure Zr and Hexagonal BN as Examples
Technical Presentation. IMECE2019-12763
K.K. Pandey, Valery I. Levitas, *Iowa State University, Ames, IA, United States*

10-29 RECENT DEVELOPMENTS IN TRIBOLOGY

10-29-2 Recent Developments in Tribology – II

Convention Center, 250A

4:00PM–5:45PM

4:00pm – A Test Rig to Characterize the Friction Force of Reciprocating Seals Under Dynamic Linear Motion
Technical Paper Publication. IMECE2019-11895
Jon Keegan, Madhumitha Ramachandran, Adam Flenniken, Geoffrey Page, Zahed Siddique, *University of Oklahoma, Norman, OK, United States*

4:21pm – On the Steady-State Performance of Finite Line Contacts Lubricated With Micropolar Fluids
Technical Presentation. IMECE2019-12617
Dhanendra Dewangan, Mihir Sarangi, *Indian Institute of Technology, Kharagpur, Kharagpur, West Bengal, India*

4:42pm – EHL Analysis of Finite Line Contact With Non-Gaussian Rough Surfaces Using Deterministic Approach
Technical Presentation. IMECE2019-12618
Dhanendra Dewangan, Mihir Sarangi, *Indian Institute of Technology, Kharagpur, Kharagpur, West Bengal, India*

5:03pm – Advanced Surface Treatments for Armament Weapon Systems
Technical Presentation. IMECE2019-12892
Adam Foltz, *U.S. Army, Picatinny Arsenal, NJ, United States*,
Christopher Mulligan, *U.S. Army CCDC AC, Watervliet, NY, United States*

TRACK II MECHANICS OF SOLIDS, STRUCTURES, AND FLUIDS

- 11-1-1: Polymer Gel – 1
- 11-1-2: Polymer Gel – 2
- 11-1-3: Biomechanics and Biomaterials
- 11-1-4: Liquid Crystal Elastomer
- 11-1-5: Soft Actuating Materials
- 11-1-6: Mechanics of Indentation, Injection and Cavitation
- 11-1-7: Structure and Device
- 11-1-8: Constitutive Modelling
- 11-1-9: Aging and Damaging
- 11-1-10: Soft Matter Physics
- 11-2-1: Design of Functional Soft Composites
- 11-2-2: Fabrication and Processing of Soft Composites
- 11-3-1: 3D Printing of Functional Materials and Composites
- 11-3-2: 3D/4D Printing of Structures and Biomaterials
- 11-5-1: Mechanics, Modeling and Manufacturing of Soft Materials and Soft Robots – I
- 11-5-2: Mechanics, Modeling and Manufacturing of Soft Materials and Soft Robots – II
- 11-5-3: Mechanics, Modeling and Manufacturing of Soft Materials and Soft Robots – III
- 11-5-4: Mechanics, Modeling and Manufacturing of Soft Materials and Soft Robots – IV
- 11-5-5: Mechanics, Modeling and Manufacturing of Soft Materials and Soft Robots – V
- 11-7-1: From Single-Crystal to Polycrystalline Behavior: Experiments and Modeling
- 11-7-2: Plastic Anisotropy (I)
- 11-7-3: Glass and Ceramic Materials
- 11-7-4: Plastic Anisotropy (II)
- 11-7-5: Novel Experimental Methods
- 11-7-6: Plasticity and Damage
- 11-7-7: Plasticity of Heterogeneous Materials
- 11-8-1: Perspective on Fracture and Failure Mechanics I
- 11-8-2: Perspective on Fracture and Failure Mechanics II
- 11-8-3: Perspective on Fracture and Failure Mechanics III
- 11-10-1: Dynamic Failure of Materials and Structures – 1
- 11-10-2: Dynamic Failure of Materials and Structures – 2
- 11-10-3: Dynamic Failure of Materials and Structures – 3
- 11-10-4: Dynamic Failure of Materials and Structures – 4
- 11-11-1: Multiscale Mechanics of Ductile Failure
- 11-12-1: Damage and Fatigue in Engineering Applications
- 11-12-2: Atmospheric Scale Crack Nucleation and Propagation Modeling
- 11-12-3: Multiscale Fracture and Fatigue Modeling in Materials
- 11-12-4: Modeling of Fatigue Crack and Interface Behavior
- 11-14-1: Mechanics of Materials in Extreme Environments: Constitutive Modeling of Polymers
- 11-14-2: Mechanics of Materials in Extreme Environments: Dynamic Behavior
- 11-14-3: Mechanics of Materials in Extreme Environments: Extreme Temperatures
- 11-17-1: Mechanics of Adhesion and Friction – I
- 11-18-1: In-Situ and Quantitative Visualization Techniques: Bio-Materials and Optical Techniques
- 11-18-2: In-Situ and Quantitative Visualization Techniques: Microscopy in Experimental Mechanics
- 11-18-3: In-Situ and Quantitative Visualization Techniques: Macro-scale Phenomena
- 11-19-1: Multiscale Models and Experimental Techniques for Composite Materials and Structures
- 11-22-1: Computational Modeling of Extreme Events – 1
- 11-22-2: Computational Modeling of Extreme Events – 2
- 11-23-1: Multi-Scale Computations 1
- 11-23-2: Multi-Scale Computations 2
- 11-23-3: Multi-Scale Computations 3
- 11-25-1: High-Performance Nanostructural Materials and Nanocomposites
- 11-26-1: Nanomechanics and Nanomaterials 1
- 11-26-2: Nanomechanics and Nanomaterials 2
- 11-26-3: Nanomechanics and Nanomaterials 3
- 11-26-4: Nanomechanics and Nanomaterials 4
- 11-27-1: Mechanics of Thin-Film and Multi-Layer Structures
- 11-28-1: Recent Advances and Applications in Meshfree and Particle Methods
- 11-32-1: Congress-Wide Symposium on Additive Manufacturing: Failure of Additively Manufactured Materials – 1
- 11-33-1: Multiscale Methods for Simulation and Design of Materials Including Machine Learning and Other Emerging Methods – I
- 11-33-2: Multiscale Methods for Simulation and Design of Materials Including Machine Learning and Other Emerging Methods – II
- 11-34-1: Phase-field Modeling and Simulation in Mechanics
- 11-35-1: Mechanics and Design of Cellular Materials
- 11-36-1: Multifunctional and Micro/Nano-Structured Materials: Modeling and Characterization (I)
- 11-36-2: Multifunctional and Micro/Nano-Structured Materials: Modeling and Characterization (II)
- 11-37-1: liSS Session 1 Composite Instabilities
- 11-37-2: liSS Session 2 Material Instabilities
- 11-37-3: liSS Session 3 Material and Structural Instabilities
- 11-37-4: liSS Session 4 Architected Materials Instabilities
- 11-37-5: liSS Session 5 Surface Instabilities
- 11-38-1: Peridynamic Modeling of Materials' Behavior I
- 11-38-2: Peridynamic Modeling of Materials' Behavior II
- 11-38-3: Peridynamic Modeling of Materials' Behavior III
- 11-39-1: Multiphysics Simulations and Experiments for Solids I
- 11-39-2: Multiphysics Simulations and Experiments for Solids II
- 11-39-3: Multiphysics Simulations and Experiments for Solids III
- 11-39-4: Multiphysics Simulations and Experiments for Solids IV
- 11-42-1: Nonlinear Dynamics, Control and Stochastic Mechanics IV
- 11-42-2: Nonlinear Dynamics, Control and Stochastic Mechanics V
- 11-43-1: Fluid-Structure Interaction
- 11-44-1: Keynote Lectures on Computational Mechanics – 1
- 11-44-2: Keynote Lectures on Computational Mechanics – 2
- 11-46-1: Young Medalist Symposium I
- 11-46-2: Young Medalist Symposium II
- 11-47-1: Drucker Medal Symposium – I
- 11-47-2: Drucker Medal Symposium – II
- 11-47-3: Drucker Medal Symposium – III
- 11-47-4: Drucker Medal Symposium – IV
- 11-49-1: Plenary Session I
- 11-49-2: Plenary Session II

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TRACK 11 MECHANICS OF SOLIDS, STRUCTURES, AND FLUIDS

MONDAY, NOVEMBER 11

11-49 PLENARY SESSIONS

11-49-1 Plenary Session I

Convention Center, 255B

9:45AM–10:30AM

9:45am – Getting Stuck and Breaking Free: Adhesion, Friction, Strength, and Toughness

Plenary Presentation. IMECE2019-14006

Kaushik Bhattacharya, *California Institute of Technology, Pasadena, CA, United States*

11-7 SYMPOSIUM ON PLASTICITY, DAMAGE, AND FRACTURE

11-7-1 From Single-Crystal to Polycrystalline Behavior: Experiments and Modeling

Convention Center, 251C

10:45AM–12:30PM

Session Organizer: H. Eliot Fang, *Sandia National Laboratories, Albuquerque, NM, United States*

10:45am – Change of the Effective Strength of Grain Boundaries in Alloy 617 Under Creep-Fatigue Loadings at 800°C

Technical Paper Publication. IMECE2019-11210

Wataru Suzuki, Kenta Ishihara, Ryo Kikuchi, Ken Suzuki, Hideo Miura, *Tohoku University, Sendai, Miyagi, Japan*

11:06am – Grain Boundary Cracking of Nickel-Based Alloy 625 Under Creep Loadings at Elevated Temperatures

Technical Paper Publication. IMECE2019-11186

Yan Liang, Yifan Luo, Ken Suzuki, Hideo Miura, *Tohoku University, Sendai, Miyagi, Japan*

11:27am – Improved Structural Performance Models for Additive Manufacturing Part Qualification

Technical Presentation. IMECE2019-13771

Kyle Johnson, *Sandia National Laboratories, Starkville, MS, United States*, **John Emery**, *Sandia National Laboratories, Albuquerque, NM, United States*, **Mircea Grigoriu**, *Cornell University, Ithaca, NY, United States*, **Jay Carroll, Joseph Bishop**, *Sandia National Laboratories, Albuquerque, NM, United States*

11:48am – A General Approach to Modeling Polycrystal Local Fields Based on New Single Crystal Model

Technical Presentation. IMECE2019-12777

Nitin Chandola, Oana Cazacu, Benoit Revil-Baudard, *University of Florida, Shalimar, FL, United States*

12:09pm – Investigating Mesh Sensitivity and Polycrystalline RVEs in Crystal Plasticity Finite Element Simulations

Technical Presentation. IMECE2019-10269

Hojun Lim, Corbett Battaile, Joseph Bishop, *Sandia National Laboratories, Albuquerque, NM, United States*, **James Foulk**, *Sandia California, Livermore, CA, United States*

11-8 SYMPOSIUM ON PERSPECTIVE ON FRACTURE AND FAILURE MECHANICS

11-8-1 Perspective on Fracture and Failure Mechanics I

Convention Center, 255E

10:45AM–12:30PM

Session Organizer: Ashfaq Adnan, *University of Texas Arlington, Arlington, TX, United States*

Session Co-Organizer: Ankit Srivastava, *Texas A&M University, College Station, TX, United States*

10:45am – Key-Note Part 1: Fracture Mechanics of Heterogeneous Materials

Technical Presentation. IMECE2019-12691

Guruswami Ravichandran, *Caltech, Pasadena, CA, United States*

11:06am – Key-Note Part 2: Fracture Mechanics of Heterogeneous Materials

Technical Presentation. IMECE2019-12938

Guruswami Ravichandran, *Caltech, Pasadena, CA, United States*

11:27am – The Interplay Between Porosity and Inertia on the Dynamic Fragmentation of Ductile Metals

Technical Presentation. IMECE2019-12857

Jose A. Rodríguez-Martínez, *University Carlos III of Madrid, Leganés, Madrid, Spain*

11:48am – Utilizing Thermography to Shed Light on Ductile Fracture

Technical Presentation. IMECE2019-13381

Justin Wilkerson, *Texas A&M University, College Station, TX, United States*, **Zachary Huber**, *Pacific Northwest National Laboratory, Richland, WA, United States*

12:09pm – Experimental Measurements of Overload and Underloads on Fatigue Crack Growth Using Digital Image Correlation

Technical Presentation. IMECE2019-10337

Hugh Bruck, Paul Lara, *University of Maryland, College Park, MD, United States*

11-10 DYNAMIC FAILURE OF MATERIALS & STRUCTURES

11-10-1 Dynamic Failure of Materials and Structures – 1

Convention Center, 251B 10:45AM–12:30PM

Session Organizer: Jun Xu, *Beihang University, Beijing, Beijing, China*

Session Co-Organizer: Roy Xu, *University of New Mexico, Albuquerque, NM, United States*

10:45am – Crack Branching in Soda-Lime Glass: A Comparative Study Using Photoelasticity, DIC, and Digital Gradient Sensing Methods – Part I
Technical Presentation. IMECE2019-11664
Hareesh Tippur, Sivareddy Dondeti, Auburn University, Auburn University, AL, United States

11:06am – Crack Branching in Soda-Lime Glass: A Comparative Study Using Photoelasticity, DIC, and Digital Gradient Sensing Methods – Part II
Technical Presentation. IMECE2019-11676
Hareesh Tippur, Sivareddy Dondeti, Auburn University, Auburn University, AL, United States

11:27am – Novel Propagation Behavior of Impact Stress Wave in One-Dimensional Hollow Spherical Structure
Technical Presentation. IMECE2019-12321
Sha Yin, Diaohao Chen, Jianxing Hu, Jun Xu, Beihang University, Beijing, China

11:48am – Quasi-Static and Dynamic Crushing of Thin-Walled Tubes Filled With Liquid Nanofoam
Technical Presentation. IMECE2019-12729
Mingzhe Li, Junfeng Li, Michigan State University, East Lansing, MI, United States, Saeed Barbat, Ford Motor Company, Dearborn, MI, United States, Mohamed Ridha Baccouche, Ford, Ann Arbor, MI, United States, Weiyi Lu, Michigan State University, East Lansing, MI, United States

12:09pm – Mixed-Mode Dynamic Fracture of Carbon Fiber Epoxy Under the Effect of Moisture in Woven and Unidirectional Laminates
Technical Presentation. IMECE2019-12249
Rodrigo Chavez, Veronica Eliasson, University of California, San Diego, La Jolla, CA, United States

11-11 MULTISCALE MECHANICS OF DUCTILE FAILURE

11-11-1 Multiscale Mechanics of Ductile Failure

Convention Center, 251A 10:45AM–12:30PM

Session Organizer: Ankit Srivastava, *Texas A&M University, College Station, TX, United States*

Session Co-Organizer: Shailendra Joshi, *University of Houston, Houston, TX, United States*

10:45am – Role of Slip Versus Twinning Versus Phase Transformations on Void Nucleation and Growth Mechanics in BCC Materials at Atomic Scales
Technical Presentation. IMECE2019-13946
Avinash Dongare, University of Connecticut, Storrs, CT, United States

11:06am – Asymptotic Approaches to Complete Contact Problems
Technical Presentation. IMECE2019-12783
Daniel J. Riddoch, David A. Hills, University of Oxford, Oxford, Oxfordshire, United Kingdom

11:27am – Effect of Inclusions on the Bendability of Dual-Phase Steels
Technical Presentation. IMECE2019-13792
Yu Liu, Ankit Srivastava, Texas A&M University, College Station, TX, United States

11:48am – Void Growth and Coalescence in Porous Plastic Solids With Sigmoidal Hardening
Technical Presentation. IMECE2019-12565
Shailendra Joshi, University of Houston, Houston, TX, United States

12:09pm – Grain Boundary Ductile Failure in Plastically Heterogeneous Materials
Technical Presentation. IMECE2019-13879
Edwin Chiu, Ankit Srivastava, Texas A&M University, College Station, TX, United States

11-17 MECHANICS OF ADHESION AND FRICTION

11-17-1 Mechanics of Adhesion and Friction – I

Convention Center, 255D 10:45AM–12:30PM

10:45am – Rate and Mode-Mix Dependent Traction Separations for a Silicon/Epoxy Interface
Technical Presentation. IMECE2019-13134
Tianhao Yang, Rui Huang, Kenneth Liechti, University of Texas, Austin, TX, United States

11:06am – Self-healing Investigation of Dynamic Covalent Thermoset Polyimine and Its Nanocomposites
Technical Presentation. IMECE2019-12817
Chuanqian Shi, Jianliang Xiao, Zhanan Zou, University of Colorado Boulder, Boulder, CO, United States

11:27am – Using Finite Element Analyses to Assess the Effect of a Thickness Gradient on the Stress Profile at the Epoxy/Silicone Interface of Thin Coatings Subjected to Pull-Off Loading

Technical Presentation. IMECE2019-13029

Melissa Gibbons, James Kohl, *University of San Diego, La Jolla, CA, United States*

11:48am – Modeling Adhesive Contacts Under Mixed-Mode Loading

Technical Presentation. IMECE2019-13064

Lucia Nicola, Mohsen Salehani, Nilgoon Irani, *Delft University of Technology, Delft, Netherlands*, Francisco Perez Rafols, *University of Padua, Padova, Italy*

12:09pm – Effect of Interfacial Contact Forces in Real-Time Interactive Assembly Simulation of Cable Harness

Technical Presentation. IMECE2019-10004

Gnanavel B K, Rajarajeswari Nachiaapan, *Saveetha Engineering College, Chennai, Tamilnadu, India*, Boopathy S, *Saveetha University, Chennai, Tamilnadu, India*, Kamesh K, *Murugappa Polytechnic, Chennai, Tamilnadu, India*, Vijay Amirtha Rayan J, *Saveetha Engineering College, Chennai, Tamilnadu, India*

11-18 IN-SITU AND QUANTITATIVE VISUALIZATION TECHNIQUES FOR FRACTURE AND FAILURE

11-18-1 In-Situ and Quantitative Visualization Techniques: Bio-Materials and Optical Techniques

Convention Center, 251E 10:45AM–12:30PM

Session Organizer: Ryan Berke, *Utah State University, Logan, UT, United States*

Session Co-Organizer: Natasha Vermaak, *Lehigh University, Bethlehem, PA, United States*, Owen Kingstedt, *University of Utah, Salt Lake City, UT, United States*, Scott Mao, *University of Pittsburgh, Pittsburgh, PA, United States*

10:45am – Refined Methods of Image Processing for Lacunae Quantification in Diabetic Cortical Bone

Technical Presentation. IMECE2019-12873

Yoshihiro Obata, *University of Utah, Newport, NC, United States*, Claire Acevedo, *University of Utah, Salt Lake City, UT, United States*

11:06am – Fracture Behavior of Bovine Cortical Bone Embrittled by Ribosylation to Mimic Diabetes Skeletal Fragility

Technical Presentation. IMECE2019-13442

Tanner Snow, William Woolley, James Rosenberg, Claire Acevedo, Owen Kingstedt, *University of Utah, Salt Lake City, UT, United States*

11:27am – An SEM-Based Full-Field Measurement Technique Using the Grid-Method

Technical Presentation. IMECE2019-12906

Hadi Mirmohammad, Owen Kingstedt, *University of Utah, Salt Lake City, UT, United States*

11:48am – Digital Image Correlation Using Super Resolution Imaging Techniques

Technical Presentation. IMECE2019-12912

Robert S. Hansen, Daniel Waldram, Ryan Berke, *Utah State University, Logan, UT, United States*

12:09pm – DIC at Long Working Distances: The Effect of Aperture

Technical Presentation. IMECE2019-13785

Katharine Burn, Cynthia Rigby, Ryan Berke, Ethan Nickerson, *Utah State University, Logan, UT, United States*

11-28 RECENT ADVANCES AND APPLICATIONS IN MESHFREE AND PARTICLE METHODS

11-28-1 Recent Advances and Applications in Meshfree and Particle Methods

Convention Center, 259 10:45AM–12:30PM

Session Organizer: Sheng-Wei Chi, *University of Illinois at Chicago, Chicago, IL, United States*

Session Co-Organizer: Mike Hillman, *Pennsylvania State University, University Park, PA, United States*

10:45am – Modeling Flow Drill Screw Driving Process Using a Momentum-consistent Smoothed Particle Galerkin (MC-SPG) method

Technical Presentation. IMECE2019-12293

C.T. Wu, Xiaofei Pan, Wei Hu, *Livermore Software Technology Corporation, Livermore, CA, United States*

11:20am – An Immersed Volumetric Nitsche's Approach for Composites With Application to Direct Numerical Simulation of Micro-CT Images

Technical Presentation. IMECE2019-12540

Mike Hillman, Jiarui Wang, *Pennsylvania State University, University Park, PA, United States*, Guohua Zhou, *Optimal Inc., Plymouth, MI, United States*, Anna Madra, *Pennsylvania State University, University Park, PA, United States*

11:40am – The Conforming Reproducing Kernel Method: Recent Developments and Applications

Technical Presentation. IMECE2019-13703

Jacob Koester, Michael R. Tupek, *Sandia National Laboratories, Albuquerque, NM, United States*, Jiun-Shyan Chen, *University of California, San Diego, La Jolla, CA, United States*

12:00pm – An RKPM-Based Shock Algorithm for Modeling Immersed Fluid-Structure Interactions in Blast Events

Technical Presentation. IMECE2019-12651

Tsung-Hui Huang, Haoyan Wei, Jiun-Shyan Chen, *University of California, San Diego, La Jolla, CA, United States*

12:20pm – A Semi-Lagrangian Reproducing Kernel Approach for Simulation of Penetration Into Geomaterials
Technical Presentation. IMECE2019-12501

Sheng-Wei Chi, Mohammed Mujtaba Atif, *University of Illinois at Chicago, Chicago, IL, United States*, **Ashkan Mahdavi**, *IQA Solutions Inc., Long Beach, CA, United States*, **Craig Foster**, *University of Illinois at Chicago, Chicago, IL, United States*

11-39 SYMPOSIUM ON MULTIPHYSICS SIMULATIONS AND EXPERIMENTS FOR SOLIDS

11-39-1 Multiphysics Simulations and Experiments for Solids I
Convention Center, 255A 10:45AM-12:30PM

Session Organizer: Huijuan Zhao, *Clemson University, Clemson, SC, United States*

Session Co-Organizer: Shabnam Konica, *Michigan Technological University, Houghton, MI, United States*

10:45am – Thermal and Mechanical Behavior of Graphene Under Heat Flux (Part I)

Technical Presentation. IMECE2019-13614
Huijuan Zhao, *Clemson University, Clemson, SC, United States*

11:06am – Thermal and Mechanical Behavior of Graphene Under Heat Flux (Part II)

Technical Presentation. IMECE2019-13617
Huijuan Zhao, *Clemson University, Clemson, SC, United States*

11:27am – On the Modelling of Multi-Chain Reaction-Diffusion Coupling in High-Temperature Oxidation of Polymers

Technical Presentation. IMECE2019-13215
Shabnam Konica, Trisha Sain, *Michigan Technological University, Houghton, MI, United States*

11:48am – Coupled Mechanical and Thermal Transport Behavior of Semiconductor Multiplayers

Technical Presentation. IMECE2019-13612
Yang Li, Weixuan Li, Youping Chen, *University of Florida, Gainesville, FL, United States*

12:09pm – Integration of Phase-Field Model and Crystal Plasticity for the Prediction of Process-Structure-Property Relation of Additively Manufactured Metallic Materials
Technical Presentation. IMECE2019-13026

Lei Chen, *Mississippi State University, Mississippi State, MS, United States*, **Zhuo Wang**, *Mississippi State University, Starkville, MS, United States*, **Ricardo A. Lebensohn**, *Los Alamos National Laboratory, Los Alamos, NM, United States*, **Yucheng Liu, Mark Horstemeyer**, *Mississippi State University, Starkville, MS, United States*

11-42 NONLINEAR DYNAMICS, CONTROL, AND STOCHASTIC MECHANICS

11-42-1 Nonlinear Dynamics, Control. and Stochastic Mechanics IV

Convention Center, 251D 10:45AM-12:30PM

Session Organizer: Dumitru Caruntu, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

Session Co-Organizer: Marco Amabili, *McGill University, Montreal, QC, Canada*

10:45am – Nonlinear Damping in Large-Amplitude Vibrations of Viscoelastic Plates

Technical Paper Publication. IMECE2019-10339
Marco Amabili, Prabakaran Balasubramanian, Giovanni Ferrari, *McGill University, Montreal, QC, Canada*

11:06am – Noncoaxial Vibration of Electrostatically Actuated DWCNT: Frequency Response of Primary Resonance

Technical Paper Publication. IMECE2019-11187
Dumitru Caruntu, Ezequiel Juarez, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

11:27am – Investigation of the Airflow in a Deflector Wheel Classifier

Technical Presentation. IMECE2019-12782
Martin Weers, Annett Wollmann, *Technical University of Clausthal, Clausthal-Zellerfeld, Lower Saxony, Germany*, **Bernd Benker**, *CUTEC Research Center, Clausthal-Zellerfeld, Lower Saxony, Germany*, **Alfred P. Weber**, *Technical University of Clausthal, Lower Saxony, Lower Saxony, Germany*

11:48am – Life Time Analysis of Piezoelectric Vibration Energy Harvesters for Powering Pacemakers

Technical Presentation. IMECE2019-13721
Nikta Amiri, M. Amin Karami, *University at Buffalo, Buffalo, NY, United States*

11-46 YOUNG MEDALIST SYMPOSIUM

11-46-1 Young Medalist Symposium I
Convention Center, 250C 10:45AM-12:30PM

Session Organizer: Matt Pharr, *Texas A&M University, College Station, TX, United States*

10:45am – 3D MEMS Through Mechanically-Guided Assembly

Technical Presentation. IMECE2019-13050
Yihui Zhang, *Tsinghua University, Beijing, China*

11:06am – Thermal Fluid Flows on Moving Domains With Applications to Metallic Additive Manufacturing

Technical Presentation. IMECE2019-12606
Jinhui Yan, *University of Illinois at Urbana-Champaign, Champaign, IL, United States*

11:27am – Magnetic Symmetry-Breaking Actuation for Shape Morphing and Soft Robotics

Technical Presentation. IMECE2019-12498

Ruike Zhao, Shuai Wu, Rundong Zhang, *Ohio State University, Columbus, OH, United States***11:48am – Strength of Additively Manufactured Brittle Foams**

Technical Presentation. IMECE2019-13253

Sirui Bi, Enze Chen, Stavros Gaitanaros, *Johns Hopkins University, Baltimore, MD, United States***12:09pm – Imperfection-Sensitivity of Ultra-Thin CFRP Cylindrical Shells at Low Temperatures**

Technical Presentation. IMECE2019-12779

Xin Ning, *Penn State University, State College, PA, United States***11-7 SYMPOSIUM ON PLASTICITY, DAMAGE, AND FRACTURE****11-7-2 Plastic Anisotropy (I)**

Convention Center, 251C

2:00PM–3:45PM

Session Organizer: William Scherzinger, *Sandia National Laboratories, Albuquerque, NM, United States***2:00pm – Failure of Advanced High Strength Steel Sheets**

Invited Presentation. IMECE2019-10275

Frederic Barlat, Vivek K. Barnwal, *POSTECH, Pohang, Korea (Republic)***2:42pm – Hill's Mathematical Theory of Plastic Anisotropy: 70 Years On**

Technical Presentation. IMECE2019-12592

Wei Tong, J. Sheng, Mohammed Alharbi, *Southern Methodist University, Dallas, TX, United States***3:03pm – Micromorphic Theory of Plasticity and Its Finite Element Analysis**

Technical Presentation. IMECE2019-12950

James Lee, *George Washington University, Washington, DC, United States*, Jiaoyan Li, *Idaho National Laboratory, Idaho Falls, ID, United States*, Kerlin Robert, *George Washington University, Washington, DC, United States***3:24pm – Mechanical Properties of Steel Printed on Ceramics**

Technical Paper Publication. IMECE2019-10392

Seyed Allameh, *Northern Kentucky University, Newport, KY, United States*, Miguel Ortiz Rejón, *Northern Kentucky University, Highland Height, KY, United States***3:45pm – Mechanical Characterization of Valve Compression Packing at High Temperature**

Technical Paper Publication. IMECE2019-10103

Xavier Legault, Abdel-Hakim Bouzid, Ali Salah Omar Aweimer, *École de Technologie Supérieure, Montreal, QC, Canada***11-8 SYMPOSIUM ON PERSPECTIVE ON FRACTURE AND FAILURE MECHANICS****11-8-2 Perspective on Fracture and Failure Mechanics II**

Convention Center, 255E

2:00PM–3:45PM

Session Organizer: Ankit Srivastava, *Texas A&M University, College Station, TX, United States*Session Co-Organizer: Ashfaq Adnan, *University of Texas at Arlington, Arlington, TX, United States***2:00pm – Harnessing the Interface Mechanics of Hard Films and Soft Substrates for 3D Assembly by Controlled Buckling – Part I**

Technical Presentation. IMECE2019-12905

Yihui Zhang, *Tsinghua University, Beijing, China*, Yonggang Huang, *Northwestern University, Evanston, IL, United States***2:21pm – Harnessing the Interface Mechanics of Hard Films and Soft Substrates for 3D Assembly by Controlled Buckling – Part II**

Technical Presentation. IMECE2019-12936

Yihui Zhang, *Tsinghua University, Beijing, China*, Yonggang Huang, *Northwestern University, Evanston, IL, United States***2:42pm – “Sideways” and Stable Crack Propagation in a Silicone Elastomer**

Technical Presentation. IMECE2019-13254

Matt Pharr, Seunghyun Lee, *Texas A&M University, College Station, TX, United States***3:03pm – Extracting Quantitative Information From Fracture Surfaces of Al Alloys and MMC**

Technical Presentation. IMECE2019-13674

Yali Barak, Dror Freedman, Shmuel Osovski, *Technion – Israel Institute of Technology, Haifa, Israel***3:24pm – Observing Fracture Process at Atomic Scale With Experimental Molecular Dynamics**

Technical Presentation. IMECE2019-13491

Scott Mao, *University of Pittsburgh, Pittsburgh, PA, United States*

11-10 DYNAMIC FAILURE OF MATERIALS & STRUCTURES

11-10-2 Dynamic Failure of Materials and Structures – 2

Convention Center, 251B 2:00PM–3:45PM

Session Organizer: Roy Xu, *University of New Mexico, Albuquerque, NM, United States*

Session Co-Organizer: Jun Xu, *Beihang University, Beijing, Beijing, China*

2:00pm – Keynote Presentation Part I: RKPM Shock Modeling of Fragment-Impact Processes in Structures Under Air Blast

Technical Presentation. IMECE2019-11726
Jiun-Shyan Chen, Tsung-Hui Huang, Haoyan Wei, *University of California, San Diego, La Jolla, CA, United States*

2:21pm – Keynote Presentation Part II: RKPM Shock Modeling of Fragment-Impact Processes in Structures Under Air Blast

Technical Presentation. IMECE2019-11733
Jiun-Shyan Chen, Tsung-Hui Huang, Haoyan Wei, *University of California, San Diego, La Jolla, CA, United States*

2:42pm – Dynamic Mechanical Behavior of Lithium-Ion Pouch Cells Subjected to High-Velocity Impact

Technical Presentation. IMECE2019-10444
Yanyu Chen, *University of Louisville, Louisville, KY, United States*

3:03pm – Impact Analysis of Honeycomb Core Sandwich Panels

Technical Paper Publication. IMECE2019-11740
Shah Alam, Damodar Khanal, *Texas A&M University-Kingsville, Kingsville, TX, United States*

11-18 IN-SITU AND QUANTITATIVE VISUALIZATION TECHNIQUES FOR FRACTURE AND FAILURE

11-18-2 In-Situ and Quantitative Visualization Techniques: Microscopy in Experimental Mechanics

Convention Center, 251E 2:00PM–3:45PM

Session Organizer: Owen Kingstedt, *University of Utah, Salt Lake City, UT, United States*

Session Co-Organizers: Natasha Vermaak, *Lehigh University, Bethlehem, PA, United States*, Ryan Berke, *Utah State University, Logan, UT, United States*, Scott Mao, *University of Pittsburgh, Pittsburgh, PA, United States*

2:00pm – Heavy Ion Irradiation Effects on GaN/AlGaN High Electron Mobility Transistor Failure at Off-State

Technical Presentation. IMECE2019-11378
Zahabul Islam, Md Haque, *Pennsylvania State University, University Park, PA, United States*

2:21pm – Three-Dimensional Analysis of Fracture Mechanism in Rocks Under Microwave Treatments by X-Ray CT-Scan

Technical Paper Publication. IMECE2019-12000
Khashayar Teimoori, Ferri Hassani, Agus P. Sasmito, *McGill University, Montreal, QC, Canada*

2:42pm – Effects of Grain Orientation on the Dynamic Compressive Response of Highly Oriented Ti₃SiC₂

Technical Presentation. IMECE2019-13622
Xingyuan Zhao, *Colorado School of Mines, Golden, CO, United States*, **Leslie Lamberson, Michel Barsoum,** *Drexel University, Philadelphia, PA, United States*

3:03pm – Demystifying Orowan Alternating Slip: Revealing Collaborative Ductile Rupture Mechanisms in High-Purity Copper With In Situ X-Ray Computed Tomography

Technical Presentation. IMECE2019-13673
Brendan Croom, *Air Force Research Laboratory, Dayton, OH, United States*, **Helena (Huiqing) Jin,** *Sandia National Laboratories, Livermore, CA, United States*, **Philip Noell, Brad Boyce,** *Sandia National Labs, Albuquerque, NM, United States*, **Xiaodong Li,** *University of Virginia, Charlottesville, VA, United States*

3:24pm – Tensile Response of a Copper/Nanoporous Copper Laminate Structure

Technical Presentation. IMECE2019-13322
Timothy Ibru, *Georgia Institute of Technology, Decatur, GA, United States*, **Antonia Antoniou,** *Georgia Institute of Technology, Atlanta, GA, United States*

11-39 SYMPOSIUM ON MULTIPHYSICS SIMULATIONS AND EXPERIMENTS FOR SOLIDS

11-39-2 Multiphysics Simulations and Experiments for Solids II

Convention Center, 255A 2:00PM–3:45PM

Session Organizer: Mohammed Zikry, *North Carolina State University, Raleigh, NC, United States*

Session Co-Organizer: Ying Li, *University of Connecticut, Storrs, CT, United States*

2:00pm – Unveiling Mechanics of Anomalous High Strength and Low Stiffness in Polymer Nanocomposites Through Molecular Dynamics Simulations

Invited Presentation. IMECE2019-13255
Ying Li, Seok-Woo Lee, *University of Connecticut, Storrs, CT, United States*

2:42pm – Modeling the Behavior of Heterogeneous Systems Subjected to the Coupled Effects of Electromagnetic and Mechanical Fields

Technical Presentation. IMECE2019-13021
Mohamed Elbadry, Michael Steer, Mohammed Zikry, *North Carolina State University, Raleigh, NC, United States*

3:03pm – Chemomechanics of Transfer Printing of Thin Films in a Liquid Environment**Technical Presentation. IMECE2019-12868****Yue Zhang, Baoxing Xu, University of Virginia, Charlottesville, VA, United States****3:24pm – Unveiling Mechanics of Anomalous High Strength and Low Stiffness in Polymer Nanocomposites Through Molecular Dynamics Simulations: Part II****Technical Presentation. IMECE2019-13352****Ying Li, Seok-Woo Lee, University of Connecticut, Storrs, CT, United States****11-42 NONLINEAR DYNAMICS, CONTROL, AND STOCHASTIC MECHANICS****11-42-2 Nonlinear Dynamics, Control, and Stochastic Mechanics V****Convention Center, 255D****2:00PM–3:45PM****Session Organizer:** Marco Amabili, *McGill University, Montreal, QC, Canada***Session Co-Organizers:** Dumitru Caruntu, *University of Texas Rio Grande Valley, Edinburg, TX, United States*, Yuris Dzenis, *University of Nebraska, Lincoln, NE, United States***2:00pm – Focusing Mechanism of Non-Spherical Particles in Microchannels****Technical Presentation. IMECE2019-13851****Marzieh Chaharlang, Katrina Rose Cernucan, University of Utah, Salt Lake, UT, United States****2:21pm – Bio-Inspired Flapping Flier: Theory and Application****Technical Presentation. IMECE2019-13915****Amirsaman Rezaei, Fernando Quevedo, Dipan Deb, Haitham Taha, University of California, Irvine, Irvine, CA, United States****2:42pm – Acoustic Emission Evaluation of Mode Mixity of Fracture: A Precursor for Mechanics-Based Predictive NDE of Composites and Structures****Technical Presentation. IMECE2019-13917****Yuris Dzenis, University of Nebraska, Lincoln, NE, United States****11-43 FLUID-STRUCTURE INTERACTION****11-43-1 Fluid-Structure Interaction****Convention Center, 257****2:00PM–3:45PM****Session Organizer:** Kostas Karazis, *Framatome Inc., Lynchburg, VA, United States***Session Co-Organizer:** Brian Painter, *Framatome Inc., Lynchburg, VA, United States***2:00pm – Estimated Fluid Force and Damping Characteristics of a Thin Film Damper Comparison Between Closed-Form Solutions and Numerical Analysis****Technical Paper Publication. IMECE2019-10171****Jason Cook, Oak Ridge National Laboratory, Oak Ridge, TN, United States****2:21pm – A Level Set Based Geometry Handling Approach Used in the Immersed Boundary Methods for Fluid-Structure Interaction****Technical Paper Publication. IMECE2019-10237****Guangfa Yao, Numersolution, LLC, Mason, OH, United States****2:42pm – Experiments on Vortex Shedding From Reconfigured Flexible Filaments Vibrating in Flow****Technical Paper Publication. IMECE2019-10393****Jorge F. Silva-Leon, Escuela Superior Politecnica del Litoral, Guayaquil, Ecuador, Andrea Cioncolini, University of Manchester, Manchester, United Kingdom****3:03pm – Effect of Grid-Generated Turbulence on the Dynamics of a Flexible Filament Hanging in Cross-Flow****Technical Paper Publication. IMECE2019-10404****Jorge F. Silva-Leon, Escuela Superior Politecnica del Litoral, Guayaquil, Ecuador, Andrea Cioncolini, University of Manchester, Manchester, United Kingdom****3:24pm – Performance Analysis of the Impeller of a Centrifugal Air Compressor****Technical Paper Publication. IMECE2019-11123****T.R. Jebieshia, FMTRC, Daejoo Machinery, Daegu, Korea (Republic), S.K. Raman, H.D. Kim, Andong National University, Gyeong-Sangbuk-do, Korea (Republic)****11-44 LECTURES ON COMPUTATIONAL MECHANICS****11-44-1 Lectures on Computational Mechanics – 1****Convention Center, 251D****2:00PM–3:45PM****Session Organizer:** Dong Qian, *University of Texas at Dallas, Richardson, TX, United States***Session Co-Organizer:** Ashfaq Adnan, *University of Texas Arlington, Arlington, TX, United States***2:00pm – Multi-Scale Modeling With Machine Learning and Uncertainty Quantification for Predicting Fatigue Crack Evolution****Technical Presentation. IMECE2019-12554****Somnath Ghosh, Johns Hopkins University, Baltimore, MD, United States****2:21pm – Multi-Scale Modeling With Machine Learning and Uncertainty Quantification for Predicting Fatigue Crack Evolution: Part II****Technical Presentation. IMECE2019-12555****Somnath Ghosh, Johns Hopkins University, Baltimore, MD, United States****2:42pm – Multiscale Analysis and Design of Heterogeneous Materials: Sensitivity Analysis and Reduced-Order Modeling: Part 1****Technical Presentation. IMECE2019-12559****Philippe Geubelle, David Brandyberry, University of Illinois at Urbana-Champaign, Urbana, IL, United States, Maryam Shakiba, Virginia Tech, Blacksburg, VA, United States, Xiang Zhang, University of Illinois at Urbana-Champaign, Urbana, IL, United States**

3:03pm – Multiscale Analysis and Design of Heterogeneous Materials: Sensitivity Analysis and Reduced-Order Modeling: Part 2

Technical Presentation. IMECE2019-12560

Philippe Geubelle, David Brandyberry, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*, Maryam Shakiba, *Virginia Tech, Blacksburg, VA, United States*, Xiang Zhang, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

11-7 SYMPOSIUM ON PLASTICITY, DAMAGE, AND FRACTURE

11-7-3 Glass and Ceramic Materials

Convention Center, 251C

4:00PM–5:45PM

Session Organizer: Jake Ostien, *Sandia National Laboratories, Livermore, CA, United States*

4:00pm – Constitutive Modeling of Glass-Ceramic Materials

Technical Presentation. IMECE2019-12770

Brian Lester, Kevin Long, *Sandia National Laboratories, Albuquerque, NM, United States*

4:21pm – Effect of Ion-Exchange Chemistry on the Fracture of Chemically Strengthened Sodium Aluminosilicate Glass

Technical Paper Publication. IMECE2019-11700

Benedict Egboiyi, Trisha Sain, *Michigan Technological University, Houghton, MI, United States*

4:42pm – Modeling of Fracture of Functionally Graded Thermal Barrier Coatings Under High Heat Fluxes

Technical Presentation. IMECE2019-12275

Vera Petrova, Siegfried Schmauder, *University of Stuttgart, Stuttgart, Germany*

5:03pm – Structural and Mechanical Analysis of Silane Compounds Coatings on AISI 304

Technical Paper Publication. IMECE2019-10721

Akinsanya Damilare Baruwa, Esther Akinlabi, *University of Johannesburg, Johannesburg, South Africa*, O.P. Oladijo, *Botswana International University of Science & Technology, Palapye, Palapye, Botswana*, F.M. Mwema, *University of Johannesburg, Johannesburg, Gauteng, South Africa*

5:24pm – On the Interfacial Shear Strength of CNT Sheet-Wrapped Carbon Fiber Epoxy Composites

Technical Presentation. IMECE2019-12544

Xuemin Wang, *Georgia Southern University, Statesboro, GA, United States*, Sadeq Malakooti, Tingge Xu, Ihika Rampalli, Dongyang Cao, Monica Jung de Andrade, Ray Baughman, *University of Texas at Dallas, Richardson, TX, United States*, Samit Roy, *University of Alabama, Tuscaloosa, AL, United States*, Hongbing Lu, *University of Texas at Dallas, Plano, TX, United States*

11-8 SYMPOSIUM ON PERSPECTIVE ON FRACTURE AND FAILURE MECHANICS

11-8-3 Perspective on Fracture and Failure Mechanics III

Convention Center, 255E

4:00PM–5:45PM

Session Organizer: Ashfaq Adnan, *University of Texas at Arlington, Arlington, TX, United States*

Session Co-Organizer: Ankit Srivastava, *Texas A&M University, College Station, TX, United States*

4:00pm – Multiscale Modeling of Fracture in Metal Matrix Composites

Technical Presentation. IMECE2019-12658

Yan Li, Leon Phung, *California State University, Long Beach, Long Beach, CA, United States*, Cyril Williams, *Army Research Laboratory, Aberdeen Proving Ground, MD, United States*

4:21pm – Fracture Behavior of Energy Storage Materials

Technical Presentation. IMECE2019-13805

Siva Nadimpali, *New Jersey Institute of Technology, Newark, NJ, United States*

4:42pm – On Migrating Twins and Growing Voids in Crystalline Plasticity

Technical Presentation. IMECE2019-12566

Shailendra Joshi, *University of Houston, Houston, TX, United States*

5:03pm – Fracture, Fatigue and Adhesion of Soft Materials I

Technical Presentation. IMECE2019-12824

Xuanhe Zhao, *Massachusetts Institute of Technology, Cambridge, MA, United States*

5:24pm – Fracture, Fatigue and Adhesion of Soft Materials II

Technical Presentation. IMECE2019-12825

Xuanhe Zhao, *Massachusetts Institute of Technology, Cambridge, MA, United States*

11-10 DYNAMIC FAILURE OF MATERIALS & STRUCTURES

11-10-3 Dynamic Failure of Materials and Structures – 3

Convention Center, 251B

4:00PM–5:45PM

Session Organizer: Yucheng Liu, *Mississippi State University, Mississippi State University, MS, United States*

Session Co-Organizer: Hamid Nayeb Hashemi, *Northeastern University, Boston, MA, United States*

4:00pm – Thermoelastic Response of Functionally Graded Fiber-Reinforced Rotating Disk With Non-Uniform Thickness Profile Under Variable Angular Velocity

Technical Paper Publication. IMECE2019-10213

Hamid Nayeb Hashemi, Yue Zheng, Ashkan Vaziri, *Northeastern University, Boston, MA, United States*, Masoud Olia, *Wentworth Institute of Technology, Boston, MA, United States*

4:21pm – Investigation of Mechanical Behavior of Chopped Carbon Fiber Reinforced Sheet Molding Compound (SMC) Composites

Technical Paper Publication. IMECE2019-10698

Xuze Sun, Nanjing University of Aeronautics and Astronautics, Nanjing, Jiangsu, China, **Carlos Engler-Pinto**, Ford Motor Company, Dearborn, MI, United States, **Li Huang, Shiyao Huang**, Ford Motor Research and Engineering (Nanjing) Co., Ltd., Nanjing, China, **Haibin Tang, Haitao Cui**, Nanjing University of Aeronautics and Astronautics, Nanjing, Jiangsu, China, **Xuming Su**, Ford Motor Company, Dearborn, MI, United States

4:42pm – Monotonic and Fatigue Testing of Polymer and Composite Materials Used in Heavy Duty Trucks

Technical Paper Publication. IMECE2019-11680

Kevan Gahan, Oregon State University, Wilsonville, OR, United States, **John Parmigiani**, Oregon State University, Corvallis, OR, United States

5:03pm – Numerical Modelling of Impact Behavior of Composite Sandwich Panel With Honeycomb Core

Technical Paper Publication. IMECE2019-11721

Shah Alam, Aakash Bungatavula, Texas A&M University-Kingsville, Kingsville, TX, United States

5:24pm – Effects of Crystal Orientation, Size Scale, and Strain Rate on Penetration Mechanisms of Single Crystal Copper Subjected To Impact From a Single Crystal Nickel

Technical Presentation. IMECE2019-12161

Yucheng Liu, Mississippi State University, Mississippi State University, MS, United States

11-18 IN-SITU AND QUANTITATIVE VISUALIZATION TECHNIQUES FOR FRACTURE AND FAILURE

11-18-3 In-Situ and Quantitative Visualization Techniques: Macro-Scale Phenomena

Convention Center, 251E

4:00PM–5:45PM

Session Organizer: Natasha Vermaak, Lehigh University, Bethlehem, PA, United States

Session Co-Organizers: Ryan Berke, Utah State University, Logan, UT, United States, Owen Kingstedt, University of Utah, Salt Lake City, UT, United States, Scott Mao, University of Pittsburgh, Pittsburgh, PA, United States

4:00pm – Parametric Analysis of Specimen Geometry for Vibration-Based Fatigue Testing

Technical Presentation. IMECE2019-13169

Brandon Furman, Emma German, Benjamin Hill, Matthew Calvin, Ryan Berke, Utah State University, Logan, UT, United States

4:21pm – A Multi-Insert Assembly for High-Throughput Fatigue Characterization

Technical Presentation. IMECE2019-13477

Emma E. German, Samantha D. Burton, Brandon Furman, Utah State University, Logan, UT, United States, **Dino A. Celli, Casey M. Holycross, Onome Scott-Emuakpor**, Air Force Research Laboratory, Wright-Patterson AFB, OH, United States, **Ryan Berke**, Utah State University, Logan, UT, United States

4:42pm – Dynamic Interlaminar Crack Propagation in 3D-Printed ABS Plastic

Technical Presentation. IMECE2019-13328

Weston Craig, Utah State University, Idaho Falls, ID, United States, **Robert J Rowley, Christopher Stolinski, Ryan Berke**, Utah State University, Logan, UT, United States, **Owen Kingstedt**, University of Utah, Salt Lake City, UT, United States

5:03pm – Computer Vision-Based Quantitative Evaluation of Fracture Type in Metals

Technical Presentation. IMECE2019-13283

Dayakar Naik Lavadiya, Ravi Kiran Yellavajjala, North Dakota State University, Fargo, ND, United States

5:24pm – A Study of Hybrid Composite Sandwich Beam

Technical Paper Publication. IMECE2019-11845

Shah Alam, Texas A&M University-Kingsville, Kingsville, TX, United States, **Guoqiang Li**, Louisiana State University, Baton Rouge, LA, United States

11-22 COMPUTATIONAL MODELING OF EXTREME EVENTS

11-22-1 Computational Modeling of Extreme Events – 1

Convention Center, 257

4:00PM–5:45PM

Session Organizer: Jiun-Shyan Chen, University of California, San Diego, La Jolla, CA, United States

Session Co-Organizer: Kent Danielson, U.S. Army ERDC, Vicksburg, MS, United States

4:00pm – Framework for Shock Compression of Glass Based on Thermodynamics: A Multi-Scale “Continuum-to-MD” Approach

Technical Presentation. IMECE2019-13070

Roshdy Barsoum, Office of Naval Research, Arlington, VA, United States

4:21pm – A Treatment for Multi-material Boundaries in Stabilized Conforming Nodal Integration (SCNI) Based RKPM Methods

Technical Presentation. IMECE2019-13075

Dominic Wilmes, Jeffrey Limbacher, Joseph Magallanes, Karagozian & Case, Glendale, CA, United States

4:42pm – A Reproducing-Kernel Meshfree Method on Nonconvex Domains Using Biharmonic Weight Functions

Technical Presentation. IMECE2019-13058

Joseph Bishop, Sandia National Laboratories, Albuquerque, NM, United States

5:03pm – A Contact Model for Multi-Material Eulerian Hydrocodes: Extensions for Self-Contact

Technical Presentation. IMECE2019-13387

David Littlefield, *University of Alabama At Birmingham, Birmingham, AL, United States*

5:24pm – Computational Prediction of the Damage to a Military Vehicle Composite Armor Due to Ballistic Impact

Technical Presentation. IMECE2019-12960

Jagadeep Thota, *University of Wisconsin-Green Bay, Green Bay, WI, United States*, Mohamed Trabia, Brendan O'Toole, *University of Nevada Las Vegas, Las Vegas, NV, United States*

11-25 HIGH-PERFORMANCE NANOSTRUCTURAL MATERIALS AND NANOCOMPOSITES

11-25-1 High-Performance Nanostructural Materials and Nanocomposites

Convention Center, 255D

4:00PM–5:45PM

Session Organizer: Davood Askari, *Wichita State University, Wichita, KS, United States*

Session Co-Organizers: Dmitry Papkov, *University of Nebraska–Lincoln, Lincoln, NE, United States*, Mehran Tehrani, *University of New Mexico, Albuquerque, NM, United States*

4:00pm – Study of the Effect of Carbon Nano-Tube Waviness and Volume Fraction on the Damping Property of a Polymer Composite

Technical Paper Publication. IMECE2019-11843

Shank S. Kulkarni, Alireza Tabarraei, Satyam Shukla, *University of North Carolina at Charlotte, Charlotte, NC, United States*

4:21pm – Adjustable Transparent Conductive Film Based on Graphene/AgNW/Graphene Sandwich Structure

Technical Presentation. IMECE2019-12536

Yanxiao Li, Congjie Wei, Chenglin Wu, *Missouri University of Science and Technology, Rolla, MO, United States*

4:42pm – Graphene Kirigami Heterostructure Enables Strain-Controlled Thermal Transparency

Technical Presentation. IMECE2019-12939

Yuan Gao, *University of Virginia, Charlottesville, VA, United States*

5:03pm – Processing and Characterization of Electrospun Poly(Methyl Methacrylate) Nanocomposite Fibers Reinforced With Graphene Nanoflakes

Technical Presentation. IMECE2019-13900

Arab Hussein, Zhizhong Dong, Bernard Kear, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*, Assimina Pelegri, *Rutgers, The State University of New Jersey, East Brunswick, NJ, United States*, Stephen Tse, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*

5:24pm – Application of Nonconventional Materials, CNTs, in Road Maintenance: A Review

Technical Presentation. IMECE2019-13889

Robabeh Jazaei, Robabeh Jazaei, *University of Wisconsin-Platteville, Platteville, WI, United States*, Samad Gharehdaghi, *University of Wisconsin-Platteville, Pensacola, Florida, United States*, Fatemeh Azari, *University of Nevada, Las Vegas, Las Vegas, NV, United States*

11-39 SYMPOSIUM ON MULTIPHYSICS SIMULATIONS AND EXPERIMENTS FOR SOLIDS

11-39-3 Multiphysics Simulations and Experiments for Solids III

Convention Center, 255A

4:00PM–5:45PM

Session Organizer: Yingchao Yang, *University of Maine, Orono, ME, United States*

Session Co-Organizer: Dong Qian, *University of Texas at Dallas, Richardson, TX, United States*

4:00pm – A Massively Parallel Concurrent Atomistic Continuum Method

Technical Presentation. IMECE2019-13192

Adrian Diaz, Boyang Gu, *University of Florida, Gainesville, FL, United States*, Steve Plimpton, *Sandia National Laboratories, Albuquerque, NM, United States*, Youping Chen, *University of Florida, Gainesville, FL, United States*, Dave McDowell, *Georgia Institute of Technology, Atlanta, GA, United States*

4:21pm – Directional Sensing Based on Flexible Aligned Carbon Nanotube Film Nanocomposites

Technical Presentation. IMECE2019-11573

Yingchao Yang, *University of Maine, Orono, ME, United States*

4:42pm – Mechanics of Expansive Growth in Fungal Cells: A Statistical Model of the Cell Wall

Technical Presentation. IMECE2019-13279

Shankar Lalitha Sridhar, Revathi Priyanka Mohan, Guillaume Lostec, *University of Colorado Boulder, Boulder, CO, United States*, Joseph K.E. Ortega, *University of Colorado Denver, Denver, CO, United States*, Franck Vernerey, *University of Colorado at Boulder, Boulder, CO, United States*

5:03pm – Interfibrillar Mechanics of Collagen in Bone

Technical Presentation. IMECE2019-12007

Yang Wang, Seyedreza Morsali, Majid Minary, Dong Qian, *University of Texas at Dallas, Richardson, TX, United States*

5:24pm – Interfacial Fatigue Crack Propagation Behavior of Multiferoic Concentric Composite Rings

Technical Presentation. IMECE2019-13742

Ryan M. Stampfli, George Youssef, *San Diego State University, San Diego, CA, United States*

11-44 KEYNOTE LECTURES ON COMPUTATIONAL MECHANICS

11-44-2 Keynote Lectures on Computational Mechanics – 2

Convention Center, 251D 4:00PM–5:45PM

Session Organizer: Ashfaq Adnan, *University of Texas at Arlington, Arlington, TX, United States*

Session Co-Organizer: Dong Qian, *University of Texas at Dallas, Richardson, TX, United States*

4:00pm – Part I: Isogeometric and Meshfree Methods for Expreme-Event Simulation

Technical Presentation. IMECE2019-13660

Yuri Bazilevs, *Brown University, Providence, RI, United States*

4:21pm – Part II: Isogeometric and Meshfree Methods for Expreme-Event Simulation

Technical Presentation. IMECE2019-13662

Yuri Bazilevs, *Brown University, Providence, RI, United States*

4:42pm – Microscale Phase-Field Approach to Martensitic Phase Transformations at Finite Strains Which Satisfies Lattice Instability Conditions

Technical Presentation. IMECE2019-12786

Hamed Babaei, *Iowa State University, Ames, IA, United States*

5:03pm – Lectures on Computational Mechanics

Technical Presentation. IMECE2019-13049

Ashfaq Adnan, *University of Texas at Arlington, Arlington, TX, United States*

11-46 YOUNG MEDALIST SYMPOSIUM

11-46-2 Young Medalist Symposium II

Convention Center, 250C

4:00PM–5:45PM

Session Organizer: Xin Ning, *Penn State University, State College, PA, United States*

4:00pm – An Adaptive Quasi-Continuum Approach for Modeling Fracture and Adhesion in Networked Materials: Application to Polymeric Materials

Technical Presentation. IMECE2019-12647

Ahmed Elbanna, Ahmed Ghareeb, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

4:21pm – Scaling of Structural Strength in Soft Elastomers and the Relation to Fracture Energy and Process Zone Size

Technical Presentation. IMECE2019-12810

Kedar Kirane, Kevin Gonzalez, Jing Xue, *Stony Brook University, Stony Brook, NY, United States*

4:42pm – Homogenization of Elastic Dielectric Composites With Rapidly Oscillating Passive and Active Source Terms

Technical Presentation. IMECE2019-13174

Victor Lefevre, *Northwestern University, Evanston, IL, United States*

5:03pm – Chemo-Mechanical Degradation in V_2O_5 Thin Film Cathodes of Li-Ion Batteries

Technical Presentation. IMECE2019-13257

Matt Pharr, Yuwei Zhang, Yuting Luo, Cole Fincher, Sarbajit Banerjee, *Texas A&M University, College Station, TX, United States*

5:24pm – Phononic Materials as Ultrasonic Filters for Nondestructive Evaluation Measurements

Technical Presentation. IMECE2019-13726

Kathryn Matlack, Elizabeth J. Smith, Ignacio Arretche, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

TUESDAY, NOVEMBER 12

11-49 PLENARY SESSIONS

11-49-2 Plenary Session II

355B

9:45AM–10:30AM

9:45am – Full-Field Methods for Characterizing the Non-Linear Anisotropic Response of the Anterior Cruciate Ligament of the Knee

Plenary Presentation. IMECE2019-14007

Ellen Arruda, *University of Michigan, Ann Arbor, MI, United States*

11-1 MECHANICS OF SOFT MATERIALS

11-1-1 Polymer Gel-1

Convention Center, 255A

10:45AM–12:30PM

Session Organizer: Sung Hoon Kang, *Johns Hopkins University, Baltimore, MD, United States*

10:45am – Experiments and Modeling the Viscoelastic Behavior of Polymeric Gels

Invited Presentation. IMECE2019-13383

Shawn Chester, *New Jersey Institute of Technology, North Caldwell, NJ, United States*, Nikola Bosnjak, Justin Newkirk, *New Jersey Institute of Technology, Newark, NJ, United States*

11:27am – A Linear Visco-Poroelastic Model for Swelling and Creep of Polymer Gels

Technical Presentation. IMECE2019-13284

Rui Huang, Si Chen, Chad Landis, Krishanswamy Ravi-Chandar, *University of Texas at Austin, Austin, TX, United States*

11:48am – Chemomechanics of Hydrogels

Technical Presentation. IMECE2019-12256

Yuhang Hu, *Georgia Institute of Technology, Atlanta, GA, United States*, Mohammad Dehghanydahaj, *Sharif University of Technology, Terhan, Islamic Republic of Iran*, Haohui Zhang, *Georgia Institute of Technology, Atlanta, GA, United States*

12:09pm – Poroelasticity of Gelatin-Based Hydrogels

Technical Presentation. IMECE2019-13725

Si Chen, Krishanswamy Ravi-Chandar, *University of Texas at Austin, Austin, TX, United States*

11-7 SYMPOSIUM ON PLASTICITY, DAMAGE, AND FRACTURE

11-7-4 Plastic Anisotropy (II)

Convention Center, 255E

10:45AM–12:30PM

Session Organizer: Benoit Revil-Baudard, *University of Florida, Shalimar, FL, United States*

10:45am – Implementation and Verification of Continuum Plasticity Models for Modeling and Simulation: Part 1

Technical Presentation. IMECE2019-12806

William Scherzinger, Brian Lester, *Sandia National Laboratories, Albuquerque, NM, United States*, Jake Ostien, *Sandia National Laboratories, Livermore, CA, United States*

11:06am – Implementation and Verification of Continuum Plasticity Models for Modeling and Simulation: Part 2

Technical Presentation. IMECE2019-12808

William Scherzinger, Brian Lester, *Sandia National Laboratories, Albuquerque, NM, United States*, Jake Ostien, *Sandia National Laboratories, Livermore, CA, United States*

11:27am – New Equivalent Expression of Karafillis and Boyce (1993) Orthotropic Yield Criterion and Implications in Terms of Parameters Identification

Technical Presentation. IMECE2019-12471

Oana Cazacu, *University of Florida, Shalimar, FL, United States*, William Scherzinger, *Sandia National Laboratories, Albuquerque, NM, United States*

11:48am – On the Plastic Anisotropy of a HCP Cylindrical Bar Under Quasi-Static and Dynamic Uniaxial Tensile Loading

Technical Presentation. IMECE2019-12130

J. Sheng, Colin Loeffler, Xu Nie, Wei Tong, *Southern Methodist University, Dallas, TX, United States*, Brett Sanborn, Bo Song, *Sandia National Laboratories, Albuquerque, NM, United States*

12:09pm – The Effect of Plastic Dissipation in the Formation of Dynamic Necking Instabilities in Incompressible Materials Displaying Tension-Compression Asymmetry

Technical Presentation. IMECE2019-12858

Jose A. Rodriguez-Martinez, Komi E. N'souglo, *University Carlos III of Madrid, Leganés, Madrid, Spain*, Oana Cazacu, *University of Florida, Shalimar, FL, United States*

11-10 DYNAMIC FAILURE OF MATERIALS & STRUCTURES

11-10-4 Dynamic Failure of Materials and Structures – 4

Convention Center, 259

10:45AM–12:30PM

Session Organizer: Shah Alam, *Texas A&M University-Kingsville, Kingsville, TX, United States*

Session Co-Organizer: Jun Xu, *Beihang University, Beijing, China*

10:45am – Impact Analysis of a Composite Armor System

Technical Paper Publication. IMECE2019-11748

Shah Alam, Mohammad Saquib, *Texas A&M University-Kingsville, Kingsville, TX, United States*

11:06am – Experimental and Numerical Investigation of Dynamic Impact on Universal Breakaway Steel Post

Technical Paper Publication. IMECE2019-12209

Javad Mehrmashhadi, *University of Nebraska-Lincoln, Lincoln, NE, United States*, Mojdeh Asadollahipajouh, *University of Nevada, Las Vegas, Las Vegas, NV, United States*, John Reid, *University of Nebraska-Lincoln, Lincoln, NE, United States*

11:27am – High-Strain-Rate Plastic Deformation and Failure Behavior of Ti-6Al-4V Alloy

Poster Presentation. IMECE2019-12264

Chun Ran, *Beijing Institute of Technology, Beijing, China***11:48am – Impact Mitigation of Recoverable DNA-Inspired Double Helical Metamaterials**

Technical Presentation. IMECE2019-12322

Jianxing Hu, Jun Xu, Sha Yin, *Beihang University, Beijing, China***11-14 MECHANICS OF MATERIALS IN EXTREME ENVIRONMENTS: EXPERIMENTS AND MODELING****11-14-1 Mechanics of Materials in Extreme Environments: Constitutive Modeling of Polymers**

Convention Center, 255D

10:45AM–12:30PM

Session Organizer: Tarek M. Hatem, *British University in Egypt, Cairo Governorate, Egypt***10:45am – A Nonlinear Visco-Hyper Elastic Constitutive Model for Modeling Behavior of Polyurea at Large Deformations**

Technical Paper Publication. IMECE2019-10071

Shank S. Kulkarni, Alireza Tabarraei, *University of North Carolina at Charlotte, Charlotte, NC, United States***11:06am – Constitutive Compressive Behavior of Polyurea with Exposure to Aggressive Marine Environments**

Technical Presentation. IMECE2019-11584

Irine Neba Mforsoh, Arun Shukla, *University of Rhode Island, Kingston, RI, United States***11:27am – Constitutive Behavior of Solid Propellant in Large Deformations: A Physical-Based Modeling Approach**

Technical Presentation. IMECE2019-12516

Chen Yang, *Michigan State University, East Lansing, MI, United States***11:48am – Mechanical Behavior of Thermosetting Polymers Undergoing High Strain-Rate Impact**

Technical Paper Publication. IMECE2019-10459

Peter Sable, John Borg, *Marquette University, Milwaukee, WI, United States***12:09pm – Effect of Bolted Joints on Shock Propagation Across Structures Under Medium Impact Loading**

Poster Paper Publication. IMECE2019-11799

Pouya Shojaei, Mohamed Trabia, Brendan O'Toole, *University of Nevada, Las Vegas, Las Vegas, NV, United States***11-22 COMPUTATIONAL MODELING OF EXTREME EVENTS****11-22-2 Computational Modeling of Extreme Events – 2**

Convention Center, 257

10:45AM–12:30PM

Session Organizer: Joseph Bishop, *Sandia National Laboratories, Albuquerque, NM, United States***10:45am – Richtmyer-Meshkov Instabilities, Modeling, and Strength at Extreme Rates**

Technical Presentation. IMECE2019-12740

Michael Prime, *Los Alamos National Laboratory, Los Alamos, NM, United States***11:06am – Quantifying Damage and Residual Capacity of Structures Subjected to Impulsive Loads**

Technical Presentation. IMECE2019-13797

Lauren Stewart, Rebecca Nylen, *Georgia Institute of Technology, Atlanta, GA, United States***11:27am – Calibration Strategies and Modeling Approaches for Predicting Load-Displacement Behavior and Failure for Multiaxial Loadings in Threaded Fasteners**

Technical Paper Publication. IMECE2019-10521

John Mersch, Jeffrey Smith, George Orient, Peter W. Grimmer, Jhana S. Gearhart, *Sandia National Laboratories, Albuquerque, NM, United States***11:48am – Characteristics Study of Mild-Detonating Fuse and Flexible Linear Shaped Charge for Metal Plate Cutting**

Technical Paper Publication. IMECE2019-11110

Juho Lee, Joosik Lee, Heon Joo Lee, YounKil Kang, *Agency for Defense Development, DaeJeon, Korea (Republic)***12:09pm – Finite Element Microstructural Analysis of Thermal Damage in High Volume Fraction RVE of Particle-Reinforced Refractory Composites**

Technical Paper Publication. IMECE2019-12040

Kamran Makarian, *Villanova University, Ardmore, PA, United States*, Sridhar Santhanam, *Villanova University, Villanova, PA, United States***11-38 PERIDYNAMIC MODELING OF MATERIALS? BEHAVIOR****11-38-1 Peridynamic Modeling of Materials' Behavior I**

Convention Center, 258

10:45AM–12:30PM

Session Organizer: Florin Bobaru, *University of Nebraska-Lincoln, Lincoln, NE, United States*Session Co-Organizer: Erkan Oterkus, *University of Strathclyde, Glasgow, United Kingdom***10:45am – Overall Equilibrium in Coupled FEM-PD Models**

Technical Presentation. IMECE2019-13301

Greta Ongaro, Ugo Galvanetto, Tao Ni, *University of Padova, Padova, Italy*, Pablo Seleson, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*, Mirco Zaccariotto, *University of Padova, Padova, Italy*

11:06am – A Peridynamic Correspondence Model Using Higher-Order Deformation Gradient

Technical Presentation. IMECE2019-12811

WaiLam Chan, Hailong Chen, *University of Kentucky, Lexington, KY, United States*

11:27am – Concurrent Multiscale Coupling of Peridynamic With Finite Element Method for Fracture Simulations

Technical Presentation. IMECE2019-12907

Rui Zhang, Shogo Wada, Clint Nicely, Dong Qian, *University of Texas at Dallas, Richardson, TX, United States*

11:48am – Peridynamic Modelling of Damage and Fracture in Tempered Glass

Technical Presentation. IMECE2019-13934

Ziguang Chen, Yunpeng Liu, *Huazhong University of Science and Technology, Wuhan, China*, Florin Bobaru, *University of Nebraska-Lincoln, Lincoln, NE, United States*

12:09pm – Seamless Coupling of Peridynamics and Finite Element Method in Commercial Software of Finite Element to Solve Elasto-Dynamics Problems

Technical Paper Publication. IMECE2019-10136

Xiaonan Wang, Shank S. Kulkarni, Alireza Tabarraei, *University of North Carolina at Charlotte, Charlotte, NC, United States*

11-47 DRUCKER MEDAL SYMPOSIUM

11-47-1 Drucker Medal Symposium – I

Convention Center, 251E

10:45AM–12:30PM

10:45am – Macroscopic Response, Field Statistics, and Microstructure Evolution in Viscoplastic Polycrystals

Technical Presentation. IMECE2019-12848

Shuvrangs Das, Pedro Ponte Castaneda, *University of Pennsylvania, Philadelphia, PA, United States*

11:06am – Non-Associative Plastic Flow, Second-Order Work, and Instabilities: Part I. Evidence From Experiments and Microscale Simulations

Technical Presentation. IMECE2019-13523

John L. Bassani, *University of Pennsylvania, Philadelphia, PA, United States*

11:27am – Non-Associative Plastic Flow, Second-Order Work, and Instabilities: Part II. Continuum Models and Macroscale Simulations

Technical Presentation. IMECE2019-13526

John L. Bassani, *University of Pennsylvania, Philadelphia, PA, United States*

11:48am – Necking and Failure in Tantalum

Technical Presentation. IMECE2019-13741

Krishanswamy Ravi-Chandar, *University of Texas Austin, Austin, TX, United States*

12:09pm – Understanding the Plastic Behavior of Tungsten From First Principles to Crystal Plasticity

Technical Presentation. IMECE2019-13836

David Cereceda, *Villanova University, Villanova, PA, United States*, Martin Diehl, Franz Roters, Dierk Raabe, *Max-Planck-Institut für Eisenforschung, Dusseldorf, Germany*, Jose Manuel Perlado, *Universidad Politecnica de Madrid, Madrid, Spain*, Jaime Marian, *University of California, Los Angeles, Los Angeles, CA, United States*

11-1 MECHANICS OF SOFT MATERIALS

11-1-2 Polymer Gel-2

Convention Center, 255A

2:00PM–3:45PM

Session Organizer: Yuhang Hu, *Georgia Institute of Technology, Atlanta, GA, United States*

2:00pm – Propagation of Pressure Diffusion Wave and Shear Wave in Gels With Tunable Wave Propagation Properties

Technical Presentation. IMECE2019-12235

Bohan Wang, Yuhang Hu, *Georgia Institute of Technology, Atlanta, GA, United States*

2:21pm – Modelling Stress Softening and Necking Phenomena in Double Network Hydrogels

Technical Paper Publication. IMECE2019-12253

Vahid Morovati, Mohammad Ali Saadat, Roozbeh Dargazany, *Michigan State University, East Lansing, MI, United States*

2:42pm – Poroelastic Effects on Steady State Crack Growth in Polymer Gels Under Plane Stress

Technical Presentation. IMECE2019-13278

Yalin Yu, Chad Landis, Rui Huang, *University of Texas at Austin, Austin, TX, United States*

3:03pm – Modeling Light-Activated Polymeric Gels

Technical Presentation. IMECE2019-13367

Nikola Bosnjak, *New Jersey Institute of Technology, Newark, NJ, United States*, Shawn Chester, *New Jersey Institute of Technology, North Caldwell, NJ, United States*

3:24pm – Muscle-Like Hydrogels by Mechanical Training

Technical Presentation. IMECE2019-12268

Shaoting Lin, Ji Liu, *Massachusetts Institute of Technology, Cambridge, MA, United States*

11-7 SYMPOSIUM ON PLASTICITY, DAMAGE, AND FRACTURE

11-7-5 Novel Experimental Methods

Convention Center, 255E

2:00PM–3:45PM

Session Organizer: Nitin Chandola, *University of Florida, Shalimar, FL, United States*

2:00pm – Analysis of Tube Expansion Using 3D Digital Image Correlation and Numerical Modeling

Technical Paper Publication. IMECE2019-10035

Fethi Abbassi, *American University of the Middle East, Dasman, Kuwait*, **Furqan Ahmad**, *Dhofar University, Salalah, Dhofar, Oman*, **Ali Karrech**, *University of Western Australia, Perth, Australia*, **Md. Saiful Islam**, *Dhofar University, Salalah, Okinawa Japan*

2:21pm – Characterizing Shear Plastic Deformation and Failure Using Solid Bar Torsion Experiment With DIC

Technical Presentation. IMECE2019-12992

Helena (Huiqing) Jin, *Sandia National Laboratories, Livermore, CA, United States*, **Wei-yang Lu**, *Sandia National Laboratories, Pleasanton, CA, United States*, **James Foulk**, **Jake Ostien**, *Sandia National Laboratories, Livermore, CA, United States*

2:42pm – Structural Size Effects in the Transverse Compressive Strength of Unidirectional Fiber Composite Laminates

Technical Presentation. IMECE2019-12669

Jing Xue, **Kedar Kirane**, *Stony Brook University, Stony Brook, NY, United States*

3:03pm – Testing Methodologies for Anisotropic Circumferential Properties of Nuclear Fuel Cladding

Technical Presentation. IMECE2019-13469

Robert S. Hansen, *Utah State University, Logan, UT, United States*, **David Kamerman**, *Idaho National Laboratory, Idaho Falls, ID, United States*, **Ryan Berke**, *Utah State University, Logan, UT, United States*

3:24pm – Seismic Design of Buried Pipelines Using Fracture Mechanics: Past, Present, and Future

Poster Presentation. IMECE2019-13925

Mohammad (Sasan) Iranpour, *Allnorth Consulting Engineers, Vancouver, BC, Canada*

11-14 MECHANICS OF MATERIALS IN EXTREME ENVIRONMENTS: EXPERIMENTS AND MODELING

11-14-2 Mechanics of Materials in Extreme Environments: Dynamic Behavior

Convention Center, 255D

2:00PM–3:45PM

Session Organizer: Owen Kingstedt, *University of Utah, Salt Lake City, UT, United States*

2:00pm – Shock and High Pressure Response of Boron Carbide: Experiments and MD Modeling

Technical Presentation. IMECE2019-10212

Ghatu Subhash, **Amnaya Awasthi**, **Matthew Devries**, *University of Florida, Gainesville, FL, United States*

2:21pm – Constitutive Modeling of Dynamic Strain Aging in HCP Metals

Technical Presentation. IMECE2019-12343

Yooseob Song, **George Voyiadjis**, *Louisiana State University, Baton Rouge, LA, United States*

2:42pm – Comparative Study of the Dynamic Behavior of AA2519 Aluminum Alloy in T6 and T8 Temper Conditions

Technical Paper Publication. IMECE2019-10978

Adewale Olasumboye, *Corning Incorporated, Corning, NY, United States*, **Gbadebo Owolabi**, *Howard University, Washington, DC, United States*, **Olufemi Koya**, *Obafemi Awolowo University, Ile Ife, Osun, Nigeria*, **Horace Whitworth**, **Nadir Yilmaz**, *Howard University, Washington, DC, United States*

3:03pm – Modification to Peierl-Nabarro Dislocation Theory for Very High Strain Rate Deformation of Polycrystalline Metals

Technical Presentation. IMECE2019-10165

Noushad Bin Jamal M, **Lakshmana Rao Chebolu**, *Indian Institute of Technology Madras, Madras, Chennai, Tamilnadu, India*, **Cemal Basaran**, *State University of New York, Buffalo, NY, United States*

11-33 MULTISCALE METHODS FOR SIMULATION AND DESIGN OF MATERIALS INCLUDING MACHINE LEARNING AND OTHER EMERGING METHODS

11-33-1 Multiscale Methods for Simulation and Design of Materials Including Machine Learning and Other Emerging Methods – I

Convention Center, 257

2:00PM–3:45PM

2:00pm – Molecular Simulations You Can Trust and Reproduce: The OpenKIM Framework

Technical Presentation. IMECE2019-12720

Ryan S. Elliott, *University of Minnesota, Saint Paul, MN, United States*, **Ellad B. Tadmor**, *University of Minnesota, Minneapolis, MN, United States*

2:21pm – Coupling CPFEM With Phase Field Modeling from Crack Propagation in Polycrystalline Materials

Technical Presentation. IMECE2019-13952

Somnath Ghosh, Johns Hopkins University, Baltimore, MD, United States

2:42pm – Chemo-Mechanical Coupling and Curing in Process Modeling of Multi-Constituent Materials:

Part 1. Solid-Solid Mixture Model

Technical Presentation. IMECE2019-13954

Arif Masud, University of Illinois at Urbana-Champaign, Urbana, IL, United States

3:03pm – Chemo-Mechanical Coupling and Curing in Process Modeling of Multi-Constituent Materials.

Part 2: Fluid-Solid Mixture Model

Technical Presentation. IMECE2019-13955

Arif Masud, University of Illinois at Urbana-Champaign, Urbana, IL, United States

11-38 PERIDYNAMIC MODELING OF MATERIALS' BEHAVIOR

11-38-2 Peridynamic Modeling of Materials' Behavior II

Convention Center, 258

2:00PM-3:45PM

Session Organizer: Ibrahim Guven, Virginia Commonwealth University, Richmond, VA, United States

Session Co-Organizer: Erdogan Madenci, University of Arizona, Tucson, AZ, United States

2:00pm – Wild Things: Mechanics of Unstable Peridynamic Materials

Technical Presentation. IMECE2019-12831

Stewart Silling, Sandia National Laboratories, Albuquerque, NM, United States

2:21pm – A Semi-Lagrangian, Constitutive Correspondence Modeling Framework for Peridynamics

Technical Presentation. IMECE2019-12841

Masoud Behzadinasab, John Foster, University of Texas at Austin, Austin, TX, United States

2:42pm – Anisotropy in Two-Dimensional and Planar Elasticity Bond-Based Peridynamics

Technical Presentation. IMECE2019-13297

Jeremy Trageser, Pablo Seleson, Oak Ridge National Laboratory, Oak Ridge, TN, United States

3:03pm – Coupling of Dissolution and Fracture for Corrosion Damage Problems

Technical Presentation. IMECE2019-13883

Florin Bobaru, Siavash Jafarzadeh, University of Nebraska-Lincoln, Lincoln, NE, United States, Ziguang Chen, Huazhong University of Science and Technology, Wuhan, China

3:24pm – Peridynamic Reaction-Diffusion Model for Degradation of Bulk-Erosive Polymers

Technical Presentation. IMECE2019-13935

ChenWen Tian, Huazhong University of Science and Technology, Wuhan, Hubei, China, Jiangming Zhao, University of Nebraska-Lincoln, Lincoln, NE, United States, Ziguang Chen, Huazhong University of Science and Technology, Wuhan, China, Florin Bobaru, University of Nebraska-Lincoln, Lincoln, NE, United States

11-47 DRUCKER MEDAL SYMPOSIUM

11-47-2 Drucker Medal Symposium – II

Convention Center, 251E

2:00PM-3:45PM

2:00pm – A Gradient-Damage Theory for Fracture of Quasi-Brittle Materials

Technical Presentation. IMECE2019-12612

Lallit Anand, Massachusetts Institute of Technology, Cambridge, MA, United States

2:21pm – Molecular Dynamic Simulation of Fracture Toughness of LixSi Alloys in Lithium Ion Battery

Technical Presentation. IMECE2019-13528

Jianmin Qu, Tufts University, Medford, MA, United States

2:42pm – Pressure- and Rate-Dependent Yielding of Nano-Phase Segregated Polyurea Copolymer

Technical Presentation. IMECE2019-13559

Kyung-Suk Kim, Brown University, Providence, RI, United States

3:03pm – Quasibrittle Fracture Mechanics With Size Effect: Does It Apply to Fiber Composites?

Technical Presentation. IMECE2019-13739

Zdenek P. Bazant, Gianluca Cusatis, Northwestern University, Evanston, IL, United States, Marco Salviato, University of Washington, Seattle, WA, United States, Weixin Li, John Hopkins University, Baltimore, MD, United States, Abdullah Donmez, Northwestern University, Evanston, IL, United States

11-1 MECHANICS OF SOFT MATERIALS

11-1-3 Biomechanics and Biomaterials

Convention Center, 255A

4:00PM-5:45PM

Session Organizer: Ming Guo, Massachusetts Institute of Technology, Cambridge, MA, United States

4:00pm – Experimental Determination of Layer-Specific Hyperelastic Parameters of Human Descending Thoracic Aortas

Technical Paper Publication. IMECE2019-10667

Isabella Bozzo, Marco Amabili, Prabhakaran Balasubramanian, Ivan Breslavskyi, Giovanni Ferrari, McGill University, Montreal, QC, Canada

4:21pm – Particle Swarm Optimization Method for Hyperelastic Characterization of Soft Tissues
 Technical Paper Publication. IMECE2019-11829
 Mohammadreza Ramzanpour, Mohammad Hosseini Farid, Mariusz Ziejewski, Ghodrat Karami, North Dakota State University, Fargo, ND, United States

4:42pm – A Universal Law for Interaction of 2D Materials With Cellular Membranes
 Technical Presentation. IMECE2019-12391
 Fatemeh Ahmadpoor, Guijin Zou, Huajian Gao, Brown University, Providence, RI, United States

5:03pm – Fatigue Mechanics of Tissue Adhesives
 Technical Presentation. IMECE2019-12589
 Xiang Ni, Jianyu Li, McGill University, Montreal, QC, Canada

5:24pm – Biomechanical Imaging of Cancer Cells and Tumor Development in 3D
 Technical Presentation. IMECE2019-12961
 Ming Guo, Yulong Han, Massachusetts Institute of Technology, Cambridge, MA, United States

11-7 SYMPOSIUM ON PLASTICITY, DAMAGE, AND FRACTURE

11-7-6 Plasticity and Damage
 Convention Center, 255E **4:00PM–5:45PM**

Session Organizer: Oana Cazacu, University of Florida, Shalimar, FL, United States

4:00pm – Experimental and Computational Aspects of Ductile Failure for Structural Engineering Alloys
 Technical Presentation. IMECE2019-12856
 Jake Ostien, James Foulk, Helena (Huiqing) Jin, Andrew Stershic, Brandon Talamini, Sandia National Laboratories, Livermore, CA, United States, Sharlotte L. Kramer, William Scherzinger, Edmundo Corona, Timothy Shelton, Sandia National Laboratories, Albuquerque, NM, United States

4:21pm – Calibration of Ductile Failure Models Accounting for Triaxiality and Lode Angle Effects
 Technical Presentation. IMECE2019-12910
 Edmundo Corona, Sharlotte L. Kramer, Amanda Jones, Sandia National Laboratories, Albuquerque, NM, United States

4:42pm – Finite Element Analysis of the Effect of Porosity on the Plasticity and Damage Behavior of Mg AZ31 and Al 6061 T651 Alloys
 Technical Paper Publication. IMECE2019-10672
 Allen Perkins, Mississippi State University, Mississippi State, MS, United States, Wenhua Yang, Mississippi State University, Starkville, MS, United States, Yucheng Liu, Lei Chen, Caleb Yenusah, Mississippi State University, Mississippi State, MS, United States

5:03pm – Phase Field Modeling of Elastic-Plastic Fracture Mechanics
 Technical Presentation. IMECE2019-13025
 Brandon Talamini, Sandia National Laboratories, Livermore, CA, United States, Michael R. Tupek, Sandia National Laboratories, Albuquerque, NM, United States, Andrew Stershic, Jake Ostien, Sandia National Laboratories, Livermore, CA, United States

5:24pm – A Finite Strain Constitutive Model for Shape Memory Alloys Incorporating Transformation-Induced Plasticity and Two-Way Shape Memory Effect
 Technical Presentation. IMECE2019-13639
 Lei Xu, Texas A&M University, College Station, TX, United States, Theocharis Baxevanis, University of Houston, Houston, TX, United States, Dimitris Lagoudas, Texas A&M University, College Station, TX, United States

11-14 MECHANICS OF MATERIALS IN EXTREME ENVIRONMENTS: EXPERIMENTS AND MODELING

11-14-3 Mechanics of Materials in Extreme Environments: Extreme Temperatures
 Convention Center, 255D **4:00PM–5:45PM**

Session Organizer: Ryan Berke, Utah State University, Logan, UT, United States

4:00pm – Effect of Intra-Build Location, Loading Direction, and Direct Age Hardening Heat-Treatment on Quasi-Static and Dynamic Response of Additively Manufactured Inconel 718 Volume
 Technical Presentation. IMECE2019-12819
 Nadia Kouraytem, Raphael A. Chanut, Timmanee Loveless, Dillon S. Watring, Ashley D. Spear, Owen Kingstedt, University of Utah, Salt Lake City, UT, United States

4:21pm – Characterizing the Impact of Phase-Angle on Thermo-Mechanical Fatigue Behavior
 Technical Presentation. IMECE2019-13349
 Adam Smith, Robert Hansen, Think Thai, Ryan Berke, Utah State University, Logan, UT, United States

4:42pm – Competition of Reflected and Emitted Light in High Temperature DIC Measurement
 Technical Presentation. IMECE2019-13100
 Think Thai, Jonathan Ruesch, Utah State University, Logan, UT, United States, Paul Gradl, NASA Marshall Space Flight Center, Huntsville, AL, United States, Tadd Truscott, Ryan Berke, Utah State University, Logan, UT, United States

5:03pm – Effects of Braking Pressure Distribution on Temperature Field and Stress Field During Braking
 Technical Paper Publication. IMECE2019-10379
 Xianyu Zeng, Beihang University, Beijing, China, Yu Liu, BAIC, Beijing, China, Xiandong Liu, Yingchun Shan, Yue Zhang, Xiaoran Wang, Beihang University, Beijing, China

5:24pm – Delamination Detection in Composite Plates Using Linear and Nonlinear Ultrasonic Guided Waves
 Technical Paper Publication. IMECE2019-10928
 Yanfeng Shen, Mingjing Cen, *Shanghai Jiao Tong University, Shanghai, China*

11-33 MULTISCALE METHODS FOR SIMULATION AND DESIGN OF MATERIALS INCLUDING MACHINE LEARNING AND OTHER EMERGING METHODS

11-33-2 Multiscale Methods for Simulation and Design of Materials Including Machine Learning and Other Emerging Methods – II

Convention Center, 257 **4:00PM–5:45PM**

4:00pm – Data-Driven Multiscale Modeling of Materials Synthesis

Technical Presentation. IMECE2019-13084
 Karel Matous, *University of Notre Dame, Notre Dame, IN, United States*

4:21pm – Machine Learning in the Development and Application of Interatomic Force Fields

Technical Presentation. IMECE2019-12248
 Doyl Dickel, *Mississippi State University, Starkville, MS, United States*, Christopher Barrett, *Mississippi State University, Mississippi State, MS, United States*

4:42pm – Machine Learned Discovery of Materials for Organic Solar Cells

Technical Presentation. IMECE2019-11883
 Joydeep Munshi, Ganesh Balasubramanian, *Lehigh University, Bethlehem, PA, United States*

5:03pm – A Deep Learning Model for Torsional Deformation of Thick Multi-Walled Carbon Nanotubes

Technical Presentation. IMECE2019-13410
 Upendra Yadav, Shashank Pathrudkar, Susanta Ghosh, *Michigan Technological University, Houghton, MI, United States*

11-38 PERIDYNAMIC MODELING OF MATERIALS' BEHAVIOR

11-38-3 Peridynamic Modeling of Materials' Behavior III

Convention Center, 258 **4:00PM–5:45PM**

Session Organizer: Shank S. Kulkarni, *University of North Carolina at Charlotte, Charlotte, NC, United States*

Session Co-Organizer: Pablo Seleson, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*

4:00pm – Dynamic Damage Prediction of Fiber-Reinforced Composite Laminates Using a Peridynamic Model

Technical Presentation. IMECE2019-12487
 Dandan Lyu, Bo Ren, C.T. Wu, *Livermore Software Technology Corporation, Livermore, CA, United States*

4:21pm – Peridynamics Modeling of Damage Nucleation From Forging Flaws in Rotor Components
 Technical Presentation. IMECE2019-12767
 Mohammad Rezaul Karim, Timothy Germann, *Los Alamos National Laboratory, Los Alamos, NM, United States*, Kai Kadau, *Siemens, Charlotte, NC, United States*

4:42pm – A Stochastically Homogenized Peridynamic Model for Intraply Fracture in Fiber-Reinforced Composites
 Technical Presentation. IMECE2019-12830

Javad Mehrmashhadi, Jiangming Zhao, *University of Nebraska-Lincoln, Lincoln, NE, United States*, Ziguang Chen, *Huazhong University of Science and Technology, Wuhan, China*, Florin Bobaru, *University of Nebraska-Lincoln, Lincoln, NE, United States*

5:03pm – Peridynamic Model for Corrosion-induced Fracture in Reinforced Concrete

Technical Presentation. IMECE2019-13899
 Florin Bobaru, Jiangming Zhao, Javad Mehrmashhadi, *University of Nebraska-Lincoln, Lincoln, NE, United States*, Ziguang Chen, *Huazhong University of Science and Technology, Wuhan, China*

5:24pm – Modeling the Creep Damage of P91 Steel Using Peridynamics

Technical Paper Publication. IMECE2019-10069
 Shank S. Kulkarni, Alireza Tabarraei, Xiaonan Wang, *University of North Carolina at Charlotte, Charlotte, NC, United States*

11-39 SYMPOSIUM ON MULTIPHYSICS SIMULATIONS AND EXPERIMENTS FOR SOLIDS

11-39-4 Multiphysics Simulations and Experiments for Solids IV

Convention Center, 251D **4:00PM–5:45PM**

Session Organizer: Assimina Pelegri, *Rutgers, The State University of New Jersey, East Brunswick, NJ, United States*

Session Co-Organizer: Hailong Chen, *University of Kentucky, Lexington, KY, United States*

4:00pm – A Data-Driven Modeling and Simulation Method of Battery Imbalance Regulations

Technical Presentation. IMECE2019-12466
 Chao Li, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*, Assimina Pelegri, *Rutgers, The State University of New Jersey, East Brunswick, NJ, United States*

4:21pm – Adhesion of Two-Dimensional Titanium Carbides (MXenes) to MXenes and Graphene

Technical Presentation. IMECE2019-12535
 Yanxiao Li, Congjie Wei, Chenglin Wu, *Missouri University of Science and Technology, Rolla, MO, United States*

4:42pm – Thermomechanical Modeling of Fracture in Ceramic Nuclear Fuel: A Peridynamics Approach

Technical Presentation. IMECE2019-12684

Hailong Chen, *University of Kentucky, Lexington, KY, United States*, **Benjamin Spencer**, *Idaho National Laboratory, Idaho Falls, ID, United States*

5:03pm – Core/shell Nb₂O₅ Nanoparticles/Carbon on Multi-Walled Carbon Nanotubes as Symmetrical Supercapacitor Electrodes

Poster Presentation. IMECE2019-12743

Davi Marcelo Soares, *Kansas State University, Manhattan, KS, United States*, **Rafael Vicentini**, *University of Campinas, Campinas, SP, Brazil*, **Gurpreet Singh**, *Kansas State University, Manhattan, KS, United States*, **Hudson Zanin**, *University of Campinas, Campinas, SP, Brazil*

5:24pm – Synthesis of Tungsten Oxide and Carbide Composite by Hot Filament Chemical for Aqueous-Based Electrolytes for Supercapacitors

Poster Presentation. IMECE2019-12820

Davi Marcelo Soares, *Kansas State University, Manhattan, KS, United States*, **Rafael Vicentini**, *University of Campinas, Campinas, SP, Brazil*, **Gurpreet Singh**, *Kansas State University, Manhattan, KS, United States*, **Alfredo Carlos Peterlevitz**, **Hudson Zanin**, *University of Campinas, Campinas, SP, Brazil*

11-47 DRUCKER MEDAL SYMPOSIUM

11-47-3 Drucker Medal Symposium – III

Convention Center, 251E

4:00PM–5:45PM

4:00pm – Kinematics of Inelasticity: Validity and Limits of Applicability of $F = FeF_i$

Technical Presentation. IMECE2019-12642

Celia Reina, *University of Pennsylvania, Philadelphia, PA, United States*, **Sergio Conti**, *University of Bonn, Bonn, Germany*

4:21pm – On 2D Discrete Dislocation Plasticity of BCC Crystals

Technical Presentation. IMECE2019-12775

Tarun Katiyar, **Erik Van Der Giessen**, *University of Groningen, Groningen, Netherlands*

4:42pm – Experimental Recovery of the Plastic Distortion from Multiplicative Decomposition of the Deformation Gradient Tensor

Technical Presentation. IMECE2019-12803

Jeffrey Kysar, *Columbia University, New York, NY, United States*

5:03pm – Insights into Plastic Flow Through High Energy X-Ray Diffraction

Technical Presentation. IMECE2019-13059

Armand Beaudoin, *Cornell University, Ithaca, NY, United States*, **Kamalika Chatterjee**, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*, **Darren Pagan**, *Cornell University, Ithaca, NY, United States*, **Paul Shade**, *Air Force Research Laboratory, Wright Patterson Air Force Base, OH, United States*

5:24pm – Finite Deformation Mesoscale Field Dislocation Mechanics

Technical Presentation. IMECE2019-13310

Amit Acharya, *Carnegie Mellon University, Pittsburgh, PA, United States*

WEDNESDAY, NOVEMBER 13

11-1 MECHANICS OF SOFT MATERIALS

11-1-4 Liquid Crystal Elastomer

Convention Center, 257

10:45AM–12:30PM

Session Organizer: Shengqiang Cai, *University of California, San Diego, Cambridge, CA, United States*

10:45am – Liquid Crystal Elastomers

Invited Presentation. IMECE2019-13168

Kaushik Bhattacharya, *California Institute of Technology, Pasadena, CA, United States*

11:27am – Anomalous Inflation of Nematic Elastomer Balloon

Technical Presentation. IMECE2019-12679

Shengqiang Cai, *University of California, San Diego, Cambridge, CA, United States*

11:48am – Extreme Impact Energy Absorption Behaviors of Liquid Crystal Elastomer Structures

Technical Presentation. IMECE2019-13397

Seung-Yeol Jeon, Zeyu Zhu, *Johns Hopkins University, Baltimore, MD, United States*, **Nicholas Traugott**, *University of Colorado, Denver, Westminster, CO, United States*, **Christopher Yakacki**, *University of Colorado Denver, Denver, CO, United States*, **Thao Nguyen, Sung Hoon Kang**, *Johns Hopkins University, Baltimore, MD, United States*

12:09pm – Statistical Field Theory Model for Liquid Crystal Elastomers

Technical Presentation. IMECE2019-13875

Pratik Khandagale, Kaushik Dayal, Carmel Majidi, *Carnegie Mellon University, Pittsburgh, PA, United States*

11-7 SYMPOSIUM ON PLASTICITY, DAMAGE, AND FRACTURE

11-7-7 Plasticity of Heterogeneous Materials

Convention Center, 259

10:45AM–12:30PM

Session Organizer: H. Eliot Fang, *Sandia National Laboratories, Albuquerque, NM, United States*

10:45am – Dynamic Behavior of Cohesionless Granular Materials

Technical Presentation. IMECE2019-12778

Benoit Revil-Baudard, Oana Cazacu, *University of Florida, Shalimar, FL, United States*

11:06am – Mesoscale Modeling of Cementitious Materials

Technical Presentation. IMECE2019-13024

Mei Chandler, Mark Adley, William Lawrimore, Robert Moser, *U.S. Army Engineer Research and Development Center, Vicksburg, MS, United States*

11:27am – Implementation of Granular Micromechanics Based Nonlinear Material Model Into FEA

Technical Presentation. IMECE2019-13632

Rizacan Sarikaya, Anil Misra, *University of Kansas, Lawrence, KS, United States*

11:48am – Quasi-Static and Dynamic Triaxial Compression Simulations of Cor-Tuf Concrete

Technical Presentation. IMECE2019-13697

Micael Edwards, *U.S. Army Engineer Research and Development Center, Vicksburg, MS, United States*

12:09pm – Tensorial Stress-Strain Fields, Large Elastoplasticity, and Friction in Diamond Anvil Cell up to 400 GPa

Technical Presentation. IMECE2019-12736

Mehdi Kamrani, *Iowa State University, Ames, IA, United States*, **Biao Feng**, *Los Alamos National Laboratory, New Mexico, NM, United States*

11-23 MULTI-SCALE COMPUTATIONS IN FLUIDS, STRUCTURES, AND MATERIALS

11-23-1 Multi-Scale Computations 1

Convention Center, 260

10:45AM–12:30PM

Session Organizer: Yozo Mikata, *Fluor, Schenectady, NY, United States*

Session Co-Organizers: Glaucio Paulino, *Georgia Institute of Technology, Urbana, IL, United States*, George Voyiadjis, *Louisiana State University, Baton Rouge, LA, United States*

10:45am – Fatigue Crack Propagation for Semi-Elliptical and Quarter-Elliptical Cracks

Technical Presentation. IMECE2019-12319

Yozo Mikata, *Fluor, Schenectady, NY, United States*

11:06am – Size Effects and Shear Band Simulations Using Implicit Gradient Plasticity for Finite Deformation

Technical Presentation. IMECE2019-12342

George Voyiadjis, Yooseob Song, *Louisiana State University, Baton Rouge, LA, United States*

11:27am – Concurrent Atomistic-Continuum Simulation of the Dislocation Pileup-Induced Phase Transformation in Titanium Under Deformation

Technical Presentation. IMECE2019-13264

Yipeng Peng, Liming Xiong, *Iowa State University, Ames, IA, United States*

11:48am – Error Control in Multi-Physics Computations With Multiresolution Wavelets

Technical Presentation. IMECE2019-13811

Cale Harnish, *University of Notre Dame, Notre Dame, IN, United States*, **Luke Dalessandro**, *University of Washington, Seattle, WA, United States*, **Karel Matous**, *University of Notre Dame, Notre Dame, IN, United States*, **Daniel Livescu**, *Los Alamos National Lab, Los Alamos, NM, United States*

12:09pm – Irving Kirkwood Method for One Dimensional Nanostructures

Technical Presentation. IMECE2019-12676

Smriti Smriti, Ajeet Kumar, *Indian Institute of Technology Delhi, New Delhi, Delhi, India*

11-47 DRUCKER MEDAL SYMPOSIUM**11-47-4 Drucker Medal Symposium- IV**

Convention Center, 258

10:45AM–12:30PM

10:45am – Fracture Toughness of Fibrin Gels

Technical Presentation. IMECE2019-12731

Prashant Purohit, *University of Pennsylvania, Philadelphia, PA, United States***11:06am – Relation Between Blood Pressure and Pulse Wave Velocity for Human Arteries**

Technical Presentation. IMECE2019-12835

Yinji Ma, *Tsinghua University, Beijing, China*, Yonggang Huang, *Northwestern University, Evanston, IL, United States***11:27am – A Study on the Mechanical Properties of Solid Electrolyte Interphase in Lithium-Ion Batteries and Their Influence on the Electrode Surface Stability**

Technical Presentation. IMECE2019-13210

Pradeep Guduru, Insun Yoon, *Brown University, Providence, RI, United States***11:48am – The Effect of Non-Schmid Behaviour of Twinning on Localized Deformation in Mg Alloys**

Technical Presentation. IMECE2019-13590

Kaan Inal, Abhijit Brahme, Alena Gracheva, *University of Waterloo, Waterloo, ON, Canada*, Julie Levesque, *CMQ, Trois-Rivières, QC, Canada***11-1 MECHANICS OF SOFT MATERIALS****11-1-5 Soft Actuating Materials**

Convention Center, 257

2:00PM–3:45PM

Session Organizer: Shengqiang Cai, *University of California, San Diego, Cambridge, CA, United States***2:00pm – Soft Electrets**

Invited Presentation. IMECE2019-13042

Pradeep Sharma, *University of Houston, Houston, TX, United States***2:42pm – Electrically Controlled Liquid Crystal Elastomer Based Soft Tubular Actuator With Multimodal Actuation**

Technical Presentation. IMECE2019-12951

Qiguang He, *University of California, San Diego, La Jolla, CA, United States*, Shengqiang Cai, *University of California, San Diego, Cambridge, CA, United States***3:03pm – Heterogeneous Orientation and Actuation in Liquid Crystal Elastomers**

Technical Presentation. IMECE2019-13116

Aurelie Azoug, Tyler Estrada, Oscar Mallet, Katelynn Harmon, *Oklahoma State University, Stillwater, OK, United States***3:24pm – Programmable and Controllable Electro-Deformation in Liquid Crystal Elastomers**

Technical Presentation. IMECE2019-12623

Yiwei Xu, Yiqing Zhang, Yongzhong Huo, *Fudan University, Shanghai, China***11-23 MULTI-SCALE COMPUTATIONS IN FLUIDS, STRUCTURES, AND MATERIALS****11-23-2 Multi-Scale Computations 2**

Convention Center, 260

2:00PM–3:45PM

Session Organizer: Yozo Mikata, *Fluor, Schenectady, NY, United States*Session Co-Organizer: Glaucio Paulino, *Georgia Institute of Technology, Urbana, IL, United States*, Alireza V. Amirkhizi, *University of Massachusetts Lowell, Lowell, MA, United States***2:00pm – Shear and Longitudinal Waves in 1D Phononic Metamaterials**

Technical Presentation. IMECE2019-12336

Yozo Mikata, *Fluor, Schenectady, NY, United States***2:21pm – Modeling of the Effective Viscosity of Solution Containing CNT Fillers**

Technical Presentation. IMECE2019-13239

Zhongjie Qian, Minoru Taya, *University of Washington, Seattle, WA, United States***2:42pm – Exceptional Points in Phononic Crystals**

Technical Presentation. IMECE2019-13062

Weidi Wang, Alireza Amirkhizi, *University of Massachusetts, Lowell, Lowell, MA, United States***3:03pm – Effective Mechanical Properties of 2D Random Network of Long Fibers**

Technical Presentation. IMECE2019-13268

Soham Mane, Taizhi Jiang, Fardin Khabaz, Revanth Bodepudi, William Sullivan, Brian Korgel, Kenneth Liechti, Roger Bonnecaze, Rui Huang, *University of Texas at Austin, Austin, TX, United States***3:24pm – Mechanical Instability of Multi-Layer Graphene Under Substrate Strain Engineering**

Technical Presentation. IMECE2019-13671

Upendra Yadav, Susanta Ghosh, *Michigan Technological University, Houghton, MI, United States***11-27 MECHANICS OF THIN-FILM AND MULTI-LAYER STRUCTURES****11-27-1 Mechanics of Thin-Film and Multi-Layer Structures**

Convention Center, 355C

2:00PM–3:45PM

2:00pm – Mechanics of Thin Film Wrinkling on Shape Memory Polymers

Technical Presentation. IMECE2019-13916

Jianliang Xiao, *University of Colorado Boulder, Boulder, CO, United States***2:21pm – In Situ Nanomechanical Characterization of Multi-Layer MXene Membranes**

Technical Presentation. IMECE2019-12533

Yanxiao Li, Congjie Wei, Chenglin Wu, *Missouri University of Science and Technology, Rolla, MO, United State*

2:42pm – Instabilities of Thin Films on a Compliant Substrate: Direct Numerical Simulations From Local Surface Wrinkling to Global Buckling
 Technical Presentation. IMECE2019-13197
 Siavash Nikravesh, Yu-Lin Shen, *University of New Mexico, Albuquerque, NM, United States*

3:03pm – Finite Element Modelling of Nickel Aluminide Metallic Coatings
 Technical Presentation. IMECE2019-12480
 Sukwinder Sandhu, Kevin Anderson, *California State Polytech University, Pomona, CA, United States*

3:24pm – Effect of CMAS on Interfacial Crack and Residual Stress in TBC System
 Technical Presentation. IMECE2019-13232
 Qingmin Yu, Dun Guo, *Northwestern Polytechnical University, Xi'an, Shaanxi, China*

11-37 INSTABILITIES IN SOLIDS AND STRUCTURES

11-37-1 IiSS Session 1 Composite Instabilities
 Convention Center, 259 **2:00PM–3:45PM**

Session Organizer: Stavros Gaitanaros, *Johns Hopkins University, Baltimore, MD, United States*

Session Co-Organizer: Stelios Kyriakides, *University of Texas at Austin, Austin, TX, United States*

2:00pm – Macroscopic Instabilities and Domain Formation in Reinforced Elastomers
 Technical Presentation. IMECE2019-12816
 Joshua Furer, Pedro Ponte Castaneda, *University of Pennsylvania, Philadelphia, PA, United States*

2:21pm – Wrinkling to Crinkling Transitions and Curvature Localization in a Magnetoelastic Film-Substrate System
 Technical Presentation. IMECE2019-12999
 Laurence Bodelot, Kostas Danas, *Ecole Polytechnique, Palaiseau, France*

2:42pm – Controlling Pull-In Instabilities in Dielectric Elastomers via the Addition of Filler Particles
 Technical Presentation. IMECE2019-13173
 Victor Lefevre, *Northwestern University, Evanston, IL, United States*, Oscar Lopez-Pamies, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

3:03pm – Micropolar Continuum Approach to Modeling Compressive Failure of Fiber Reinforced Composites
 Technical Presentation. IMECE2019-13363
 Armanj Hasanyan, *California Institute of Technology, Pasadena, CA, United States*, Anthony Waas, *University of Michigan, Ann Arbor, MI, United States*

3:24pm – Modeling the Onset of Macroscopic Fiber Kinking in Soft Composites With Fiber Plasticity
 Technical Presentation. IMECE2019-13508
 Fernanda F. Fontenele, *Cornell University, Ithaca, NY, United States*, Michalis Agoras, *University of Thessaly, Greece, Volos*, Nikolaos Bouklas, *Cornell University, Ithaca, NY, United States*

11-1 MECHANICS OF SOFT MATERIALS

11-1-6 Mechanics of Indentation, Injection, and Cavitation
 Convention Center, 257 **4:00PM–5:45PM**

Session Organizer: Victor Lefevre, *Northwestern University, Evanston, IL, United States*

4:00pm – Role of Collagen-Coil Elasticity on the Cavitation Mechanisms in Soft Material
 Technical Presentation. IMECE2019-13911
 Khandakar Mahmud, Ashfaq Adnan, *University of Texas Arlington, Arlington, TX, United States*

4:21pm – Cavitation Mechanisms in Soft Material: A Multiscale Study
 Technical Presentation. IMECE2019-13918
 Ashfaq Adnan, Fuad Hasan, Khandakar Mahmud, *University of Texas at Arlington, Arlington, TX, United States*, Wonmo Kang, *U.S. Naval Research Lab, Washington, DC, United States*

4:42pm – The Poker-Chip Experiments of Gent and Lindley (1959) Explained
 Technical Presentation. IMECE2019-13582
 Aditya Kumar, Oscar Lopez-Pamies, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

5:03pm – The Mechanics and Physics of Injection in Subcutaneous Tissue: A Finite Strain Poroelasticity Model With Absorption/Diffusion of Chemical Species
 Technical Presentation. IMECE2019-12557
 Ludovic Gil, Michel Jabbour, Nicolas Triantafyllidis, *Ecole Polytechnique, Palaiseau, France*

5:24pm – Investigation of Cyclic and Frequency Nanoindentation Effects in Polydimethylsiloxane
 Technical Paper Publication. IMECE2019-12187
 Hinal Patel, Chen Yang, Howon Lee, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*, Assimina Pelegri, *Rutgers, The State University of New Jersey, East Brunswick, NJ, United States*

11-5 MECHANICS, MODELING AND MANUFACTURING OF SOFT MATERIALS AND SOFT ROBOTS

11-5-1 Mechanics, Modeling, and Manufacturing of Soft Materials and Soft Robots – I

Convention Center, 258 4:00PM–5:45PM

4:00pm – Development of Shape Memory Alloy Actuated Caudal Fin Soft Robotic Fish Propulsion System

Technical Presentation. IMECE2019-11244

Abel Thangawng, Rylan King, Vasil Iakimovitch, Marius Pruessner, Ravi Ramamurti, Jason Geder, *U.S. Naval Research Laboratory, Washington, DC, United States*

4:21pm – Extension-Torsion-Inflation Coupling In Compressible Magnetoelastomeric Tubes With Helical Magnetic Anisotropy

Technical Presentation. IMECE2019-12844

Darius Diogo Barreto, Ajeet Kumar, Sushma Santapuri, *Indian Institute of Technology Delhi, New Delhi, India*

4:42pm – Invited Talk: 3D Printing of Soft Materials and Soft Robots I

Technical Presentation. IMECE2019-12921

Xuanhe Zhao, *Massachusetts Institute of Technology, Cambridge, MA, United States*

5:03pm – Invited Talk: 3D Printing of Soft Materials and Soft Robots II

Technical Presentation. IMECE2019-12924

Xuanhe Zhao, *Massachusetts Institute of Technology, Cambridge, MA, United States*

5:24pm – Self-Folding Structures Using Locally Heated Shape Memory Polymers

Technical Presentation. IMECE2019-13129

Andres Villada, Dana Stamo, Jianliang Xiao, *University of Colorado Boulder, Boulder, CO, United States*

11-23 MULTI-SCALE COMPUTATIONS IN FLUIDS, STRUCTURES, AND MATERIALS

11-23-3 Multi-Scale Computations 3

Convention Center, 260 4:00PM–5:45PM

Session Organizer: Yozo Mikata, *Fluor, Schenectady, NY, United States*

Session Co-Organizers: Glaucio Paulino, *Georgia Institute of Technology, Urbana, IL, United States*, Sourav Banerjee, *University of South Carolina, Columbia, SC, United States*

4:00pm – Effect of Different Distributed Fibers on Effective Material Properties of Unidirectional Composites

Technical Presentation. IMECE2019-11660

Vahid Tavaf, Mohammadsadegh Saadatzi, Sourav Banerjee, *University of South Carolina, Columbia, SC, United States*

4:21pm – In-situ Characterization of Nonlinear Mechanical Behavior of Multilayer MXenes

Technical Presentation. IMECE2019-12538

Yanxiao Li, Congjie Wei, Chenglin Wu, *Missouri University of Science and Technology, Rolla, MO, United States*

4:42pm – A Locally Exact Asymptotic Homogenization Theory for Structures With Periodic Microstructures

Technical Presentation. IMECE2019-12865

Zhelong He, Marek-Jerzy Pindera, *University of Virginia, Charlottesville, VA, United States*

5:03pm – Defect Geometry and Size Govern Strength and Toughness of Diamond Nanowires

Technical Presentation. IMECE2019-13190

Zhaocheng Zhang, Md. Hossain, *University of Delaware, Newark, DE, United States*

5:24pm – Nanomechanics of Osteogenesis Imperfecta Bone using Molecular Dynamics Simulations

Technical Presentation. IMECE2019-13557

Devendra Dubey, *Indian Institute of Technology Delhi, New Delhi, Delhi, India*

11-32 CONGRESS-WIDE SYMPOSIUM ON ADDITIVE MANUFACTURING: FAILURE OF ADDITIVELY MANUFACTURED MATERIALS

11-32-1 Congress-Wide Symposium on Additive Manufacturing: Failure of Additively Manufactured Materials – 1

Convention Center, 355C 4:00PM–5:45PM

4:00pm – Identification of the Mechanical Characteristics of 3D Printed NinjaFlex®

Technical Paper Publication. IMECE2019-11674

Patrick Messimer, Brendan O'Toole, Mohamed Trabia, *University of Nevada, Las Vegas, Las Vegas, NV, United States*

4:21pm – The Effect of Time Delay on 3D Printed Part Strength

Technical Paper Publication. IMECE2019-11790

Jasmine Gay, Marquese A. Pollard, Carl Moore, Jr., Tarik Dickens, Hui Wang, *Florida State University, Tallahassee, FL, United States*

4:42pm – Processing-Structure-Property Relationships of Bisphenol-A-Polycarbonate Samples Prepared by Fused Filament Fabrication

Technical Presentation. IMECE2019-13123

Lichen Fang, Yishu Yan, Ojaswi Agarwal, *Johns Hopkins University, Baltimore, MD, United States*, Jonathan Seppala, *National Institute of Standards and Technology, Gaithersburg, MD, United States*, Kevin Hemker, Sung Hoon Kang, *Johns Hopkins University, Baltimore, MD, United States*

5:03pm – Mesoscale Tensile Testing of Additively-Manufactured Ti-6Al-4V to Track the Evolution of Porosity and Microstructural Heterogeneities

Technical Presentation. IMECE2019-13677

Jake Benzing, Li-Anne Liew, Nikolas Hrabe, Frank DeIRio, National Institute of Standards and Technology, Boulder, CO, United States

5:24pm – Characterization of Thermo-Mechanical Properties of Copper Nano-Particle Infused Acrylonitrile Butadiene Styrene (ABS): 3D Printed Specimens

Technical Presentation. IMECE2019-13912

Viswajit Talluru, Swapnil Suryakan, Ankur Jain, Ashfaq Adnan, University of Texas at Arlington, Arlington, TX, United States

4:42pm – Dependence of Elastic Instability on Different Prescribed Stress Measures During Phase Transformations

Technical Presentation. IMECE2019-12787

Hamed Babaei, Valery I. Levitas, Iowa State University, Ames, IA, United States

5:03pm – Kink Band Analysis in 3D for Anisotropic Plastic Media

Technical Presentation. IMECE2019-12801

Henrik M. Jensen, Aarhus University, Aarhus C, Denmark

5:24pm – Nucleation in the Phase-Field Approach to Brittle Fracture

Technical Presentation. IMECE2019-12953

Oscar Lopez-Pamies, University of Illinois at Urbana-Champaign, Urbana, IL, United States

11-37 INSTABILITIES IN SOLIDS AND STRUCTURES

11-37-2 liSS Session 2 Material Instabilities

Convention Center, 259

4:00PM–5:45PM

Session Organizer: Ryan S. Elliott, University of Minnesota, Saint Paul, MN, United States

Session Co-Organizer: Nicolas Triantafyllidis, Ecole Polytechnique, Palaiseau, France

4:00pm – Revisiting Step Bunching in Crystal Growth: Beyond the Quasistatic Approximation: Part I. Onset of Instability

Technical Presentation. IMECE2019-12681

Laurent Guin, Michel Jabbour, Nicolas Triantafyllidis, Leopold Shaabani-Ardali, Ecole Polytechnique, Palaiseau, France

4:21pm – Revisiting Step Instabilities During Crystal Growth: Beyond the Quasistatic Approximation: Part II. Nonlinear Evolution Laws

Technical Presentation. IMECE2019-13826

Laurent Guin, Lucas Benoit-Marechal, Michel Jabbour, Nicolas Triantafyllidis, Ecole Polytechnique, Palaiseau, France

THURSDAY, NOVEMBER 14

11-1 MECHANICS OF SOFT MATERIALS**11-1-7 Structure and Device****Convention Center, 250B****8:15AM–10:00AM**

Session Organizer: Qiming Wang, *University of Southern California, Los Angeles, CA, United States*

8:15am – Light Weight Sandwich and Composite Beam Analysis Using Improved Higher Order Theory With Consideration of Layer Wise Technique

Technical Presentation. IMECE2019-12397

Temesgen Takele Kasa, *Pukyong National University, Busan, Korea (Republic)*

8:36am – Swelling-Twist-Shearing Interaction in Fiber-Stiffened Hyperelastic Tubes

Technical Presentation. IMECE2019-12625

Thomas Pence, *Michigan State University, East Lansing, MI, United States*, **Hasan Demirkoparan,** *Carnegie Mellon University in Qatar, Doha, Qatar*

8:57am – Mechanical Behavior of Bio-Inspired Surface Architected Soft Substrates

Technical Presentation. IMECE2019-11930

Hessein Ali, Hossein Ebrahimi, Jeremy Stephen, Ryan Horton, Ranajay Ghosh, *University of Central Florida, Orlando, FL, United States*

9:18am – Effects of Orientations on Efficiency of Energy Harvesting from Heart Motion Using Ultrathin Flexible Piezoelectric Devices

Technical Presentation. IMECE2019-12056

Yangyang Zhang, Ji Wang, *Ningbo University, Ningbo, Zhejiang, China*, **Chaofeng Lü,** *Zhejiang University, Hangzhou, China*

9:39am – Programming 3D Architectures Using Kirigami

Technical Presentation. IMECE2019-13503

Yaoye Hong, Jie Yin, *North Carolina State University, Raleigh, NC, United States*

11-2 FUNCTIONAL SOFT COMPOSITES – DESIGN, MECHANICS, AND MANUFACTURING

11-2-1 Design of Functional Soft Composites**Convention Center, 250C****8:15AM–10:00AM**

Session Organizer: H. Jerry Qi, *Georgia Institute of Technology, Atlanta, GA, United States*

8:15am – Current and Future Trends in Soft Materials Mechanics Research: A National Science Foundation Perspective

Technical Presentation. IMECE2019-13431

Siddiq Qidwai, Nakhiah Goulbourne, *National Science Foundation, Alexandria, VA, United States*

8:36am – Current and Future Trends in Soft Materials Mechanics Research: A National Science Foundation Perspective

Technical Presentation. IMECE2019-13459

Siddiq Qidwai, Nakhiah Goulbourne, *National Science Foundation, Alexandria, VA, United States*

8:57am – Symmetry-Breaking Magnetic Actuation for Soft Robotics and Active Metamaterials

Technical Presentation. IMECE2019-13137

Shuai Wu, Qiji Ze, Rundong Zhang, Nan Hu, Yang Cheng, Fengyuan Yang, Ruike Zhao, *Ohio State University, Columbus, OH, United States*

9:18am – Design of Soft Functional Composites Based on Machine Learning

Technical Presentation. IMECE2019-13176

Craig Hamel, H. Jerry Qi, *Georgia Institute of Technology, Atlanta, GA, United States*

9:39am – Nonlinear Bending Deformation of Soft Electrets and Prospects for Engineering Flexoelectricity and Transverse (d31) Piezoelectricity

Technical Presentation. IMECE2019-13121

Amir Hossein Rahmati, Shengyou Yang, *University of Houston, Houston, TX, United States*, **Siegfried Bauer,** *Johannes Kepler University Linz, Linz, Austria*, **Pradeep Sharma,** *University of Houston, Houston, TX, United States*

11-5 MECHANICS, MODELING, AND MANUFACTURING OF SOFT MATERIALS AND SOFT ROBOTS

11-5-2 Mechanics, Modeling, and Manufacturing of Soft Materials and Soft Robots – II

Convention Center, 250D**8:15AM–10:00AM**

8:15am – Modeling Locomotion in Soft Robots using Planar Discrete Elastic Rods

Technical Presentation. IMECE2019-12511

Nathaniel Goldberg, *University of California, Berkeley, Berkeley, CA, United States*, **Xiaonan Huang, Carmel Majidi,** *Carnegie Mellon University, Pittsburgh, PA, United States*, **Alyssa Novelia, Oliver M. O'Reilly,** *University of California, Berkeley, Berkeley, CA, United States*, **Derek A. Paley, William L. Scott,** *University of Maryland, College Park, MD, United States*

8:36am – A General Result for the Magnetoelastic Response of Isotropic Suspensions of Iron and Ferrofluid Particles in Rubber

Technical Presentation. IMECE2019-12952

Oscar Lopez-Pamies, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

8:57am – Ingestible Hydrogel Device

Technical Presentation. IMECE2019-13287

Xinyue Liu, Shaoting Lin, *Massachusetts Institute of Technology, Cambridge, MA, United States*

9:18am – Transparent Soft Robots for Effective Camouflage

Technical Presentation. IMECE2019-13356

Jian Zhu, National University of Singapore, Singapore, Singapore

9:39am – New Continuum Theory and Finite Element Framework for Modeling Magneto-Active Elastomers With Strong Mechano-Magnetic Interaction

Technical Presentation. IMECE2019-13798

Yin Liu, Changyong Cao, Michigan State University, East Lansing, MI, United States

11-12 SYMPOSIUM ON MODELING OF THE FRACTURE, FAILURE, AND FATIGUE IN SOLIDS

11-12-1 Damage and Fatigue in Engineering Applications

Convention Center, 250E

8:15AM–10:00AM

Session Organizer: Ke Li, Schlumberger, Sugar Land, TX, United States

Session Co-Organizer: Huijuan Zhao, Clemson University, Clemson, SC, United States

8:15am – Predicting the Risk of Twist-Off for Rotary Shouldered Threaded Connections With a Statistical Approach

Technical Paper Publication. IMECE2019-11061

Haitao Zhang, Ke Li, Schlumberger, Sugar Land, TX, United States

8:36am – Analysis of CCR Expansion Joints

Technical Paper Publication. IMECE2019-10559

Sanjay Kaul, Rajpalsinh Gohil, Parul Bisharia, Apoorva Roy, Honeywell UOP, Haryana, India

8:57am – Efficiently Predicting Fatigue Life of Drill Collars With Ports Subjected to Variable-Amplitude Bending or Torsional Loads

Technical Paper Publication. IMECE2019-11066

Fei Song, Ke Li, Schlumberger, Sugar Land, TX, United States, Sepand Ossia, Schlumberger, Cambridge, MA, United States

9:18am – Unified Mechanics Theory

Technical Presentation. IMECE2019-10204

Cemal Basaran, State University of New York at Buffalo, Buffalo, NY, United States

9:39am – Damage Mechanics of Lead-Rubber Seismic Isolation Bearings Using the Unified Mechanics Theory

Technical Presentation. IMECE2019-10042

Cemal Basaran, Martin Hernandez, State University of New York at Buffalo, Lima, Peru

11-26 MODELING AND EXPERIMENTS IN NANOMECHANICS AND NANOMATERIALS

11-26-1 Nanomechanics and Nanomaterials 1

Convention Center, 260

8:15AM–10:00AM

Session Organizer: Yozo Mikata, Fluor, Schenectady, NY, United States

Session Co-Organizers: Jeffrey Kysar, Columbia University, New York, NY, United States, Scott Price, GE Research Center, Niskayuna, NY, United States, Changhong Ke, State University of New York at Binghamton, Binghamton, NY, United States

8:15am – Large Deformation of Carbon Nanotubes in 2D and 3D

Technical Presentation. IMECE2019-12335

Yozo Mikata, Fluor, Schenectady, NY, United States

8:36am – Propulsion of Helical FePd Nanorobots Under Applied Magnetic Field

Technical Presentation. IMECE2019-13231

Minoru Taya, University of Washington, Seattle, WA, United States

8:57am – Mechanics and Fabrication of Architected Composite Lattice Materials

Technical Presentation. IMECE2019-12305

Richard L. Li, Shruti Rastogi, Jeffrey Kysar, Columbia University, New York, NY, United States

9:18am – Bending and Interlayer Shear Moduli of Ultrathin Boron Nitride Nanosheets

Technical Presentation. IMECE2019-13547

Wenyang Qu, State University of New York at Binghamton, Binghamton, NY, United States, Soumendu Bagchi, University of Illinois at Urbana-Champaign, Urbana, IL, United States, Xiaoming Chen, Xi'an Jiaotong University, Xi'an, Shaanxi, China, Huck Beng Chew, University of Illinois at Urbana-Champaign, Urbana, IL, United States, Changhong Ke, State University of New York at Binghamton, Binghamton, NY, United States

9:39am – Nanomechanics of Bone

Technical Presentation. IMECE2019-13890

Iwona Jasiuk, University of Illinois at Urbana-Champaign, Urbana, IL, United States

11-35 MECHANICS AND DESIGN OF CELLULAR MATERIALS

11-35-1 Mechanics and Design of Cellular Materials

Convention Center, 250F

8:15AM–10:00AM

Session Organizer: Muhammad Ali, Ohio University, Athens, OH, United States

8:15am – Functionally Graded Cellular Core Cross Tube: Finite Element Study

Technical Paper Publication. IMECE2019-10752

Muhammad Ali, Eboreime Ohioma, Khairul Alam, Sean Jensen, Ohio University

8:36am – Two-Eimensional Networks of Long Fibers: Structural and Elastic Properties

Technical Presentation. IMECE2019-13348
Soham Mane, Rui Huang, *University of Texas at Austin, Austin, TX, United States*

8:57am – Microstructure-Controlled Damage Mechanisms in Elastomer-Matrix Syntactic Foams: Quantitative 3D Analyses From In Situ XCT Experiments

Technical Presentation. IMECE2019-13658
Brendan Croom, *Air Force Research Laboratory, Dayton, OH, United States*, **Helena (Huiqing) Jin**, *Sandia National Laboratories, Livermore, CA, United States*, **Judith Brown, Jay Carroll, Kevin Long**, *Sandia National Laboratories, Albuquerque, NM, United States*, **Xiaodong Li**, *University of Virginia, Charlottesville, VA, United States*

9:18am – Results From a Broad Survey of Common Truss-Lattice Materials

Technical Presentation. IMECE2019-13898
Andrew Gross, *University of South Carolina, Columbia, SC, United States*

9:39am – Dynamic Behavior of Discretely Bonded Cross Tube With Functionally Graded Cellular Structure

Technical Paper Publication. IMECE2019-10753
Muhammad Ali, Eboreime Ohioma, Khairul Alam, Sean Jenson, *Ohio University, Athens, OH, United States*

11-36 MULTIFUNCTIONAL AND MICRO/NANO-STRUCTURED MATERIALS: MODELING AND CHARACTERIZATION

11-36-1 Multifunctional and Micro/Nano-Structured Materials: Modeling and Characterization (I)
Convention Center, 258 8:15AM–10:00AM

Session Organizer: Xin-Lin Gao, *Southern Methodist University, DALLAS, TX, United States*

Session Co-Organizer: David Valliyappan Natarajan, *Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia*

8:15am – Boundary Integral Equations Method in the Coupled Theory of Thermoelasticity for Porous Materials

Technical Paper Publication. IMECE2019-10367
Merab Svanadze, *Ilia State University, Tbilisi, Georgia*

8:36am – A New Bernoulli-Euler Beam Model Based on a Reformulated Strain Gradient Elasticity Theory

Technical Presentation. IMECE2019-11094
Gongye Zhang, Xin-Lin Gao, *Southern Methodist University, Dallas, TX, United States*

8:57am – On Multiple Inhomogeneities in Plane Elasticity

Technical Paper Publication. IMECE2019-12051
Elie Honein, *University of Balamand, Tripoli, Lebanon*, **Tony Honein**, *Avanus Corporation, Ogden, UT, United States*, **Michel Najjar**, *Avanus Corporation, Minden, NV, United States*, **Habib Rai**, *University of Balamand, Tripoli, Lebanon*

9:18am – Two Extended Versions of Hill’s Lemma Based on the Couple Stress Theory

Technical Presentation. IMECE2019-11528
Ahmad Gad, Xin-Lin Gao, *Southern Methodist University, Dallas, TX, United States*

9:39am – Atomistic Measurement of the Adhesion Strength at the Ice-Graphite Interface

Technical Presentation. IMECE2019-13838
Hang Li, Yipeng Peng, Liming Xiong, *Iowa State University, Ames, IA, United States*

11-37 INSTABILITIES IN SOLIDS AND STRUCTURES

11-37-3 liSS Session 3 Material and Structural Instabilities

Convention Center, 355C 8:15AM–10:00AM

Session Organizer: Oscar Lopez-Pamies, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

Session Co-Organizer: Kostas Danas, *Ecole Polytechnique, Palaiseau, France*

8:15am – Transition of Collapse Modes in Tubular Structures and Its Applications

Technical Presentation. IMECE2019-10168
X. Allan Zhong, *Halliburton Energy Services, Carrollton, TX, United States*

8:36am – 3-Segment Arch-Like Strip Under External Pressure

Technical Presentation. IMECE2019-12301
Judah Ari-Gur, *Western Michigan University, Kalamazoo, MI, United States*

8:57am – Effect of Phase Transformation on the Stability of Pseudoelastic NiTi Tubes Under Bending

Technical Presentation. IMECE2019-12636
Karlos Kazinakis, Stelios Kyriakides, *University of Texas at Austin, Austin, TX, United States*

9:18am – Localization of Deformation in a Beam on a Nonlinear Foundation Using Group Theory and Path-Following Bifurcation Methods

Technical Presentation. IMECE2019-13019
Shrinidhi Shrikant Pandurangi, *Cornell University, Ithaca, NY, United States*, **Ryan S. Elliott**, *University of Minnesota, Saint Paul, MN, United States*, **Timothy J. Healey**, *Cornell University, Ithaca, NY, United States*, **Nicolas Triantafyllidis**, *Ecole Polytechnique, Palaiseau, France*

9:39am – Constitutive Modeling of Shape Memory Alloys and Simulation of Structural Response

Technical Presentation. IMECE2019-13452
Mohammed Alsawalhi, Chad Landis, *University of Texas at Austin, Austin, TX, United States*

11-1 MECHANICS OF SOFT MATERIALS

11-1-8 Constitutive Modelling

Convention Center, 250B

10:15AM–12:00PM

Session Organizer: Qiguang He, *University of California, San Diego, La Jolla, CA, United States*

10:15am – Thermodynamics-Based Stability Criteria and Constitutive Modeling of Isotropic Hyperelastic Solids

Technical Presentation. IMECE2019-10211

Ghatu Subhash, Kshitiz Upadhyay, Douglas Spearot, *University of Florida, Gainesville, FL, United States*

10:36am – A Simple Explicit Homogenization Solution for the Macroscopic Elastic Response of Isotropic Porous Elastomers

Technical Presentation. IMECE2019-13172

Victor Lefevre, *Northwestern University, Evanston, IL, United States*, Bhavesh Shrimali, Oscar Lopez-Pamies, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

10:57am – Linear Elastic Properties of Swollen Elastomers Undergoing Large Deformations

Technical Presentation. IMECE2019-12917

Dai Okumura, Hironori Kawabata, *Nagoya University, Nagoya, Japan*, Shawn Chester, *New Jersey Institute of Technology, North Caldwell, NJ, United States*

11:18am – Coupled Magneto-Mechanical Response of NdFeB Particle-Filled, Viscoelastic Elastomers

Technical Presentation. IMECE2019-12998

Dipayan Mukherjee, Laurence Bodelot, Kostas Danas, *Ecole Polytechnique, Palaiseau, France*

11:39am – Extreme Enhancement of the Nonlinear Elastic Response of Elastomer Nanoparticulate Composites via Interphases

Technical Presentation. IMECE2019-12955

Oscar Lopez-Pamies, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

11-2 FUNCTIONAL SOFT COMPOSITES – DESIGN, MECHANICS, AND MANUFACTURING

11-2-2 Fabrication and Processing of Soft Composites

Convention Center, 250C

10:15AM–12:00PM

Session Organizer: Ruike Zhao, *Ohio State University, Columbus, OH, United States*

10:15am – Digital Light Processing 3D Additive Manufacturing for Soft Functional Composites and 4D Printing

Technical Presentation Part I. IMECE2019-13527

Xiao Kuang, H. Jerry Qi, *Georgia Institute of Technology, Atlanta, GA, United States*

10:36am – Digital Light Processing 3D Additive Manufacturing for Soft Functional Composites and 4D Printing Part II

Technical Presentation. IMECE2019-13529

Xiao Kuang, H. Jerry Qi, *Georgia Institute of Technology, Atlanta, GA, United States*

10:57am – Graphene Crinkles and Their Potential for Soft-Composites

Technical Presentation. IMECE2019-13536

Mrityunjay Kothari, *Massachusetts Institute of Technology, Cambridge, MA, United States*, Kyung-Suk Kim, *Brown University, Providence, RI, United States*

11:18am – Soft Matter Composites With Programmable Liquid Metal Microstructures for Tunable Mechanical and Thermal Properties

Technical Presentation. IMECE2019-13510

A.B.M Tahidul Haque, Ravi Tutika, Michael D. Bartlett, *Iowa State University, Ames, IA, United States*

11:39am – Electro-Mechanical Behavior of Smart Sandwich Plates With Porous Core and Graphene-Reinforced Nanocomposite Layers

Technical Paper Publication. IMECE2019-10796

Kamran Behdinan, Rasool Moradi-Dastjerdi, *University of Toronto, Toronto, ON, Canada*

11-5 MECHANICS, MODELING, AND MANUFACTURING OF SOFT MATERIALS AND SOFT ROBOTS

11-5-3 Mechanics, Modeling, and Manufacturing of Soft Materials and Soft Robots – III

Convention Center, 250D

10:15AM–12:00PM

10:15am – Deformation Behavior of Hydrogel/Shape Memory Polymer and Its Application in Designing a Soft Actuator With new Mechanism

Technical Presentation. IMECE2019-13048

Zishun Liu, Zhengjie Li, Rong Huang, *Xi'an Jiaotong University, Xi'an, China*

10:36am – Smart, Fast-Responsive, Soft Gripper With Self-Powered Tribo-Skins

Technical Presentation. IMECE2019-13416

Shoue Chen, Yaokun Pang, Changyong Cao, *Michigan State University, East Lansing, MI, United States*

10:57am – Mechanics Guided Design of High-Performance Soft Robots

Technical Presentation. IMECE2019-13433

Jie Yin, *North Carolina State University, Raleigh, NC, United States*

11:18am – A Biomimetic Robotic Jellyfish Based on Shape Memory Alloy Springs

Technical Presentation. IMECE2019-13519

Mohammad A. Kazemi-Lari, Anthony D. Dostine, Jiadi Zhang, Logan P. Bergeron, Alan S. Wineman, John A. Shaw, *University of Michigan, Ann Arbor*

11:39am – Predictive Failure Modeling of Anomalous Soft Tissues: A Fractional Calculus Framework
 Technical Presentation. IMECE2019-13533
 Eduardo A. Barros de Moraes, Jorge Suzuki, Mohsen Zayernouri, *Michigan State University, East Lansing, MI, United States*

11-12 SYMPOSIUM ON MODELING OF THE FRACTURE, FAILURE, AND FATIGUE IN SOLIDS

11-12-2 Atomistic Scale Crack Nucleation and Propagation Modeling
 Convention Center, 250E **10:15AM–12:00PM**

Session Organizer: Alireza Tabarraei, *University of North Carolina at Charlotte, Charlotte, NC, United States*

Session Co-Organizers: Md. Imrul Reza Shishir, *University of North Carolina at Charlotte, Charlotte, NC, United States*,
 Huijuan Zhao, *Clemson University, Clemson, SC, United States*

10:15am – Crack Nucleation and Rate-Dependent Fracture of Transient Networks

Technical Presentation. IMECE2019-13342
 Tong Shen, Franck Vernerey, *University of Colorado Boulder, Boulder, CO, United States*

10:36am – Analysis of Atomistic J-Integral in Homogeneous and Heterogeneous Materials

Technical Presentation. IMECE2019-13195
 Zhaocheng Zhang, Md. Hossain, *University of Delaware, Newark, DE, United States*

10:57am – MD-Phase-Field Interpretation of Anisotropic Fracture Behavior of MXene

Technical Presentation. IMECE2019-12539
 Congjie Wei, Chenglin Wu, *Missouri University of Science and Technology, Rolla, MO, United States*

11:18am – A Molecular Dynamic Study of Nano-Fracture of C3N

Technical Paper Publication. IMECE2019-11543
 Md. Imrul Reza Shishir, Alireza Tabarraei, *University of North Carolina at Charlotte, Charlotte, NC, United States*

11-19 MULTISCALE MODELS AND EXPERIMENTAL TECHNIQUES FOR COMPOSITE MATERIALS AND STRUCTURES

11-19-1 Multiscale Models and Experimental Techniques for Composite Materials and Structures
 Convention Center, 250F **10:15AM–12:00PM**

10:15am – Localization, Delocalization, and Compression Fracture in Externally Pressurized Thick Cross-Ply (Very) Long Cylindrical Shells with Material Nonlinearity: A Multi-Scale and Multi-Physics Analysis
 Technical Presentation. IMECE2019-10322
 Reaz Chaudhuri, *University of Utah, Salt Lake City, UT, United States*

10:36am – A Parallelized Generalized Method of Cells Framework for Multiscale Studies of Composite Materials
 Technical Paper Publication. IMECE2019-11529
 Ashwin Rai, Travis Skinner, Aditi Chattopadhyay, *Arizona State University, Tempe, AZ, United States*

10:57am – Guidelines and Limitations of the Compact Compression Specimen
 Technical Paper Publication. IMECE2019-11713
 David Plechaty, Kevin Carpenter, John Parmigiani, *Oregon State University, Corvallis, OR, United States*

11:18am – A Multiscale Nonlocal Fiber Kinking Model for Carbon-Fiber Composites Under Compression Based on the Symmetric Eigendeformation-Based Homogenization Method
 Technical Presentation. IMECE2019-12893
 Ido Meshi, Caglar Oskay, *Vanderbilt University, Nashville, TN, United States*

11:39am – Refined Cohesive Micromechanics for Multi-Site Progressive Damage and Crack Growth
 Technical Presentation. IMECE2019-13779
 Ido Meshi, *Vanderbilt University, Nashville, TN, United States*,
 Rami Haj-Ali, *Tel-Aviv University, Tel-Aviv, Israel*

11-26 MODELING AND EXPERIMENTS IN NANOMECHANICS AND NANOMATERIALS

11-26-2 Nanomechanics and Nanomaterials 2
 Convention Center, 260 **10:15AM–12:00PM**

Session Organizer: Yozo Mikata, *Fluor, Schenectady, NY, United States*

Session Co-Organizers: Jeffrey Kysar, *Columbia University, New York, NY, United States*, Iwona Jasiuk, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

10:15am – Thermionic Emitter Lifetime Limiting Mechanisms and Predicted Detection

Technical Presentation. IMECE2019-12314
 Scott Price, *GE Research States*, Yozo Mikata, *Fluor*

10:36am – Thermal-Induced Irreversible Straining of Ultrathin Boron Nitride Nanosheets

Technical Presentation. IMECE2019-12277

Wenyang Qu, Feilin Gou, *State University of New York at Binghamton, Binghamton, NY, United States*, Xiaoming Chen, *Xi'an Jiaotong University, Xi'an, Shaanxi, China*, Changhong Ke, *State University of New York at Binghamton, Binghamton, NY, United States*

10:57am – Nano Adhesive Contact Analysis for Wavy Surfaces With Van Der Waals Force

Technical Presentation. IMECE2019-12315

Hideo Koguchi, *Niigata Institute of Technology, Nagaoka, Niigata, Japan*

11:18am – Mechanical Behavior of Hydrogen-Terminated Amorphous Silicon Particles

Technical Presentation. IMECE2019-13138

Taizhi Jiang, Raluca Gearba, *University of Texas at Austin, Austin, TX, United States*, Revanth Bodepudi, *Schlumberger, Houston, TX, United States*, Brian Korgel, Kenneth Liechti, *University of Texas at Austin, Austin, TX, United States*

11:39am – Elastic Behavior of a Germanium Nanowire Network

Technical Presentation. IMECE2019-13141

Revanth Bodepudi, *Schlumberger, Houston, TX, United States*, William Sullivan, Brian Korgel, Benny Freeman, Kenneth Liechti, *University of Texas at Austin, Austin, TX, United States*

11-36 MULTIFUNCTIONAL AND MICRO/NANO-STRUCTURED MATERIALS: MODELING AND CHARACTERIZATION

11-36-2 Multifunctional and Micro/Nano-Structured Materials: Modeling and Characterization (II)

Convention Center, 258 **10:15AM-12:00PM**

Session Organizer: Xin-Lin Gao, *Southern Methodist University, Dallas, TX, United States*

Session Co-Organizer: Vinu Unnikrishnan, *West Texas A&M University, Canyon, TX, United States*

10:15am – Macro-Scale Geometric Voids to Alter Stress Wave Propagation in Solids

Technical Paper Publication. IMECE2019-10765

C.S. Florio, *U.S. Army Combat Capabilities Development Command - Armaments Center, Picatinny Arsenal, NJ, United States*

10:36am – Architected Hollow Sphere Foams for Simultaneously Tunable Noise and Vibration

Technical Presentation. IMECE2019-10443

Yanyu Chen, *University of Louisville, Louisville, KY, United States*

10:57am – Ballistic Penetration Performance of a Unidirectional Woven Basalt Fiber Laminated Protective Armor

Technical Paper Publication. IMECE2019-11162

David Valliyappan Natarajan, *Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia*, Zurina Ahmad, Rozaiman Aziz Mohd., *Universiti Teknologi MARA, Permatang Pauh, Malaysia*, Rafiq Nor Mohd., Syafiq Manaf, Raja Sundram, *Corroserv (M) Sdn. Bhd., Kuantan, Pahang, Malaysia*

11:18am – Modeling of Roma Plastilina # 1 Ballistic Clay in the Column-Drop Test by Incorporating the Coupled Strain Rate and Temperature Effects

Technical Presentation. IMECE2019-12458

Ahmad Gad, Xin-Lin Gao, *Southern Methodist University, Dallas, TX, United States*

11:39am – Defect Induced Variabilities in Thermal Conductivity of Nano Structures

Technical Paper Publication. IMECE2019-11654

Sushan Nakarmi, *University of Alabama, Tuscaloosa, AL, United States*, Vinu Unnikrishnan, *West Texas A&M University, Canyon, TX, United States*

11-37 INSTABILITIES IN SOLIDS AND STRUCTURES

11-37-4 IISS Session 4 Architected Materials Instabilities

Convention Center, 355C **10:15AM-12:00PM**

Session Organizer: Dai Okumura, *Nagoya University, Nagoya, Japan*

Session Co-Organizer: Nikolaos Bouklas, *Cornell University, Ithaca, NY, United States*

10:15am – Continuum Modeling of Crushing of Open-Cell Foams Under Multiaxial Compression

Technical Presentation. IMECE2019-12672

Chenglin Yang, Stelios Kyriakides, *University of Texas at Austin, Austin, TX, United States*

10:36am – Microscopic and Macroscopic Instabilities in Polymeric Foams

Technical Presentation. IMECE2019-13258

Shengzhi Luan, Stavros Gaitanaros, *Johns Hopkins University, Baltimore, MD, United States*

10:57am – Asymptotic Analysis of Sponge Spicules' Sensitivity to Geometric Imperfection Regarding to Buckling Instability

Technical Presentation. IMECE2019-12909

Wenqiang Fang, Michael Monn, Haneesh Kesari, *Brown University, Providence, RI, United States*

11:18am – Buckling Instabilities, Global and Local Response in Collagen Scaffolds Used for Tissue Engineering

Technical Presentation. IMECE2019-13649
Byumsu Kim, Jill Middendorf, Nicole Diamantides, Itai Cohen, Nikolaos Bouklas, Lawrence J. Bonassar, Cornell University, Ithaca, NY, United States

11:39am – Tunable Bistable Behavior of a Clamped Elastic Beam

Technical Presentation. IMECE2019-13848
Guangchao Wan, Zi Chen, Dartmouth College, Hanover, NH, United States, Yin Liu, Wuhan University, Wuhan, China, Zhe Xu, Congran Jin, Lin Dong, Xiaomin Han, John X.J. Zhang, Dartmouth College, Hanover, NH, United States

11-1 MECHANICS OF SOFT MATERIALS

11-1-9 Aging and Damaging

Convention Center, 250B 2:00PM–3:45PM

Session Organizer: Shaoting Lin, Massachusetts Institute of Technology, Cambridge, MA, United States

2:00pm – A Micro-Mechanical Approach to Model Thermal-Induced Aging of Adhesives

Technical Presentation. IMECE2019-11771
Hamid Mohammadi, Roozbeh Dargazany, Michigan State University, East Lansing, MI, United States

2:21pm – A Variational Phase-Field Model for Fracture in Soft Elastic Materials With Surface Stress

Technical Presentation. IMECE2019-13518
Bin Li, Nikolaos Bouklas, Cornell University, Ithaca, NY, United States

2:42pm – Hydrolytic Aging in Rubber-Like Materials: A Micro-Mechanical Approach to Modeling

Technical Paper Publication. IMECE2019-11873
Amir Bahrololoumi, Roozbeh Dargazany, Michigan State University, East Lansing, MI, United States

3:03pm – A Study of Thermal Aging of MS Polymer Adhesives

Technical Presentation. IMECE2019-13079
Sharif Alazhary, Michigan State University, East Lansing, MI, United States, O.N. Omid, Michigan State University, Madison, WI, United States

3:24pm – Modelling Damage Accumulation During Cyclic Loading in Elastomeric Gels With Interpenetrating Networks

Technical Paper Publication. IMECE2019-11931
Vahid Morovati, Roozbeh Dargazany, Michigan State University, East Lansing, MI, United States

11-3 3D PRINTED SOFT MATERIALS

11-3-1 3D Printing of Functional Materials and Composites

Convention Center, 250C 2:00PM–3:45PM

Session Organizer: Howon Lee, Rutgers, The State University of New Jersey, Piscataway, NJ, United States

Session Co-Organizers: Kai Yu, University of Colorado Denver, Denver, CO, United States, Sung Hoon Kang, Johns Hopkins University, Baltimore, MD, United States, Qiming Wang, University of Southern California, Los Angeles, CA, United States

2:00pm – Mechanics of Robotic Matter

Technical Presentation. IMECE2019-12698
Chiara Daraio, California Institute of Technology, Pasadena, CA, United States

2:42pm – Additive Manufacturing of Healable, Memorizable, and Transformable Lattice Structures

Technical Presentation. IMECE2019-13280
Kun Hao Yu, Qiming Wang, University of Southern California, Los Angeles, CA, United States

2:57pm – Recyclable 3D Printing of Thermosetting Photopolymers

Technical Presentation. IMECE2019-12815
Chaoqian Luo, Kai Yu, University of Colorado Denver, Denver, CO, United States

3:12pm – Multifunctional Additively Manufactured Structures

Technical Presentation. IMECE2019-13842
George Youssef, Nha Uyen Huynh, Jordan Smilo, San Diego State University, San Diego, CA, United States, Aryan Blourchian, Raytheon, El Segundo, CA, United States

3:27pm – Conformal 3D Printing of a Soft Pressure Sensor

Technical Presentation. IMECE2019-12969
Faez Alkadi, Jazan University, Jazan, Saudi Arabia, Md. Omar Faruk Emon, Daryl Philip, University of Akron, Akron, OH, United States, Kyung-Chang Lee, Pukyong National University, Busan, Korea (Republic), Jae-Won Choi, University of Akron, Akron, OH, United States

11-5 MECHANICS, MODELING, AND MANUFACTURING OF SOFT MATERIALS AND SOFT ROBOTS

11-5-4 Mechanics, Modeling, and Manufacturing of Soft Materials and Soft Robots – IV

Convention Center, 250D 2:00PM–3:45PM

2:00pm – Using Emulsion-Gloves Integrated With Tiny-Sensor Array to Align Pulse Signal Data With Doctor's Intuitive Diagnosis

Technical Presentation. IMECE2019-13222
Xinxin Li, Shanghai Institute of Micro Technology, Chinese Academy of Sciences, Shanghai, China

2:21pm – Reconfigurable Biomimetic Soft Robots

Technical Presentation. IMECE2019-13351

Bingzhe Xu, *City University of Hongkong, Kowloon, Hong Kong*, **Zi Chen**, *Dartmouth College, Hanover, NH, United States*, **Yuwei Hu**, *National University of Singapore, Singapore, Singapore*, **Yiming Luo**, *Hubei University of Technology, Wuhan, China*, **Chia-hung Chen**, *National University of Singapore, Singapore, Singapore*, **Peng Shi**, *City University of Hongkong, Hongkong, Hong Kong*

2:42pm – Modeling of Fiber-Reinforced Polymeric Gels

Technical Presentation. IMECE2019-13368

Nikola Bosnjak, *New Jersey Institute of Technology, Newark, NJ, United States*, **Shuolun Wang**, *University of Notre Dame, Notre Dame, IN, United States*, **Daehoon Han**, **Howon Lee**, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*, **Shawn Chester**, *New Jersey Institute of Technology, North Caldwell, NJ, United States*

3:03pm – Fabrication and Characterization of Multifunctional Sea-Urchin-Like Micromotor

Technical Presentation. IMECE2019-13655

Yaosheng Zhang, **Junghoon Yeom**, *Michigan State University, East Lansing, MI, United States*

3:24pm – A Phase-Field Based Machine Learning Framework for Damage Prediction in Standard-to-Soft Materials

Technical Presentation. IMECE2019-13690

Hadi Salehi, **Eduardo A. Barros de Moraes**, **Mohsen Zayernouri**, *Michigan State University, East Lansing, MI, United States*

11-12 SYMPOSIUM ON MODELING OF THE FRACTURE, FAILURE AND FATIGUE IN SOLIDS

11-12-3 Multiscale Fracture and Fatigue Modeling in Materials

Convention Center, 250E

2:00PM–3:45PM

2:00pm – Strain Rate Effects on Interfacial Microarchitectural Mechanical Locking in Thermoplastic Composites

Technical Presentation. IMECE2019-13846

Anmol Kothari, **Hongseok Choi**, **Huijuan Zhao**, **Paul Joseph**, **Gang Li**, *Clemson University, Clemson, SC, United States*

2:21pm – A Numerical Homogenization-Based Phase-Field Fracture Modeling for Linear Elastic Heterogeneous Porous Media

Technical Presentation. IMECE2019-13488

Bang He, **Pania Newell**, *University of Utah, Salt Lake City, UT, United States*

2:42pm – Computational Fracture Mechanics Modeling of Creep-Fatigue Crack Growth in a Nickel-Base Superalloy

Technical Presentation. IMECE2019-12987

Joshua Pribe, *Purdue University, Lafayette, IN, United States*, **Halsey Ostergaard**, **Jamie J. Kruzic**, *University of New South Wales, Sydney, New South Wales, Australia*, **Thomas Siegmund**, *Purdue University, West Lafayette, IN, United States*

3:03pm – Determination of Representative Volume Elements for Small Cracks Using Finite-Element Modeling Combined With Machine Learning

Technical Presentation. IMECE2019-13161

Karen J. DeMille, **Ashley D. Spear**, *University of Utah, Salt Lake City, UT, United States*

3:24pm – Multiscale Modeling of Twinning and Detwinning Behavior of HCP Polycrystals During Cyclic Loadings

Technical Presentation. IMECE2019-12700

Mohammadreza Yaghoobi, **Aeriel Murphy-Leonard**, **Veera Sundararaghavan**, **John Allison**, *University of Michigan, Ann Arbor, MI, United States*

11-26 MODELING AND EXPERIMENTS IN NANOMECHANICS AND NANOMATERIALS

11-26-3 Nanomechanics and Nanomaterials 3

Convention Center, 260

2:00PM–3:45PM

Session Organizer: **Yozo Mikata**, *Fluor, Schenectady, NY, United States*

Session Co-Organizers: **Jeffrey Kysar**, *Columbia University, New York, NY, United States*, **Reaz Chaudhuri**, *University of Utah, Salt Lake City, UT, United States*, **Hideo Koguchi**, *Niigata Institute of Technology, Nagaoka, Niigata, Japan*

2:00pm – Crack Path Instabilities in Mono-Crystalline BCC Transition Metals

Technical Presentation. IMECE2019-10320

Reaz Chaudhuri, *University of Utah, Salt Lake City, UT, United States*

2:21pm – Nanomechanical Characterization of Boron Nitride Nanotube – Ceramic Interfaces

Technical Presentation. IMECE2019-12278

Chenglin Yi, **Christopher Dmuchowski**, **Feilin Gou**, **Changhong Ke**, *State University of New York at Binghamton, Binghamton, NY, United States*

2:42pm – In Situ Raman Micromechanical Measurements of Electrospun Nanotube Polymer Nanocomposite Fibers

Technical Presentation. IMECE2019-12318

Ohood Q. Alsmairat, **Feilin Gou**, **Changhong Ke**, *State University of New York at Binghamton, Binghamton, NY, United States*

3:03pm – Impact Resistance Comparisons of Cement-Based Composites Reinforced by Multi-Walled and Single-Walled Carbon Nano-Tubes

Technical Presentation. IMECE2019-12039

Robabeh Jazaei, Robabeh Jazaei, *University of Wisconsin-Platteville, Platteville, WI, United States*, **Moses Karakouzian, Brendan O'Toole, Jaeyun Moon**, *University of Nevada, Las Vegas, Las Vegas, NV, United States*, **Samad Gharehdaghi**, *University of West Florida, Pensacola, FL, United States*

3:24pm – Reactive Molecular Dynamics Study on Crack Propagation in Amorphous Silica Under Both Dry and Wet Conditions

Technical Presentation. IMECE2019-13212

Truong Vo, *University of Utah, Utah, UT, United States*, **Angelo Damone**, *Technical University of Kaiserslautern, Kaiserslautern, Germany*, **Pania Newell**, *University of Utah, Salt Lake City, UT, United States*

11-37 INSTABILITIES IN SOLIDS AND STRUCTURES

11-37-5 liSS Session 5 Surface Instabilities

Convention Center, 355C

2:00PM–3:45PM

Session Organizer: Kostas Danas, *Ecole Polytechnique, Palaiseau, France*

Session Co-Organizer: Dai Okumura, *Nagoya University, Nagoya, Japan*

2:00pm – Self-Folding and Assembly of Two-Dimensional Materials by Solution Evaporation

Technical Presentation. IMECE2019-12861

Qingchang Liu, Baoxing Xu, *University of Virginia, Charlottesville, VA, United States*

2:21pm – Creases in Soft Materials Are Localized Wrinkles, Not Distinct Bifurcations

Technical Presentation. IMECE2019-12988

Ryan S. Elliott, *University of Minnesota, Saint Paul, MN, United States*, **Andrew Akerson**, *University of Minnesota, Minneapolis, MN, United States*, **Shrinidhi Shrikant Pandurang, Timothy J. Healey**, *Cornell University, Ithaca, NY, United States*, **Nicolas Triantafyllidis**, *Ecole Polytechnique, Palaiseau, France*

2:42pm – Evolution of Surface Patterns From Hexagonal Dimples to a Labyrinth in a Stiff Gel Film Bonded on a Soft Substrate

Technical Presentation. IMECE2019-13056

Miyoshi Hiroaki, Dai Okumura, *Nagoya University, Nagoya, Aichi, Japan*

3:03pm – Surface Blistering of Soft Materials: The Rate Control and The Skin Patterns

Technical Presentation. IMECE2019-13339

Tong Shen, Eduard Benet, Franck Vernerey, *University of Colorado Boulder, Boulder, CO, United States*

3:24pm – Extreme Mechanical Instabilities Through Periodic Buckle-Delamination

Technical Presentation. IMECE2019-13443

Jie Yin, *North Carolina State University, Raleigh, NC, United States*, **Qiuting Zhang**, *Temple University, Philadelphia, PA, United States*

11-1 MECHANICS OF SOFT MATERIALS

11-1-10 Soft Matter Physics

Convention Center, 250B

4:00PM–5:45PM

Session Organizer: Ming Guo, *Massachusetts Institute of Technology, Cambridge, MA, United States*

4:00pm – Reversible Binding: A Solution to Selective Transport of Particles Inside Soft Materials

Technical Presentation. IMECE2019-13269

Shankar Lalitha Sridhar, Kanghyeon Koo, Loren Hough, Franck Vernerey, *University of Colorado Boulder, Boulder, CO, United States*

4:21pm – Correlations Between Non-Affine Deformation and Topology in Polymer Networks

Technical Presentation. IMECE2019-13344

Robert Wagner, Tong Shen, Franck Vernerey, *University of Colorado Boulder, Boulder, CO, United States*

4:42pm – Active Mechanics of Fire-Ant Aggregations: A Statistical Approach

Technical Presentation. IMECE2019-13345

Robert Wagner, *University of Colorado Boulder, Boulder, CO, United States*

5:03pm – Self-assembly on Lipid Membranes as a First Passage Time Problem

Technical Presentation. IMECE2019-12733

Prashant Purohit, *University of Pennsylvania, Philadelphia, PA, United States*

11-3 3D PRINTED SOFT MATERIALS

11-3-2 3D/4D Printing of Structures and Biomaterials

Convention Center, 250C

4:00PM–5:45PM

Session Organizer: Kai Yu, *University of Colorado Denver, Denver, CO, United States*

Session Co-Organizers: Sung Hoon Kang, *Johns Hopkins University, Baltimore, MD, United States*, Howon Lee, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*, Qiming Wang, *University of Southern California, Los Angeles, CA, United States*

4:00pm – Failure of Soft Fiber Composites With Spatially-Programmed Orientation

Technical Presentation. IMECE2019-12993

Chengyang Mo, Yijie Jiang, Jordan R. Raney, *University of Pennsylvania, Philadelphia, PA, United States*

4:21pm – Near-Optimal 3D-Printed Random Porous-Like Polymer Materials

Technical Presentation. IMECE2019-12997
Othmane Zerhouni, Gabriella Tarantino, Kostas Danas,
Ecole Polytechnique, Palaiseau, France

4:42pm – Bioprinting Porous Viscoelastic Hydrogels

Technical Presentation. IMECE2019-12562
Guangyu Bao, Jianyu Li, Luc Mongeau, *McGill University, Montreal, QC, Canada*

5:03pm – 4D Printed Transformable Cell-Culture Insert for a Standard Well Plate for Rapid Target Validation and Drug Evaluation

Technical Presentation. IMECE2019-13435
Chen Yang, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States,* **Michelle Chadwick, Hatem Sabaawy,** *Rutgers Cancer Institute of New Jersey, Rutgers, The State University of New Jersey, New Brunswick, NJ, United States,* **Howon Lee,** *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*

5:24pm – Self-Adaptive Cardiovascular Implants to Accommodate Growth

Technical Presentation. IMECE2019-13394
Ozan Erol, Emilio Bachtiar, Runhan Tao, Narutoshi Hibino, Lewis H. Romer, David Gracias, Sung Hoon Kang, *Johns Hopkins University, Baltimore, MD, United States*

11-5 MECHANICS, MODELING, AND MANUFACTURING OF SOFT MATERIALS AND SOFT ROBOTS

11-5-5 Mechanics, Modeling, and Manufacturing of Soft Materials and Soft Robots – V

Convention Center, 250D **4:00PM–5:45PM**

4:00pm – Understanding the Mechanics of Self-healing Polymers Through Coarse-Grained Molecular Dynamic Simulations

Technical Presentation. IMECE2019-13259
Zhiqiang Shen, *University of Connecticut, Willington, CT, United States,* **Qiming Wang,** *University of Southern California, Los Angeles, CA, United States,* **Ying Li,** *University of Connecticut, Storrs, CT, United States*

4:21pm – A Ferrofluid-Driven Soft Caudal Fin With Infinitely Variable Stiffness for Robotic Fish

Poster Presentation. IMECE2019-13424
Bin Qiu, Daoheng Sun, Shouju Yao, Kaihan Yao, Chao Wu, Zhou Zhou, Ruiqian Ye, *Xiamen University, Xiamen, Fujian, China*

4:42pm – Investigation of the Hydrolysis Aging of Thermoset Adhesives Within Salinated and Desalinated Solutions

Technical Presentation. IMECE2019-13553
Wanru Miao, *Michigan State University, East Lansing, MI, United States*

5:03pm – A Bayesian Framework for Fractional Modeling of Anomalous Materials: Application to Soft Tissue

Technical Presentation. IMECE2019-13751
Jorge Suzuki, Tyler Tuttle, Sara Roccabianca, Mohsen Zayernouri, *Michigan State University, East Lansing, MI, United States*

11-12 SYMPOSIUM ON MODELING OF THE FRACTURE, FAILURE, AND FATIGUE IN SOLIDS

11-12-4 Modeling of Fatigue Crack and Interface Behavior

Convention Center, 250E **4:00PM–5:45PM**

Session Organizer: **Fatih Karpat,** *Uludag University, Bursa, Turkey*

Session Co-Organizers: **Yanfeng Shen,** *Shanghai Jiao Tong University, Shanghai, China,* **Huijuan Zhao,** *Clemson University, Clemson, SC, United States*

4:00pm – Frictional Shakedown for Continuous Coupled Contact

Technical Presentation. IMECE2019-12802
Nils M. Cwiekala, David A. Hills, *University of Oxford, Oxford, Oxfordshire, United Kingdom*

4:21pm – The Mechanical Response of a Cantilever Beam With an Embedded Crack With Non-Linear Crack Surface Closure Effects

Technical Paper Publication. IMECE2019-11018
Xiaomin Fang, *Ford Motor Company, Northville, MI, United States,* **Panos Charalambides,** *University of Maryland, Baltimore County, Baltimore, MD, United States*

4:42pm – Numerical Investigation of Nonlinear Lamb Wave Time Reversing for Fatigue Crack Detection

Technical Paper Publication. IMECE2019-10881
Junzhen Wang, Yanfeng Shen, *Shanghai Jiao Tong University, Shanghai, Shanghai, China*

5:03pm – Effects of Drive Side Pressure Angle on Gear Fatigue Crack Propagation Life for Spur Gears With Symmetric and Asymmetric Teeth

Technical Paper Publication. IMECE2019-11510
Fatih Karpat, Oguz Dogan, Tufan Yilmaz, Celalettin Yuce, Onur Can Kalay, Esin Karpat, Osman Kopmaz, *Bursa Uludag University, Bursa, Turkey*

5:24pm – High-Cycle Fatigue Behavior of Type 4340 Steel Pressurized Blocks Including Mean Stress Effect

Technical Paper Publication. IMECE2019-10353
Elie Badr, Joanne Ishak, *Notre Dame University, Zouk Mikael, Lebanon*

11-26 MODELING AND EXPERIMENTS IN NANOMECHANICS AND NANOMATERIALS

11-26-4 Nanomechanics and Nanomaterials 4

Convention Center, 260 4:00PM–5:45PM

Session Organizer: Yozo Mikata, *Fluor, Schenectady, NY, United States*

Session Co-Organizers: Jeffrey Kysar, *Columbia University, New York, NY, United States*, Cemal Basaran, *State University of New York at Buffalo, Buffalo, NY, United States*, Tarek Ragab, *Arkansas State University, State University, AR, United States*

4:00pm – Impact of Doping Level on Dissipative Carrier Transport in GNR TFET Devices

Technical Presentation. IMECE2019-10244

Cemal Basaran, Weixiang Zhang, *State University of New York at Buffalo, Buffalo, NY, United States*, **Tarek Ragab**, *Arkansas State University, State University, AR, United States*, **Ji Zhang**, *State University of New York at Buffalo, Buffalo, NY, United States*

4:21pm – Electrostatic Doping Based All GNR Tunnel FET: An Energy Efficient Design for Power Electronics

Technical Presentation. IMECE2019-10245

Cemal Basaran, Weixiang Zhang, *State University of New York at Buffalo, Buffalo, NY, United States*, **Tarek Ragab**, *Arkansas State University, State University, AR, United States*, **Ji Zhang**, *State University of New York at Buffalo, Buffalo, NY, United States*

4:42pm – Mechanical and Electrical Properties of Graphene Nano Mesh Heterojunctions

Technical Presentation. IMECE2019-10205

Ji Zhang, Weixiang Zhang, *State University of New York at Buffalo, Buffalo, NY, United States*, **Tarek Ragab**, *Arkansas State University, State University, AR, United States*

5:03pm – Frictional Properties of Graphene Nano Flakes on Diamond Substrate

Technical Presentation. IMECE2019-10207

Ji Zhang, *State University of New York at Buffalo, Buffalo, NY, United States*, **Ehsan Osloub, Fatima Siddiqui**, *State University of New York at Buffalo, Amherst, NY, United States*, **Weixiang Zhang**, *State University of New York at Buffalo, Buffalo, NY, United States*, **Tarek Ragab**, *Arkansas State University, State University, AR, United States*

5:24pm – Electron-Induced Wind Forces in Metallic Graphene Nanoribbons

Technical Presentation. IMECE2019-10208

Ji Zhang, *State University of New York at Buffalo, Buffalo, NY, United States*, **Tarek Ragab**, *Arkansas State University, State University, AR, United States*, **Cemal Basaran**, *State University of New York at Buffalo, Buffalo, NY, United States*

11-34 PHASE-FIELD MODELING AND SIMULATION IN MECHANICS

11-34-1 Phase-Field Modeling and Simulation in Mechanics

Convention Center, 355C 4:00PM–5:45PM

Session Organizer: Chad Landis, *University of Texas at Austin, Austin, TX, United States*

4:00pm – A High Order Reproducing Kernel Collocation Scheme for the Phase-Field Fracture Model

Technical Presentation. IMECE2019-11909

Ashkan Mahdavi, Sheng-Wei Chi, *University of Illinois at Chicago, Chicago, IL, United States*

4:21pm – A Multiphase Phase Field Model for Multivariant Martensitic Transformations at Large Strains

Technical Presentation. IMECE2019-12776

Anup Basak, Valery Levitas, *Iowa State University, Ames, IA, United States*

4:42pm – A Scale-Independent Simulation of Interactions Between Multivariant Martensitic Microstructure and Discrete Dislocation Bands

Technical Presentation. IMECE2019-12781

S.E. Esfahani, Valery I. Levitas, *Iowa State University, Ames, IA, United States*

5:03pm – Phase-Field Modeling of Fatigue Crack Growth

Technical Presentation. IMECE2019-13450

Yu-Sheng Lo, Chad Landis, *University of Texas at Austin, Austin, TX, United States*, **Michael Borden**, *Coreform LLC, Orem, UT, United States*

5:24pm – Thermodynamically Consistent Phase-Field Model for Strain-Crystallizing Rubber-Like Materials

Technical Presentation. IMECE2019-13520

Bin Li, Nikolaos Bouklas, *Cornell University, Ithaca, NY, United States*

TRACK 12 MICRO- AND NANO-SYSTEMS ENGINEERING AND PACKAGING

- 12-1-1: MENS/NEMS: Manufacturing and Applications**
- 12-2-1: Plenary Session I**
- 12-2-2: Plenary Session II**
- 12-3-1: Design and Fabrication, Analysis, Processes, and Technology for Micro and Nano Devices and Systems**
- 12-4-1: Computational Studies on MEMS and Nanostructures**
- 12-5-1: Micro and Nano Systems in Medicine and Biology**
- 12-6-1: Micro/Nano Materials and Devices**
- 12-7-1: Applied Mechanics and Materials in Micro and Nano-Systems – 1**
- 12-7-2: Applied Mechanics and Materials in Micro and Nanosystems – 2**
- 12-7-3: Applied Mechanics and Materials in Micro and Nanosystems – 3**
- 12-8-1: Microfluidics and Nanofluidics in Bioengineering Applications II**
- 12-8-2: Micro/Nanoscale Electrokinetics**
- 12-10-1: Inertial Navigation: MEMS/NEMS to Bio-Inspired**

ACKNOWLEDGMENT

TRACK ORGANIZERS

Yingtao Liu, *University of Oklahoma, United States*
 Weihua Su, *University of Alabama, United States*

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 Adam Huang, *University of Arkansas, United States*
 Nazmul Islam, *University of Texas Rio Grande Valley, United States*
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 Ioana Voiculescu, *City College of New York, United States*
 Wei Xue, *Rowan University, United States*
 Byoung Hee You, *Texas State University, United States*

SESSION ORGANIZERS

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 Paul R. Chiarot, *State University of New York at Binghamton, United States*

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 Jungkyu Park, *Kennesaw State University, United States*
 Ioana Voiculescu, *City College of New York, United States*
 Wei Xue, *Rowan University, United States*
 Byoung Hee You, *Texas State University, United States*

TRACK 12 MICRO- AND NANO-SYSTEMS ENGINEERING AND PACKAGING

WEDNESDAY, NOVEMBER 13

12-2 PLENARY PRESENTATIONS IN MEMS/NEMS ENGINEERING AND PACKAGING

12-2-1 Plenary Session I

Convention Center, 255B

8:45AM–10:30AM

8:45am – Taking Microfluidics From Research Ideas to a Real Product

Plenary Presentation. IMECE2019-14008

Bruce Gale, *University of Utah, Salt Lake City, UT, United States*

12-2-2 Plenary Session II

9:45AM–10:30AM

9:45am – Drag Reduction of Watercraft: Microfluidics Applied to Macroscale Objects

Plenary Presentation. IMECE2019-14009

Chang-jin Kim, *University of California, Los Angeles, Los Angeles, CA, United States*

12-7 APPLIED MECHANICS AND MATERIALS IN MICRO- AND NANO-SYSTEMS

12-7-1 Applied Mechanics and Materials in Micro and Nano-Systems – 1

Convention Center, 355C

10:45AM–12:30PM

Session Organizer: Zayd C. Leseman, *Kansas State University, Manhattan, KS, United States*

Session Co-Organizer: Ahsan Mian, *Wright State University, Dayton, OH, United States*

10:45am – A Dual Actuator Mixed-Mode Interaction Tester
Technical Presentation. IMECE2019-11749

Tianhao Yang, Rui Huang, Kenneth Liechti, *University of Texas at Austin, Austin, TX, United States*

11:06am – Stick-Slip Tuning in Electromechanical Drumhead Resonators From Two-Dimensional Material Interfaces

Technical Presentation. IMECE2019-11867

Sunphil Kim, Emil Annevelink, Edmund Han, Jaehyung Yu, Elif Ertekin, Pinshane Huang, Arend van der Zande, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

11:27am – Thermal Property Measurements of Si μ -Cantilever Beams Using the Suspended Thermoreflectance Technique

Technical Paper Publication. IMECE2019-11690

Dipta Sarkar, Samuel Oxandale, Tyler Hieber, *Kansas State University, Manhattan, KS, United States*, **M.G. Baboly**, *University of Jamestown, Jamestown, ND, United States*, **Zayd C. Leseman**, *Kansas State University, Manhattan, KS, United States*

11:48pm – Opportunities for Radiation Pressure in Characterization of Micro-/Nano-Materials

Technical Paper Publication. IMECE2019-11466

Zayd C. Leseman, *Kansas State University, Manhattan, KS, United States*

12:09pm – Sensitivity Calibration of Bi-Material Micro-Cantilever Based Actuator With Nonlinear Material Properties: Theoretical Investigation

Technical Presentation. IMECE2019-13637

Mahabubur Rahman, Huijuan Zhao, *Clemson University, Clemson, SC, United States*

12-3 DESIGN AND FABRICATION, ANALYSIS, PROCESSES, AND TECHNOLOGY FOR MICRO AND NANO DEVICES AND SYSTEMS

12-3-1 Design and Fabrication, Analysis, Processes, and Technology for Micro and Nano Devices and Systems

Convention Center, 355F

2:00PM–3:45PM

Session Organizer: Namwon Kim, *Texas State University, San Marcos, TX, United States*

Session Co-Organizers: Byoung Hee You, *Texas State University, San Marcos, TX, United States*, Adam Huang, *University of Arkansas, Fayetteville, AR, United States*

2:00pm – Non-Invasive Tracking of Micro-Scale Microrobot Using Photoacoustic Imaging

Technical Paper Publication. IMECE2019-10629

Yan Yan, *Wayne State University, Detroit, MI, United States*, **Zachary Carey**, *Lawrence Technological University, Southfield, MI, United States*, **Mohammad Mehrmohammadi**, *Wayne State University, Detroit, MI, United States*, **Wuming Jing**, *Lawrence Technological University, Southfield, MI, United States*

2:21pm – Measurement of the Residual Stress Distribution in the 3D-Stacked Electronic Modules by Embedded Strain Sensors

Technical Paper Publication. IMECE2019-11106

Ryota Mizuno, Genta Nakauchi, Ken Suzuki, Hideo Miura, *Tohoku University, Sendai, Miyagi, Japan*

2:42pm – Packaging Challenges of Thin High Bandwidth POP

Technical Paper Publication. IMECE2019-11181
Fletcher (Cheng-Piao) Tung, Yu-Po Wang, Jensen (Ying-Chou) Tsai, Joe (Chih-Nan) Lin, Gary (Yue-Long) Fan, Siliconware Precision Industries Co., Ltd., Taichung, Taiwan

3:03pm – Design and Fabrication of a Multi-Scale Fluidic Motherboard for a Universal Molecular Processing System (uMPS)

Technical Paper Publication. IMECE2019-11921
Daniel Park, Louisiana State University, Baton Rouge, LA, United States, Xiaoxiao Zhao, Yijie Kang, Louisiana State University, Baton Rouge, LA, United States, M. Witek, K. Dathathreya, University of Kansas, Lawrence, KS, United States, Byoung Hee You, Texas State University, San Marcos, TX, United States, Steven Soper, University of Kansas, Lawrence, KS, United States, Michael Murphy, Louisiana State University, Baton Rouge, LA, United States

3:24pm – Tolerance Allocation of Kinematically Coupled Polymer Microfluidic Modules

Technical Presentation. IMECE2019-12791
Joseph Miller, Devanda Lek, Texas State University, San Marcos, TX, United States, Du Hwan Chun, Haejoong Na, Yeungnam University, Gyeongsan, Korea (Republic), Moo Yeon Lee, Dong-A University, Busan, Korea (Republic), Namwon Kim, In-Hyouk Song, Byoung Hee You, Texas State University, San Marcos, TX, United States

12-8 MICROFLUIDICS 2019: MICROFLUIDICS IN MICRO- AND NANOSYSTEMS

12-8-1 Microfluidics and Nanofluidics in Bioengineering Applications II

Convention Center, 355F

4:00PM-5:45PM

Session Organizer: Nazmul Islam, University of Texas Rio Grande Valley, Edinburg, TX, United States

Session Co-Organizer: Bruce Gale, University of Utah, Salt Lake City, UT, United States

4:00pm – Study of Angle-of-Attack (AoA) for Airfoil in Deterministic Lateral Displacement (DLD)

Technical Paper Publication. IMECE2019-11708
Kawkab Ahasan, Jong-Hoon Kim, Washington State University Vancouver, Vancouver, WA, United States

4:21pm – From Architecture Control of Photo-Cross-Linked Poly(Ethylene Glycol) Diacrylate to Navigation of Neural Stem Cells on the Microfibrous Scaffolds

Technical Presentation. IMECE2019-12904
Farrokh Sharifi, Reza Montazami, Nicole Hashemi, Iowa State University, Ames, IA, United States

4:42pm – Flow Induced Structures and Instabilities of Viscoelastic Wormlike Micellar Solutions

Technical Presentation. IMECE2019-12990
Emad Jafari Nodoushan, Texas State University, San Marcos, TX, United States, Taeil Yi, Kyungnam University, Changwon, Gyeongsangnam-do, Korea (Republic), Young Ju Lee, Namwon Kim, Texas State University, San Marcos, TX, United States

5:03pm – Self-Alignment Induced Sperm Separation in Inertial Focusing Device

Technical Presentation. IMECE2019-13884
Haidong Feng, Alex Jafek, Timothy Jenkins, Kenneth Aston, Bruce Gale, University of Utah, Salt Lake City, UT, United States

5:24pm – Microfluidic Sperm Preparation for Intrauterine Insemination

Technical Presentation. IMECE2019-13401
Alex Jafek, Haidong Feng, Hayden Brady, Marzieh Chaharlang, Kevin Petersen, Dallin Broberg, Jim Hotaling, Douglas Carrell, Raheel Samuel, Kenneth Aston, Bruce Gale, University of Utah, Salt Lake City, UT, United States

THURSDAY, NOVEMBER 14

12-1 GENERAL TOPICS OF MEMS/NEMS**12-1-1 MENS/NEMS: Manufacturing and Applications****Convention Center, 355E****8:15AM–10:00AM****Session Organizer:** Ioana Voiculescu, *City College of New York, New York, NY, United States***Session Co-Organizer:** Nazmul Islam, *University of Texas Rio Grande Valley, Edinburg, TX, United States***8:15am – Additively Manufactured Embedded Electronics****Technical Presentation. IMECE2019-10962****Aamir Hamad**, *Wright State University, Fairborn, OH, United States*, **Ahsan Mian**, *Wright State University, Dayton, OH, United States***8:36am – Direct Inkjet Printing of Nanosilver Ink on Flexible and Rigid Substrates****Technical Presentation. IMECE2019-11686****Aamir Hamad**, *Wright State University, Fairborn, OH, United States*, **Ahsan Mian**, *Wright State University, Dayton, OH, United States***8:57am – Strain and Photovoltaic Sensitivities of Dumbbell-Shape GNR-Base Sensors****Technical Paper Publication. IMECE2019-11076****Jowesh Goundar**, **Takuya Kudo**, **Qinqiang Zhang**, **Ken Suzuki**, **Hideo Miura**, *Tohoku University, Sendai, Miyagi, Japan***9:18am – Flexible Valveless Pump for Bio Applications****Technical Paper Publication. IMECE2019-12270****Masoud Naghdi**, *University of Mississippi, University, MS, United States*, **Farhad Farzbod**, *University of Mississippi, Sunnyvale, CA, United States*, **Paul Goggans**, *University of Mississippi, University, MS, United States***12-5 APPLICATIONS OF MICRO AND NANO SYSTEMS IN MEDICINE AND BIOLOGY****12-5-1 Micro and Nano Systems in Medicine and Biology****Convention Center, 251B****8:15AM–10:00AM****Session Organizer:** Nazmul Islam, *University of Texas Rio Grande Valley, Edinburg, TX, United States***Session Co-Organizer:** Ioana Voiculescu, *City College of New York, New York, NY, United States***8:15am – Microfluidic Temperature Behavior in a Multi-Material 3D Printed Chip****Technical Paper Publication. IMECE2019-11470****Derek Sanchez**, **Greg Nordin**, **Troy Munro**, *Brigham Young University, Provo, UT, United States***8:36am – Fabrication, Modeling, and Testing of a Miniaturized Fast Neutron Detector****Technical Paper Publication. IMECE2019-11534****Samuel Oxandale**, **Luke Stegeman**, **Tyler Hieber**, **Dipta Sarkar**, *Kansas State University, Manhattan, KS, United States*, **Steven L. Bellinger**, *Radiation Detection Technologies, Manhattan, KS, United States*, **Amir Bahadori**, **Zayd C. Leseman**, *Kansas State University, Manhattan, KS, United States***8:57am – Study of Low-Frequency Narrow Bandwidth Surface Acoustic Wave Sensor for Liquid Applications****Technical Paper Publication. IMECE2019-11618****Kun-Lin Lee**, **Ioana Voiculescu**, *City College of New York, New York, NY, United States***9:18am – Placenta-on-a-Chip: A Microfluidic Platform to Study Caffeine Transport****Technical Presentation. IMECE2019-12901****Rajeendra L. Pemathilaka**, **Nicole Hashemi**, *Iowa State University, Ames, IA, United States***9:39am – Optimization of Porous, 3D Vertically Aligned Carbon Nanotube Electrodes for Electrochemical Biosensing****Technical Presentation. IMECE2019-13188****Benjamin J. Brownlee**, *Brigham Young University, Provo, UT, United States*, **Jonathan Claussen**, *Iowa State University, Ames, IA, United States*, **Brian D. Iverson**, *Brigham Young University, Provo, UT, United States***12-6 MICRO AND NANO DEVICES****12-6-1 Micro/Nano Materials and Devices****Convention Center, 251C****8:15AM–10:00AM****Session Organizer:** Wei Xue, *Rowan University, Glassboro, NJ, United States***Session Co-Organizer:** Devanda Lek, *Texas State University, San Marcos, TX, United States***8:15am – Manipulating DNA Translocation through Polymer-Based Entropic Trap Arrays With Different Surface Charge Densities****Technical Presentation. IMECE2019-12058****Junseo Choi**, **Zheng Jia**, *Louisiana State University, Baton Rouge, LA, United States*, **Steven Soper**, *University of Kansas, Lawrence, KS, United States*, **Sungook Park**, *Louisiana State University, Baton Rouge, LA, United States***8:36am – Design of Low Power Microshutter Arrays****Poster Presentation. IMECE2019-12529****Li Jiang**, **Naga S. Korivi**, *Tuskegee University, Tuskegee, AL, United States*, **Jason Clark**, *Auburn University, Auburn, AL, United States*

8:57am – Design of Surface-Enhanced Raman Spectroscopy (SERS) Based on Transformation Optics for Probe Sensing

Technical Presentation. IMECE2019-12531
 Mohammadrahim Kazemzadeh, Weiliang Xu, Neil Broderick, Kamran Zargar, *University of Auckland, Auckland, New Zealand*

9:18am – An Integrated Nanofluidic System for Blood Sample Ion Current Rectification (ICR) Biosensing

Technical Presentation. IMECE2019-13047
 Haidong Feng, *University of Utah, Salt Lake City, UT, United States*, Eric Ervin, Sean German, Jack Wisniewski, Mike Krupta, *Electronic Biosciences, Inc., Salt Lake City, UT, United States*, Bruce Gale, *University of Utah, Salt Lake City, UT, United States*

12-4 COMPUTATIONAL STUDIES ON MEMS AND NANOSTRUCTURES

12-4-1 Computational Studies on MEMS and Nanostructures

Convention Center, 355E 10:15AM–12:00PM

Session Organizer: Daniel Kaplan, *U.S. Army RDECOM-ARDEC, Picatinny Arsenal, NJ, United States*

Session Co-Organizer: Gregory Hader, *U.S. Army RDECOM-ARDEC, New Jersey, NJ, United States*, Muhammad Akbar, *Tennessee State University, Nashville, TN, United States*, Jungkyu Park, *Kennesaw State University, Marietta, GA, United States*, Ibrahim Alhomoudi, *King Abdulaziz City for Science and Tech, Riyadh, Saudi Arabia*

10:15am – First-Principle Calculations of the Binding Energy of the Coating Components of New Generation Dental Implants

Technical Paper Publication. IMECE2019-10059
 Alla V. Balueva, *University of North Georgia, Gainesville, GA, United States*, Iliia Dashevskiy, *Ishlinsky Institute for Problems in Mechanics RAS, Moscow, Russia*, Patricia Todebush, Chasen Campbell, Eduardo Valdez, *University of North Georgia, Gainesville, GA, United States*

10:36am – First Principle Analysis of the Effect of Strain on Electronic Transport Properties of Dumbbell-Shape Graphene Nanoribbons

Technical Paper Publication. IMECE2019-11107
 Takuya Kudo, Qinqiang Zhang, Ken Suzuki, Hideo Miura, *Tohoku University, Sendai, Miyagi, Japan*

10:57am – Optimization of a Manifold Microchannel Heat Sink Using an Improved Version of the Augmented Epsilon Constraint Method

Technical Paper Publication. IMECE2019-11496
 Lagouge Tartibu, Modestus Okechukwu Okwu, *University of Johannesburg, Johannesburg, South Africa*

11:18am – A Novel Direct-Write UV-Photolithography Using One-Dimensional Optical Birefringence in Electro-spun Microfiber

Technical Presentation. IMECE2019-13115
 JongHyun (Joe) Kim, Dongwoon Shin, Abiral Regmi, Jiyoung Chang, *University of Utah, Salt Lake City, UT, United States*

12-8 MICROFLUIDICS 2019: MICROFLUIDICS IN MICRO- AND NANOSYSTEMS

12-8-2 Micro/Nanoscale Electrokinetics

Convention Center, 251C 10:15AM–12:00PM

Session Organizer: Nazmul Islam, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

Session Co-Organizer: Paul R. Chiarot, *State University of New York at Binghamton, Binghamton, NY, United States*

10:15am – Scaling Behavior in Electrohydrodynamic Jetting of Polymeric Solutions

Technical Paper Publication. IMECE2019-10426
 Abhishek Kumar Singh, Kaushlendra Dubey, Rajiv Kumar Srivastava, Supreet Singh Bahga, *Indian Institute of Technology, New Delhi, New Delhi, India*

10:36am – Analysis of Combined Electroosmotic and Pressure Driven Flow of Multilayer Immiscible Fluids in a Narrow Capillary

Technical Paper Publication. IMECE2019-10466
 Juan P. Escandon, David A. Torres, *Instituto Politécnico Nacional, SEPI-ESIME Unidad Azcapotzalco, Mexico, Mexico*

10:57am – DC-Biased AC Electrokinetics Effect on V-Shaped Electrode Patterns for Microfluidics Applications

Technical Paper Publication. IMECE2019-11734
 Mohammad Salman Parvez, Mohammad Fazlay Rubby, Samir M. Iqbal, Nazmul Islam, *University of Texas Rio Grande Valley, Edinburg, TX, United States*

11:18am – Microfluidic-Based Fabrication and Dielectrophoretic Manipulation of Microcapsules

Technical Paper Publication. IMECE2019-11903
 Sepehr Maktabi, Jeffrey W. Schertzer, Paul R. Chiarot, *State University of New York at Binghamton, Binghamton, NY, United States*

12-10 INERTIAL NAVIGATION: MEMS/NEMS TO BIO-INSPIRED

12-10-1 Inertial Navigation: MEMS/NEMS to Bio-Inspired

Convention Center, 251B 10:15AM–12:00PM

Session Organizer: Gregory Hader, *U.S. Army RDECOM-ARDEC, Picatinny Arsenal, NJ, United States*

Session Co-Organizer: Daniel Kaplan, *U.S. Army RDECOM-ARDEC, Picatinny Arsenal, NJ, United States*

10:15am – A Brief History of Honeywell's Gun-Hard Inertial Measurement Units

Invited Presentation. IMECE2019-13106

Dan Endean, *Honeywell International, Plymouth, MN, United States*, **Todd Braman**, *Honeywell International, Minneapolis, MN, United States*, **Andrew Brown**, *Honeywell International, Plymouth, MN, United States*, **Jim Broderick**, *Honeywell International, Minneapolis, MN, United States*, **Kevin Christ**, **Patrick Duffy**, *Honeywell International, Plymouth, MN, United States*

10:57am – Soft Catch Gun System as a Versatile Tool for High-G Gun Launch Testing of IMUs and Guidance Electronics

Technical Presentation. IMECE2019-13446

Grzegorz Hader, **Robert Marchak**, *U.S. ARMY CCDC - Armaments Center, Picatinny Arsenal, NJ, United States*

11:18am – Bio-Inspired Guidance, Navigation, and Control: Nature Knows Best

Technical Presentation. IMECE2019-13608

Grzegorz Hader, *U.S. ARMY CCDC – Armaments Center, Picatinny Arsenal, NJ, United States*, **Jessica Carvalho**, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*

11:39am – Review of Tactical and Navigation Grade IMUs for Gun Launched Precision Guided Munitions

Technical Presentation. IMECE2019-13616

Grzegorz Hader, **Christopher Stout**, **Mauricio Guevara**, **Augustus Henninger**, *U.S. Army CCDC – Armaments Center, Picatinny Arsenal, NJ, United States*

12-7 APPLIED MECHANICS AND MATERIALS IN MICRO- AND NANO-SYSTEMS

12-7-2 Applied Mechanics and Materials in Micro and Nanosystems – 2

Convention Center, 251B 2:00PM–3:45PM

Session Organizer: Zayd C. Leseman, *Kansas State University, Manhattan, KS, United States*

Session Co-Organizer: Ahsan Mian, *Wright State University, Dayton, OH, United States*

2:00pm – Performance Variation of Nano-Scaled Devices in 3D-IC Packaging Architecture Induced by TSV Residual Stress

Technical Paper Publication. IMECE2019-10450

Chang-Chun Lee, **Pei-Chen Huang**, **Chi-Wei Wang**, *National Tsing Hua University, Hsinchu, Taiwan*

2:21pm – Electromigration Analysis of Power Modules by Electrical-Thermal-Mechanical Coupled Model

Technical Paper Publication. IMECE2019-10558

Mitsuaki Kato, **Takahiro Omori**, **Akihiro Goryu**, **Tomoya Fumikura**, **Kenji Hirohata**, *Toshiba Corporation, Kawasaki, Kanagawa, Japan*

2:42pm – Angle Dependent Bending Stiffness of Few-Layer Graphene

Technical Presentation. IMECE2019-11830

Jaehyung Yu, **Edmund Han**, **Emil Annevelink**, **Elif Ertekin**, **Pinshane Huang**, **Arend van der Zande**, *University of Illinois at Urbana Champaign, Urbana, IL, United States*

3:03pm – Suspended Graphene NH₃ Sensors Using Direct-Write Functional Fibers

Poster Presentation. IMECE2019-13353

Abiral Regmi, **Jiyoung Chang**, **JongHyun (Joe) Kim**, **Dongwoon Shin**, *University of Utah, Salt Lake City, UT, United States*

3:24pm – Quality Enhancement of Low Temperature Metal Organic Chemical Vapor Deposited MoS₂: An Experimental and Computational Investigation

Technical Presentation. IMECE2019-11491

Zahabul Islam, **Joshua Robinson**, *Pennsylvania State University, State College, PA, United States*, **Md Haque**, *Pennsylvania State University, University Park, PA, United States*

12-7 APPLIED MECHANICS AND MATERIALS IN MICRO- AND NANO-SYSTEMS

12-7-3 Applied Mechanics and Materials in Micro and Nanosystems – 3

Convention Center, 251B

4:00PM–5:45PM

Session Organizer: Zayd C. Leseman, *Kansas State University, Manhattan, KS, United States*

Session Co-Organizer: Ahsan Mian, *Wright State University, Dayton, OH, United States*

4:00pm – Size and Spatial Density Attributes of Material Flaw Populations in Polysilicon MEMS Structures

Technical Presentation. IMECE2019-12790

Robert Cook, *National Institute of Standards and Technology, Gaithersburg, MD, United States*, **Frank DeIRio**, *National Institute of Standards and Technology, Boulder, CO, United States*, **Brad Boyce**, *Sandia National Laboratories, Albuquerque, NM, United States*

4:21pm – Validation of an Atomistic Field Theory for Contact Electrification Using a MEMS Load Cell

Technical Paper Publication. IMECE2019-11349

Tyler Hieber, *Kansas State University, Manhattan, KS, United States*, **Mohamad I. Cheikh**, **James Chen**, *State University of New York at Buffalo, Buffalo, NY, United States*, **Zayd C. Leseman**, *Kansas State University, Manhattan, KS, United States*

4:42pm – Insights Into the Mechanical Properties of Bi-Layer Germanene Coupled by Covalent Bonding

Technical Paper Publication. IMECE2019-12129

Mohammad Motalab, **Mahmuda R. Arshee**, **Saqeeb Adnan**, **Pritom Bose**, **Ratul Paul**, *Bangladesh University of Engineering and Technology, Dhaka, Bangladesh*

5:03pm – Understanding Interface Dominated Microstructures in Metal-Metal (Mg/Nb) Composites for Ultra-High Strength and Formability

Technical Presentation. IMECE2019-13481

Anugraha Thyagatur Kidigannappa, *University of Nevada, Reno, Reno, NV, United States*

TRACK 13 SAFETY ENGINEERING, RISK AND RELIABILITY ANALYSIS

- 13-1-1: Reliability Methods**
- 13-4-1: Reliability and Risk in Energy Systems**
- 13-5-1: Reliability and Risk in Manufacture Systems**
- 13-6-1: Prognostic and Health Management – I**
- 13-6-2: Prognostic and Health Management – II**
- 13-8-1: General Topics on Risk, Safety and Reliability**
- 13-9-1: Safety in Transportation, Agriculture, and Off-Road Vehicles**
- 13-10-1: Crashworthiness, Occupant Protection, and Biomechanics – I**
- 13-10-2: Crashworthiness, occupant Protection, and Biomechanics – II**
- 13-12-1: Plenary Session**

ACKNOWLEDGMENT

TRACK ORGANIZERS

Mihai Diaconeasa, *The B. John Garrick Institute for the Risk Sciences, United States*

Mohammad Pourgol-Mohamad, *Johnson Controls Inc., United States*

John Wiechel, *SEA Ltd., United States*

Dngji Zhou, *Shanghai Jiao Tong University, China*

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Arun Veeramany, *Pacific Northwest National Laboratory, United States*

John Wiechel, *SEA Ltd., United States*

TRACK 13 SAFETY ENGINEERING, RISK, AND RELIABILITY ANALYSIS

WEDNESDAY, NOVEMBER 13

13-12 PLENARY SESSION

13-12-1 Plenary Session

Convention Center, 255C 9:45AM–10:30AM

9:45am – System Resilience: Definitions, Quantification, and Associated Economics

Plenary Presentation. IMECE2019-14010

Bilal Ayyub, *University of Maryland, College Park, MD, United States*

13-6 PROGNOSTIC AND HEALTH MANAGEMENT

13-6-1 Prognostic and Health Management – I

Convention Center, 355D 10:45AM–12:30PM

Session Organizer: Xiaobin Le, *Wentworth Institute of Technology, Boston, MA, United States*

10:45am – Research on the Diagnosis Method of Reciprocating Compressor Valve Leakage Fault With Vibration Signal

Technical Paper Publication. IMECE2019-10700

Zetian Zhang, Chenggang Hou, Xueying Li, Zhaoning Zhang, *Xi'an Jiaotong University, Xi'an, Shaanxi, China*

11:06am – A Computer Vision Based Automated Polarity Testing System of Rocket Motor Nozzle

Technical Paper Publication. IMECE2019-11130

Guan Wang, Hang Yi, *China Academy of Launch Vehicle Technology, Beijing, China*, Dengji Zhou, *Shanghai Jiao Tong University, Shanghai, Shanghai*

11:27am – Telemetry Data Prediction of Launch Vehicle Attitude Control Engine Using LSTM

Technical Paper Publication. IMECE2019-11193

Hang Yi, Guan Wang, Hui Geng, Hao Xu, *China Academy of Launch Vehicle Technology, Beijing, China*, Wei Wang, *Beijing Institute of Astronautical Systems Engineering, Beijing, China*, Dengji Zhou, *Shanghai Jiao Tong University, Shanghai, Shanghai*

11:48am – Distributed Training for Data Driven Models in Power Machinery Online Monitoring

Technical Paper Publication. IMECE2019-11282

Hang Wu, *Shanghai Jiao Tong University, Shanghai, China*, Wei Wang, *Beijing Institute of Astronautical Systems Engineering, Beijing, China*, Dengji Zhou, Shixi Ma, Huisheng Zhang, *Shanghai Jiao Tong University, Shanghai, China*

13-6 PROGNOSTIC AND HEALTH MANAGEMENT

13-6-2 Prognostic and Health Management – II

Convention Center, 355D 2:00PM–3:45PM

Session Organizer: John Wiechel, *SEA Limited, Worthington, OH, United States*

2:00pm – A Dynamic Pipeline Network Health Assessment Software Platform for Optimal Risk-Based Prioritization of Inspection, Structural Health Monitoring, and Proactive Management

Technical Paper Publication. IMECE2019-11806

Wadie Chalgham, Mihai Diaconeasa, Keo-Yuan Wu, Ali Mosleh, *University of California, Los Angeles, Los Angeles, CA, United States*

2:21pm – A Smart Pipeline Monitoring and Emergency Response System Using Web Services

Technical Paper Publication. IMECE2019-11825

Wadie Chalgham, Mihai Diaconeasa, *University of California, Los Angeles, Los Angeles, CA, United States*, Khalid Elgazzar, Abdennour Seibi, *University of Louisiana at Lafayette, Lafayette, LA, United States*

2:42pm – Damage Classification of Composites Using Machine Learning

Technical Paper Publication. IMECE2019-11851

Shweta Dabetwar, Stephen Ekwaro-Osire, Joao Dias, *Texas Tech University, Lubbock, TX, United States*

3:03pm – A Numerical and Experimental Study Supporting a Methodology for Live Monitoring, Leak Detection, and Automatic Response in Water Pipelines

Technical Paper Publication. IMECE2019-11861

Wadie Chalgham, Mihai Diaconeasa, *University of California, Los Angeles, Los Angeles, CA, United States*, Raju Gottumukkala, Abdennour Seibi, *University of Louisiana at Lafayette, Lafayette, LA, United States*

13-1 RELIABILITY METHODS

13-1-1 Reliability Methods

Convention Center, 355D 4:00PM–5:45PM

Session Organizer: John Wiechel, *SEA Limited, Worthington, OH, United States*

Session Co-Organizer: Mohammad Pourgol-Mohamad, *Johnson Controls Inc., York, PA, United States*

4:00pm – A Probabilistic Fatigue Damage Model for Describing the Entire Set of Fatigue Test Data of the Same Material

Technical Paper Publication. IMECE2019-10224

Xiaobin Le, *Wentworth Institute of Technology, Boston, MA, United States*

4:21pm – Developing an Efficient Approach for Unmanned Aerial Vehicle Reliability Analysis

Technical Presentation. IMECE2019-10342

Ahmad Khayyati, *Sahand University of Technology, Tabriz, Azerbaijan*, **Mohammad Pourgol-Mohamad**, *Johnson Controls Inc., York, PA, United States*

4:42pm – Failure Modes/Mechanisms of Generator Axial Fan Blades: A Fracture and Integrity Analysis

Technical Presentation. IMECE2019-11241

Humberto Gomez, *Universidad del Norte, Barranquilla, Atlantico, Colombia*

5:03pm – Model-Based Resilience Assessment Framework for Autonomous Systems

Technical Paper Publication. IMECE2019-12288

Mihai Diaconeasa, *University of California, Los Angeles, Los Angeles, CA, United States*, **Andrey Morozov**, *Technische Universität Dresden, Dresden, Germany*, **Ann Tai**, *ATanalytics, Santa Monica, CA, United States*, **Ali Mosleh**, *University of California, Los Angeles, Los Angeles, CA, United States*

THURSDAY, NOVEMBER 14

13-10 CRASHWORTHINESS, OCCUPANT PROTECTION, AND BIOMECHANICS

13-10-1 Crashworthiness, Occupant Protection, and Biomechanics – I

Convention Center, 355D **8:15AM–10:00AM**

Session Organizer: Lingyu Sun, *Beihang University, Beijing, China*

Session Co-Organizer: Mohamed Ridha Baccouche, *Ford, Ann Arbor, MI, United States*

8:15am – Review of Design Techniques of Armored Vehicles for Protection Against Blast From Improvised Explosive Devices

Technical Paper Publication. IMECE2019-10227
Hisham Kamel, *Military Technical College, Cairo, Egypt*

8:36am – Strain Rate Enhanced Fluid-Solid Interaction in Liquid Nanofoam-Filled Tubes

Technical Presentation. IMECE2019-10240
Mingzhe Li, *Michigan State University, East Lansing, MI, United States*, Saeed Barbat, *Ford Motor Company, Dearborn, MI, United States*, Mohamed Ridha Baccouche, *Ford, Ann Arbor, MI, United States*, Jamel Belwafa, *Ford Motor Company, Dearborn, MI, United States*, Weiyi Lu, *Michigan State University, East Lansing, MI, United States*

8:57am – Comparison of Dummy and Human Body Models in Automotive Side Impact Collisions According to the Regulatory Standards

Technical Paper Publication. IMECE2019-10680
D.V. Suresh Koppisetty, Sai Srinivas Akhil Hawaldar, Hamid Lankarani, *Wichita State University, Wichita, KS, United States*

9:18am – Insight Into the Design of Blast-Mitigating Floor Mats Using Design of Experiments

Technical Paper Publication. IMECE2019-10598
Hisham Kamel, *Military Technical College, Cairo, Egypt*

13-10 CRASHWORTHINESS, OCCUPANT PROTECTION, AND BIOMECHANICS

13-10-2 Crashworthiness, Occupant Protection, and Biomechanics – II

Convention Center, 355D **10:15AM–12:00PM**

10:15am – Structural Design and Performance Analysis of a Deployable Vehicle Shelter With Hybrid FRP Composites and Aluminum

Technical Paper Publication. IMECE2019-10703
Jinxi Wang, Lingyu Sun, Lijun Li, Jianyu Duan, *Beihang University, Beijing, China*

10:36am – Design, Analysis, and Test of Multi-Stage Crashworthiness Energy Absorbing Device for Railway Vehicles

Technical Paper Publication. IMECE2019-12310
Haifeng Hong, *CRRC MA Corporation, Quincy, MA, United States*, Hongtao Liu, *CRRC Changchun Railway Vehicles Co., Ltd., Changchun, Jilin, China*, Ziwen Fang, *CRRC MA Corporation, Quincy, MA, United States*, Kefei Wang, *CRRC Changchun Railway Vehicles Co., Ltd., Changchun, Jilin, China*, Jianran Wang, *CRRC MA Corporation, Quincy, MA, United States*, Qi Luo, *CRRC Changchun Railway Vehicles Co., Ltd., Changchun, Jilin, China*

10:57am – Deformation and Energy Absorption of Steel Square Tubes With Optimized Shape Design

Technical Paper Publication. IMECE2019-12446
Xiaofang Liu, *CRRC MA Corporation, Quincy, MA, United States*, Yanwen Liu, *CRRC Changchun Railway Vehicles Co., Ltd., Chang-chun, China*, Ziwen Fang, Haifeng Hong, Jianran Wang, *CRRC MA Corporation, Quincy, MA, United States*, Peng Lu, *CRRC Changchun Railway Vehicles Co., Ltd., Changchun, China*, Ruixian Xiu, *Changchun Normal University, Changchun, China*

11:18am – Sensitivity Analysis of Factors Effecting Head Injury Criteria Evaluation Using Computational Simulations With a Free Motion Headform Model

Technical Presentation. IMECE2019-13685
Sai Srinivas Akhil Hawaldar, D.V.Suresh Koppisetty, Hamid Lankarani, *Wichita State University, Wichita, KS, United States*

13-4 RELIABILITY AND RISK IN ENERGY SYSTEMS

13-4-1 Reliability and risk in energy systems

Convention Center, 355D **2:00PM–3:45PM**

Session Organizer: Mohammad Pourgol-Mohamad, *Johnson Controls Inc., York, PA, United States*

Session Co-Organizer: John Wiechel, *SEA Limited, Worthington, OH, United States*

2:00pm – Investigation on the Condition Evaluation Method Based on NSET Model of the Propulsion System in Large Scale Ship

Technical Paper Publication. IMECE2019-11161
Jinxin Zhao, Jian Zhou, Peng Shang, Yinxun Zhang, *Xi'an Jiao Tong University, Xi'an, Shannxi, China*

2:21pm – An Analysis of the Trends in US Offshore Oil and Gas Safety and Environmental Performance

Technical Paper Publication. IMECE2019-11857
Jeremy Gernand, *Penn State University, State College, PA, United States*

2:42pm – Probabilistic Design and Uncertainty Quantification of the Structure of a Monopile Offshore Wind Turbine

Technical Paper Publication. IMECE2019-11862
Abraham Nispel, Stephen Ekwaro-Osire, Joao Dias, *Texas Tech University, Lubbock, TX, United States*, Americo Cunha Jr., *Rio de Janeiro State University, Rio de Janeiro, Brazil*

3:03pm – Uncertainty Quantification of Wind Turbine Wakes Under Random Wind Conditions

Technical Paper Publication. IMECE2019-11872
Tassia Pereira, Stephen Ekwaro-Osire, *Texas Tech University, Lubbock, TX, United States*, Joao Dias, Nicholas J. Ward, *Texas Tech University, Lubbock, TX, United States*, Americo Cunha Jr., *Rio de Janeiro State University, Rio de Janeiro, Brazil*

13-8 GENERAL TOPICS ON RISK, SAFETY, AND RELIABILITY

13-8-1 General topics on Risk, Safety, and Reliability Convention Center, 250F 2:00PM–3:45PM

Session Organizer: Arun Veeramany, *Pacific Northwest National Laboratory, Richland, WA, United States*

2:00pm – Automotive Laminated Side Glazing Rollover Performance When Subjected to Roadway Abrasion and Occupant Loading

Technical Paper Publication. IMECE2019-10238
Donald Phillips, *National Forensic Engineers, Arlington, TN, United States*, Stephen Batzer, *Batzer Engineering, Fife Lake, MI, United States*

2:21pm – Six-Sigma Challenges in Services With Human-Based Data: An Investigative Case Study for Clients' Satisfaction in Gas Company

Technical Paper Publication. IMECE2019-10344
Mohammad Pourgol-Mohamad, *Johnson Controls Inc., York, PA, United States*

2:42pm – Risk Assessment of Escalator Sidewall Entrapment Between the Years 1990 and 2017

Technical Paper Publication. IMECE2019-11432
Thomas Bress, *Exponent, Bowie, MD, United States*, Eugenia Kennedy, *Exponent Failure Analysis, Natick, MA, United States*, Marianne Sullivan, *Exponent, Philadelphia, PA, United States*, Mark Guttag, *Exponent, Inc., Natick, MA, United States*

3:03pm – Assessment of Elevator Risk and Code Requirements to Address These Hazards

Technical Paper Publication. IMECE2019-11451
Thomas Bress, *Exponent, Bowie, MD, United States*, Eugenia Kennedy, *Exponent Failure Analysis, Natick, MA, United States*, Marianne Sullivan, *Exponent, Philadelphia, PA, United States*, Mark Guttag, *Exponent, Inc., Natick, MA, United States*

13-5 RELIABILITY AND RISK IN MANUFACTURE SYSTEMS

13-5-1 Reliability and Risk in Manufacture Systems Convention Center, 355D 4:00PM–5:45PM

Session Organizer: John Wiechel, *SEA Limited, Worthington, OH, United States*

4:00pm – Explosion Testing of Relief Valves for Underground Refuge Alternatives

Technical Paper Publication. IMECE2019-10592
John Homer, Ashley Whitson, *CDC NIOSH, Pittsburgh, PA, United States*, Bruce Whisner, Jeffrey Yonkey, *NIOSH-Pittsburgh Mining Research Division, Pittsburgh, PA, United States*, David Yantek, *CDC NIOSH, Pittsburgh, PA, United States*

4:21pm – Effect of Particle Breakage on Explosibility of Coal/Rock Dust Mixtures due to Dispersion in 20-L Chambers

Technical Paper Publication. IMECE2019-10640
Naseem Rayyan, Inoka E. Perera, *NIOSH/CDC, Pittsburgh, PA, United States*

4:42pm – Failure Mechanism of Diamond Saw Blade Sawing Concrete

Technical Paper Publication. IMECE2019-10803
Shanshan Hu, Liang He, Yingning Hu, *Guangxi University, Nanning, Guangxi, China*, Chengyong Wang, *Guangdong University of Technology, Guangzhou, Guangdong, China*, Hongqun Tang, *Guangxi University, Nanning, Guangxi, China*

5:03pm – Carpal Tunnel Injury in Automobile Collisions

Technical Paper Publication. IMECE2019-12285
John Wiechel, *SEA Ltd., Worthington, OH, United States*, Douglas Morr, *SEA, Ltd., Columbus, OH, United States*, Tara Amenson, *SEA, Ltd., Columbus, OH, United States*, Brian Boggess, *SEA Ltd., Charlotte, NC, United States*

5:24pm – For How Long Should Effective Burn-In Testing of an Electronic Product Last?

Technical Presentation. IMECE2019-12443
Ephraim Suhir, *Bell Labs, Murray Hill, NJ, United States*

13-9 SAFETY IN TRANSPORTATION, AGRICULTURE, AND OFF-ROAD VEHICLES

13-9-1 Safety in Transportation, Agriculture, and Off-Road Vehicles

Convention Center, 250F

4:00PM–5:45PM

Session Organizer: Jeremy Gernand, *Penn State University, State College, PA, United States*

4:00pm – Design and Development of a Cost-Effective LIDAR System for Transportation

Technical Paper Publication. IMECE2019-11279

Theodore Wiklund, Mark Heim, Jaret Halberstadt, Michael Duncan, Deven Mittman, Thomas DeAgostino, Christopher Depcik, *University of Kansas, Lawrence, KS, United States*

4:21pm – Numerical Analysis With Physical Test Correlation and Design Optimization of a Rollover Protective Structure (ROPS)

Technical Paper Publication. IMECE2019-11478

Fatih Karpat, *Uludag University, Bursa, Turkey*, Mehmet Yahsi, M. Kaan Akalp, *Türk Traktor, Ankara, Turkey*

4:42pm – Lane Change Dynamics of a Commercial Tractor- Trailer

Technical Paper Publication. IMECE2019-11479

Brian Boggess, Harold Ralston, *SEA Ltd., Charlotte, NC, United States*, Douglas Morr, *SEA, Ltd., Columbus, OH, United States*, Bryan Strawbridge, *SEA Ltd., Charlotte, NC, United States*, Ashley Dunn, Elaine Castro, *SEA Ltd., Columbus, OH, United States*, Dusty Boyd, *SEA Ltd., Charlotte, NC, United States*

5:03pm – Heavy Truck Fuel Storage System Design for Improved Impact Protection

Technical Paper Publication. IMECE2019-11854

Peter (PJ) Leiss, Marcus Mazza, Erin Shipp, *Robson Forensic, Inc., Lancaster, PA, United States*

5:24pm – Development of Vehicle Safety Rating Systems and Application to Off-Road Vehicles

Technical Paper Publication. IMECE2019-12178

Scott Keschull, R. Michael Van Auken, *Dynamic Research, Inc., Torrance, CA, United States*

TRACK 14 DESIGN, SYSTEMS, AND COMPLEXITY

- 14-1-1: Product and Process Design I**
- 14-1-2: Product and Process Design II**
- 14-1-3: Product and Process Design III**
- 14-1-4: Product and Social Aware Design**
- 14-2-1: CAD, CAM and CAE Design I**
- 14-2-2: CAD, CAM and CAE Design II**
- 14-3-1: Optimization I**
- 14-3-2: Optimization II**
- 14-3-3: Optimization III**
- 14-4-1: Design for Additive Manufacturing I**
- 14-4-2: Design for Additive Manufacturing II**
- 14-6-1: Plenary Session**

ACKNOWLEDGMENT

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Giorgio Colombo, *Politecnico di Milano, Italy*
Caterina Rizzi, *University of Bergamo, Italy*

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Muhammad Salman, *Kennesaw State University, United States*
Martin L. Tanaka, *Western Carolina University, United States*
Miri Weiss Cohen, *Braude College of Engineering, Israel*

TRACK 14 DESIGN, SYSTEMS AND COMPLEXITY

WEDNESDAY, NOVEMBER 13

14-6 PLENARY SESSION

14-6-1 Plenary Session

Convention Center, 255F

9:45AM–10:30AM

9:45am – Design for Additive Manufacturing: Opportunities and Challenges

Plenary Presentation. IMECE2019-14011

David Rosen, *Singapore University of Technology & Design and Georgia Institute of Technology, Marietta, GA, United States*

14-2 CAD, CAM, AND CAE DESIGN

14-2-1 CAD, CAM, and CAE Design I

Convention Center, 355F

10:45AM–12:30PM

Session Organizer: Caterina Rizzi, *University of Bergamo, Dalmine, Italy*

Session Co-Organizer: Suat Coemert, *Technical University of Munich, Garching, Bavaria, Germany*

10:45am – A Motion Capture Realization Method for Assisting in Product Design via Parametric Surfaces

Technical Paper Publication. IMECE2019-10315

Miri Weiss Cohen, *Braude College of Engineering, Karmiel, Israel*, Daniele Regazzoni, *University of Bergamo, Dalmine, Italy*

11:06am – Gait Analysis in the Assessment of Patients Undergoing a Total Hip Replacement

Technical Paper Publication. IMECE2019-10491

Daniele Regazzoni, Andrea Vitali, Filippo Colombo Zefinetti, Caterina Rizzi, *University of Bergamo, Dalmine, Italy*

11:27am – Improving Packing Efficiency and Component Handling Reliability in Logistics With a Novel CAD Approach

Technical Paper Publication. IMECE2019-11209

Sergei Chekurov, *Aalto University, Espoo, Finland*, Ismo Mäkelä, *DeskArtes, Helsinki, Finland*

11:48am – A Compared Approach on How Deep Learning May Support Reverse Engineering for Tolerance Inspection

Technical Paper Publication. IMECE2019-11325

Michele Bici, Seyed Saber Mohammadi, Francesca Campana, *Sapienza Università di Roma, Rome, Italy*

14-4 DESIGN FOR ADDITIVE MANUFACTURING

14-4-1 Design for Additive Manufacturing I

Convention Center, 355E

10:45AM–12:30PM

Session Organizer: Martin L. Tanaka, *Western Carolina University, Cullowhee, NC, United States*

Session Co-Organizer: Sergei Chekurov, *Aalto University, Espoo, Finland*

10:45am – Design for Additive Manufacturing: Effectiveness of Unit Cell Design Guidelines as Ideation Tools

Technical Paper Publication. IMECE2019-11539

I'Shea Boyd, *University of Maryland, Baltimore, MD, United States*, Mohammad Fazelpour, *University of Maryland, College Park, MD, United States*

11:06am – Axiomatic Design to Foster Additive Manufacturing-Specific Design Knowledge

Technical Paper Publication. IMECE2019-11480

Sergei Chekurov, Niklas Kretschmar, *Aalto University, Espoo, Finland*, Marco Rossoni, Davide Felice Redaelli, Giorgio Colombo, *Politecnico di Milano, Milano, Italy*

11:27am – Utilizing Design for Metal Additive Manufacturing and Topology Optimization to Improve Product Designs

Technical Paper Publication. IMECE2019-10633

Martin L. Tanaka, Jeremy J. Smith, *Western Carolina University, Cullowhee, NC, United States*

11:48am – Determination of Future Robust Product Features for Modular Product Family Design

Technical Paper Publication. IMECE2019-10497

Erik Greve, Christoph Rennpferdt, Tobias Hartwich, Dieter Krause, *Hamburg University of Technology, Hamburg, Germany*

14-4 DESIGN FOR ADDITIVE MANUFACTURING

14-4-2 Design for Additive Manufacturing II

Convention Center, 355E

2:00PM–3:45PM

Session Organizer: Marco Rossoni, *Politecnico di Milano, Milano, Italy*

Session Co-Organizer: Erik Greve, *Hamburg University of Technology, Hamburg, Germany*

2:00pm – Design Process Deconstructed: The Industry Case of an Elevator Button Assembly Redesigned for Additive Manufacturing

Technical Paper Publication. IMECE2019-11219

Tuomas Puttonen, *Aalto University, Espoo, Finland*

2:21pm – Categorization of Design for Additive Manufacturing Concepts

Technical Paper Publication. IMECE2019-11354

Sergei Chekurov, *Aalto University*

2:42pm – Replicas Fabrication by Laser Scanner and Additive Manufacturing: A Preliminary Investigation

Technical Paper Publication. IMECE2019-11497

Marco Rossoni, Giorgio Colombo, *Politecnico di Milano, Milano, Italy*

3:03pm – Design and Test of a Direct-Metal-Laser-Sintering (DMLS) Manufactured Heat Exchanger for Efficient Geothermal System

Technical Presentation. IMECE2019-12274

Jiajun Xu, *University of the District of Columbia, Washington, DC, United States*

14-3 OPTIMIZATION

14-3-1 Optimization I

Convention Center, 355E

4:00PM–5:45PM

Session Organizer: Miri Weiss Cohen, *Braude College of Engineering, Karmiel, Israel*

Session Co-Organizer: Justin Mancovsky, *Clarke Valve, North Kingston, RI, United States*

4:00pm – Optimum Synthesis of Rigid Mechanisms Using a Dynamic Ant-Search Method With Sensitivity Analysis

Technical Paper Publication. IMECE2019-10262

Nadim Diab, Omar Itani, Ahmad Smaili, *Rafik Hariri University, Mount Lebanon, Lebanon*

4:21pm – Optimization Design of Redundant Cable Driven Parallel Robots Based on Constant Stiffness Space

Technical Paper Publication. IMECE2019-10488

Zhiwei Cui, Xiaoqiang Tang, Senhao Hou, Haining Sun, *Tsinghua University, Beijing, China*, Dianjun Wang, *Beijing Institute of Petrochemical Technology, Beijing, China*

4:42pm – Optimal Synthesis of Topology for Compliant Mechanisms

Technical Paper Publication. IMECE2019-10699

Antonio Caputi, Davide Russo, *Università degli Studi di Bergamo, Dalmine, Italy*

5:03pm – Simulation of a 7R Manipulator Inverse Calibration by Using an Optimized Neural Network Based on Beetle Antennae Search Algorithm

Technical Paper Publication. IMECE2019-11199

Yuxiang Wang, Zhangwei Chen, *Zhejiang University, Hangzhou, China*, Hongfei Zu, *Zhejiang Sci-Tech University, Hangzhou, Zhejiang Province, China*, Xiang Zhang, *Hangzhou Dianzi University, Hangzhou, Zhejiang Province, China*

THURSDAY, NOVEMBER 14

14-1 PRODUCT AND PROCESS DESIGN**14-1-1 Product and Process Design I****Convention Center, 251A 8:15AM–10:00AM****Session Organizer:** Shuichi Fukuda, *Keio University, Tokyo, Japan***Session Co-Organizer:** Marko Ebermann, *Chemnitz University of Technology, Chemnitz, Saxony, Germany***8:15am – Influence of Geometric Shape Defects on Operating Parameters in Cylindrical Journal Bearings****Technical Paper Publication. IMECE2019-10179****Marko Ebermann, Björn Prase, Alexander Hasse, Chemnitz University of Technology, Chemnitz, Saxony, Germany****8:36am – Analysis of Cornering Strength of Steel Wheels Including the Effects of Disc and Rim Interference Assembly****Technical Paper Publication. IMECE2019-10346****Bin Dang, Yingchun Shan, Xiandong Liu, Xiaoran Wang, Yue Zhang, Xianyu Zeng, Beihang University, Beijing, China****8:57am – 3D Assembly Model Matching Based on Motion Features and Shape Distribution****Technical Paper Publication. IMECE2019-11144****Ji Baoning, Li Yuan, Jie Zhang, Yu Jianfeng, Northwestern Polytechnical University, Xi'an, China****9:18am – Meshing Characteristics and Engagement of Anti-Backlash Single- and Double-Roller Enveloping Hourglass Worm Gear****Technical Paper Publication. IMECE2019-11332****Xingqiao Deng, Jie Wang, Shike Wang, Shisong Wang, Xihua University, Chengdu, China, Yucheng Liu, Ge He, Mississippi State University, Mississippi State, MS, United States****14-2 CAD, CAM, AND CAE DESIGN****14-2-2 CAD, CAM, and CAE Design II****Convention Center, 251E 8:15AM–10:00AM****Session Organizer:** Daniele Regazzoni, *University of Bergamo, Dalmine, Italy***Session Co-Organizer:** Hakan Petersson, *Halmstad University, Halmstad, Sweden***8:15am – Experimental and FEM-Based Payload Analysis of Ti-6Al-4V Flexure Hinges****Technical Paper Publication. IMECE2019-10105****Suat Coemert, Luca G. Wegener, Baturay Yalvac, Julia Fuckner, Tim C. Lueth, Technical University of Munich, Garching, Germany****8:36am – A New Mobile Anti-Ramming System****Technical Paper Publication. IMECE2019-11296****Sergio Baragetti, Emanuele Vincenzo Arcieri, Università degli Studi di Bergamo, Dalmine, Italy****8:57am – Mesh-Less Analysis of Products: A Revolution Within Computer Based Design Analysis****Technical Paper Publication. IMECE2019-11550****Hakan Petersson, Halmstad University, Halmstad, Sweden****9:18am – Feature Extraction for Mechanical Design Validation Using Supervised Finite Element Analysis****Technical Presentation. IMECE2019-12418****Edward Schwalb, MSC Software, Newport Beach, CA, United States****9:39am – Unsupervised Validation of FEM Variants Using IOU Descriptors****Technical Presentation. IMECE2019-12419****Edward Schwalb, MSC Software, Newport Beach, CA, United States****14-1 PRODUCT AND PROCESS DESIGN****14-1-2 Product and Process Design II****Convention Center, 251A 10:15AM–12:00PM****Session Organizer:** Marco Mandolini, *Università Politecnica delle Marche, Ancona, Italy***Session Co-Organizer:** Muhammad Salman, *Kennesaw State University, Marietta, GA, United States***10:15am – Research on the Performance of Metal Connectors of Injection-Molded Long-Glass-Fiber Reinforced Thermoplastic Composite Wheel****Technical Paper Publication. IMECE2019-10348****Yue Zhang, Yingchun Shan, Xiandong Liu, Tian He, Xiaoran Wang, Bin Dang, Xianyu Zeng, Beihang University, Beijing, China****10:36am – Design and Experimental Study of Radial Piston Pump With Valve Plate Distribution****Technical Paper Publication. IMECE2019-11286****Peng Dong, Shengdun Zhao, Yongfei Wang, Peng Zhang, Xi'an Jiao Tong University, Xi'an, China, Xiaolan Han, Xi'an Shiyou University, Xi'an, China, Chen Liu, Xi'an University of Technology, Xi'an, Shaanxi, China, Dean Meng, Yuanzhe Dong, Xi'an Jiao Tong University, Xi'an, China****10:57am – Conceptual Cost Estimation of Multistage Axial Compressor Modules****Technical Paper Publication. IMECE2019-11587****Claudio Favi, Università di Parma, Parma, Italy, Federico Campi, Marco Mandolini, Università Politecnica delle Marche, Ancona, Ancona, Italy, Irene Martinelli, BHGE, Firenze, Italy, Michele Germani, Polytechnic University of Marche, Ancona, Italy****11:18am – Design and Start-Up of a Plant for Dairy Processed Sweets****Technical Paper Publication. IMECE2019-11647****Jessica Gissella Maradey Lazaro, Universidad Autónoma De Bucaramanga, Bucaramanga, Santander, Colombia, Gianina Garrido, Servicio Nacional de Apr Colombia, Kevin Caceres, Universidad Autonoma de Bucaramanga, Bucaramanga, Colombia**

14-3 OPTIMIZATION

14-3-2 Optimization II

Convention Center, 251E

10:15AM-12:00PM

Session Organizer: Amit Banerjee, *Penn State University Harrisburg, Middletown, PA, United States*

Session Co-Organizer: Catherine LeBoeuf, *Clarke Valve, North Kingstown, RI, United States*

10:15am – Reliability-Based MDSO for Co-Design of Stochastic Dynamic Systems

Technical Paper Publication. IMECE2019-10632

Saeed Azad, Michael Alexander-Ramos, *University of Cincinnati, Cincinnati, OH, United States*

10:36am – Experimental Verification of Rubber Clutch Spring Damper Torque Behavior in Time-Dependent Manner and System Optimization Using Simulated Annealing Algorithm Integrated With 1-D Modeling

Technical Paper Publication. IMECE2019-10965

Mehmet Onur Genc, *Valeo Automotive Systems, Bursa, Turkey, Necmettin Kaya,* *Uludag University, Bursa, Turkey,*

Süleyman Konakci, *Valeo Automotive Systems, Bursa, Turkey*

10:57am – Optimizing Bolting Configurations in a Pressure Vessel

Poster Paper Publication. IMECE2019-11561

Justin Mancovsky, Jarod Ferriera, Clarke Valve, *North Kingstown, RI, United States*

11:18am – New Control Valve Technology Requiring Engineering Solutions to Reduce Erosion Corrosion and Flow Accelerated Corrosion

Poster Paper Publication. IMECE2019-11563

Catherine LeBoeuf, Mark Laurito, Clarke Valve, *North Kingstown, RI, United States*

11:39am – Design Optimization of a Beam Structure of Machine Tools

Technical Paper Publication. IMECE2019-12299

Necmettin Kaya, *Uludag University, Bursa, Turkey,* **Mehmet Onur Genc,** *Valeo Automotive Systems, Bursa, Turkey*

14-1 PRODUCT AND PROCESS DESIGN

14-1-3 Product and Process Design III

Convention Center, 251A

2:00PM-3:45PM

Session Organizer: Caterina Rizzi, *University of Bergamo, Dalmine, Italy*

Session Co-Organizer: Ahm Rahman, *Pennsylvania State University Harrisburg, Middletown, PA, United States*

2:00pm – Monocular Visual Inertial Odometry (VIO) Dataset Collection With a Self-Calibrating Platform for Inertial Measurement Unit (IMU)

Technical Paper Publication. IMECE2019-10595

Yuan Tian, Marc Compere, *Embry-Riddle Aeronautical University, Daytona Beach, FL, United States*

2:21pm – Motorcycle No Fall Over Kickstand

Technical Paper Publication. IMECE2019-11032

Muhammad Salman, *Kennesaw State University, Marietta, GA, United States*

2:42pm – Design of a Composite Mountain Bike Hydraulic Disc Brake

Technical Paper Publication. IMECE2019-11057

Ahm Rahman, *Pennsylvania State University Harrisburg, Middletown, PA, United States,* **David Pugh,** *Phoenix Contact, Middletown, PA, United States*

3:03pm – Development of a Skateboard for a Physically Disabled Child

Technical Paper Publication. IMECE2019-11826

Ana Helena Costa, Maria Lucia Leite Ribeiro Okimoto, Eloisa Cardozo, Maria Lilian de Araújo Barbosa, *Universidade Federal do Paraná, Curitiba, Parana, Brazil*

14-3 OPTIMIZATION

14-3-3 Optimization III

Convention Center, 251E

2:00PM-3:45PM

Session Organizer: Antonio Caputi, *Università degli Studi di Bergamo, Dalmine, Italy*

Session Co-Organizer: Mehmet Onur Genc, *Valeo Automotive Systems, Bursa, Turkey*

2:00pm – Topology Optimization of Plastic Parts for Injection Molding

Technical Paper Publication. IMECE2019-11069

Kathryn Oliver, Sohel Anwar, Andres Tovar, *Indiana University-Purdue University Indianapolis, Indianapolis, IN, United States*

2:21pm – Multi-Objective Optimization of Parameters for Milling Using Evolutionary Algorithms and Artificial Neural Networks

Technical Paper Publication. IMECE2019-11438

Amit Banerjee, Issam Abu-Mahfouz, Ahm Rahman, *Pennsylvania State University Harrisburg, Middletown, PA, United States*

2:42pm – Infrastructure Optimization of In-Motion Charging Networks for Electric Vehicles Using Agent-Based Modeling

Poster Presentation. IMECE2019-13675

Landon Willey, John Salmon, *Brigham Young University, Provo, UT, United States*

3:03pm – Circular Saw Blade Manufacturing: Optimization Using Six Sigma Methodologies

Technical Presentation. IMECE2019-13813

Chandra Sekhar Rakurty, Joseph A. Tarr, *The M. K. Morse Company, Canton, OH, United States*

14-1 PRODUCT AND PROCESS DESIGN

14-1-4 Product and Social Aware Design

Convention Center, 251A

4:00PM–5:45PM

Session Organizer: Shuichi Fukuda, *Keio University, Tokyo, Japan*

Session Co-Organizer: Michele Bici, *Sapienza Università di Roma, Rome, Italy*

4:00pm – Designing a Better Virtual Reality (VR) Experience

Technical Paper Publication. IMECE2019-10674

Armand J. Asencio, Ian Graham, Ryan Korsen, Guohua Ma, *Wentworth Institute of Technology, Boston, MA, United States,*
James McCusker, *Wentworth Institute of Technology, Salem, NH, United States*

4:21pm – Data Driven Decisions in Prototyping and Product Development: A Framework for Uncertainty and Decision-Making

Technical Paper Publication. IMECE2019-11671

Hadi Ali, Micah Lande, *Arizona State University, Mesa, AZ, United States*

4:42pm – A Challenge to Adaptability: Learning From the Octopus

Technical Paper Publication. IMECE2019-10864

Shuichi Fukuda, *Keio University, Tokyo, Japan*

5:03pm – Designing Car-Free Cities to Welcome Millions Fleeing Rapid Sea Level Rise, Within a Few Decades

Technical Presentation. IMECE2019-13001

William Leighty, *The Leighty Foundation, Juneau, AK, United States*

5:24pm – Quantitative Performance Indicator for Learning From Failures

Technical Presentation. IMECE2019-13376

Shuichi Fukuda, *Keio University, Tokyo, Japan*

**TRACK 15 ASME INTERNATIONAL UNDERGRADUATE RESEARCH AND
DESIGN EXPO (POSTERS ONLY)**

ACKNOWLEDGMENT

TRACK ORGANIZER

Eleonora Tubaldi, *University of Arizona, United States*

SUNDAY, NOVEMBER 10

TRACK 15 ASME International Undergraduate Research and Design Expo (Posters Only)

Track Organizer: Eleonora Tubaldi, *University of Arizona,
Tucson, AZ, United States*

15-1 GENERAL

15-1-1 General

Exhibit Hall AB

5:30PM–7:00PM

U1. The Effect of Clasp Leaf Sheath on Wheat Stem Failure

Undergrad Expo. IMECE2019-13789

Joseph Cornwall, Daniel Robertson, *University of Idaho,
Moscow, ID, United States*

U2. Creating Specimen-Specific Finite Element Models From XRay Computed Tomography Data

Undergrad Expo. IMECE2019-13926

Joseph Hansen, Aaron Lewis, Ryan Larson, Douglas Cook, *Brigham Young University, Provo, UT, United States*

U3. The Influence of the Leaf Sheath on Corn Stalk Stiffness

Undergrad Expo. IMECE2019-13928

Jared Hale, *Brigham Young University, Provo, UT, United States*, Nathan Hale, *Brigham Young University, Henderson, NV, United States*, Spencer Webb, Ryan Larson, Douglas Cook, *Brigham Young University, Provo, UT, United States*

U4. Elevated Tow Track for Measuring the Lift and Drag of Fixed-Wing UAVs with up to 6-ft Wingspan

Undergrad Expo. IMECE2019-13627

Meredith Metzger, Matthew Anderson, *University of Utah,
Salt Lake City, UT, United States*

U5. An Overview of the Potential of Hybrid & Electric Vehicles in Malaysia

Undergrad Expo. IMECE2019-10006

A. Lateef Moiz Akmal, Awang Idris, *Universiti Kuala Lumpur Malaysian Spanish Institute, Kulim, Kedah, Malaysia*

U6. The Adaptive Cycle for Off-Road Vehicles

Undergrad Expo. IMECE2019-10527

Julia Briden, *Illinois Institute of Technology, Black Mountain, NC, United States*, Stoyan Stoyanov, Francisco Ruiz, *Illinois Institute of Technology, Chicago, IL, United States*

U7. Innovative Design for Water Control in Sub-Saharan Water Catchment Systems

Undergrad Expo. IMECE2019-10659

Justin Smith, Tyler D. Smith, *Southern New Hampshire University, New Durham, NH, United States*, Linda Marquis, Anat Eshed, *Southern New Hampshire University, Manchester, NH, United States*

U8. Effectiveness of Helmets in Mitigating Impact Loads

Undergrad Expo. IMECE2019-10754

Vibhu Baibhav, *Indian Institute of Technology, Roorkee, Muzaffarpur, Bihar, India*

U9. Designing a Fluidic Injection Thrust Reverser System for Turbofan Engines

Undergrad Expo. IMECE2019-10935

Raghav Kumar, Pankaj Rajput, Sunil Kumar, *New York University Abu Dhabi, Abu Dhabi, United Arab Emir.*

U10. Study of Rewetting Phenomena During Transient Cooling of Hot Surface

Undergrad Expo. IMECE2019-11303

Vibhu Baibhav, *Indian Institute of Technology, Roorkee, Muzaffarpur, Bihar, India*

U11. Solar Thermal Applications in Rural Areas

Undergrad Expo. IMECE2019-11376

Vibhu Baibhav, *Indian Institute of Technology, Roorkee, Muzaffarpur, Bihar, India*

U12. Aeroelastic Analysis of a Initial Pitch Wing

Undergrad Expo. IMECE2019-11405

Vanessa Gonzalez, Zahra Sotoudeh, *California State Polytechnic University, Pomona, Chino Hills, CA, United States*

U13. Thorough Design Analysis of a Solar Car Three-Wheel Rear Suspension System

Undergrad Expo. IMECE2019-11499

Eben Shelton, Maxwell Hammond, Phillip Deierling, *University of Iowa, Iowa City, IA, United States*

U14. Validation of the Mechanical Properties of a Carbon Fiber and Iron Particulate Multifunctional Composite

Undergrad Expo. IMECE2019-11531

Brian Wyatt Jr., Matthew Riley, *Rose-Hulman Institute of Technology, Terre Haute, IN, United States*

U15. Design and Implementation of a Pulley-Based Movable LED System

Undergrad Expo. IMECE2019-11602

Ilhan Zeki, Johnny P. Cognasi, Jason Perkins, Joseph M. Randall, Melanie Ronoh, Jeong Tae Ok, *Midwestern State University, wichita falls, TX, United States*

U16. Centrifugal Compressor Performance Prediction Using Gaussian Process Regression and Artificial Neural Networks

Undergrad Expo. IMECE2019-11855

Pau Cutrina Vilalta, Hui Wan, *University of Colorado, Colorado Springs, Colorado Springs, CO, United States*, Souyma S. Patnaik, *Air Force Research Laboratory, Wright-Patterson AFB, OH, United States*

U17. A Narrow-Track, Tilting, Recumbent Bicycle With User-Controllable Variable Stability

Undergrad Expo. IMECE2019-12167

Anthony Pierson, Alissa Shortreed, Andrew Dressel, *University of Wisconsin-Milwaukee, Milwaukee, WI, United States*

U18. Design and Fabrication of Concentrated Solar Waste Water Treatment Apparatus

Undergrad Expo. IMECE2019-12331

Samarpan Deb Maumder, Simran Saha, *Institute of Engineering & Management, Kolkata, West Bengal, India*

U19. Endothermic Vest for Firefighting Applications

Undergrad Expo. IMECE2019-12634

James Parisi, Kevin Anderson, *California State Polytechnic University, Pomona, CA, United States*

U20. Bathymetric Mapping Using Arduino Technologies

Undergrad Expo. IMECE2019-13046

Hannah Walker, *University of Southern California, San Diego, CA, United States*, **Patrick Lynett**, *University of Southern California, Los Angeles, CA, United States*

U21. Development of Autonomous Vision System for Industrial Application

Undergrad Expo. IMECE2019-13213

Anvay Pradhan, *University of Iowa, West Des Moines, IA, United States*, **Phillip Deierling**, *University of Iowa, Iowa City, IA, United States*

U22. A Model and Vibrational Analysis of a Dolphin's Acoustic System

Undergrad Expo. IMECE2019-13324

Alec Dryden, *Saint Martin's University, Lacey, WA, United States*, **Brianna M. Huhmann**, *Saint Martin's University, Puyallup, WA, United States*, **Oscar Martin-Garcia**, *Saint Martin's University, Yelm, WA, United States*, **Shawn Duan**, *Saint Martin's University, Lacey, WA, United States*

U23. Inter-Laminar Crack Propagation of 3D Printed ABS Plastic

Undergrad Expo. IMECE2019-13326

Weston Craig, *Utah State University, Idaho Falls, ID, United States*, **Ryan Berke**, *Utah State University, Logan, UT, United States*, **Owen Kingstedt**, *University of Utah, Salt Lake City, UT, United States*, **Christopher Stolinski**, **Robert J Rowley**, *Utah State University, Logan, UT, United States*

U24. Systematic Study of Process Parameters for 3D Printing Liquid Silicone

Undergrad Expo. IMECE2019-13492

Serah E. Hatch, Scott L. Thomson, *Brigham Young University, Provo, UT, United States*

U25. Improved Assembly for High-Throughput Vibration-Based Fatigue Testing

Undergrad Expo. IMECE2019-13515

Emma E. German, Samantha D. Burton, Brandon Furman, *Utah State University, Logan, UT, United States*, **Dino A. Celli, Casey M. Holycross, Onome Scott-Emuakpor**, *Air Force Research Laboratory, Wright-Patterson AFB, OH, United States*, **Ryan Berke**, *Utah State University, Logan, UT, United States*

U26. Design and Heat Transfer Analysis of a Thermoelectric Air Cooler

Undergrad Expo. IMECE2019-13722

Majed Alrefae, Yassin Alkurdi, Abdurrhman Alabdullatif, *Yanbu Industrial College, Yanbu Industrial City, Madina, Saudi Arabia*

U27. Design and Analysis of an Innovative Portable Water-Cooled Thermoelectric Generator Apparatus

Undergrad Expo. IMECE2019-13849

Eric Coday, Randall Johnson, Jordan Parker, Shawn Duan, *Saint Martin's University, Lacey, WA, United States*

U28. Control of Electrospun Jets Instabilities: In Pursuit of Perfect Continuous Nanofiber Alignment

Undergrad Expo. IMECE2019-13901

Abdelrahman Elsayed, *University of Nebraska-Lincoln, Lincoln, NE, United States*

U29. Designing Lattices for Mechanical Performance and Lightweight Structures

Undergrad Expo. IMECE2019-13902

Jacob Adams, Kayode Oluwabunmi, *University of North Texas, Denton, TX, United States*

U30. Control of Electrospun Jets Instabilities: In Pursuit of Perfect Continuous Nanofiber Alignment

Undergrad Expo. IMECE2019-13910

Abdelrahman Elsayed, Yuris Dzenis, Lucas Barry, *University of Nebraska-Lincoln, Elkhorn, NE, United States*

U31. Improvements in the Design Process of an Electric Motorcycle Using Virtual Reality

Undergrad Expo. IMECE2019-13929

Dany Pabón Villamizar, *Universidad Autónoma de Bucaramanga, Bucaramanga, Colombia*, **Sebastian Roa Prada**, *Universidad Autónoma de Bucaramanga, Floridablanca, Santander, Colombia*, **Jhonatan Ortiz**, *Tecnoparque SENA Nodo Bucaramanga, Bucaramanga, Colombia*

U32. Advanced Control System Design of a Pivoting Helicopter Prototype

Undergrad Expo. IMECE2019-13932

Jeffer S. Eugenio Barroso, Andrés L. Carrillo Peña, Hernando González, *Universidad Autónoma de Bucaramanga, Bucaramanga*, **Sebastian Roa Prada**, *Universidad Autónoma de Bucaramanga, Floridablanca, Santander, Colombia*

U33. Chemical Species Effect on Grain Boundary and Material Properties

Undergrad Expo. IMECE2019-13958

Sam Garretson, *University of Alabama, Tuscaloosa, AL, United States*

U34. Finite Element Analysis of the Effect of Porosity on the Plasticity and Damage Behavior of Mg AZ31 and Al 6061 T651 Alloys

Undergrad Expo. IMECE2019-13961

Allen Perkins, Yucheng Liu, *Mississippi State University, Mississippi State, MS, United States*, **Wenhua Yang**, *Mississippi State University, Starkville, MS, United States*, **Lei Chen, Caleb Yenusah**, *Mississippi State University, Mississippi State, MS, United States*

U35. Validating Ductility Scaling Relationships Using DIC

Undergrad Expo. IMECE2019-13962

Ashley Buxton, Adam Smith, Robert J. Rowley, *Utah State University, Logan, UT, United States*, **Owen Kingstedt**, *University of Utah, Salt Lake City, UT, United States*

U36. Flow Visualization and Drag Measurements of Image-Based Motorcycle Rider Models With Different Riding Positions

Undergrad Expo. IMECE2019-13964

Noah Jackowitz, Jensen Xi, Xiuhua Si, *California Baptist University, Riverside, CA*

U37. Determining Lung Obstruction Using Forced Oscillation Technique And Machine Learning

Undergrad Expo. IMECE2019-13965

Jensen Xi, Mohamed Talaat, Cristian Garcia, Xiuhua Si, *California Baptist University, Riverside, CA*

U38. Design, Characterization and Flow Analysis of Biodegradable Fine-Meshed Flow Diverters

Undergrad Expo. IMECE2019-13966

Zack Maggard, Joseph Puskas, Mohammad Hossan, *University of Central Oklahoma, Edmond, OK, United States*

U39. ACL-Reconstruction Supplementary Fixation Device Testing

Undergrad Expo. IMECE2019-13967

Hannah White, Gregory Zogby, Rachel Kinnison, *United States Military Academy, West Point, NY, United States*, **David Tennent**, *U.S. Army, West Point, NY, United States*, **Matthew Posner, Margaret Nowicki**, *United States Military Academy, West Point, NY, United States*

U40. Additive Manufacturing Challenges for Complex Granular Structures

Undergrad Expo. IMECE2019-13975

Jacob Hammil, Nima NejadSadeghi, Anil Misra, *University of Kansas, Lawrence, KS, United States*

U41. Quantifying Postural Control

Undergrad Expo. IMECE2019-13976

Christian Witkop, *United States Military Academy, West Point, NY, United States*, **Donald L. Goss**, *Keller Army Community Hospital, West Point, NY, United States*, **Gregory M. Freisinger**, *United States Military Academy, West Point, NY, United States*, **Nathan E. Henry**, *Keller Army Community Hospital, West Point, NY, United States*

U42. Improvement of Stiffness and Energy Absorption by Harnessing Hierarchical Interlocking in Brittle Polymer Blocks

Undergrad Expo. IMECE2019-13977

Donald Marwin, Trisha Sain, *Michigan Technological University, Houghton, MI, United States*

U43. Crystalline Phase Change in A36 Steel Alloys due to High Speed Impact

Undergrad Expo. IMECE2019-13978

Muna Slewa, *Embry-Riddle Aeronautical University – Prescott, Prescott, AZ, United States*

U44. Stereo Digital Image Correlation With Scheimpflug Adjustment

Undergrad Expo. IMECE2019-13979

Fiona Van Leeuwen, Emma German, Ryan Berke, *Utah State University, Logan, UT, United States*

U45. Tornadic Inflow Measurement Probe

Undergrad Expo. IMECE2019-13980

Ethan Moriarty, *Quinnipiac University, Hamden, CT, United States*

U46. Mass Production of Graphene-Based PVDF Wireless Strain Sensor

Undergrad Expo. IMECE2019-13981

Weston Capper, Yanxiao Li, Chenglin Wu, *Missouri University of Science and Technology, Rolla, MO, United States*

U47. Ballistic Testing and Analysis in Support of Course-Wide Differential Equation Modeling

Undergrad Expo. IMECE2019-13982

Lee Cox, *United States Military Academy, West Point, NY, United States*

U48. Design of a High-Altitude Rocket Motor Igniter Chamber

Undergrad Expo. IMECE2019-13983

Chase Lewis, *United States Military Academy, West Point, NY, United States*

U49. Design of a Wearable Sensor System for Prevention of Fatigue Induced Injuries in Baseball Pitching

Undergrad Expo. IMECE2019-13984

Julia Dunn, *University of Utah, Salt Lake City, UT, United States*

U50. Sensitivity Study of Aerial Dispersion Models for Vehicular Pollutant

Undergrad Expo. IMECE2019-13985

Alec Tauer, *Marquette University, Milwaukee, WI, United States*

U51. Metabolics of Augmented Running

Undergrad Expo. IMECE2019-13986

Shane Murphy, *United States Military Academy, West Point, NY, United States*

**U52. The Effects of Struts and Walls on a Body Centered
Cubic Lattice Design**

Undergrad Expo. IMECE2019-13987

Torrance Walker, *University of North Texas, Denton, TX,
United States*

U53. Vertical Rotor Aeroacoustic Calibration

Undergrad Expo. IMECE2019-13988

Victor Kao, *United States Military Academy, West Point, NY,
United States*

**U54. Structural Performance of MWCNT Fiber Composites
at Higher Temperature via Nanotesting**

Undergrad Expo. IMECE2019-13989

Luc Bontoux, Rutgers, *The State University of New Jersey,
Piscataway, NJ, United States*, **Assimina Pelegri**, *Rutgers
University, East Brunswick, NJ, United States*

U55. Dissipating Earthquake Energy Through Friction

Undergrad Expo. IMECE2019-13943

Myrto Kampouris, Pedro Silva, *George Washington
University, Washington, DC, United States*, **Olivia Lee**,
St. Paul's High School, Concord, NH, United States

TRACK 16 NSF (INCLUDES NSF STUDENT COMPETITION (POSTERS ONLY))

TRACK 16: NSF (INCLUDES NSF STUDENT COMPETITION (POSTERS ONLY))

ACKNOWLEDGMENT

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Adam Huang, *University of Arkansas, United States*
Marriner Merrill, *U.S. Naval Research Laboratory, United States*
Zhiting Tian, *Cornell University, United States*

TRACK 16 NSF (INCLUDES NSF STUDENT COMPETITION (POSTERS ONLY))**16-1 POSTER SESSION: NSF-FUNDED RESEARCH (GRAD & UNDERGRAD)****16-1-1****Exhibit Hall AB****12:00PM–2:30PM**

N100. Visualizing the Evolution of Magnetic Domains and Magnetization Rotation in Ni₂MnGa Magnetic Shape Memory Alloys During Magneto-Mechanical Loading
Poster Presentation. IMECE2019-13814

Glen D'Silva, Heidi Feigenbaum, Constantin Ciocanel, Northern Arizona University, Flagstaff, AZ, United States

N101. Impedance and Magnetic Non-Contact Based Multifunctional Polymer Sensor Textiles

Poster Presentation. IMECE2019-13163

Tonoy Chowdhury, Nandika D'Souza, Daina Berman, University of North Texas, Denton, TX, United States

N102. An Optical Cavity Biosensor Integrated With Capillary-Driven Microfluidics for Label-Free Immunoassays

Poster Presentation. IMECE2019-13720

Ali Khodayari Babil, Texas Tech University, Lubbock, TX, United States, **DongGee Rho, Seung Kim,** Baylor University, Waco, TX, United States, **Jungkyu Kim,** University of Utah, Salt Lake City, UT, United States

N103. Multiscale Colorectal Biomechanics and Implications in Visceral Nociception

Poster Presentation. IMECE2019-12989

Saeed Siri, Franz Maier, Stephany Santos, David Pierce, Bin Feng, University of Connecticut, Storrs, CT, United States

N104. Optimization of Farm Management Strategies Using Crop Models

Poster Presentation. IMECE2019-12859

Faezeh Akhavadegan, Javad Ansarifar, Lizhi Wang, Guiping Hu, Iowa State University, Ames, IA, United States

N105. New Algorithms for Detecting Multi-Effect and Multi-Way Epistatic Interactions

Poster Presentation. IMECE2019-12854

Javad Ansarifar, Lizhi Wang, Iowa State University, Ames, IA, United States

N106. Flexible Aerosol Jet Printed High-Performance Thermoelectric Films via Rapid and Versatile Photonic Sintering

Poster Presentation. IMECE2019-11980

Mortaza Saeidi-Javash, Chaochao Dun, Wenzheng Kuang, Nick Kempf, University of Notre Dame, South Bend, IN, United States, **Yanliang Zhang,** University of Notre Dame, Notre Dame, IN, United States

N107. Meniscus-Mediated Spontaneous Droplet Coalescence for Condensation

Poster Presentation. IMECE2019-12626

Zongqi Guo, Xianming Dai, Lei Zhang, Jyotirmoy Sarma, University of Texas at Dallas, Richardson, TX, United States

N108. Chemical Vapor Deposition Growth and Characterization of Iron-Doped MoS₂ Monolayers

Poster Presentation. IMECE2019-12632

Shichen Fu, Kyungnam Kang, Xiaotian Wang, Stevens Institute of Technology, Hoboken, NJ, United States, **Lihua Zhang, Xiao Tong,** Brookhaven National Laboratory, Upton, NY, United States, **Siwei Chen, Eui-Hyeok Yang,** Stevens Institute of Technology, Hoboken, NJ, United States

N109. Rational Design of Soft Heat Exchangers Undergoing Shape Change During Operation

Poster Presentation. IMECE2019-12654

Praveen Kotagama, Arizona State University, Phoenix, AZ, United States, **Konrad Rykaczewski,** Arizona State University, Tempe, AZ, United States

N110. Directionality Modulation of Monolayer WS₂ Emitter by Single Hydrogen-Doped Amorphous Silicon Nanospheres

Poster Presentation. IMECE2019-12656

Jie Fang, Mingsong Wang, Yuebing Zheng, University of Texas at Austin, Austin, TX, United States

N111. Comprehensive Energy Balance Analysis of Photon-Enhanced Thermionic Emission for Concentrated Solar Power Generation

Poster Presentation. IMECE2019-12663

A.N.M. Taufiq Elahi, University of Utah, Salt Lake City, UT, United States, **Mohammad Ghashami,** University of Nebraska–Lincoln, Lincoln, NE, United States, **Devon Jensen,** ACT, Salt Lake City, UT, United States, **Keunhan Park,** University of Utah, Salt Lake City, UT, United States

N112. Multivariate Model Calibration in the Absence of Experimental Observations: An Application in Metal Additive Manufacturing

Poster Presentation. IMECE2019-12674

Bing Zhang, Ibrahim Karaman, Raymundo Arroyave, Alaa Elwany, Texas A&M University, College Station, TX, United States

N113. Integrated Wildfire Evacuation Decision Support System (IWEDSS) Framework Development by Link Transmission Modeling

Poster Presentation. IMECE2019-12683

Bahar Azin, Xianfeng Terry Yang, University of Utah, Salt Lake City, UT, United States

N114. Circumferential Surface Wrinkling of Electrospun Polymer Nanofibers

Poster Presentation. IMECE2019-12713

Mojtaba Ahmadi, Xiangfa Wu, North Dakota State University, Fargo, ND, United States

N115. Modeling Thermal Instabilities During Frontal Polymerization of Thermosetting Polymers and Composites

Poster Presentation. IMECE2019-12715

Suzanne Peterson, *University of Illinois at Urbana-Champaign, Monticello, IL, United States*, Elyas Goli, Nil Parikh, Evan Lloyd, Philippe Geubelle, Nancy Sottos, Jeffrey Moore, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

N116. Competition Between Liquid Infiltration and Pore Crushing at Nanoscale

Poster Presentation. IMECE2019-12719

Mingzhe Li, *Michigan State University, East Lansing, MI, United States*, Yue Zhang, Yuan Gao, Baoxing Xu, *University of Virginia, Charlottesville, VA, United States*, Weiyi Lu, *Michigan State University, East Lansing, MI, United States*

N117. Validation of an Atomistic Field Theory for Contact Electrification Using a MEMS Load Cell

Poster Presentation. IMECE2019-12728

Tyler Hieber, *Kansas State University, Manhattan, KS, United States*, Mohamad I. Cheikh, Benjamin Kulbago, James Chen, *University at Buffalo – SUNY, Buffalo, NY, United States*, Gurpreet Singh, Zayd C. Leseman, *Kansas State University, Manhattan, KS, United States*

N118. Gum-Like Nanocomposites as Interfacial Materials for Energy Storage Devices

Poster Presentation. IMECE2019-12735

Xuwei Fu, *Washington State University, Pullman, WA, United States*, Yu Wang, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*, Wei-Hong Zhong, *Washington State University, Pullman, WA, United States*

N119. Electrochemical Performance of Polymer-Derived Ceramic Functionalized Transition Metal Dichalcogenides

Poster Presentation. IMECE2019-12741

Davi Marcelo Soares, Gurpreet Singh, *Kansas State University, Manhattan, KS, United States*

N120. Electrochemical Performance of Biomass Derived Carbons and PDC Functionalized Carbon Composite

Poster Presentation. IMECE2019-12742

Shakir Bin Mujib, *Kansas State University, Manhattan, KS, United States*, Beatriz Vessalli, *Centro de Tecnologia da Informacao Renato Archer, Campinas, Brazil*, Waldir A. Bizzo, *University of Campinas, Campinas, Brazil*, Talita Mazon, *Centro de Tecnologia da Informaçao Renato Archer, Campinas, Brazil*, Gurpreet Singh, *Kansas State University, Manhattan, KS, United States*

N121. Scheduling of Heterogeneous Connected Automated Vehicles at a General Conflict Area

Poster Presentation. IMECE2019-12746

Saeid Soleimaniamiri, Xiaopeng Li, *University of South Florida, Tampa, FL, United States*

N122. Designing Corridor Systems With Modular Vehicles Enabling En-route Docking: Continuous and Discrete Modeling Methods

Poster Presentation. IMECE2019-12747

Zhiwei Chen, Xiaopeng Li, *University of South Florida, Tampa, FL, United States*

N123. An Efficient and Robust Interface Element Constitutive Model for Finite-Element Modeling of Masonry

Poster Presentation. IMECE2019-12752

Nitin Kumar, Michele Barbato, *University of California, Davis, Davis, CA, United States*

N124. Electrospun SiOC Fiber Mats as Freestanding Electrodes for Electrochemical Energy Storage Applications

Poster Presentation. IMECE2019-12758

Shakir Bin Mujib, *Kansas State University, Manhattan, KS, United States*, Riccardo Cuccato, *Università di Padova, Padova, Italy*, Santanu Mukherjee, *Kansas State University, Manhattan, KS, United States*, Giorgia Franchin, Paolo Colombo, *Università di Padova, Padova, Italy*, Gurpreet Singh, *Kansas State University, Manhattan, KS, United States*

N125. Assessing Corrosion Resistance of 2D Nanomaterial-based Coatings on Stainless Steel Substrates

Poster Presentation. IMECE2019-12759

Shakir Bin Mujib, Santanu Mukherjee, Diana Arreola, Davi Marcelo Soares, Gurpreet Singh, *Kansas State University, Manhattan, KS, United States*

N126. Investigation on the Modeling Approaches for Tire Rotation and Contact Patch Using Computational Fluid Dynamics

Poster Presentation. IMECE2019-12765

Gen Fu, *Virginia Tech, Blacksburg, VA, United States*, Alexandrina Untaroiu, *Virginia Tech, Charlottesville, VA, United States*

N127. Rapid, Additive Synthesis of Functional Metal-Organic Framework Thin Films

Poster Presentation. IMECE2019-12771

Yujing Zhang, Evan J. Haning, Hao Sun, Chih-Hung Chang, Alan X. Wang, *Oregon State University, Corvallis, OR, United States*, Paul R. Ohodnicki, Ki-Joong Kim, *National Energy Technology Laboratory, Pittsburgh, PA, United States*

N128. Noble-Metal Free Oxygen Reduction Electrocatalysts Based on Graphitic Carbon Nitride

Poster Presentation. IMECE2019-12792

Jiayi Xu, Bin Liu, *Kansas State University, Manhattan, KS, United States*

N129. A Review of Design-Related Literature Concerning Cognitive Processes, Prototyping Strategies, and Modeling Processes

Poster Presentation. IMECE2019-12818

Alexander Murphy, Bryan Watson, Megan Tomko, Ethan Hilton, Julie Linsey, *Georgia Institute of T GA, United States*

N130. Depletion Assisted Projection Two-Photon Polymerization

Poster Presentation. IMECE2019-12829

Paul Somers, Yining Wang, Liang Pan, Xianfan Xu, *Purdue University, West Lafayette, IN, United States***N131. A Generalized Fractional-Order Elastodynamic Model for Nonlocal Attenuating Media**

Poster Presentation. IMECE2019-12832

Sansit Patnaik, *Herrick Laboratories, Purdue University, West Lafayette, IN, United States*, Fabio Semperlotti, *Purdue University, West Lafayette, IN, United States***N132. Transfer Printing of Thin Films in a Liquid Environment: Chemomechanics Theory, Computational Implementation, and Experimental Validation**

Poster Presentation. IMECE2019-12847

Yue Zhang, *University of Virginia, Charlottesville, VA, United States*, Bongjoong Kim, Chi Hwan Lee, *Purdue University, West Lafayette, IN, United States*, Baoxing Xu, *University of Virginia, Charlottesville, VA, United States***N133. Mechanistic Model for Dynamic Response Prediction of Post-Tensioned Cross Laminated Timber Rocking Wall Systems**

Poster Presentation. IMECE2019-12855

Da Huang, Shiling Pei, *Colorado School of Mines, Golden, CO, United States***N134. Rapid Manufacturing of High-Performance Carbon Fiber Composites**

Poster Presentation. IMECE2019-12867

Nil Parikh, Elyas Goli, Philippe Geubelle, Nancy Sottos, *University of Illinois at Urbana-Champaign, Urbana, IL, United States***N135. Voxlated Molecular Patterning in Three-Dimensional Freeforms**

Poster Presentation. IMECE2019-12872

Mohsen Tabrizi, *University of Pittsburgh, Pittsburgh, PA, United States*, Taylor H. Ware, *University of Texas at Dallas, Richardson, TX, United States*, M. Ravi Shankar, *University of Pittsburgh, Pittsburgh, PA, United States***N136. System Green's Function Approach to the Thermal Discrete Dipole Approximation**

Poster Presentation. IMECE2019-12895

Lindsay Walter, *University of Utah, Salt Lake City, UT, United States*, Zhuomin Zhang, Baratunde Cola, *Georgia Institute of Technology, Atlanta, GA, United States*, Mathieu Francoeur, *University of Utah, Salt Lake City, UT, United States*, Eric J. Tervo, *Georgia Institute of Technology, Atlanta, GA, United States***N137. Low Voltage, High Power-Density, Molecularly-Ordered Drivers for Untethered Microrobotics**

Poster Presentation. IMECE2019-12902

Junfeng Gao, *University of Pittsburgh, Pittsburgh, PA, United States*, Mahnoush Babaei, *Carnegie Mellon University, Pittsburgh, PA, United States*, Angel Martinez, Arul Clement, M. Ravi Shankar, *University of Pittsburgh, Pittsburgh, PA, United States***N138. Super Compliant and Soft $(\text{CH}_3\text{NH}_3)_3\text{Bi}_2\text{I}_9$ Crystal With Ultralow Thermal Conductivity**

Poster Presentation. IMECE2019-12929

Hao Ma, Chen Li, *Cornell University, Ithaca, NY, United States*, Yunwei Ma, *Virginia Tech, Blacksburg, NY, United States*, Heng Wang, *Illinois Institute of Technology, Chicago, IL, United States*, Zachary W. Rouse, *Cornell University, Ithaca, NY, United States*, Zhuolei Zhang, *Lawrence Berkeley National Laboratory, Berkeley, CA, United States*, Carla Slebodnick, *Virginia Tech, Blacksburg, VA, United States*, Ahmet Alatas, *Argonne National Laboratory, Argonne, IL, United States*, Shefford Baker, *Cornell University, Ithaca, NY, United States*, Jeffrey J. Urban, *Lawrence Berkeley National Laboratory, Berkeley, CA, United States*, Zhiting Tian, *Cornell University, Ithaca, NY, United States***N139. Electro spray Printing of Nanomaterials With Directed Assembly**

Poster Presentation. IMECE2019-12930

Yaqun Zhu, Paul R. Chiarot, *State University of New York at Binghamton, Binghamton, NY, United States***N140. Switchable Friction Coefficient on Shape Memory Photonic Crystals**

Poster Presentation. IMECE2019-12932

Yifan Zhang, Curtis Taylor, *University of Florida, Gainesville, FL, United States***N141. A Finite Difference Method for 2D Plane Strain Linear Fractional Elasticity**

Poster Presentation. IMECE2019-12943

Wei Ding, Fabio Semperlotti, *Purdue University, West Lafayette, IN, United States***N142. Boosting Nonlinear Waves by Phase Matching in Metamaterials**

Poster Presentation. IMECE2019-12947

Weijian Jiao, Stefano Gonella, *University of Minnesota, Minneapolis, MN, United States***N143. Harnessing Snap-Through Instabilities for Peristaltic Locomotion Without Digital Controllers**

Poster Presentation. IMECE2019-12948

Priyanka Bhovad, Joshua Kaufmann, Suyi Li, *Clemson University, Clemson, SC, United States***N144. Numerical Study of Powder Bed Fusion Process in Additive Manufacturing Using Smoothed Particle Hydrodynamics Combined With Ray Tracing Method**

Poster Presentation. IMECE2019-12962

Deepak Shah, Alexey Volkov, *University of Alabama, Tuscaloosa, AL, United States***N145. Modeling Femtosecond Laser Direct Writing Silicon Nanowire**

Poster Presentation. IMECE2019-12968

Shouyuan Huang, Woongsik Nam, Xianfan Xu, *Purdue University, West Lafayette, IN, United States*

N146. Statistical Modeling of Microstructure Evolution in Ti-6Al-4V During Compression

Poster Presentation. IMECE2019-12982

Eric Hoar, Mostafa Mahdavi, *Georgia Institute of Technology, Atlanta, GA, United States*, **Souvik Sahoo, Shibayan Roy**, *Indian Institute of Technology Kharagpur, West Bengal, India*, **Hamid Garmestani**, *Georgia Institute of Technology, Atlanta, GA, United States*

N147. Investigating Thermal Conductivity of Beta-Ga2O3 Using Atomistic Molecular Dynamic Simulations

Poster Presentation. IMECE2019-13002

Ankit Roy, Joydeep Munshi, Shane Hansen, Ganesh Balasubramanian, *Lehigh University, Bethlehem, PA, United States*

N148. Multi-Resolution Open-Top Light-Sheet Microscopy Enabled by a Solid Immersion Meniscus Lens (SIMlens)

Poster Presentation. IMECE2019-13009

Lindsey Barner, Adam K. Glaser, Jonathan T.C. Liu, *University of Washington, Seattle, WA, United States*

N149. Mechanically Responsive Thermal Transport in Low-Dimensional Heterostructures for Sensor Application

Poster Presentation. IMECE2019-13015

Yuan Gao, Baoxing Xu, *University of Virginia, Charlottesville, VA, United States*

N150. Optical Design and Electrohydrodynamic Jet Printing of Polymer Photonic Crystals

Poster Presentation. IMECE2019-13027

Brian Iezzi, Zahra Afkhami, *University of Michigan, Ann Arbor, MI, United States*, **David Hoelzle**, *Ohio State University, Columbus, OH, United States*, **Kira Barton, Max Shtein**, *University of Michigan, Ann Arbor, MI, United States*

N151. Optimizing HVAC Operations for Mitigating Thermal Discomfort in Demand Response-Compliant Buildings

Poster Presentation. IMECE2019-13033

Syed Ahsan Raza Naqvi, Koushik Kar, *Rensselaer Polytechnic Institute, Troy, NY, United States*

N152. A 3D Phase Field Dislocation Dynamics Model for Body-Centered Cubic Metals

Poster Presentation. IMECE2019-13068

Xiaoyao Peng, *Carnegie Mellon University, Pittsburgh, PA, United States*, **Nithin Mathew**, *Los Alamos National Laboratory, Los Alamos, NM, United States*, **Irene Beyerlein**, *University of California, Santa Barbara, Santa Barbara, CA, United States*, **Kaushik Dayal**, *Carnegie Mellon University, Pittsburgh, PA, United States*, **Abigail Hunter**, *Los Alamos National Laboratory, Los Alamos, NM, United States*

N153. Force Reconstruction at Mechanical Interfaces

Poster Presentation. IMECE2019-13078

Deborah Fowler, Patrick Logan, Peter Avitabile, *University of Massachusetts Lowell, Lowell, MA, United States*

N154. Aerosol Jet Printed Graphene Array-Based Immunosensor for Fish Spoilage Monitoring

Poster Presentation. IMECE2019-13081

Kshama Parate, Cicero C. Pola, *Iowa State University, Ames, IA, United States*, **Sonal V. Rangnekar, Mark C. Hersam**, *Northwestern University, Evanston, IL, United States*, **Carmen L. Gomes, Jonathan Claussen**, *Iowa State University, Ames, IA, United States*

N155. Influence of Humidity and Solution Conductivity on the Electrospray Printing of Polymer Films

Poster Presentation. IMECE2019-13083

Bryce Kingsley, Paul R. Chiarot, *State University of New York at Binghamton, Binghamton, NY, United States*

N156. Effect of Constraining Load and Thicknesses of Thin Steel Sheets on Their Ripplation Mechanics

Poster Presentation. IMECE2019-13093

Hussein Badr, Xingyuan Zhao, Stylianos Koumlis, *Drexel University, Philadelphia, PA, United States*, **Garritt Tucker**, *Colorado School of Mines, Golden, CO, United States*, **Leslie Lamberson, Michel Barsoum**, *Drexel University, Philadelphia, PA, United States*

N157. Analytical and Numerical Study of a Pulsatile Flow in a Porous Tube

Poster Presentation. IMECE2019-13097

Bchara Sidnawi, Sridhar Santhanam, Qianhong Wu, *Villanova University, Villanova, PA, United States*

N158. Wireless Power Transfer System for Biomedical Implants Using a Magnetolectric Laminate Transducer

Poster Presentation. IMECE2019-13104

Erik Andersen, Binh Duc Truong, Shadrach Roundy, *University of Utah, Salt Lake City, UT, United States*

N159. High-Strain-Rate Dynamics of Copolymer Microparticles for Advanced Additive Manufacturing

Poster Presentation. IMECE2019-13105

Ara Kim, Jae-Hwang Lee, *University of Massachusetts, Amherst, MA, United States*

N160. On the Characterization of Interstitial Fluid Flow in the Skeletal Muscle

Poster Presentation. IMECE2019-13110

Qiuyun Wang, *Villanova University, Villanova, PA, United States*, **Shaopeng Pei, Lucas Lu, Liyun Wang**, *University of Delaware, Newark, DE, United States*, **Qianhong Wu**, *Villanova University, Villanova, PA, United States*

N161. Effects of Environmental Temperature and Humidity on the Geometry and Strength of Polycarbonate Specimens Pre-pared by Fused Filament Fabrication

Poster Presentation. IMECE2019-13118

Lichen Fang, Yishu Yan, Ojaswi Agarwal, *Johns Hopkins University, Baltimore, MD, United States*, **Jonathan Seppala**, *National Institute of Standards and Technology, Gaithersburg, MD, United States*, **Sung Hoon Kang**, *Johns Hopkins University, Baltimore, MD, United States*

N162. Experimental Observation of Non-Reciprocal Waves in a Metamaterial Beam by Geometric Time-Modulation
Poster Presentation. IMECE2019-13133

Mohammad Ali Attarzadeh, Jesse Callanan, Mostafa Nouh, *University at Buffalo, Buffalo, NY, United States*

N163. Conformal Graphene Wrinkles With Switchable Orientation on Soft Skin Layers

Poster Presentation. IMECE2019-13136

Dongjoon Rhee, *Northwestern University, Evanston, IL, United States*, **Jeffrey T. Paci,** *University of Victoria, Victoria, BC, Canada*, **Shikai Deng,** *Northwestern University, Evanston, IL, United States*, **Won-Kyu Lee,** *Harvard University, Boston, MA, United States*, **George C. Schatz, Teri W. Odom,** *Northwestern University, Evanston, IL, United States*

N164. Cascaded Control for Building HVAC Systems in Practice

Poster Presentation. IMECE2019-13139

Deokgeun Park, *Texas A&M University, College Station, TX, United States*, **Christopher R. Price,** *Oak Ridge National Laboratory, Oak Ridge, TN, United States*, **Bryan Rasmussen,** *Texas A&M University, College Station, TX, United States*

N165. Giant Magnetocaloric Effect of Nanostructured Ni-Mn-Ga Heusler Alloys Manufacturing by Several Methods
Poster Presentation. IMECE2019-13145

Pranav Bhale, Pnina Ari-Gur, *Western Michigan University, Kalamazoo, MI, United States*, **Ronald Noebe,** *NASA Glenn Research Center, Cleveland, OH, United States*, **Jason M. Walker,** *Youngstown State University, Youngstown, OH, United States*

N166. Permeation and Microstructures of Super-Tough Hydrogels

Poster Presentation. IMECE2019-13146

Jaylene Martinez, Mengyuan Wang, Yifu Ding, *University of Colorado Boulder, Boulder, CO, United States*

N167. A Simplified Mathematical Model to Simulate the Motion of the Brain Matter in Response to Translational Impacts to the Head

Poster Presentation. IMECE2019-13156

Ji Lang, Qianhong Wu, *Villanova University, Villanova, PA, United States*

N168. Ablation Enhancement by Thermal and Non-thermal Accumulation in Ultrafast Laser Fabrication of Fused Silica at Kilo-hertz Repetition Rate

Poster Presentation. IMECE2019-13159

Xiao Jia, Xin Zhao, *Clemson University, Clemson, SC, United States*

N169. Soft Porous Lubrication With Oriented Fibers

Poster Presentation. IMECE2019-13160

Zenghao Zhu, Qianhong Wu, *Villanova University, Villanova, PA, United States*

N170. Is Chemical Domain Knowledge Even Necessary When Machine Learning Materials Properties?

Technical Presentation. IMECE2019-13170

Ryan Murdock, *University of Utah, American Fork, UT, United States*, **Kaai Kauwe, Taylor D. Sparks,** *University of Utah, Salt Lake City, UT, United States*

N171. Modeling and Test Methodologies for Monitoring Femoral Implant Insertion During Cementless Total Hip Arthroplasty

Poster Presentation. IMECE2019-13178

Tina Dardeno, Peter Avitabile, *University of Massachusetts Lowell, Lowell, MA, United States*

N172. Instability-Induced Torque-Dense Actuation in Photoresponsive Liquid Crystal Elastomer Shells

Technical Presentation. IMECE2019-13187

Mahnoush Babaei, *Carnegie Mellon University, Pittsburgh, PA, United States*, **Junfeng Gao, Arul Clement, M. Ravi Shankar,** *University of Pittsburgh, Pittsburgh, PA, United States*, **Kaushik Dayal,** *Carnegie Mellon University, Pittsburgh, PA, United States*

N173. Attaining Desired Deformations of Flexible Structures Through Mechanical Stimuli

Poster Presentation. IMECE2019-13189

Coby Turman, *Texas A&M University, Quinlan, TX, United States*, **Renzhe Chen, Anastasia Muliana,** *Texas A&M University, College Station, TX, United States*, **Negar Kalantar,** *California College of the Arts, San Francisco, CA, United States*

N174. Mass-Customized All-in-One Bubble Nanoprinting of Smart Wearable Medical Devices

Poster Presentation. IMECE2019-13200

Jimi Wang, Yuebing Zheng, *University of Texas at Austin, Austin, TX, United States*

N175. Additive Manufacture of SiOC Composites and Investigation of Their Electrochemical Energy Storage Behavior

Poster Presentation. IMECE2019-13203

Federico Toigo, *Università di Padova, Padova, Italy*, **Shakir Bin Mujib,** *Kansas State University, Manhattan, KS, United States*, **Giorgia Franchin, Paolo Colombo,** *Università di Padova, Padova, Italy*, **Gurpreet Singh,** *Kansas State University, Manhattan, KS, United States*

N176. Structure-Property Relation of Additively Manufactured Bi-Continuous Piezocomposites: A Two-Scale Model Coupled With Statistical Reconstruction of Microstructure

Poster Presentation. IMECE2019-13207

Zhuo Wang, Wenhua Yang, *Mississippi State University, Starkville, MS, United States*, **Li He, Xuan Song,** *University of Iowa, Iowa City, IA, United States*, **Lei Chen,** *Mississippi State University, Mississippi State, MS, United States*

N177. Misfit Dislocation Formation in PbTe/PbSe(001) and PbSe/PbTe(111) Heteroepitaxial Systems

Poster Presentation. IMECE2019-13208

Yang Li, *University of Florida, Gainesville, FL, United States*, Dave McDowell, *Georgia Institute of Technology, Atlanta, GA, United States*, Youping Chen, *University of Florida, Gainesville, FL, United States*

N178. Super-Stretchable and Mechanical Strong Zwitterionic Hydrogels as Strain Sensors With High Sensitivity and Long Re-peatability

Poster Presentation. IMECE2019-13217

Dong Zhang, Yanxian Zhang, Yonglan Liu, Jie Zheng, *University of Akron, Akron, OH, United States*

N179. Concurrent Atomistic-Continuum Simulation of the Dislocation Pileup-Induced Phase Transformation in Materials Under Deformation

Poster Presentation. IMECE2019-13223

Yipeng Peng, Liming Xiong, *Iowa State University, Ames, IA, United States*

N180. Time-Dependent Pressure Relaxation in Hydrogel Contact Experiments

Poster Presentation. IMECE2019-13230

Christopher Johnson, Jiho Kim, Alison C. Dunn, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

N181. A Comparative Life-Cycle Assessment of Mid-Rise Office Buildings Considering the Impact of Early Design Decisions

Poster Presentation. IMECE2019-13234

Mohsen Zaker Esteghamati, Patricia Asiatico, *Virginia Tech, Blacksburg, VA, United States*, Thea Diep Ton, *University of Washington, Seattle, WA, United States*, Natalia Zhukova, *Johns Hopkins University, Baltimore, MD, United States*, Matthew Musetich, *University of Notre Dame, Notre Dame, IN, United States*, Jeonghyun Lee, *University of California, Los Angeles, Los Angeles, CA, United States*, Madeleine M. Flint, *Virginia Tech, Blacksburg, VA, United States*

N182. Estimation of the Wind Direction From Power Production Fluctuations in Large Wind Farms

Poster Presentation. IMECE2019-13240

Federico Bernardoni, Umberto Ciri, Stefano Leonardi, *University of Texas at Dallas, Richardson, TX, United States*

N183. Atomistic Measurement of the Grain Boundary Energy and Cohesive Strength in Ice

Poster Presentation. IMECE2019-13243

Hang Li, Yipeng Peng, Liming Xiong, *Iowa State University, Ames, IA, United States*

N184. Critical Assessment of Shape Retrieval Tools (SRTs)

Poster Presentation. IMECE2019-13246

Xinyi Xiao, Sanjay Joshi, *Pennsylvania State University, University Park, PA, United States*, Oscar Tapia, J. Cecil, *Oklahoma State University, Stillwater, OK, United States*

N185. The Biomechanical Response of the Porcine Tricuspid Valve Leaflets Does Not Change Following Freezing and Thawing

Poster Presentation. IMECE2019-13267

Margaret Clark, Samuel Salinas, Rouzbeh Amini, *University of Akron, Akron, OH, United States*

N186. A Comprehensive Scoring Procedure of the Alternative Usage Task: Processing Experimental Data and Potential Use in Creativity Research

Poster Presentation. IMECE2019-13271

Tess Hartog, Amin G. Alhashim, Megan Marshall, Zahed Siddique, *University of Oklahoma, Norman, OK, United States*

N187. Mission Design of Servicing Satellites in Geosynchronous Earth Orbit

Poster Presentation. IMECE2019-13272

James Mostek, *Western Michigan University, LaGrange Park, IL, United States*, Jennifer Hudson, *Western Michigan University, Kalamazoo, MI, United States*

N188. Dynamics of Turbulence With Large Density Variations

Poster Presentation. IMECE2019-13274

Denis Aslangil, *Lehigh University, Bethlehem, PA, United States*, Daniel Livescu, *Los Alamos National Laboratory, Los Alamos, NM, United States*, Arindam Banerjee, *Lehigh University, Bethlehem, PA, United States*

N189. Plasmonic Sub-nanometer Gap Devices Based on Collapsible Nanofingers

Poster Presentation. IMECE2019-13282

Pan Hu, Boxiang Song, Yunxiang Wang, Wei Wu, *University of Southern California, Los Angeles, CA, United States*

N190. Development of Multi-Robot 3D Printing System: Cooperative 3D Printing

Poster Presentation. IMECE2019-13299

Laxmi Poudel, Wenchao Zhou, Zhenghui Sha, *University of Arkansas, Fayetteville, AR, United States*

N191. Developing Resonant Ultrasound Spectroscopy Instrument for Studying Elastic Properties of Materials

Poster Presentation. IMECE2019-13305

Emily Gima, Kristen Siaw, Oleksiy Svitelskiy, *Gordon College, Wenham, MA, United States*

N192. Measuring Local Fluxes in Transient Transport Processes and Inhomogeneous Systems

Poster Presentation. IMECE2019-13317

Adrian Diaz, Youping Chen, *University of Florida, Gainesville, FL, United States*

N193. Scalable Manufacturing of Hybrid Solid Electrolytes for All Solid State Batteries

Poster Presentation. IMECE2019-13318

Marm Dixit, **Wahid Zaman**, *Vanderbilt University, Nashville, TN, United States*, **Yousuf Bootwala**, *Georgia Institute of Technology, Atlanta, GA, United States*, **Nicholas Hortance**, **Yanjie Zheng**, *Vanderbilt University, Nashville, TN, United States*, **Marta Hatzell**, *Georgia Institute of Technology, Atlanta, GA, United States*, **Kelsey B. Hatzell**, *Vanderbilt University, Nashville, TN, United States*

N194. Synchrotron X-Ray Tomography Thermal Conductivity Analysis of Packed Bed Particle-to-sCO₂ Heat Exchangers

Poster Presentation. IMECE2019-13325

Yanjie Zheng, **Marm Dixit**, *Vanderbilt University, Nashville, TN, United States*, **Yousuf Bootwala**, **Marta Hatzell**, *Georgia Institute of Technology, Atlanta, GA, United States*, **Kelsey B. Hatzell**, *Vanderbilt University, Nashville, TN, United States*

N195. Understanding the Self-Healing of Reversible Polymer Networks Through Coarse-Grained Molecular Dynamic Simulation

Poster Presentation. IMECE2019-13331

Zhiqiang Shen, *University of Connecticut, Willington, CT, United States*, **Ying Li**, *University of Connecticut, Storrs, CT, United States*

N196. Machine Learning of Human Sequential Decisions in Engineering Systems Design

Poster Presentation. IMECE2019-13335

Molla Hafizur Rahman, **Zhenghui Sha**, *University of Arkansas, Fayetteville, AR, United States*

N197. Collaborative Robots and Safety

Poster Presentation. IMECE2019-13338

Almir Trnjanin, *Wayne State University, Detroit, MI, United States*

N198. Towards a Theory of Systems Engineering Process: A Reinforcement Learning Approach to Sequential Decision-Making Procedure

Poster Presentation. IMECE2019-13341

Salar Safarkhani, **Ilias Bilonis**, *Purdue University, West Lafayette, IN, United States*

N199. Tunable Electrical Properties of Embossed, Cellulose-Based Paper for Skin-Like Sensing

Poster Presentation. IMECE2019-13382

Tongfen Liang, **Xiyue Zou**, **Ramendra K. Pal**, **Jiaqi Liu**, **Maame Assasie**, **Wei-Jian Guo**, **Chuyang Chen**, **Jingjin Xie**, **Max Tenorio**, **Daniel Sullivan**, **Anna Root**, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*, **Paul Stansel**, *Rutgers University, Fitchburg, MA, United States*, **Anne Q. McKeown**, *Rutgers University–New Brunswick, New Brunswick, NJ, United States*, **George Weng**, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*, **William W. Sampson**, *University of Manchester, Manchester, United Kingdom*, **Assimina Pelegri**, *Rutgers University–New Brunswick, East Brunswick, NJ, United States*, **Aaron D. Mazzeo**, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*

N200. Resonant Vibrational Modes of Piezoelectric Disks in Acoustic Energy Transfer Systems

Poster Presentation. IMECE2019-13395

Vamsi Chandra Meesala, *Virginia Tech, Blacksburg, VA, United States*, **Muhammad Hajj**, *Stevens Institute of Technology, Hoboken, NJ, United States*, **Shima Shahab**, *Virginia Tech, Blacksburg, VA, United States*

N201. Collective Dislocation-Interface Interactions Using the Concurrent Atomistic-Continuum Method

Poster Presentation. IMECE2019-13406

Alex Selimov, *Georgia Institute of Technology, Atlanta, FL, United States*, **Youping Chen**, *University of Florida, Gainesville, FL, United States*, **Dave McDowell**, *Georgia Institute of Technology, Atlanta, GA, United States*

N202. Effect of Thickness on the Crystal Structure and Electrical Properties of Epitaxially Grown TiN Thin Films

Poster Presentation. IMECE2019-13427

Manosi Roy, **Nikhil Reddy Mucha**, **Svitlana Fialkova**, **Sergey Yarmolenko**, **Dhananjay Kumar**, *North Carolina A&T State University, Greensboro, NC, United States*

N203. The Path to Optical Sorting of Large Dielectric Microparticles With Whispering Gallery Modes

Poster Presentation. IMECE2019-13429

Nathan J. Jordan, *Gordon College, Wenham, MA, United States*, **Alexander King**, *Gordon College, St. Croix Falls, WI, United States*, **Oleksiy Svitelskiy**, *Gordon College, Wenham, MA, United States*

N204. A Topological Approach to Control of a Magnetic Microrobot

Poster Presentation. IMECE2019-13432

Ariella Mansfield, *University of Pennsylvania, Philadelphia, PA, United States*, **Mohid Khan**, *Johns Hopkins University, Baltimore, MD, United States*, **Dhanushka Kularatne**, **Edward Steager**, **M. Ani Hsieh**, *University of Pennsylvania, Philadelphia, PA, United States*

N205. Additive Nanomanufacturing Through Opto-Thermomechanical Printing of Nanoparticles Under Electric Field

Poster Presentation. IMECE2019-13439

Md. Shah Alam, **Chenglong Zhao**, *University of Dayton, Dayton, OH, United States*

N206. Room Temperature Processing of Functional Materials

Poster Presentation. IMECE2019-13466

Zahabul Islam, *Pennsylvania State University, State College, PA, United States*, **Md. Haque**, *Penn State University, University Park, PA, United States*

N207. Micro-Nucleate Boiling Influence in High Heat-Flux Annular Flow of Water

Poster Presentation. IMECE2019-13471

Soroush Sepahyar, Michigan Technological University, Hancock, MI, United States, Harsha Sathi, Michigan Technological University, Houghton, MI, United States, Michael Kivisalu, Michigan Technological University, Croton on Hudson, NY, United States, Amitabh Narain, Michigan Technological University, Houghton, MI, United States

N208. Biomimetic Layered Structuring of Ceramics Through Ice and Ultrasound Templating

Poster Presentation. IMECE2019-13472

Max Mroz, Taylor A. Ogden, Isaac Nelson, Milo Prisbrey, Bart Raeymaekers, Steven Naleway, University of Utah, Salt Lake City, UT, United States

N209. Effect of Thickness on the Crystal Structure and Electrical Properties of Epitaxially Grown TiN Thin Films

Poster Presentation. IMECE2019-13473

Manosi Roy, Nikhil Reddy Mucha, North Svitlana Fialkova, Sergey Yarmolenko, Dhananjay Kumar, North Carolina A&T State University, Greensboro, NC, United States

N210. Theory-Driven Auxetic Chiral Granular Metamaterials

Poster Presentation. IMECE2019-13480

Nima NejadSadeghi, Anil Misra, University of Kansas, Lawrence, KS, United States

N211. Implementation of Granular Micromechanics Based Nonlinear Material Model Into FEA

Poster Presentation. IMECE2019-13490

Rizacan Sarikaya, Anil Misra, University of Kansas, Lawrence, KS, United States

N212. Laser-Induced Graphene Interdigitated Electrodes for Rapid Detection of Salmonella enterica in Food Samples

Poster Presentation. IMECE2019-13494

Cicero C. Pola, Kshama Parate, Jonathan Claussen, Carmen L. Gomes, Iowa State University, Ames, IA, United States

N213. Sustainability of GFRP Composite Laminates Using Novel Recyclable UV Curable Thermoset SMP and SMA

Poster Presentation. IMECE2019-13499

John Konlan, Southern University and A&M College, Baton Rouge, LA, United States, Samuel Ibekwe, Karen Crosby, Patrick Mensah, Southern University and A&M College, Baton Rouge, LA, United States, Guoqiang Li, Louisiana State University, Baton Rouge, LA, United States

N214. Atheroprotective Swirling Flow: Mechanobiological Significance

Poster Presentation. IMECE2019-13501

Robert Newman, Pablo Huang-Zhang, Drexel University, Philadelphia, PA, United States, Colin Tkatch, Hospital University Pennsylvania, Philadelphia, PA, United States, Dmitri Vainchtein, Drexel University, Camden, NJ, United States, J. Yasha Kresh, Drexel University, Philadelphia, PA, United States

N215. Manipulating Bacterial Mechanosensing by Modifying Substrate Mechanics

Poster Presentation. IMECE2019-13502

Jacob Blacutt, Liyun Wang, Vernita Gordon, University of Texas at Austin, Austin, TX, United States

N216. Dynamics-Aware Deep Learning for Bioprosthetic Heart Valves

Poster Presentation. IMECE2019-13522

Aditya Balu, Kai Liang Tan, Adarsh Krishnamurthy, Soumik Sarkar, Ming-Chen Hsu, Iowa State University, Ames, IA, United States

N217. Interfacial Damage Detection of CFRP-Concrete Joints Using Active Microwave Thermography

Poster Presentation. IMECE2019-13524

Xingxing Zou, Ali Mirala, Lesley Sneed, Mohammad Tayeb Al Qaseer, Kristen M. Donnell, Missouri University of Science and Technology, Rolla, MO, United States

N218. Utilizing the Combined Shape Recovery Properties of Fiber and Matrix of a Self-Healing Polymer Composite in Effecting Healing of Early Age Cracks

Poster Presentation. IMECE2019-13525

Henry Quansah Afful, Patrick Mensah, Southern University and A&M College, Baton Rouge, LA, United States, Samuel Ibekwe, Southern University and A&M College, Baker, LA, United States, Guoqiang Li, Louisiana State University, Baton Rouge, LA, United States

N219. A Study of Material Removal Behavior During Ultra-Precision Machining of Single Crystal Sapphire Using a Slip/Fracture Activation Model

Poster Presentation. IMECE2019-13538

Suk Bum Kwon, Aditya Nagaraj, University of Wisconsin-Madison, Madison, WI, United States, Hae-Sung Yoon, Korea Aerospace University, Goyang-si, Gyeonggi-do, Korea (Republic), Sangkee Min, University of Wisconsin-Madison, Madison, WI, United States

N220. Self-Burrowing-Out Robot Inspired by Nature

Poster Presentation. IMECE2019-13539

Sichuan Huang, Julian Tao, Arizona State University, Tempe, AZ, United States

N221. Particle-Shock Interactions During Ultrafast Shear Exfoliation of 2D Layered Materials Using Compressible Flows

Poster Presentation. IMECE2019-13543

Md. Farhadul Islam, Ray Hixon, University of Toledo, Toledo, OH, United States, Reza Rizvi, York University, Toronto, ON, Canada

N222. Large-Area, Wafer Scale Nanopatterning Technique Using Interferometric Lithography

Poster Presentation. IMECE2019-13544

Vineeth Sasidharan, S.R.J Brueck, University of New Mexico, Albuquerque, NM, United States

N223. Flow Control and Separation Delay in Morphing Wing Aircraft Using Traveling Wave Actuation

Poster Presentation. IMECE2019-13552

Anthony Olivett, Mostafa Tavakkoli Anbarani, M. Amin Karami, *University at Buffalo, Buffalo, NY, United States*

N224. A Comparative Study of Life Cycle Assessment Approaches Taken to Evaluate Environmental Impacts of Seismic Dam-age of Reinforced Concrete Commercial Building

Poster Presentation. IMECE2019-13556

Jeonghyun Lee, *University of California, Los Angeles, Los Angeles, CA, United States*, Mohsen Zaker Esteghamati, Madeleine M. Flint, *Virginia Tech, Blacksburg, VA, United States*

N225. Abrasive Wear Behavior of Polyacrylamide Hydrogels Under a Range of Loads and Sliding Speeds

Poster Presentation. IMECE2019-13562

Shabnam Bonyadi, Alison C. Dunn, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

N226. Autonomous Deep Learning-Based Pose Estimation and Obstacle Avoidance for a 7-DOF Robot Manipulator

Poster Presentation. IMECE2019-13567

Alexander Bertino, Mostafa Bagheri, *San Diego State University, San Diego, CA, United States*, Miroslav Krstic, *University of California, San Diego, La Jolla, CA, United States*, Peiman Naseradinmousavi, *San Diego State University, San Diego, CA, United States*

N227. Robust Source Localization Using Phononic Scattering Response

Poster Presentation. IMECE2019-13568

Weidi Wang, *University of Massachusetts Lowell, Lowell, MA, United States*, Yan Lu, Ankit Srivastava, *Illinois Institute of Technology, Chicago, IL, United States*, Alireza V. Amirkhizi, *University of Massachusetts Lowell, Lowell, MA, United States*

N228. Mechanical and Thermal Characterization of a Hybrid Reinforced Multifunctional Composite Material Manufactured via 3D Printing

Poster Presentation. IMECE2019-13571

Okunzuwa Ekuase, Fareed Dawan, Patrick Mensah, *Southern University and A&M College, Baton Rouge, LA, United States*

N229. Visco-Hyperelastic Constitutive Modelling of Strain Rate Sensitive Soft Materials

Poster Presentation. IMECE2019-13588

Kshitiz Upadhyay, Douglas Spearot, Ghatu Subhash, *University of Florida, Gainesville, FL, United States*

N230. A Gamified CPS Test Bed for Security Experimentation

Poster Presentation. IMECE2019-13589

Declan Oberzan, Alexander Tang, Morgan Dunn, Kacy Luker, Saad Ahktar, Peter Hawrylak, *University of Tulsa, Tulsa, OK, United States*

N231. Stability and Control Analysis of Unmanned Aerial Vehicles

Poster Presentation. IMECE2019-13591

Kofi Agyemang Amankwah, Stephen Akwaboa, Patrick Mensah, *Southern University and A&M College, Baton Rouge, LA, United States*

N232. Rational Design of Laser-Etched Grooves on Paper to Improve Wicking Performance

Poster Presentation. IMECE2019-13594

Sidharth Modha, Hussein Chamouni, Yu Shen, Ashok Mulchandani, Hideaki Tsutsui, *University of California, Riverside, Riverside, CA, United States*

N233. Instrumentation and Analysis Architecture for a Gamified CPS Test Bed

Poster Presentation. IMECE2019-13596

Morgan Dunn, Eric Schnelker, Logan Jones, John Hale, *University of Tulsa, Tulsa, OK, United States*

N234. Independent Tuning of Stress and Refractive Index in Silica Waveguides Thin Films

Poster Presentation. IMECE2019-13597

Neal Wostbrock, Isaac Stricklin, Mahmoud Behzadrad, *University of New Mexico, Albuquerque, NM, United States*, Ting Shan Luk, *Sandia National Laboratories, Albuquerque, NM, United States*, Tito Busani, *University of New Mexico, Albuquerque, NM, United States*

N235. Consensus Control in Rigid-body Multi-Vehicle Systems

Poster Presentation. IMECE2019-13599

Mohammad Maadani, Eric A. Butcher, *University of Arizona, Tucson, AZ, United States*

N236. Simulation of a CPS Security Test Bed

Poster Presentation. IMECE2019-13600

Alexander Tang, Morgan Dunn, Peter Hawrylak, *University of Tulsa, Tulsa, OK, United States*

N237. Effects of Wet Transfer on Photoluminescence of WS₂

Poster Presentation. IMECE2019-13604

Xiaotian Wang, Kyungham Kang, Shichen Fu, Siwei Chen, Eui-Hyeok Yang, *Stevens Institute of Technology, Hoboken, NJ, United States*

N238. Mechanics in Electrochromic Materials

Poster Presentation. IMECE2019-13607

Xiaokang Wang, Ke Chen, Luize Scalco de Vasconcelos, Jianguo Mei, Kejie Zhao, *Purdue University, West Lafayette, IN, United States*

N239. Contact Formation and Defect Generation at the Interface of Two FCC Metallic Substrates

Poster Presentation. IMECE2019-13610

Milad Khajehvand, *Santa Clara University, Santa Clara, CA, United States*, Henri Seppänen, *Kulicke & Sof Inc., Santa Ana, CA, United States*, Panthea Sepehrband, *Santa Clara University Santa Clara, CA, United States*

N240. Framework to Forecast Mobility Pattern Using Trajectory Data for Geo-Targeting Emergency Management Activities

Poster Presentation. IMECE2019-13611

Tamara Riggs, *Oak Ridge National Laboratory, Knoxville, TN, United States*, Bandana Kar, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*

N241. Incentivizing Energy-Conserving Behaviors in Low-Income Residential Communities

Poster Presentation. IMECE2019-13619

Vanessa Kwarteng, Huijeong Kim, Sang W. Ham, Panagiota Karava, Thanh Nguyen, Ilias Billionis, *Purdue University, West Lafayette, IN, United States*

N242. Measurements of Tensile and Shear Anisotropy in a Polyvinyl Alcohol Gel Surrogate for Brain Tissue

Undergrad Expo. IMECE2019-13629

Alexa Panrudkevich, Justin Wan, Payal Hukeri, R.J. Okamoto, P.V. Bayly, *Washington University in St. Louis, St. Louis, MO, United States*

N243. Complex Three-Dimensional Material Flow During Additive Friction Stir Deposition of Dissimilar Aluminum Alloys

Poster Presentation. IMECE2019-13633

Mackenzie Perry, R. Joey Griffiths, Hunter A. Rauch, David Garcia, *Virginia Tech, Blacksburg, VA, United States*, Jennifer M. Sietins, *CCDC Army Research Laboratory, Aberdeen Proving Ground, MD, United States*, Yunhui Zhu, Hang Z. Yu, *Virginia Tech, Blacksburg, VA, United States*

N244. Maximum Lifting Weight Prediction Using 3D Skeletal Model and Dynamic Joint Strength

Poster Presentation. IMECE2019-13642

Rahid Zaman, Yujiang Xiang, *Oklahoma State University, Stillwater, OK, United States*

N245. Acoustic Side Channel Attacks on DNA Synthesizers

Poster Presentation. IMECE2019-13643

Sina Faezi, Sujit Rokka Chhetri, Arnav V. Malawade, John Chaput, *University of California, Irvine, Irvine, CA, United States*, William Grover, Philip Brisk, *University of California, Riverside, Riverside, CA, United States*, Mohammad Al Faruque, *University of California, Irvine, Irvine, CA, United States*

N246. Input-Output Integrated Computer Vision-Based Structural Health Monitoring

Poster Presentation. IMECE2019-13656

Chuanzhi Dong, Fikret N. Catbas, *University of Central Florida, Orlando, FL, United States*

N247. Structural Damage and Ground Motion Analysis in Mexico City After the 2017 Puebla Earthquake

Undergrad Expo. IMECE2019-13659

Nicholas Slavin, *California Polytechnic State University, San Luis Obispo, Oak Park, CA, United States*, Anisha Datta, *California Polytechnic State University, San Luis Obispo, San Luis Obispo, CA, United States*

N248. The Role of Automation Perceptions in Manufacturing Strategy

Poster Presentation. IMECE2019-13672

Chase Wentzky, Joshua D. Summers, *Clemson University, Clemson, SC, United States*

N249. Experimental Analysis of the Thermally Buckled Energy Harvesters for Powering Leadless Pacemakers

Technical Presentation. IMECE2019-13687

Mostafa Tavakkoli Anbarani, M. Amin Karami, *University at Buffalo, Buffalo, NY, United States*

N250. Bioinspired Routes to Damage Tolerant Materials: Unique Microstructure and Fracture Properties of Enamel in the Mammal-Like Grinding Dentition of a Hadrosaurid Dinosaur

Poster Presentation. IMECE2019-13688

Soumya Varma, Manish Jain, *University of Nevada Reno, Reno, NV, United States*, Yi Teng Lee, *Exxon Mobil, Kuala Lumpur, Malaysia*, Shane Johnson, *University of Nevada Reno, Reno, NV, United States*, Brandon A. Krick, *Lehigh University, Bethlehem, PA, United States*, Gregory M. Erickson, *Florida State University, Tallahassee, FL, United States*, Johann Michler, Daniele Casari, Jakob Schwiedrzik, *EMPA, Thun, Bern, Switzerland*, Shradha J. Vachhani, *Bruker Nano Surfaces, Minneapolis, MN, United States*, Siddhartha Pathak, *University of Nevada, Reno, Reno, NV, United States*

N251. Robust Delay-Dependent LPV Output-Feedback Blood Pressure Control With Real-Time Bayesian Estimation

Poster Presentation. IMECE2019-13689

Shahin Tasoujian, Matthew Franchek, Karolos Grigoriadis, *University of Houston, Houston, TX, United States*

N252. Experimental Analysis of Noise Filtration Using Magneto-Elastic Phononic Crystal

Technical Presentation. IMECE2019-13694

Mostafa Tavakkoli Anbarani, M. Amin Karami, *University at Buffalo, Buffalo, NY, United States*

N253. Atypical High-Voltage Capacity Loss in Tin Based Sodium-Ion Battery Chemistry

Poster Presentation. IMECE2019-13700

Susmita Sarkar, Partha P. Mukherjee, *Purdue University, West Lafayette, IN, United States*

N254. Fear and Greed Strategy Dynamics in the Collective Design of Engineering Systems

Poster Presentation. IMECE2019-13708

Ambrosio Valencia-Romero, Paul T. Grogan, *Stevens Institute of Technology, Hoboken, NJ, United States*

N255. 1-Norm: Quantifying Mechanical Wave Scattering in Biological Tissues

Poster Presentation. IMECE2019-13710

Harish Palnitkar, Martina Guidetti, Rolf O. Reiter, Thomas Royston, Dieter Klatt, *University of Illinois at Chicago, Chicago, IL, United States*

N256. Low Carbon Footprint, Biobased Micro Cellulose PLA Foams for Building Applications

Poster Presentation. IMECE2019-13719

Kayode Oluwabunmi, Nandika D'Souza, Weihuan Zhao, *University of North Texas, Denton, TX, United States, Mariela Alvarez, Haliburton, Carrollton, TX, United States*

N257. Life Time Analysis of Piezoelectric Vibration Energy Harvesters for Powering Pacemakers

Poster Presentation. IMECE2019-13728

Nikta Amiri, M. Amin Karami, *University at Buffalo, Buffalo, NY, United States*

N258. Estimating Motion and Structural Anisotropy in a Porcine Brain Using MR Elastography and Diffusion Tensor Imaging

Poster Presentation. IMECE2019-13733

J.K. Rifkin, R.J. Okamoto, CA Guertler, PV Bayly, *Washington University in St. Louis, St. Louis, MO, United States*

N259. Piezoelectric Tooth Aligner for Bone Growth Stimulation

Poster Presentation. IMECE2019-13734

Nikta Amiri, M. Amin Karami, *University at Buffalo, Buffalo, NY, United States*

N260. Identifying a Truncated Modal Basis with Multiscale Fidelity for Nonlinear Fluid Flows

Poster Presentation. IMECE2019-13737

Michael Lee, Earl Dowell, *Duke University, Durham, NC, United States*

N261. Simulation of Higher-Order Stochastic Processes

Poster Presentation. IMECE2019-13740

Lohit Vandanapu, Michael D. Shields, *Johns Hopkins University, Baltimore, MD, United States*

N262. Evaluation of an Indirect Heating Method for Self-healing and Shape Memory in Polymer Materials Using High Intensity Focused Ultrasound

Poster Presentation. IMECE2019-13753

Obinna Nwokonkwo, *Southern University and A&M College, Baton Rouge, LA, United States, Samuel Ibekwe,* *Southern University and A&M College, Baker, LA, United States, Guoqiang Li,* *Louisiana State University, Baton Rouge, LA, United States, Patrick Mensah,* *Southern University and A&M College, Baton Rouge, LA, United States*

N263. Non-Standard Timoshenko 1D Beam Model Describes Chiral Behavior of Granular Beam

Poster Presentation. IMECE2019-13756

Michele De Angelo, *Kansas University, Lawrence, KS, United States, Luca Placidi,* *Università Telematica Internazionale Uninettuno, Roma, RM, Italy, Anil Misra,* *University of Kansas, Lawrence, KS, United States*

N264. Efficient Use of Multiple Information Sources in Material Design

Poster Presentation. IMECE2019-13766

Abhilash Molkeri, Seyede F Ghoreishi, Raymundo Arroyave, Douglas Allaire, Ankit Srivastava, *Texas A&M University, College Station, TX, United States*

N265. Understanding the Interactions of Gas With 2D Nanomaterials During Compressible Flow Exfoliation: A Molecular Dy-namics Study

Poster Presentation. IMECE2019-13768

Shafkat Ahmed, *University of Toledo, Toledo, OH, United States, Reza Rizvi,* *York University, Toronto, ON, Canada*

N266. Molecular Dynamics Simulation of Horizontal Ribbon Growth of Silicon Crystals: A Forced Velocity Simulation Approach

Poster Presentation. IMECE2019-13769

Victor Fabiyi, *Clarkson University, Potsdam, NY, United States*

N267. In-Situ Full-Field Mapping of Melt Flow Dynamics in Laser Metal Additive Manufacturing

Poster Presentation. IMECE2019-13772

Qilin Guo, *Missouri University of Science and Technology, Rolla, MO, United States, Cang Zhao,* *Argonne National Laboratory, Lemont, IL, United States, Minglei Qu, Lianghua Xiong, Luis I. Escano, S. Mohammad H. Hojjatzadeh,* *Missouri University of Science and Technology, Rolla, MO, United States, Niranjana D. Parab, Kamel Fezzaa, Tao Sun,* *Argonne National Laboratory, Lemont, IL, United States, Lianyi Chen,* *Missouri University of Science and Technology, Rolla, MO, United States*

N268. Innovative Geothermal Solar Thermal Hybrid System With Thermal Energy Storage

Poster Presentation. IMECE2019-13782

Francesca Moloney, *University of South Florida, Land O Lakes, FL, United States, D. Yogi Goswami,* *University of South Florida, Tampa, FL, United States*

N269. Levee Fragility Behavior and Failure Probability under Projected Flood Loadings in a Warming Climate

Poster Presentation. IMECE2019-13790

Aneseh Alborzi, *University of California, Irvine, Irvine, CA, United States, Firas H. Jasim,* *Mississippi State University, Starkville, MS, United States, Iman Mallakpour,* *University of California, Irvine, Irvine, CA, United States, Farshid Vahedifard,* *Mississippi State University, Starkville, MS, United States, Amir AghaKouchak,* *University of California, Irvine, Irvine, CA, United States*

N270. Investigation on the Stability of Natural Convection in an Annular Cavity With Non-Isothermal Walls

Poster Presentation. IMECE2019-13795

Sneha Sondur, Ann M. Mescher, *University of Washington, Seattle, WA, United States*

N271. Are We Teaching Systems Engineering Students What They Need to Learn?

Poster Presentation. IMECE2019-13799

Tracy El Khoury, Karen Marais, *Purdue University, West Lafayette, IN, United States*

N272. Design of Multi-Scale Lattices Using Topology Optimization

Poster Presentation. IMECE2019-13803

Hesaneh Kazemi, *University of Connecticut, Vernon, CT, United States*, Ashkan Vaziri, *Northeastern University, Boston, MA, United States*, Julian Norato, *University of Connecticut, Storrs, CT, United States*

N273. Mapping the Research Landscape of Uncertainty Quantification in Materials Modeling

Poster Presentation. IMECE2019-13806

B.S. Aakash, Michael Shields, *Johns Hopkins University, Baltimore, MD, United States*

N274. Study of Natural Convection inside a Closed Rectangular Air-Filled Cavity With Non-Isothermal Walls

Poster Presentation. IMECE2019-13808

Sneha Sondur, Ann M Mescher, *University of Washington, Seattle, WA, United States*

N275. Periodic Cellular Materials With Temperature-induced Phase Transformations

Poster Presentation. IMECE2019-13827

Yunlan Zhang, Pablo Zavattieri, Mirian Velay-Lizancos, *Purdue University, West Lafayette, IN, United States*, Nilesh Mankame, *General Motors, Warren, MI, United States*, David Restrepo, *University of Texas at San Antonio, San Antonio, TX, United States*

N276. Modeling the Impacts of Regional Drought on Global Nutrition

Poster Presentation. IMECE2019-13832

Alexandre Martinez, Amir AghaKouchak, Steven Davis, *University of California Irvine, Irvine, CA, United States*

N277. Phonon Dispersion and Lifetimes of Two-Dimensional Hybrid (C₄H₉NH₃)₂PbI₄ Perovskite Crystals

Poster Presentation. IMECE2019-13840

Chen Li, Hao Ma, *Cornell University, Ithaca, NY, United States*, Tianyang Li, *Duke University, Durham, NC, United States*, Ahmet Alatas, *Argonne National Laboratory, Lemont, IL, United States*, David Mitzi, *Duke University, Durham, NC, United States*, Zhiting Tian, *Cornell University, Ithaca, NY, United States*

N278. Full-Waveform Inversion of Seismic Input Motions in a Near-Surface, Finite Domain

Poster Presentation. IMECE2019-13850

Bruno Peruqui Guidio, Chanseok Jeong, *Catholic University of America, Washington, DC, United States*

N279. Piezoresistivity Characterization of Thin-Film Carbon-Doped PDMS Using a Conductive Hemispherical Probe

Poster Presentation. IMECE2019-13857

Christopher Green, Burak Aksak, *Texas Tech University, Lubbock, TX, United States*

N280. Optimizing Composites for Multi-Functional Applications Using Topology Optimization and Dinosaur Dentition

Poster Presentation. IMECE2019-13862

Tomas Grejtak, Xiu Jia, Tomas Babuska, *Lehigh University, Bethlehem, PA, United States*, Stephen K. Hendriks, *Florida State University, Tallahassee, FL, United States*, Manish Jain, Soumya Varma, Yi T. Lee, *University of Nevada Reno, Reno, NV, United States*, Natasha Vermaak, *Lehigh University, Bethlehem, PA, United States*, Gregory M. Erickson, *Florida State University, Tallahassee, FL, United States*, Siddhartha Pathak, *University of Nevada, Reno, Reno, NV, United States*, Brandon A. Krick, *Lehigh University, Bethlehem, PA, United States*

N281. Maneuvering Control Strategy of an Underwater Vessel With Undulating Fin Propulsion

Poster Presentation. IMECE2019-13863

Mohammad Irfan Uddin, Gonzalo Garcia Garreton, Oscar Curet, *Florida Atlantic University, Boca Raton, FL, United States*

N282. Powder-Bed Fusion Process of Cu-Cr-Zr Alloy: Melt-Pool Dynamics and Process Optimization

Poster Presentation. IMECE2019-13881

M. Shafiqur Rahman, Paul Schilling, Paul Herrington, *University of New Orleans, New Orleans, LA, United States*, Uttam Chakravarty, *University of New Orleans, Kenner, LA, United States*

N283. Nanomanufacturing and Characterization of Aligned and Layered Laminated Continuous Nanofiber-Reinforced Composites

Poster Presentation. IMECE2019-13904

Lucas Barry, *University of Nebraska-Lincoln, Elkhorn, NE, United States*, Abdelrahman Elsayed, Yuris Dzenis, *University of Nebraska-Lincoln, Lincoln, NE, United States*

N284. Stress Corrosion Cracking of Graphene

Poster Presentation. IMECE2019-13937

Mohan Surya Raja Elapolu, Alireza Tabarraei, *University of North Carolina at Charlotte, Charlotte, NC, United States*

N285. A Low-Temperature Printing Technology for Inkjet Printed Sensors Using Plasma-Activated, Metal-Salt Based Inks

Poster Presentation. IMECE2019-13941

Yongkun Sui, Yifan Dai, Chung-Chiun Liu, R. Mohan Sankaran, Christian Zorman, *Case Western Reserve University, Cleveland, OH, United States*

N286. The Influence of Simple Polymers on the Dispersion of Colloidal Nanosilica in Ultra-High Performance Concrete
Poster Presentation. IMECE2019-13949

Douglas Hendrix, Kay Wille, *University of Connecticut, Storrs, CT, United States*

N287. 1D Control-Oriented Model for Predicting Surge Inception: Model Order Reduction of Nonlinear Hyperbolic PDEs for Wave Dynamics in Turbocharged IC Engines
Poster Presentation. IMECE2019-13950

Alexandra Taylor, Marcello Canova, *Ohio State University, Columbus, OH, United States*

16-2 POSTER SESSION: NSF RESEARCH EXPERIENCE FOR UNDERGRADUATES (REU)

16-2-1

Exhibit Hall AB

12:00PM–2:30PM

N288. Numerical Analysis of Stick Bombs

Poster Presentation. IMECE2019-12646

Lucas Allegrette, Thomas Siegmund, *Purdue University, West Lafayette, IN, United States*

N289. Leonardo's Lintel: Analysis With 21st Century Tools

Poster Presentation. IMECE2019-12653

Ethan Guenther, Thomas Siegmund, *Purdue University, West Lafayette, IN, United States*

N290. Modeling, Simulation, and Stability Analysis of Cilia Oscillations

Undergrad Expo. IMECE2019-13087

Yenan Shen, Louis G. Woodhams, PV Bayly, *Washington University in St. Louis, St. Louis, MO, United States*

N291. Determining Nanoparticle Biodistribution Using a Time Dependent Physiologically Based Multi-Scale Pharmacokinetic Model

Technical Presentation. IMECE2019-13091

Emma Glass, *The College of William and Mary, Williamsburg, VA, United States*, **Ravi Radhakrishnan**, *University of Pennsylvania, Philadelphia, PA, United States*

N292. Use of CFD Modeling to Predict Performance of 3D Printed Plastic Heat Exchangers

Poster Presentation. IMECE2019-13281

Rylie Brown, *Dordt University, Boise, ID, United States*, **Gregory Michna**, *South Dakota State University, Brookings, SD, United States*

N293. Visualization of Flow Distribution in Through-Tool Minimum Quantity Lubrication (MQL) Drilling

Poster Presentation. IMECE2019-13289

Vivian S. Su, *University of Utah, Orem, UT, United States*, **Daniel Paulo-Wach**, *University of California, Berkeley, Berkeley, CA, United States*, **Jay Raval, Aman Nigam**, *Texas A&M University, College Station, TX, United States*, **Bruce L. Tai**, *Texas A&M University, Bryan, TX, United States*

N294. Cobalt Supply Insights in the Face of Increased Electric Vehicle Demand

Poster Presentation. IMECE2019-13295

Danielle N. Beatty, *University of Utah, Sale Lake City, UT, United States*, **Xinkai Fu**, *Massachusetts Institute of Technology, Cambridge, MA, United States*, **Gabrielle Gaustad**, *Alfred University, Alfred, NY, United States*, **Gebrand Cedar**, *University of California, Berkeley, Berkeley, CA, United States*, **Richard Roth, Randolph Kirchain, Michele Bustamante**, *Massachusetts Institute of Technology, Cambridge, MA, United States*, **Callie Babbitt**, *Rochester Institute of Technology, Rochester, NY, United States*, **Elsa Olivetti**, *Massachusetts Institute of Technology, Cambridge, MA, United States*

N295. Muscle Activation Patterns During Use of the CSU 4OptimX Exercise Robot

Poster Presentation. IMECE2019-13296

Andrew Shelton, *Cleveland State University, Williamsville, NY, United States*, **Erivelton Gualter Dos Santos, Humberto De Las Casas, Hanz Richter**, *Cleveland State University, Cleveland, OH, United States*

N296. Portable Electrochemical Sensing and Internet-of-Things (IoT) for Wearable Papertronic Sensors

Poster Presentation. IMECE2019-13384

Sukhjot Singh, Emily Gruber, Ramendra K. Pal, Sowmya Balakrishnan, Mark Orzeszko, Aaron D. Mazzeo, *Rutgers, The State University of New Jersey, Piscataway, NJ, United States*

N297. High Modulus Supercapacitors for Structural Energy and Power

Poster Presentation. IMECE2019-13417

Anish Patel, *Texas A&M University, College Station, TX, United States*, **Charles Shelton**, *University of Alabama in Huntsville, Fairhope, AL, United States*, **John Harris**, *Samsung, College Station, TX, United States*, **Jodie L. Lutkenhaus**, *Texas A&M University, College Station, TX, United States*

N298. Analyzing Interlayer Behavior for Layer-by-Layer Slot Die Coating

Poster Presentation. IMECE2019-13549

Daniel Liao, Dipankar Behera, Michael Cullinan, *University of Texas at Austin, Austin, TX, United States*

N299. Application of Predictive Analytics Tool Boxes for Maximizing Thermal Performance of A Basic Thermal Energy Storage (TES) Unit

Poster Presentation. IMECE2019-13620

Meghan Truong, *Texas A&M University, Houston, TX, United States*, **Nandan Shettigar**, *Texas A&M University, Carrollton, TX, United States*, **Ashok Thyagarajan, Debjyoti Banerjee**, *Texas A&M University, College Station, TX, United States*

N300. Optimizing 3D Printed Heat Exchanger Designs for Enhanced Thermal Energy Storage (TES) Platforms

Poster Presentation. IMECE2019-13623

Meghan Truong, *Texas A&M University, Houston, TX, United States*, **Nandan Shettigar**, *Texas A&M University, Carrollton, TX, United States*, **Abigail Meza**, **Ashok Thyagarajan**, **Debjyoti Banerjee**, *Texas A&M University, College Station, TX, United States*

N301. Design and Testing of Thermal Energy Storage (TES) Platforms by Enhancing Reliability of Phase Change Materials

Poster Presentation. IMECE2019-13628

Meghan Truong, *Texas A&M University, Houston, TX, United States*, **Nandan Shettigar**, *Texas A&M University, Carrollton, TX, United States*, **Ashok Thyagarajan**, *Texas A&M University, College Station, TX, United States*, **Navin Kumar**, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*, **Debjyoti Banerjee**, *Texas A&M University, College Station, TX, United States*

N302. Enhanced Microparticle Spraying Using Ultrasonic Droplet Generation

Undergrad Expo. IMECE2019-13630

Jonathan S. Powles, *Vanderbilt University, Nashville, TN, United States*, **Nathan A. Reed**, *Washington University in St. Louis, St. Louis, MO, United States*, **John Meacham**, *Washington University in St. Louis, Webster Groves, MO, United States*

N303. Magnetic Freeze-Casting With Tri-Axial Nested Helmholtz Coils to Fabricate Bioinspired Porous Helical and Bouligand Structures

Poster Presentation. IMECE2019-13631

Sierra Freitas, **Lauren M. Kochaver**, **John Varga**, **Paul Wadsworth**, **Max Mroz**, **Owen Kingstedt**, *University of Utah, Salt Lake City, UT, United States*, **Jamie J. Kruzic**, *School of Mechanical and Manufacturing Engineering, Sydney, Utah, Australia*, **Steven Naleway**, **Isaac Nelson**, *University of Utah, Salt Lake City, UT, United States*

N304. Modeling and Analysis of Age-Dependent Transmission Tower Hurricane Failures

Poster Presentation. IMECE2019-13748

Keoni Sanny, **Yousef Mohammadi Darestani**, **Abdollah Shafieezadeh**, *Ohio State University, Columbus, OH, United States*

N305. Utilization of 3D Printing Technology for Camouflaging Drone Detecting Devices

Poster Presentation. IMECE2019-13793

Misheel Sodgerel, *Washington University in St. Louis, Cary, NC, United States*, **Missy Cummings**, *Duke University, Durham, NC, United States*

N306. Applications of Active Microwave Thermography for Structural Health Monitoring

Poster Presentation. IMECE2019-13800

Lia VanZant, **Daniel Bischof**, **Xingxing Zou**, **Lesley Sneed**, **Mohammad Tayeb Al Qaseer**, **Kristen M. Donnell**, *Missouri University of Science and Technology, Rolla, MO, United States*

N307. An In-Depth Understanding of Single-Phase Immersion Cooling Strategies for Data Centers

Poster Presentation. IMECE2019-13878

Ephrem Kejela, **Abel Misrak**, **Tushar Jashvantbhai Chauhan**, **Dereje Agonafer**, *University of Texas at Arlington, Arlington, TX, United States*

TRACK 17 VIRTUAL PODIUM (POSTERS)

ACKNOWLEDGMENT

TRACK ORGANIZER

Albert Ratner, *University of Iowa, United States*

TRACK 17 VIRTUAL PODIUM (POSTERS)

Track Organizer: Albert Ratner, *University of Iowa, Iowa City, IA, United States*

17-1 ACOUSTICS, VIBRATION, AND PHONONICS

17-1-1 Acoustics, Vibration, and Phononics
Exhibit Hall #4 12:00PM–2:30PM

V400. Simulation and Optimization of a Surface Acoustic Wave Transducer for Contactless Bolt Tension Quantification

Poster Presentation. IMECE2019-11517
Hani Alhazmi, Rasim Guldiken, *University of South Florida, Tampa, FL, United States*

V401. Analysis of Binaural Impulse Response Data in a Non-Diffuse Sound Field

Poster Presentation. IMECE2019-12269
Heather Lai, Anne Balant, *SUNY New Paltz, New Paltz, NY, United States*

17-2 ADVANCED MANUFACTURING

17-2-1
Exhibit Hall AB 12:00PM–2:30PM

V403. Electrical Discharge Machining With Very Fine Silicon Powder in the Dielectric: Surface Modification of Tool Steel

Poster Presentation. IMECE2019-10144
Fred Amorim, Cesar Oleinik, *Pontificia Universidade Católica do Parana, Curitiba, PR, Brazil*

V404. Minimum Destructive and Noninvasive Test Methods for Natural Materials

Poster Presentation. IMECE2019-10416
Satya Prasad Paruchuru, Aruna Prabha Kolluri, *VNR VJJET, Hyderabad, Telangana, India*

V405. Standardization Aspects of Fracture Testing of Bone and Bio-Materials

Poster Presentation. IMECE2019-10417
Satya Prasad Paruchuru, Aruna Prabha Kolluri, *VNR VJJET, Hyderabad, Telangana, India*

V406. A Virtual Machining System for Toolpath Optimization

Poster Presentation. IMECE2019-10696
Bowen Qi, Hong Seok Park, *University of Ulsan, Ulsan, China*

V407. Controllable Freeform Photothermal Manufacturing of Graphene Devices From Industrial and Agricultural Bio-Byproducts

Poster Presentation. IMECE2019-11360
Wyatt Panaccione, Zhewen Yin, Emily Phan, Xiaohe Luan, Yunjo Jeong, Michael Cai Wang, *University of South Florida, Tampa, FL, United States*

V408. Digitally Defined Patterns for Manufacturing by Utilizing Point-Patterning

Poster Presentation. IMECE2019-11525
John Cotter, *University of South Florida, Dade City, FL, United States*, Nathan Crane, *Brigham Young University, Provo, UT, United States*, Rasim Guldiken, *University of South Florida, Tampa, FL, United States*

V409. Surface Quality Monitoring in End Mill Trimming of FRP Composites

Poster Presentation. IMECE2019-12690
Ramulu Mamidala, Rishi Pahuja, *University of Washington, Seattle, WA, United States*

V410. De-icing Using Additively Manufactured Heating Elements

Poster Presentation. IMECE2019-12851
Shaheryar Atta Khan, Ismail Lazoglu, *Koc University, Istanbul, Istanbul, Turkey*

V411. Flexible and Printable Circuits: From Production to Inkjet Printing of Graphene

Poster Presentation. IMECE2019-12915
Amir Ehsan Niaraki Asli, Nicole Hashemi, *Iowa State University, Ames, IA, United States*

V412. Radial Toolpath Use in Incremental Forming

Poster Presentation. IMECE2019-13037
Tyler Grimm, *Clemson University, Greenville, SC, United States*, Laine Mears, *Clemson University, Anderson, SC, United States*

V413. Stochastic Milling Toolpath Development

Poster Presentation. IMECE2019-13038
Tyler Grimm, *Clemson University, Greenville, SC, United States*, Laine Mears, *Clemson University, Anderson, SC, United States*

V414. Printing of Plano-Convex and Positive-Meniscus Lens Array on a Flexible Substrate via Electrohydrodynamic Jetting for Its Optical Applications

Poster Presentation. IMECE2019-13119
JongHyun (Joe) Kim, Dongwoon Shin, Abiral Regmi, Jiyoung Chang, *University of Utah, Salt Lake City, UT, United States*

V415. Rotational Effect on Natural Frequencies and Mode Shapes of Timoshenko Rotating Workpiece in the Ultrasonic Vibration-Assisted Turning Process

Poster Presentation. IMECE2019-13247
H. Soleimanimehr, M. Ghelmani, *Islamic Azad University, Tehran, Islamic Republic of Iran*, Nariman Ashrafi, *Payame Noor University, Tehran, Islamic Republic of Iran*

V416. Effect of Tailstock on Natural Frequencies and Mode Shapes of Timoshenko Workpiece in the Ultrasonic Vibration-Assisted Turning Process

Poster Presentation. IMECE2019-13251
H. Soleimanimehr, S.M. Jafari, *Islamic Azad University, Tehran, Islamic Republic of Iran*, Nariman Ashrafi, *Payame Noor University, Tehran, Islamic Republic of Iran*

V417. A Flexible Laser Induced Graphitic Sensor for Flow Rate Sensing Applications

Poster Presentation. IMECE2019-13371

Behrokh Abbasnejad, David McGloin, *University of Technology Sydney, Sydney, NSW, Australia*, **Lee Clemon**, *University of Technology Sydney, Ultimo, NSW, Australia*

17-4 BIOMEDICAL & BIOTECHNOLOGY ENGINEERING

17-4-2 Biomedical & Biotechnology Engineering
Exhibit Hall AB **12:00PM–2:30PM**

V418. Low-Cost Automated Labeling and Clearing of Clinical Specimens for High-Throughput Nondestructive 3D Pathology

Poster Presentation. IMECE2019-13107

Kaylene Pang, *University of Washington, Bellevue, WA, United States*, **Soyoung Kang**, *University of Washington, Seattle, WA, United States*, **Martin Poenot**, *Facebook, Seattle, WA, United States*, **Lawrence True, Nicholas Reder, Adam K. Glaser, Jonathan T.C. Liu**, *University of Washington, Seattle, WA, United States*

V419. New Bioreactor Design for Intervertebral Disc

Poster Presentation. IMECE2019-13142

Ran Huo, David-Michael Phillips, *McGill University, Montreal, QC, Canada*, **Sam Selmani**, *Oligo Medic, Montreal, QC, Canada*, **Jianyu Li, McGill University, Montreal, QC, Canada**

V420. Relating the Intricate Structure of Quasi-indestructible *Armillaria Ostoyae* Rhizomorphs to Its Mechanical Properties

Poster Presentation. IMECE2019-13474

Debora Lyn Porter, Alexander J. Bradshaw, Bryn T.M. Dentinger, Steven Naleway, *University of Utah, Salt Lake City, UT, United States*

V421. Apparatus for Push-out Testing of Rat Calvarial Defect Repairs

Poster Presentation. IMECE2019-13731

Jiwan Han, Zachary Lawson, Andrew Robbins, Melissa A. Grunlan, Michael Moreno, *Texas A&M University, College Station, TX, United States*

V422. Chromometric Analysis of Pig Bladder Mucosal Surfaces for Vascular Mapping

Poster Presentation. IMECE2019-13775

Zachary Cullingsworth, Naveen Nandan, Konstantin Frolov, Adam Klasuner, John Speich, *Virginia Commonwealth University, Richmond, VA, United States*

V423. Development of Methods to Fabricate, Mechanically Characterize, and Analyze Cell Response in Biomimetic Engineered Scaffolds

Poster Presentation. IMECE2019-13592

Raghuveer Lalitha Sridhar, Michael Moreno, Alan Freed, Ergun Akleman, Andrew Robbins, Erica Huebner, Cynthia Co, *Texas A&M University, College Station, TX, United States*

V424. Exploration of Electrospinning Protocols for Production of Mechanically Tunable Vascular Grafts

Poster Presentation. IMECE2019-13657

Shannon Ingram, *Texas A&M University, Fulshear, TX, United States*, **Michael Moreno, Andrew Robbins**, *Texas A&M University, College Station, TX, United States*

V425. Method for Finding the Flexural Rigidity of Individual Internodal Regions of Maize Stalks

Poster Presentation. IMECE2019-13882

Nathanael Nelson, Michael Yancey, Chung Shan Liao, *Brigham Young University, Provo, UT, United States*, **Christopher Stubbs**, *New York University, Brooklyn, NY, United States*, **Douglas Cook**, *Brigham Young University, Provo, UT, United States*

V426. Improving Calcium Phosphate Cement Injectability and 3D-printability Using Microspheres for Dental Materials

Poster Presentation. IMECE2019-13887

Tony Yin, Steven Naleway, *University of Utah, Salt Lake City, UT, United States*

V427. Posture and Muscle Activation Changes Prior to an Impact in Response to a Directional Warning

Technical Presentation. IMECE2019-11796

Mohammad Homayounpour, Jonathan Douglas Mortensen, Andrew Merryweather, *University of Utah, Salt Lake City, UT, United States*

V428. Validation of Pressure Insoles as an Accurate and Precise Force Measurement Device

Poster Presentation. IMECE2019-13096

Jordan Smith, Robert Felmlee, *Gannon University, Erie, PA, United States*, **Mary Crowe**, *Lake Erie College of Osteopathic Medicine, Erie, PA, United States*, **Scott Steinbrink, Davide Piovesan**, *Gannon University, Erie, PA, United States*

17-4-3 Biomedical Devices – Posters

Exhibit Hall AB **12:00PM–2:30PM**

V429. Testing of a Non-Invasive Cardiac Output Measurement System

Poster Presentation. IMECE2019-12541

Alton Reich, Sami Bayyuk, Jason Heym, *Vital Metrix, Huntsville, AL, United States*

V430. Development of a Handheld QTc Interval Reader to Improve Convenience of Monitoring Patients at Risk of Prolonged QTc

Poster Presentation. IMECE2019-12974

Trinh Vo, Marissa Shibuya, Nanye Du, Hengjia Zhu, *University of Washington, Seattle, WA, United States*, **Jon Neher**, *Valley Family Medicine, Renton, WA, United States*, **Soyoung Kang**, *University of Washington, Seattle, WA, United States*, **Martin Poenot**, *Facebook, Seattle, WA, United States*, **Dan Cornish**, *UW Family Medicine, Seattle, WA, United States*, **Jonathan T.C. Liu, Eric Seibel**, *University of Washington, Seattle, WA, United States*

V431. Neck Loading Model of a Child in a Car Seat

Poster Presentation. IMECE2019-13321

Parisa Saboori, Jack Consolini, *Manhattan College, Bronx, NY, United States*, Magdeline Schoonover, *Manhattan College, New York, NY, United States***V432. Inflating-Pulsating Glove: A New Treatment for Infantile Cystic Fibrosis**

Poster Presentation. IMECE2019-13327

Jack Consolini, Parisa Saboori, *Manhattan College, Bronx, NY, United States***V433. Guidewire Innovations and Placement Simulator to Prevent Loss of Wire in Catheterization**

Poster Presentation. IMECE2019-13595

Yuri Hudak, *University of Washington, Bothell, WA, United States*, Erin Graf, Cassidy Quigley, Joseph Wong, Rebecca Darrow, Jonathan T.C. Liu, Soyoun Kang, Eric Seibel, Darren Li, *University of Washington, Seattle, WA, United States***V434. Piezoelectric Tooth Aligner for Bone Growth Stimulation**

Poster Presentation. IMECE2019-13735

Nikta Amiri, M. Amin Karami, *University at Buffalo, Buffalo, NY, United States***V435. The Effect of Wearing Insoles on Lower Extremity Gait Kinematics of Adults During Activities of Daily Living**

Poster Presentation. IMECE2019-13839

Dorien Butter, Sarvenaz Chaeibakhsh, Andrew Merryweather, K. Bo Foreman, *University of Utah, Salt Lake City, UT, United States***V436. Traumatic Brain Injury at the Cellular Level: Design of a Controlled Cortical Impact Bioreactor**

Poster Presentation. IMECE2019-13651

Shannon Ingram, *Texas A&M University, Fulshear, TX, United States*, Michael Moreno, Andrew Robbins, *Texas A&M University, College Station, TX, United States***V437. How Well Do IMUs Capture Tibia and Femoral Kinematics During a Simulated Jump Landing?**

Poster Presentation. IMECE2019-12996

Amanda Esquivel, Mirel Adjaroski, *University of Michigan-Dearborn, Dearborn, MI, United States*, Melanie Beaulieu, So Young Baek, James Ashton-Miller, *University of Michigan, Ann Arbor, MI, United States***V438. Automated Leveling of Pressure Transducers Used in Pulmonary Artery Catheterization**

Poster Presentation. IMECE2019-13359

Cody Cooper, *University of Washington, Seattle, WA, United States*, Stephen A. Phillips, *University of Washington, Shoreline, WA, United States*, Shikhar Varshney, *University of Washington, Seattle, WA, United States*, Greta Anaman, *University of Washington Medical Center, Seattle, WA, United States*, Martin Poenot, *Facebook, Seattle, WA, United States*, Soyoun Kang, Eric Seibel, Jonathan T.C. Liu, *University of Washington, Seattle, WA, United States***V439. Detection of Mercury (II) Ion Using Graphene Oxide Fluorescence Resonance Energy Transfer (FRET) Aptamer Sensor in a Microfluidic Device**

Poster Presentation. IMECE2019-12384

Ruey-Jen Yang, *National Cheng Kung University, Tainan, Taiwan, Taiwan***17-5 DYNAMICS, VIBRATION, AND CONTROL****17-5-1 Dynamics, Vibration, and Control**

Exhibit Hall AB

12:00PM–2:30PM

V440. Vibrational Analysis of Solar Sails

Poster Presentation. IMECE2019-13825

D. Lee, Ni Li, *California State University, Los Angeles, Los Angeles, CA, United States***17-6 ENERGY****17-6-1 Energy**

Exhibit Hall AB

12:00PM–2:30PM

V441. Cuckoo Searching Process Dependent Bulk-Heterojunction Nanomorphology of P3HT: PCBM Based Organic Solar Cells

Poster Presentation. IMECE2019-11834

Joydeep Munshi, Ganesh Balasubramanian, *Lehigh University, Bethlehem, PA, United States***V442. Thermal and Daylight Analysis of Window With Double External Solar Screens**

Poster Presentation. IMECE2019-10018

Esam Alawadhi, *Kuwait University, Safat, Kuwait***V443. The Influence of the Phase Change Temperature Range and the Phase Change Hysteresis of a PCM on the Performance of an Air-PCM Heat Storage Unit**

Poster Paper Publication. IMECE2019-10438

Pavel Charvat, Martin Zalesak, Lubomir Klimes, *Brno University of Technology, Brno, Czech Republic***V444. Investigating the Phase Change of a Two-Phase Salt Mixture for a Latent Heat Storage Device**

Poster Presentation. IMECE2019-12357

Jared M. Becker, Liana S. Suleiman, Michael J. Augspurger, H.S. Udaykumar, *University of Iowa, Iowa City, IA, United States***V445. The Effect of Wax on Hydrate Formation in Oil-Dominated System**

Poster Presentation. IMECE2019-12434

Wei Wang, Qiyu Huang, Dongxu Zhang, Xianwen Cheng, *China University of Petroleum-Beijing, Beijing, China***V446. Alternatives to Electricity Systems for Total Decarbonization of the World's Largest Industry: Humanity's Energy Sector**

Poster Presentation. IMECE2019-12575

William Leighty, *The Leighty Foundation, Juneau, AK, United States*

V447. Dynamic Behaviors of Small Plates in Acoustic Energy Harvesting Tubes

Poster Presentation. IMECE2019-12764
Grant Gunderson, Jacob Schiffman, Ryan Brunner, *University of St. Thomas, Saint Paul, MN, United States,*
Jeong Ho You, *University of St. Thomas, Woodbury, MN, United States*

V448. Thermal Energy Storage for Long-Duration Electricity Storage Using a Solid Particle Storage Medium and a High-Efficiency Power Cycle

Poster Presentation. IMECE2019-12957
Jeffrey Gifford, *National Renewable Energy Laboratory, Golden, CO, United States,* **Zhiwen Ma,** *National Renewable Energy Laboratory, Lakewood, CO, United States,* **Patrick Davenport,** *National Renewable Energy Laboratory, Golden, CO, United States*

V449. Statistics-Based Fault Detection and Diagnosis for Residential HVAC Systems Using Cloud-Based Thermostat Data

Poster Presentation. IMECE2019-13152
Fangzhou Guo, *Texas A&M University, College Station, TX, United States,* **Austin Rogers,** *Pacific Northwest National Laboratory, Richland, WA, United States,* **Bryan Rasmussen,** *Texas A&M University, College Station, TX, United States*

V450. Fast and Accurate Single Diode Model for Photovoltaic Design

Poster Presentation. IMECE2019-13276
Hussein Sharadga, Shima Hajimirza, *Texas A&M University, College Station, TX, United States*

V451. Effects of Air Excess Ratio on Performance and Emissions Characteristics of a Natural Gas/Diesel Dual Fuel Engine in CHP Applications

Poster Presentation. IMECE2019-13388
Sunyoup Lee, Jeongwoo Lee, Seokwhan Lee, Changgi Kim, Cheolwoong Park, *Korea Institute of Machinery and Materials, Dae-jeon, Korea (Republic)*

V452. Pyrolysis Activation Energy for Carbonaceous Materials: From Biomass to Low Rank Coal

Poster Presentation. IMECE2019-13463
Evan Terrell, *Washington State University, Pullman, WA, United States,* **Erika Bartolomei,** *CNRS, University of Lorraine, Nancy, France, France,* **Manuel Garcia-Perez,** *Washington State University, Pullman, WA, United States*

V453. Zero-Energy Buildings by Use of PV/T Panel, M-Cycle, Desiccant and Heat Wheels

Poster Presentation. IMECE2019-13665
Prakash Dhamshala, *University of Tennessee at Chattanooga, Chattanooga, TN, United States*

V454. Multi-scale Modeling of Protonic Ceramic Fuel Cells and Fuel Cell Systems

Poster Presentation. IMECE2019-13736
Kyle Ferguson, Robert Braun, *Colorado School of Mines, Golden, CO, United States*

V455. Multifunctional Nanofibers for Electrochemical Energy Storage

Poster Presentation. IMECE2019-13758
Xiangfa Wu, *North Dakota State University, Fargo, ND, United States*

V456. Potential Repurposing of Reverse Osmosis Concentrate for Energy Storage Applications

Poster Presentation. IMECE2019-13834
Gerardo Maldonado, *California State Polytechnic University, Pomona, Cathedral City, CA, United States,* **Kusaii Abu-Shaban, Ega Herlim, Katie Sun, Bryan Craw, Ronell Lim, Severin Zaluzec, Nicole Garcia, Benjamin Kong, Joseph Kiriakos, Kirk Johnston, Christopher Salerno, Reza Baghaei Lakeh,** *California State Polytechnic University, Pomona, Pomona, CA, United States*

V457. Student Housing Energy, Emission and Cost Assesment

Poster Presentation. IMECE2019-13885
Gabriel Legorburu, Amanda Smith, *University of Utah, Salt Lake City, UT, United States*

V458. Part Load Performance of Microturbine Combined Heat and Power Systems for a Distributed Generation Optimization Tool

Poster Presentation. IMECE2019-13924
Chris Hampel, Robert Braun, *Colorado School of Mines, Golden, CO, United States,* **Bill Becker,** *National Renewable Energy Laboratory, Golden, CO, United States*

17-7 ENGINEERING EDUCATION

17-7-1

Exhibit Hall AB

12:00PM–2:30PM

V459. Towards Flipping the Undergraduate Fluid Mechanics Class

Poster Presentation. IMECE2019-13944
Mohammed Al Busaidi, Chad Garcia, Christine Brown, Rasim Guldiken, *University of South Florida, Tampa, FL, United States*

17-8 FLUIDS ENGINEERING

17-8-1

Exhibit Hall AB

12:00PM–2:30PM

17-9 HEAT TRANSFER AND THERMAL ENGINEERING

17-9-1 Heat Transfer and Thermal Engineering

Exhibit Hall AB

12:00PM–2:30PM

V460. Computational Design Optimization of PCM-Based Attenuator of Fluid Temperature Fluctuations

Poster Paper Publication. IMECE2019-10381
Lubomir Klimes, Lukas Kozubik, Pavel Charvat, *Br University of Technology, Brno, Czech Republic*

V461. Simultaneous Measurement of Specific Heat and Thermal Conductivity in Extreme Environment by Front Pump Rear Probe Technique

Poster Presentation. IMECE2019-12224

Xianghai Meng, Jihoon Jeong, Yaguo Wang, Jung-Fu Lin, University of Texas at Austin, Austin, TX, United States

V462. Mapping Temperature Gradients Around Evaporating Sessile Water Droplets

Poster Presentation. IMECE2019-12838

Mohamed Mousa, University of Illinois at Urbana-Champaign, Urbana, IL, United States, Daniel Orejon, University of Edinburgh, Edinburgh, United Kingdom, Nenad Miljkovic, University of Illinois at Urbana-Champaign, Urbana, IL, United States

V463. Micro-Nanoengineered Surfaces for Enhanced Water Harvesting

Poster Presentation. IMECE2019-12900

George Popovic, Soumyadip Sett, Kalyan Boyina, Kazi Fazle Rabbi, Stephen Bosch, Majid Linjawi, Nenad Miljkovic, University of Illinois at Urbana-Champaign, Urbana, IL, United States

V464. Synthesis and Thermal Transport Properties of High-Surface Area Hexagonal Boron Nitride Foam Structures

Poster Presentation. IMECE2019-12954

Qianru Jia, Li Shi, University of Texas at Austin, Austin, TX, United States

V465. Experimental Analysis of Commercially Available PCM Cooling Process and Energy Storage Capacity

Poster Presentation. IMECE2019-12959

Kaja Lapinska, Columbia University, New York, NY, United States, Piotr Baszczynski, Artur Gutkowski, Lodz University of Technology, Lodz, Lodzkie, Poland, Grzegorz Owczarek, Central Institute for Labour Protection National Research Institute, Lodz, Lodzkie, Poland, Mateusz Stajuda, Lodz University of Technology, Lodz, Lodz, Poland

V466. Design of an Experiment for Validating 3D Heat Transfer Simulations During Magnetic-Assisted Cochlear Implant Surgery

Poster Presentation. IMECE2019-13035

Fateme Esmailie, Mathieu Francoeur, Timothy Ameal, University of Utah, Salt Lake City, UT, United States

V467. Thermal Performance of Capillary-Controlled Thin Sintered-Particle Wick

Poster Presentation. IMECE2019-13057

Munonyedi Egbo, Yahya Nasersharifi, Gisuk Hwang, Wichita State University, Wichita, KS, United States

V468. Flow and Heat Transfer Characteristics for a Flow Over Double Semi-Circular Cylinders

Poster Presentation. IMECE2019-13102

Sultan Alshareef, Timothy Ameal, Todd Harman, University of Utah, Salt Lake City, UT, United States

V469. Development of Metrology for the High-Temperature Characterization of Solar-Thermal Receivers

Poster Presentation. IMECE2019-13135

Riley Crist, Keunhan Park, Mathieu Francoeur, Sameer Rao, University of Utah, Salt Lake City, UT, United States

V470. Interacting Effects of Heater Size, Container Size, and Wettability on Pool Boiling Critical Heat Flux

Poster Presentation. IMECE2019-13196

Zhenyu She, Vijay Dhir, University of California, Los Angeles, Los Angeles, CA, United States

V471. EHD Assisted SJR Nozzle to Enhance Drying Rate of Moist Porous Medium

Poster Presentation. IMECE2019-13298

Mengqiao Yang, Jamal Yagoobi, Burt Tilley, Worcester Polytechnic Institute, Worcester, MA, United States

V472. Thermal Modeling and Monitoring of Power Electronic Components Using Hardware in the Loop

Poster Presentation. IMECE2019-13358

Finnegan Lynch, Loyola Marymount University, Mesa, AZ, United States, Asif Emon, University of Arkansas, Fayetteville, AR, United States

V473. Effects of Electron-Phonon Interactions on Thermal Transport in Quasi-1D NbSe₃ Nanowires

Poster Presentation. IMECE2019-13618

Zhiliang Pan, Yi Tao, Vanderbilt University, Nashville, TN, United States, Lin Yang, Lawrence Berkeley National Laboratory, Berkeley, CA, United States, Deyu Li, Vanderbilt University, Nashville, TN, United States

V474. Near Field Heat Transfer in Topological Insulators With Spin-Hall Effect

Poster Presentation. IMECE2019-13661

Morgan Blankenship, University of North Texas, Aubrey, TX, United States, Zihao Zhang, University of North Texas, Frisco, TX, United States

V475. Heat Transfer in a Porous Medium With Local Heating and Evaporation on the Top Boundary

Poster Presentation. IMECE2019-13807

Luca Valdarno, Vijay Dhir, University of California, Los Angeles, Los Angeles, CA, United States

V476. Heat Transfer Enhancement in Minichannel Flow

Poster Presentation. IMECE2019-13893

Luis Serrano Torres, Ana G. Mendez University System, Gurabo, PR, United States, Gerardo Carbajal, Florida Polytechnic University, Lakeland, FL, United States

V477. Numerical Study of Nucleate Boiling Coupled With the Thermal Response of the Solid Substrate Using Level Set Method

Poster Presentation. IMECE2019-13931

Atindra Krishnan, Vijay Dhir, University of California, Los Angeles, Los Angeles, CA, United States

V478. Theoretical and Experimental Study of Heat Pipe Performance at Various Orientation Angles

Poster Presentation. IMECE2019-13933

Salar Effati, Fred Barez, *San Jose State University, San Jose, CA, United States*

17-10 ADVANCED MATERIALS: DESIGN, PROCESSING, CHARACTERIZATION AND APPLICATIONS

17-10-1 Advanced Materials: Design, Processing, Characterization and Applications

Exhibit Hall AB

12:00PM–2:30PM

V479. Thermomechanical Metamaterials Based on Three-Dimensional Composite Tetrahedra: Bistability Regimes and Negative Thermal Expansion

Poster Presentation. IMECE2019-13237

John T. Klein, Eduard Karpov, *University of Illinois at Chicago, Chicago, IL, United States*

V480. Theory and Design Principles of Chiral Thermomechanical Metamaterials With Continuous Negative Thermal Expansion

Poster Presentation. IMECE2019-13238

Debajyoti Saha, Andrew P. Modell, Eduard Karpov, *University of Illinois at Chicago, Chicago, IL, United States*

V481. Impression Creep Behavior of Cast ZE63 and ZE41 Magnesium Alloys

Poster Presentation. IMECE2019-13185

E. Kermani, F. Biniyazan, *Islamic Azad University, Tehran, Islamic Republic of Iran*, B. Rezaee, *Iran University of Science and Technology, Tehran, Islamic Republic of Iran*, H. Soleimanimehr, *Islamic Azad University, Tehran, Islamic Republic of Iran*, Nariman Ashrafi, *Payame Noor University, Tehran, Islamic Republic of Iran*

V482. Recycling of Thermoplastic Waste in Industry

Poster Presentation. IMECE2019-12068

Sadek Salem Cherif, *University of Tizi-ouzou “Mouloud Mammeri”, Tizi-Ouzou, Algeria*

V483. A Predictive Scheme Based on Machine Learning Technique for Discovery of Materials for Organic Solar Cells

Poster Presentation. IMECE2019-11858

Joydeep Munshi, Ganesh Balasubramanian, *Lehigh University, Bethlehem, PA, United States*

V484. Evaluation of Thermal Effects in Turning Processes: Numerical and Experimental Approach

Poster Paper Publication. IMECE2019-10423

Aruna Prabha Kolluri, *VNR VJIET, Hyderabad, Telangana, India*, Srinivasa Prasad Balla, *Gitam University, Visakhapatnam, Andhra Pradesh, India*, Satya Prasad Paruchuru, *VNR VJIET, Hyderabad, India*

V485. Creep Damage Assessment of 2.25Cr-1Mo Steel Welded Joint by Using a Miniature Specimen

Poster Presentation. IMECE2019-12675

Takanobu Kakikoshi, *Chiba Institute of Technology, Narashino, Japan*, Takashi Ogata, *Chiba Institute of Technology, Chiba, Japan*

V486. Experimental Investigation of PolyJet 3D Printing Process: Effects of Finish Type and Material Color on Color Appearance

Poster Presentation. IMECE2019-12688

Xingjian Wei, Li Zeng, Zhijian Pei, *Texas A&M University, College Station, TX, United States*

V487. Experimental Investigation of PolyJet 3D Printing Process: Effects of Orientation and Layer Thickness on Thermal Glass Transition Temperature

Poster Presentation. IMECE2019-12721

Jackson Sanders, *Texas A&M, Katy, TX, United States*, Xingjian Wei, Zhijian Pei, *Texas A&M University, College Station, TX, United States*

V488. Reducing Diameter and Layers of CNTs and Impregnating With PAA Solution for Fabrication of High Strength CNT Yarn

Poster Presentation. IMECE2019-13319

Kazuyoshi Sogo, Naruki Hisaji, *Waseda University, Shinjuku-ku, Tokyo, Japan*, Kazuhiko Takahashi, *Toyota Motor Corporation, Toyota-shi, Aichi, Japan*, Hiroataka Inoue, Yasuhiko Hayashi, *Okayama University, Okayama-shi, Okayama, Japan*, Atsushi Hosoi, Hiroyuki Kawada, *Waseda University, Tokyo, Japan*

17-11 MECHANICS OF SOLIDS, STRUCTURES AND FLUIDS

17-11-1

Mechanics of Solids, Structures and Fluids

Exhibit Hall AB

12:00PM–2:30PM

V489. Sound Source Localization by Bio-Inspired MEMS Microphones

Poster Presentation. IMECE2019-10757

Ashiqur Rahaman, Byungki Kim, *Korea University of Technology and Education, Cheonan, Korea (Republic)*

17-11-2 Track 11 Poster Session/ Student Poster Competition

Exhibit Hall AB

12:00PM–2:30PM

Session Organizer: Caglar Oskay, *Vanderbilt University, Nashville, TN, United States*

V490. Seamless Coupling of Peridynamics and Finite Element Method in Commercial Software of Finite Element to Solve Elas-to-Dynamics Problems

Poster Presentation. IMECE2019-12508

Shank S. Kulkarni, Xiaonan Wang, Alireza Tabarraei, *University of North Carolina, States*

V491. Concurrent Multiscale Coupling of Peridynamic With Finite Element Method for Fracture Simulations

Poster Presentation. IMECE2019-12908

Rui Zhang, Shogo Wada, Clint Nicely, Dong Qian, *University of Texas at Dallas, Richardson, TX, United States***V492. Analysis on Creep-Fatigue Damage Interaction of the Modified 9Cr-1Mo Steel Based on Continuum Damage Mechanics**

Poster Presentation. IMECE2019-13167

Uijeong Ro, Sangyeop Kim, Moon Ki Kim, *Sungkyunkwan University, Suwon, Korea (Republic)***V493. A Semi-Lagrangian, Constitutive Correspondence Modeling Framework for Peridynamics**

Poster Presentation. IMECE2019-13220

Masoud Behzadinasab, John Foster, *University of Texas at Austin, Austin, TX, United States***V494. Misorientation Angle Governs Strength and Toughness of Diamond Bicrystal**

Poster Presentation. IMECE2019-13277

Zhaocheng Zhang, Md. Hossain, *University of Delaware, Newark, DE, United States***V495. A Peridynamic Computational Investigation of Carbon Nanotube Yarn Reinforced Composites**

Poster Presentation. IMECE2019-13419

Forrest Baber, *Virginia Commonwealth University, Richmond, VA, United States*, Ibrahim Guven, *Virginia Commonwealth University, Richmond, VA, United States***V496. Error Control in Multi-physics Computations with Multiresolution Wavelets**

Poster Presentation. IMECE2019-13815

Cale Harnish, *University of Notre Dame, Notre Dame, IN, United States*, Luke Dalessandro, *University of Washington, Seattle, WA, United States*, Karel Matous, *University of Notre Dame, Notre Dame, IN, United States*, Daniel Livescu, *Los Alamos National Laboratory, Los Alamos, NM, United States***V497. A Molecular Dynamic Study of Nano-Fracture of C3N**

Poster Presentation. IMECE2019-12644

Md. Imrul Reza Shishir, Alireza Tabarraei, *University of North Carolina at Charlotte, Charlotte, NC, United States***V498. Strength and Debonding Analysis of Adhesively Bonded Joints (ABJs)**

Poster Presentation. IMECE2019-13755

Xiangfa Wu, *North Dakota State University, Fargo, ND, United States***17-15 ASME SOCIETY-WIDE MICRO AND NANO TECHNOLOGY FORUM****17-15-1 ASME Society-Wide Micro and Nano Technology Forum**

Exhibit Hall AB

12:00PM–2:30PM

V499. Standardization Aspects of Methods for Testing of Engineered Biological-Tissue

Poster Presentation. IMECE2019-12878

Satya Prasad Paruchuru, *VNR VJIEET, Hyderabad, India*, Aruna Prabha Kolluri, *VNR VJIEET, Hyderabad, Telangana, India***V500. Prediction of Heat Exchanger Thermal Fatigue Life Using Machine Learning**

Poster Presentation. IMECE2019-13055

Michael Stebbins, Fisseha Alemayehu, *West Texas A&M University, Canyon, TX, United States***V501. Set-Up of Camera Sensitivity in Non-Contacting Full-Field Strain Measurement up to 1600°C**

Poster Presentation. IMECE2019-13108

Thinh Thai, Adam Smith, Robert Hansen, Robert J. Rowley, Ryan Berke, *Utah State University, Logan, UT, United States***V502. Inter-Laminar Crack Propagation of 3D Printed ABS Plastic**

Poster Presentation. IMECE2019-13329

Weston Craig, *Utah State University, Idaho Falls, ID, United States*, Robert J. Rowley, Ryan Berke, Christopher Stolinski, *Utah State University, Logan, UT, United States*, Owen Kingstedt, *University of Utah, Salt Lake City, UT, United States***V503. Improved Assembly for High-Throughput Vibration-Based Fatigue Testing**

Poster Presentation. IMECE2019-13511

Emma E. German, Samantha D. Burton, Brandon Furman, *Utah State University, Logan, UT, United States*, Dino A. Celli, Casey M. Holycross, Onome Scott-Emuakpor, *Air Force Research Laboratory, Wright-Patterson AFB, OH, United States*, Ryan Berke, *Utah State University, Logan, UT, United States***V504. Electrical Conductivity Assessment of Smart Cement-Based Nanocomposite With Low Dosage of Graphene**

Poster Presentation. IMECE2019-11971

Robabeh Jazaei, Robabeh Jazaei, *University of Wisconsin-Platteville, Platteville, WI, United States*, Samad Gharehdaghi, *University of West Florida, Pensacola, FL, United States*, Fatemeh Azari, *University of Nevada, Las Vegas, Las Vegas, NV, United States***V505. Rapid Prototyping of Microfluidic Channels Using Electro-Spun Nano-Fiber Mold**

Poster Presentation. IMECE2019-12874

Utpal Saha, Dongwoon Shin, Himanshu Sant, Jiyoung Chang, Bruce Gale, *University of Utah, Salt Lake City, United States*

V506. 3D Printed Micro-Grippers for Biological Applications

Poster Presentation. IMECE2019-13377

Shingo Kozaki, Yukihiro Moritoki, Taichi Furukawa, Shoji Maruo, *Yokohama National University, Yokohama, Kanagawa-ken, Japan*

V507. Droplet-Based Multi-Material Two-Photon Lithography

Poster Presentation. IMECE2019-13380

Hotaka Hirata, Sho Kubota, Taichi Furukawa, Shoji Maruo, *Yokohama National University, Yokohama, Kanagawa-ken, Japan*

V508. A Graphene-Integrated Microfluidic Platform for Probing Electrical Activities of Retina

Poster Presentation. IMECE2019-13593

Alberto Esteban Linares, Yuchen Zhang, Matthew Fitzgerald, Thayer Walmsley, Yaqiong Xu, Deyu Li, *Vanderbilt University, Nashville, TN, United States*

V509. Ultra-Fast Dry Dip Coating Assembly Strategy for Future Flexible Devices

Poster Presentation. IMECE2019-12518

Dong Zhou, Bo Li, *Villanova University, Villanova, PA, United States*

V510. High-aspect-ratio Magnetically Tunable Nanopillar Array

Poster Presentation. IMECE2019-12519

Zhiren Luo, *North Carolina State University, Raleigh, NC, United States*, Xu Zhang, *University of Pennsylvania, Philadelphia, PA, United States*, Benjamin Evans, *Elon University, Elon, NC, United States*, Chih-Hao Chang, *North Carolina State University, Raleigh, NC, United States*

V511. Cuckoo Searching Process Dependent Bulk-Heterojunction Nanomorphology of P3HT: PCBM Based Organic Solar Cells

Poster Presentation. IMECE2019-12546

Joydeep Munshi, Ganesh Balasubramanian, *Lehigh University, Bethlehem, PA, United States*

V512. A Predictive Scheme Based on Machine Learning Technique for Discovery of Materials for Organic Solar Cells

Poster Presentation. IMECE2019-12547

Joydeep Munshi, Ganesh Balasubramanian, *Lehigh University, Bethlehem, PA, United States*

V513. Cryothermal Vacuum Measurement of Thermochromic Variable Emissivity Coatings for Spacecraft Thermal Management

Poster Presentation. IMECE2019-12551

Sydney Taylor, Neal Boman, Jeremy Chao, Liping Wang, *Arizona State University, Tempe, AZ, United States*

V514. Enhanced Conversion Efficiency in Near-Field Thermophotovoltaic Systems Enabled by Tandem PV Cell

Poster Presentation. IMECE2019-12552

Payam Sabbaghi, Qing Ni, Liping Wang, *Arizona State University, Tempe, AZ, United States*

V515. Disorder Enhanced Thermal Conductivity Anisotropy in Two-Dimensional Materials and van der Waals Heterostructures

Poster Presentation. IMECE2019-12581

Kyunghoon Kim, Jixiong He, Jun Liu, *North Carolina State University, Raleigh, NC, United States*

V516. On the Importance of Using Exact Phonon Dispersion Relations to Calculate Interfacial Thermal Conductance

Poster Presentation. IMECE2019-12582

Harish Subramanyan, Jixiong He, Jun Liu, *North Carolina State University, Raleigh, NC, United States*

V517. Thermal Enhancement and Shape Stabilization of a Phase-change Energy-Storage Material via Copper Nanowire Aerogel

Poster Presentation. IMECE2019-12584

Lin Zhang, Lu An, Yaohui Wang, Andrew Lee, *Villanova University, Villanova, PA, United States*, Yue Schuman, *TA Instruments, New Castle, DE, United States*, Ani Ural, *Villanova University, Villanova, PA, United States*, Amy Fleischer, *California Polytechnic State University, San Luis Obispo, CA, United States*, Gang Feng, *Villanova University, Villanova, PA, United States*

V518. Comparisons Between Time-Domain and Frequency-Domain Normal Mode Analysis Techniques for Predicting Thermal Conductivity

Poster Presentation. IMECE2019-12585

Jixiong He, Jun Liu, *North Carolina State University, Raleigh, NC, United States*

V519. Effect of Non-Ionic Surfactant on Thermal Performance of Micro/Nano-encapsulated Lauric Acid as Phase Change Material Core With Poly(Methyl Methacrylate) shell

Poster Presentation. IMECE2019-12587

Xiaosong Liu, Gang Feng, *Villanova University, Villanova, PA, United States*, Amy Fleischer, *California Polytechnic State University, San Luis Obispo, CA, United States*

V520. Impact of Nanoscale Radiative Transfer on the Reverse Saturation Current of Photodiodes for Near-Field Thermophoto-voltaic Generators

Poster Presentation. IMECE2019-12609

Dudong Feng, Eric J. Tervo, Shannon K. Yee, Zhuomin Zhang, *Georgia Institute of Technology, Atlanta, GA, United States*

V521. Effect of Current Density and Temperature on Template Assisted Cobalt Nanowire

Poster Presentation. IMECE2019-12630

Ali Imran Shiave, *University of North Carolina at Greensboro, Greensboro, NC, United States*, Ram Mohan, *North Carolina A&T State University, Greensboro, NC, United States*, Mahendran Samykano, *Universiti Malaysia Pahang, Kuantan, Malaysia*

V522. Mechanical Behavior of Collagen Mimetic Peptides Under Fraying Deformation Via Molecular Dynamics

Poster Presentation. IMECE2019-12631

Atul Rawal, *Joint School of Nanoscience & Nanoengineering, Greensboro, NC, United States*, **Kristen L. Rhinehardt**, **Ram Mohan**, *North Carolina A&T State University, Greensboro, NC, United States*

V523. Suspended Thermo-Reflectance: A Novel Thermal Property Measurement Technique for Micro/Nano-Scale Devices

Poster Presentation. IMECE2019-12648

Dipta Sarkar, **Zayd C. Leseman**, *Kansas State University, Manhattan, KS, United States*

V524. Analysis of Electrode Characteristic Dependent Lithium-Ion Battery Reliability With Drop Hammer Impact Test

Technical Presentation. IMECE2019-12678

Vikas Tomar, **Bing Li**, **Casey Jones**, *Purdue University, West Lafayette, IN, United States*

V525. Plasma Etching of Sapphire Antireflection Subwavelength Nanostructures

Poster Presentation. IMECE2019-12687

Yi-An Chen, **I-Te Chen**, **Chih-Hao Chang**, *North Carolina State University, Raleigh, NC, United States*

V526. Effect of Nano Silica on Mechanical Characteristics of Two-Phase Composites Cement Paste: A Molecular Predictive Modeling Study

Poster Presentation. IMECE2019-12717

Nirmalay Barua, **Ingrid Padilla Espinosa**, **Ram Mohan**, *North Carolina A&T State University, Greensboro, NC, United States*

V527. Enhanced Refrigerant-Side Heat Transfer of R134a in Etched Aluminum Tubes

Poster Presentation. IMECE2019-12723

Nithin Vinod Upot, **Allison J Mahvi**, **Nenad Miljkovic**, *University of Illinois at Urbana-Champaign, Urbana, IL, United States*

V528. Simultaneous Measurement of Specific Heat and Thermal Conductivity by Front Pump Rear Probe Technique

Poster Presentation. IMECE2019-12795

Xianghai Meng, **Jung-Fu Lin**, **Yaguo Wang**, *University of Texas at Austin, Austin, TX, United States*

V529. Strain Effects on the Thermal Properties of Silicon Thin Films

Poster Presentation. IMECE2019-12837

Lis Stolik, *University of Minnesota, Minneapolis, MN, United States*, **Fabian J. Medina**, *University of Arizona, Tucson, AZ, United States*, **Xuewang Wu**, *University of Minnesota at Twin Cities, Minneapolis, MN, United States*, **Dongchao Xu**, *University of Arizona, Tucson, AZ, United States*, **James Kakalios**, *University of Minnesota, Minneapolis, MN, United States*, **Qing Hao**, *University of Arizona, Tucson, AZ, United States*, **Xiaojia Wang**, *University of Minnesota, Minneapolis, MN, United States*

V530. Development of New Neural Network Force Fields With First-Principles Level Accuracy and Application to Thermal Transport

Technical Presentation. IMECE2019-12840

Alejandro Rodriguez, **Guangzhao Qin**, **Ming Hu**, *University of South Carolina, Columbia, SC, United States*

V531. Investigation of Process Induced Variations in Polyjet Printing With Digital Polypropylene via Homogeneous 3D Tensile Test Coupon

Poster Presentation. IMECE2019-12897

Ravi Pratap Singh Tomar, **Furkan Ulu**, **Ajit Kelkar**, **Ram Mohan**, *North Carolina A&T State University, Greensboro, NC, United States*

V532. Optimization of Aperiodic Superlattice Structure through Physics-Informed Machine Learning

Poster Presentation. IMECE2019-12942

Pranay Chakraborty, **Tengfei Ma**, **Yan Wang**, *University of Nevada, Reno, Reno, NV, United States*

V533. Development of Thermally Conductive Polymer/CNF-CNT Nanocomposite Materials via PolyJet Additive Manufacturing by Improvement of Digital Material Design

Poster Presentation. IMECE2019-13003

Furkan Ulu, **Ram Mohan**, **Ravi Pratap Singh Tomar**, *North Carolina A&T State University, Greensboro, NC, United States*

V534. Nanoscale Semi-Liquid Coating With Durable Liquid Repellency Even to Highly-Wetting Fluids

Poster Presentation. IMECE2019-13072

Lei Zhang, **Zongqi Guo**, **Jyotirmoy Sarma**, **Xianming Dai**, *University of Texas at Dallas, Richardson, TX, United States*

V535. On the Characterization of Interstitial Fluid Flow in the Skeletal Muscle

Poster Presentation. IMECE2019-13088

Qiuyun Wang, *Villanova University, Villanova, PA, United States*, **Shaopeng Pei**, **Lucas Lu**, **Liyun Wang**, *University of Delaware, Newark, DE, United States*, **Qianhong Wu**, *Villanova University, Villanova, PA, United States*

V536. Analytical and Numerical Study of a Pulsatile Flow in a Porous Tube

Poster Presentation. IMECE2019-13098

Bhara Sidnawi, **Sridhar Santhanam**, **Qianhong Wu**, *Villanova University, Villanova, PA, United States*

V537. Spatial Decomposition Neural Network Force Fields With First-Principles Level Accuracy and Application to Thermal Transport

Technical Presentation. IMECE2019-13122

Alejandro Rodriguez, **Guangzhao Qin**, **Ming Hu**, *University of South Carolina, Columbia, SC, United States*

V538. Modeling of Li-Si Battery Materials Through Spatial Decomposition Neural Network Force Fields (SNNFFs)

Technical Presentation. IMECE2019-13125

Alejandro Rodriguez, **Ming Hu**, *University of South Carolina, Columbia, SC, United States*

V539. A Simplified Mathematical Model to Simulate the Motion of the Brain Matter in Response to Translational Impacts to the Head

Poster Presentation. IMECE2019-13154

Ji Lang, Qianhong Wu, Villanova University, Villanova, PA, United States

V540. Soft Porous Lubrication With Oriented Fibers

Poster Presentation. IMECE2019-13158

Zenghao Zhu, Qianhong Wu, Villanova University, Villanova, PA, United States

V541. Electrochemically Etched Durable Superhydrophobic Surfaces

Poster Presentation. IMECE2019-13334

Kazi Fazle Rabbi, Soumyadip Sett, Matthew Wu, Kalyan Boyina, Nenad Miljkovic, University of Illinois at Urbana-Champaign, Urbana, IL, United States

V542. Observation of Second Sound in Graphite up to 150K

Poster Presentation. IMECE2019-13361

Samuel Huberman, Ryan Duncan, Ke Chen, Massachusetts Institute of Technology, Cambridge, MA, United States, Bai Song, Peking University, Beijing, China, Vazrik Chiloyan, Massachusetts Institute of Technology, Watertown, MA, United States, Zhiwei Ding, Alexei Maznev, Gang Chen, Keith Nelson, Massachusetts Institute of Technology, Cambridge, MA, United States

V543. Implementation of Granular Micromechanics Based Nonlinear Material Model Into FEA

Poster Presentation. IMECE2019-13405

Rizacan Sarikaya, Anil Misra, University of Kansas, Lawrence, KS, United States

V544. Innovative Hole Making Process in Woven Composite Laminates

Poster Presentation. IMECE2019-13423

Vishwas Jadhav, Ajit Kelkar, North Carolina A&T State University, Greensboro, NC, United States

V545. Thin Film Boiling Heat Transfer Through Nanoporous Membranes

Poster Presentation. IMECE2019-13445

Qingyang Wang, Renkun Chen, University of California, San Diego, La Jolla, CA, United States

V546. Theory-Driven Auxetic Chiral Granular Metamaterials

Poster Presentation. IMECE2019-13487

Nima NejadSadeghi, Anil Misra, University of Kansas, Lawrence, KS, United States

V547. Shape Controllable Soft Bilayer Pneumatic Actuators and Applications

Poster Presentation. IMECE2019-13504

Yinding Chi, Jie Yin, North Carolina State University, Raleigh, NC, United States

V548. Programming 3D Architectures Using Kirigami

Poster Presentation. IMECE2019-13507

Yaoye Hong, Jie Yin, North Carolina State University, Raleigh, NC, United States

V549. Reconfigurable Architected Mechanical Metamaterial Based on the 3D Modular Kirigami

Poster Presentation. IMECE2019-13513

Yanbin Li, Jie Yin, North Carolina State University, Raleigh, NC, United States

V550. Using DFT Calculations to Design W-Re-X Alloys for Fusion Energy Applications

Poster Presentation. IMECE2019-13534

Yichen Qian, David Cereceda, Villanova University, Villanova, PA, United States

V551. Quantifying Thermal Transport in Amorphous Silicon Using Mean Free Path Spectroscopy

Poster Presentation. IMECE2019-13575

Jiawei Zhou, Ying Pan, Gang Chen, Massachusetts Institute of Technology, Cambridge, MA, United States

V552. Large Impact of Electron-Phonon Interaction on Heat Transport of Silicon at Room Temperature

Poster Presentation. IMECE2019-13580

Jiawei Zhou, Doug Shin, Ke Chen, Ryan Duncan, Alexei Maznev, Keith Nelson, Gang Chen, Massachusetts Institute of Technology, Cambridge, MA, United States

V553. Predicting Thermal Conductivity of Silicon in Different Phases Using a Neural Network Interatomic Potential

Technical Presentation. IMECE2019-13664

Ruiyang Li, Eungkyu Lee, Tengfei Luo, University of Notre Dame, Notre Dame, IN, United States

V554. The Effect of Organic Chain Length and Binding Chemistry on Thermal Transport in 2D Hybrid Perovskite Crystals

Poster Presentation. IMECE2019-13706

Md. Abu Jafar Rasel, Joseph Feser, University of Delaware, Newark, DE, United States

V555. Fabrication and Characterization of Multifunctional Sea-Urchin-Like Micromotor

Poster Presentation. IMECE2019-13715

Yaozhong Zhang, Junghoon Yeom, Michigan State University, East Lansing, MI, United States

V556. TDTR With Semiconducting Transducers at UV Wavelength

Poster Presentation. IMECE2019-13727

Joseph Feser, University of Delaware, Newark, DE, United States

V557. Non-Standard Timoshenko 1D Beam Model**Describes Chiral Behavior of Granular Beam****Poster Presentation. IMECE2019-13762**

Michele De Angelo, *Kansas University, Lawrence, KS, United States*, **Luca Placidi**, *Università Telematica Internazionale Uninettuno, Roma, RM, Italy*, **Anil Misra**, *University of Kansas, Lawrence, KS, United States*

V558. The Effect of Dimensionality on Phonon Localization**Poster Presentation. IMECE2019-13817**

Tengfei Ma, **Lei Cao**, **Yan Wang**, *University of Nevada, Reno, Reno, NV, United States*

V559. Wireless PVDF/Carbon Black Nanocomposite Coated Carbon Fiber Strain Sensor**Poster Presentation. IMECE2019-13843**

Yanxiao Li, **Chenglin Wu**, *Missouri University of Science and Technology, Rolla, MO, United States*

V560. Self Supported Cu Doped TiO₂ Nano-Fibrous Blankets for Visible Light Photo Catalysis**Poster Presentation. IMECE2019-13858**

Fateh Mikaeili, **Perena Gouma**, *Ohio State University, Columbus, OH, United States*

V561. Roll-to-Roll Self-Assembly and Analysis of Non-Monodispersed Nanospheres**Poster Presentation. IMECE2019-13870**

I-Te Chen, **Timothy Chen**, **Chih-Hao Chang**, *North Carolina State University, Raleigh, NC, United States*

TRACK 18 CONGRESS-WIDE SYMPOSIA

TRACK 18 CONGRESS-WIDE SYMPOSIA

WEDNESDAY, NOVEMBER 13

18-1 PLENARY SESSION

18-1-1 Plenary Session

Sponsored by: *NDPD Division*

355B

8:45AM–10:30AM

8:45am – Failure is Not an Option: Avoiding Operational Disruptions With Mechanistic and Data-Driven Damage Prognostics

Plenary Presentation. IMECE2019-14012

Kai Goebel, *PARC, a Xerox Company, Palo Alto, CA, United States*

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
A	Raja	3-4-2	IMECE2019-10931	30	Afsharfard	Aref	1-6-1	IMECE2019-12146	2
A S	Krishnan	6-2-3	IMECE2019-11079	67	Agafonov	Andrey	4-9-1	IMECE2019-11298	42
A. Hegazi	Hesham	6-4-1	IMECE2019-11285	64	Agarwal	Kriti	10-11-1	IMECE2019-13833	116
Aakash	B.S.	16-1-1	IMECE2019-13806	202	Agarwal	Kriti	10-5-1	IMECE2019-13837	127
Aasebø	Stefan	5-11-1	IMECE2019-10434	55	Agarwal	Ojaswi	2-2-5	IMECE2019-13113	20
Abandeh	Samer	5-4-1	IMECE2019-10234	54	Agarwal	Ojaswi	11-32-1	IMECE2019-13123	155
Abbasi	Hamza	7-10-1	IMECE2019-10540	77	Agarwal	Ojaswi	16-1-1	IMECE2019-13118	194
Abbasnejad	Behrokh	2-2-7	IMECE2019-13365	18	Aghabaglou	Fariba	8-4-1	IMECE2019-13103	89
Abbasnejad	Behrokh	4-12-1	IMECE2019-13225	45	AghaKouchak	Amir	16-1-1	IMECE2019-13790	201
Abbasnejad	Behrokh	17-2-1	IMECE2019-13371	206	AghaKouchak	Amir	16-1-1	IMECE2019-13832	202
Abbassi	Fethi	3-10-1	IMECE2019-12221	31	Aghilinejad	Arian	8-6-1	IMECE2019-10209	88
Abbassi	Fethi	11-7-5	IMECE2019-10035	147	Agonafer	Dereje	16-2-1	IMECE2019-13878	204
Abdeldayem	Mohamed Ahmed Aboelftooh	8-11-1	IMECE2019-10311	85	Agoras	Michalis	11-37-1	IMECE2019-13508	154
Abdelhady	Mohamed	9-19-1	IMECE2019-12956	103	Agostinho	Carlos	2-8-4	IMECE2019-11711	22
Abdelmajid	Ghassan	6-10-1	IMECE2019-10720	72	Ahasan	Kawkab	12-8-1	IMECE2019-11708	170
Abdelmaksoud	Ahmed	6-4-1	IMECE2019-11285	64	Ahkhtar	Saad	16-1-1	IMECE2019-13589	199
Abdel-Mesih	Bahy	6-10-4	IMECE2019-11016	75	Ahmad	Furqan	3-10-1	IMECE2019-12221	31
Abdo	Jamil	10-12-1	IMECE2019-11042	129	Ahmad	Furqan	8-3-1	IMECE2019-12222	89
Abdo	Peter	8-9-4	IMECE2019-10553	85	Ahmad	Furqan	11-7-5	IMECE2019-10035	147
Abdulgani	Zeenathul Farida	6-2-3	IMECE2019-11079	67	Ahmad	Omar	9-16-1	IMECE2019-12083	111
Abdulghani	Mohannad	6-10-2	IMECE2019-10967	73	Ahmad	Zurina	11-36-2	IMECE2019-11162	162
Abdulhadi	Hasanain	10-9-2	IMECE2019-11646	124	Ahmadi	Mojtaba	16-1-1	IMECE2019-12713	191
Abdulrahman Y. Alyoussef	Yazeed	10-26-1	IMECE2019-10308	114	Ahmadiparidari	Alireza	6-11-1	IMECE2019-11804	68
Abdulrasool	Ali A.	8-3-2	IMECE2019-12300	90	Ahmadipoor	Fatemeh	11-1-3	IMECE2019-12391	149
Abdulrazzaq	Nabeel	9-36-1	IMECE2019-11847	96	Ahmed	Ayesha	10-26-6	IMECE2019-12109	121
Abdulrazzaq	Nabeel	9-51-1	IMECE2019-11624	110	Ahmed	Kareem	8-9-1	IMECE2019-13953	83
Abo-Elnor	Mootaz	8-11-1	IMECE2019-10311	85	Ahmed	Mahmoud	4-5-3	IMECE2019-10425	37
Abramowitz	Harvey	6-8-1	IMECE2019-12545	71	Ahmed	Mahmoud	4-10-1	IMECE2019-10427	40
Abramowitz	Harvey	9-57-1	IMECE2019-11870	107	Ahmed	Pranzal	9-53-1	IMECE2019-11000	112
Abramowitz	Harvey	9-59-1	IMECE2019-11313	110	Ahmed	Shafkat	16-1-1	IMECE2019-13768	201
Abrecht	David G.	10-27-3	IMECE2019-12899	131	Ahmed	Shoab	9-41-1	IMECE2019-11283	96
Abshirini	Mohammad	3-5-1	IMECE2019-11467	27	Ahmed	Shoab	9-64-1	IMECE2019-10760	97
Abu Al-Rub	Rashid	9-41-1	IMECE2019-10500	96	Ahmed	Shuja	2-6-2	IMECE2019-11445	11
Abu Al-Rub	Rashid	9-36-1	IMECE2019-11523	96	Ahmed	Faiyaz	2-2-3	IMECE2019-11863	16
Abu Al-Rub	Rashid	9-64-1	IMECE2019-10507	97	AlHARA	Tatsuhito	5-3-3	IMECE2019-12629	47
Abu Al-Rub	Rashid	9-64-1	IMECE2019-11498	97	Ait Moussa	Abdellah	4-10-2	IMECE2019-11530	41
Abuelyamen	Ahmed	6-4-2	IMECE2019-11046	66	Ajuka	Luke	9-31-1	IMECE2019-11183	111
Abu-Mahfouz	Issam	5-2-3	IMECE2019-11346	59	Akalp	M. Kaan	13-9-1	IMECE2019-11478	179
Abu-Mahfouz	Issam	14-3-3	IMECE2019-11438	184	Akasheh	Firas	7-5-1	IMECE2019-10747	81
Abuouf	Yasser	4-5-3	IMECE2019-10425	37	Akbar	Usman	2-13-2	IMECE2019-10158	11
Abuouf	Yasser	4-10-1	IMECE2019-10427	40	Akbari	Hadi	9-41-1	IMECE2019-10229	96
Abusafieh	Abdelqader	2-9-2	IMECE2019-11232	9	Akbarzadeh	Rokhsareh	6-11-3	IMECE2019-10580	71
Abu-Shaban	Kusaii	17-6-1	IMECE2019-13834	208	Akei	Masahiro	5-9-1	IMECE2019-10130	48
Acar	Pinar	3-13-1	IMECE2019-10531	29	Akerson	Andrew	11-37-5	IMECE2019-12988	165
Acar	Pinar	10-19-2	IMECE2019-13032	130	Akhavizadegan	Faezeh	16-1-1	IMECE2019-12859	191
Acevedo	Claire	11-18-1	IMECE2019-12873	135	Aakhtar	Saad	9-43-1	IMECE2019-11033	93
Acevedo	Claire	11-18-1	IMECE2019-13442	135	Aakhtar	Saad	9-43-1	IMECE2019-12081	93
Acharya	Amit	11-47-3	IMECE2019-13310	151	Aakhtar	Syed Sohail	10-10-1	IMECE2019-11720	113
Acharya	Sumanta	9-46-1	IMECE2019-13500	103	Aakhtar	Syed Sohail	10-10-3	IMECE2019-10960	116
Acharya	Sunil	2-2-3	IMECE2019-10805	16	Akinlabi	Syed Sohail	10-9-3	IMECE2019-11526	127
Acosta-Carrion	Luis M.	10-26-5	IMECE2019-11919	120	Akinlabi	Esther	10-27-2	IMECE2019-12513	13
Adair	Desmond	8-7-1	IMECE2019-10876	84	Akinlabi	Esther	2-7-4	IMECE2019-10715	25
Adair	Desmond	8-7-1	IMECE2019-10921	84	Akinlabi	Esther	10-26-3	IMECE2019-11163	117
Adams	Bradley R.	9-6-1	IMECE2019-13537	98	Akinlabi	Esther	10-9-3	IMECE2019-10690	127
Adams	Jacob	15-1-1	IMECE2019-13902	188	Akinlabi	Esther	11-7-3	IMECE2019-10721	140
Addamani	Rudreshi	2-6-1	IMECE2019-11208	9	Akleman	Ergun	17-4-2	IMECE2019-13592	206
Adeniran	Joshua	6-11-3	IMECE2019-10580	71	Akmal	A. Lateef Moiz	15-1-1	IMECE2019-10006	187
Adeoye	Stephen	9-19-2	IMECE2019-10470	104	Aksak	Burak	16-1-1	IMECE2019-13857	202
Aderyani	Sarah	10-9-1	IMECE2019-12502	122	Aksu	Murat	2-13-1	IMECE2019-11345	8
Adhikari	Pashupati	6-4-5	IMECE2019-11831	71	Akwaboa	Stephen	16-1-1	IMECE2019-13591	199
Adjaroski	Mirel	17-4-3	IMECE2019-12996	207	Akyuzlu	Kazim	3-3-1	IMECE2019-12919	32
Adley	Mark	11-7-7	IMECE2019-13024	152	Akyuzlu	Kazim	8-3-2	IMECE2019-12727	90
Adnan	Ashfaq	4-2-2	IMECE2019-13923	39	Akyuzlu	Kazim	8-3-3	IMECE2019-12726	91
Adnan	Ashfaq	4-2-3	IMECE2019-13906	40	Al Ahmad	Sara	7-12-1	IMECE2019-10925	79
Adnan	Ashfaq	11-44-2	IMECE2019-13049	143	Al Busaidi	Mohammed	17-7-1	IMECE2019-13944	208
Adnan	Ashfaq	11-1-6	IMECE2019-13911	154	Al Faruque	Mohammad	16-1-1	IMECE2019-13643	200
Adnan	Ashfaq	11-1-6	IMECE2019-13918	154	Al Jasmi	Nawal	5-2-3	IMECE2019-12080	59
Adnan	Ashfaq	11-32-1	IMECE2019-13912	156	Al Omari	Salah Addin	6-7-3	IMECE2019-10326	70
Adnan	Saqeeb	12-7-3	IMECE2019-12129	174	Al Qaseer	Mohammad Tayeb	16-1-1	IMECE2019-13524	198
Afful	Henry Quansah	16-1-1	IMECE2019-13525	198	Al Qaseer	Mohammad Tayeb	16-2-1	IMECE2019-13800	204
Afkhami	Zahra	16-1-1	IMECE2019-13027	194	Alabdulkarem	Abdullah	6-10-2	IMECE2019-10967	73
Afolabi	Jeremiah O.	5-9-3	IMECE2019-11301	51	Alabdullatif	Abdurhman	15-1-1	IMECE2019-13722	188
					Al-Abri	Omar S.	10-26-3	IMECE2019-11156	117
					Aladesanmi	Victor	10-27-2	IMECE2019-12513	13

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Al-Allaq	Aiman	10-10-5	IMECE2019-10083	119	Allaire	Douglas	16-1-1	IMECE2019-13766	201
Al-Allaq	Aiman	10-14-1	IMECE2019-10084	122	Allameh	Seyed	10-13-1	IMECE2019-10395	129
Alam	Khairul	11-35-1	IMECE2019-10752	158	Allameh	Seyed	11-7-2	IMECE2019-10392	137
Alam	Khairul	11-35-1	IMECE2019-10753	159	Allegrette	Lucas	16-2-1	IMECE2019-12646	203
Alam	Md. Shah	16-1-1	IMECE2019-13439	197	Aller	Henry	9-29-2	IMECE2019-13448	105
Alam	Shah	11-10-2	IMECE2019-11740	138	Allison	James	5-2-4	IMECE2019-13707	60
Alam	Shah	11-10-3	IMECE2019-11721	141	Allison	James	8-2-2	IMECE2019-13370	87
Alam	Shah	11-18-3	IMECE2019-11845	141	Allison	John	10-2-1	IMECE2019-12699	126
Alam	Shah	11-10-4	IMECE2019-11748	144	Allison	John	11-12-3	IMECE2019-12700	164
Alam	Shah Saud	7-6-1	IMECE2019-10028	78	Allred	David	9-15-1	IMECE2019-11699	108
Alam	Shah Saud	9-41-1	IMECE2019-10031	96	Almehmedi	Fahad	6-9-2	IMECE2019-10402	73
Alam	Shahriar	9-63-1	IMECE2019-10150	95	Almendra	Diego	8-2-1	IMECE2019-11548	86
Alandikar	Shashank	2-13-3	IMECE2019-12309	13	Almohammedali	Maher	6-11-2	IMECE2019-13092	70
Al-aqeeli	Nasser	6-10-1	IMECE2019-10720	72	Almuzaini	Abdullah	10-13-1	IMECE2019-10395	129
Alarifi	Ibrahim	6-5-2	IMECE2019-10949	63	Alnaimat	Fadi	6-7-3	IMECE2019-10326	70
Alarifi	Ibrahim	10-26-1	IMECE2019-10308	114	Alotaibi	Ahmed M.	4-12-1	IMECE2019-11089	45
Alarifi	Ibrahim	10-24-1	IMECE2019-10298	123	Alotaibi	Mutlaq	10-24-1	IMECE2019-10298	123
Alarifi	Ibrahim	10-24-1	IMECE2019-10307	123	Alp	Nazmi Bülent	4-10-2	IMECE2019-11530	41
Alatas	Ahmet	9-25-2	IMECE2019-12963	100	Alqahtani	Abdulmohsen	10-24-1	IMECE2019-10298	123
Alatas	Ahmet	16-1-1	IMECE2019-12929	193	Alqahtani	Talal	6-1-2	IMECE2019-11486	62
Alatas	Ahmet	16-1-1	IMECE2019-13840	202	Al-Qarishey	Hussein	6-10-4	IMECE2019-11257	75
Al-Athel	Khaled	10-26-3	IMECE2019-11120	117	Al-Qarishey	Hussein	7-6-1	IMECE2019-11264	78
Alawadhi	Esam	9-57-1	IMECE2019-10017	107	Alqsair	Umar	8-9-2	IMECE2019-10723	83
Alawadhi	Esam	17-6-1	IMECE2019-10018	207	Alqsair	Umar	8-9-3	IMECE2019-10727	84
Alay	Eren	4-2-2	IMECE2019-13542	39	Alrefae	Majed	15-1-1	IMECE2019-13722	188
Alazhary	Sharif	11-1-9	IMECE2019-13079	163	Alsagri	Ali Sulaiman	6-10-4	IMECE2019-10909	75
Alberts	Thomas	4-6-1	IMECE2019-11389	36	Alsawalhi	Mohammed	11-37-3	IMECE2019-13452	159
Alborzi	Aneseh	16-1-1	IMECE2019-13790	201	Alshahrani	Saad	6-2-2	IMECE2019-11357	65
Albulayhid	Thamer	10-24-1	IMECE2019-10298	123	Al-Shammari	Hammad	2-3-2	IMECE2019-10986	25
Alcock	Adam Christopher	9-2-1	IMECE2019-11182	104	Al-Shammari	Hammad	6-1-2	IMECE2019-10755	62
Aldana	Andres	5-12-1	IMECE2019-11450	53	Al-Shammari	Hammad	6-11-3	IMECE2019-10479	71
Aldawood	Ghufuran	5-7-1	IMECE2019-10174	55	Al-Sharafi	Abdullah	6-10-1	IMECE2019-10720	72
Al-Dossary	Ali	6-9-1	IMECE2019-10222	72	Alshareef	Sultan	9-51-2	IMECE2019-13101	112
Aleman	Maria A.	9-41-1	IMECE2019-11283	96	Alshareef	Sultan	17-9-1	IMECE2019-13102	209
Alemayehu	Fisseha	17-15-1	IMECE2019-13055	211	Alshehaby	Mohammad	9-46-1	IMECE2019-10974	103
Alexander-Ramos	Michael	14-3-2	IMECE2019-10632	184	Alshurbaji	Mohamad	6-3-1	IMECE2019-10590	61
Alfulayyih	Yasir	6-10-2	IMECE2019-10391	73	Alshwairekh	Ahmed	8-9-2	IMECE2019-10723	83
Alghafis	Abdullah A.	8-9-2	IMECE2019-10723	83	Alshwairekh	Ahmed	8-9-3	IMECE2019-10727	84
Alghafis	Abdullah A.	8-9-3	IMECE2019-10727	84	Alsmairat	Ohood Q.	11-26-3	IMECE2019-12318	164
Alhadri	Muapper	2-3-2	IMECE2019-10986	25	Altan	M. Cengiz	3-5-1	IMECE2019-11467	27
Alhadri	Muapper	6-1-2	IMECE2019-10755	62	Altimemy	Muhannad	8-9-1	IMECE2019-10899	83
Alhadri	Muapper	6-11-3	IMECE2019-10479	71	Alvarez	Mariela	16-1-1	IMECE2019-13719	201
Alhammedi	Alya	9-36-1	IMECE2019-11523	96	Alves	Anabela	7-13-1	IMECE2019-13999	77
Alharbi	Mohammed	11-7-2	IMECE2019-12592	137	Alwatban	Anas M.	8-9-2	IMECE2019-10723	83
Alhashim	Amin G.	16-1-1	IMECE2019-13271	196	Alwatban	Anas M.	8-9-3	IMECE2019-10727	84
Alhasni	Hani	8-9-4	IMECE2019-10257	85	Alwattar	Tahseen	10-9-2	IMECE2019-11628	124
Alhazmi	Hani	17-1-1	IMECE2019-11517	205	Alya	Sachin	2-2-2	IMECE2019-12213	15
Alhummidy G.	Khaled	10-26-1	IMECE2019-10308	114	Alzo'ubei	Bara'ah	5-4-1	IMECE2019-10234	54
Almotery					Alzoubi	Mahmoud	9-43-1	IMECE2019-11033	93
Ali	Farhan	5-16-1	IMECE2019-11312	54	Amabili	Marco	4-5-2	IMECE2019-11520	36
Ali	Hadi	14-1-4	IMECE2019-11671	185	Amabili	Marco	5-5-1	IMECE2019-10663	47
Ali	Hessein	11-1-7	IMECE2019-11930	157	Amabili	Marco	11-42-1	IMECE2019-10339	136
Ali	Mohamed	2-9-2	IMECE2019-11232	9	Amabili	Marco	11-1-3	IMECE2019-10667	148
Ali	Mohamed	9-36-1	IMECE2019-11523	96	Amankwah	Kofi Agyemang	16-1-1	IMECE2019-13591	199
Ali	Mohamed	9-64-1	IMECE2019-11498	97	Amaya	Jorge L.	4-10-2	IMECE2019-10627	41
Ali	Mohammad	9-53-1	IMECE2019-11000	112	Ambrogi	Luca	6-2-1	IMECE2019-11485	64
Ali	Muhammad	11-35-1	IMECE2019-10752	158	Ameel	Timothy	4-9-1	IMECE2019-13034	42
Ali	Muhammad	11-35-1	IMECE2019-10753	159	Ameel	Timothy	9-51-2	IMECE2019-13101	112
Aliniagerdroudbari	Haniph	2-3-2	IMECE2019-10986	25	Ameel	Timothy	17-9-1	IMECE2019-13035	209
Aliniagerdroudbari	Haniph	6-1-2	IMECE2019-10755	62	Ameel	Timothy	17-9-1	IMECE2019-13102	209
Aliniagerdroudbari	Haniph	6-11-3	IMECE2019-10479	71	Amenson	Tara	13-5-1	IMECE2019-12285	178
Alizadeh	Vahidreza	1-1-1	IMECE2019-13010	1	Ameta	Gaurav	2-2-1	IMECE2019-11727	14
Alizadeh	Vahidreza	10-24-2	IMECE2019-13007	125	Amin	M. Ruhul	9-63-1	IMECE2019-10150	95
Aljabr	Ahmad	6-9-2	IMECE2019-10402	73	Amin	M. Ruhul	9-64-1	IMECE2019-10152	97
Aljabr	Ahmad	6-10-4	IMECE2019-10909	75	Amin	M. Ruhul	9-53-1	IMECE2019-11000	112
Aljaghtam	Mutabe	2-2-7	IMECE2019-12215	18	Amiri	Rouzbeh	16-1-1	IMECE2019-13267	196
Al-Jarrah	Mohammad	5-4-1	IMECE2019-10234	54	Amiri	Nikta	11-42-1	IMECE2019-13721	136
Al-Jumaily	Ahmed	1-10-1	IMECE2019-10197	3	Amiri	Nikta	16-1-1	IMECE2019-13728	201
Al-Jumaily	Ahmed	4-4-2	IMECE2019-10405	35	Amiri	Nikta	16-1-1	IMECE2019-13734	201
Al-Jumaily	Ahmed	4-6-1	IMECE2019-11049	36	Amiri	Nikta	17-4-3	IMECE2019-13735	207
Alkadi	Faez	11-3-1	IMECE2019-12969	163	Amirkhizi	Alireza	1-1-1	IMECE2019-13010	1
Al-Ketan	Oraib	9-36-1	IMECE2019-11523	96	Amirkhizi	Alireza	10-24-2	IMECE2019-13007	125
Al-Ketan	Oraib	9-64-1	IMECE2019-11498	97	Amirkhizi	Alireza	10-19-1	IMECE2019-13467	127
Alkurdi	Yassin	15-1-1	IMECE2019-13722	188	Amirkhizi	Alireza	11-23-2	IMECE2019-13062	153

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Amirkhizi	Alireza V.	16-1-1	IMECE2019-13568	199	Armstrong	Aaron	7-4-1	IMECE2019-11926	80
Amorim	Antônio	8-4-3	IMECE2019-11747	91	Arora	B.B.	8-4-2	IMECE2019-11319	90
Amorim	Fred	17-2-1	IMECE2019-10144	205	Arpacioglu	Bertan	3-6-1	IMECE2019-11153	27
Amy	Caleb	6-7-1	IMECE2019-12667	66	Arreola	Diana	16-1-1	IMECE2019-12759	192
Amy	Caleb	9-2-1	IMECE2019-12772	104	Arretche	Ignacio	11-46-2	IMECE2019-13726	143
An	Lu	17-15-1	IMECE2019-12584	212	Arroyave	Raymundo	2-12-2	IMECE2019-12784	13
Anaman	Greta	17-4-3	IMECE2019-13359	207	Arroyave	Raymundo	10-19-1	IMECE2019-13155	127
Anand	Lallit	11-47-2	IMECE2019-12612	148	Arroyave	Raymundo	16-1-1	IMECE2019-12674	191
Anand	N.K.	6-14-1	IMECE2019-11800	75	Arroyave	Raymundo	16-1-1	IMECE2019-13766	201
Anand	N.K.	6-14-2	IMECE2019-11811	76	Arruda	Ellen	11-49-2	IMECE2019-14007	144
Anandan	Nishita	2-5-1	IMECE2019-11436	15	Arshad	Muzammil	9-39-2	IMECE2019-12826	101
Anany	Mohammed	6-5-2	IMECE2019-10332	63	Arshee	Mahmuda R.	12-7-3	IMECE2019-12129	174
Andersen	Erik	16-1-1	IMECE2019-13104	194	Artates	Jonivan	5-11-1	IMECE2019-10189	55
Andersen	Blake	4-5-1	IMECE2019-11661	34	Artifice	Andreia	2-8-3	IMECE2019-11393	20
Anderson	Kevin	7-10-1	IMECE2019-10098	77	Asadollahipajouh	Mojdeh	11-10-4	IMECE2019-12209	144
Anderson	Kevin	7-7-1	IMECE2019-10099	80	Asadzadeh	Mostafa	9-19-2	IMECE2019-10470	104
Anderson	Kevin	8-9-1	IMECE2019-10101	83	Asadzadeh	Mostafa	9-51-1	IMECE2019-10045	109
Anderson	Kevin	8-9-3	IMECE2019-10100	84	Asawa	Kaustubh	8-6-3	IMECE2019-13285	90
Anderson	Kevin	9-66-1	IMECE2019-13947	97	Asegun	Henry	6-7-1	IMECE2019-12667	66
Anderson	Kevin	9-66-1	IMECE2019-13973	97	Asegun	Henry	9-2-1	IMECE2019-12772	104
Anderson	Kevin	11-27-1	IMECE2019-12480	154	Asencio	Armand J.	14-1-4	IMECE2019-10674	185
Anderson	Kevin	15-1-1	IMECE2019-12634	188	Asghari	Maryam	6-10-3	IMECE2019-12445	74
Anderson	Matthew	15-1-1	IMECE2019-13627	187	Ashok Magar	Sameer	10-29-1	IMECE2019-10647	128
Anderssen	Eric	9-25-1	IMECE2019-10691	98	Ashraf	Hafiz Muhammad	5-16-1	IMECE2019-11312	54
Andersson	Sean	5-6-1	IMECE2019-13112	56	Ashrafi	Nariman	2-11-1	IMECE2019-13244	8
Andrade	Joana	2-8-4	IMECE2019-10985	22	Ashrafi	Nariman	17-2-1	IMECE2019-13247	205
Andrade	Rafael	7-4-1	IMECE2019-10676	80	Ashrafi	Nariman	17-2-1	IMECE2019-13251	205
Andriolo	Jessica M.	2-4-2	IMECE2019-11456	16	Ashrafi	Nariman	17-10-1	IMECE2019-13185	210
Anglada	Quinn	2-7-1	IMECE2019-10032	23	Ashrafzadeh	Farhad	7-6-1	IMECE2019-11447	78
Anicode	Sundaram Vinod Kumar	3-12-1	IMECE2019-13204	29	Ashton-Miiller	James	17-4-3	IMECE2019-12996	207
Anih	Nchetachukwu	7-10-1	IMECE2019-11751	77	Asiatico	Patricia	16-1-1	IMECE2019-13234	196
Annevelink	Emil	12-7-1	IMECE2019-11867	169	Askari	Omid	6-16-1	IMECE2019-10991	65
Annevelink	Emil	12-7-2	IMECE2019-11830	173	Askari	Omid	6-2-3	IMECE2019-10994	66
Ansaf	Bahaa	10-14-1	IMECE2019-10084	122	Askari	Omid	6-16-2	IMECE2019-10996	69
Ansari	Ab Rahman Md. Ismail	4-10-1	IMECE2019-13476	40	Aslangil	Denis	16-1-1	IMECE2019-13274	196
Ansarifar	Javad	16-1-1	IMECE2019-12854	191	Assasie	Maame	10-25-1	IMECE2019-13379	123
Ansarifar	Javad	16-1-1	IMECE2019-12859	191	Assasie	Maame	16-1-1	IMECE2019-13382	197
Anthony Xavior	M.	2-6-2	IMECE2019-10026	11	Aston	Kenneth	12-8-1	IMECE2019-13401	170
Anthony Xavior	M. Ruhul	10-26-1	IMECE2019-10162	114	Aston	Kenneth	12-8-1	IMECE2019-13884	170
Antoniou	Antonia	11-18-2	IMECE2019-13322	138	Atefrad	Pedram	6-9-2	IMECE2019-12005	73
Antunes	Hugo	2-8-3	IMECE2019-11415	21	Atif	Mohammed Mujtaba	11-28-1	IMECE2019-12501	136
Anwar	Sohel	4-12-1	IMECE2019-11089	45	Atlaschian	Omid	8-11-1	IMECE2019-13738	86
Anwar	Sohel	5-2-2	IMECE2019-11077	58	Attarzadeh	Mohammad Ali	1-1-3	IMECE2019-12852	2
Anwar	Sohel	5-2-3	IMECE2019-11295	59	Attarzadeh	Mohammad Ali	16-1-1	IMECE2019-13133	195
Anwar	Sohel	5-4-5	IMECE2019-11062	60	Attia	Ali M.A.	3-2-1	IMECE2019-11047	28
Anwar	Sohel	14-3-3	IMECE2019-11069	184	Attia	Ali M.A.	6-5-2	IMECE2019-10686	63
Anzai	Hitomi	4-4-1	IMECE2019-11125	33	Attia	Tamer	4-13-3	IMECE2019-10616	46
Anzai	Hitomi	4-10-3	IMECE2019-10866	42	Attia	Tamer	5-4-2	IMECE2019-12030	56
Aoki	Takaaki	4-6-1	IMECE2019-10382	36	Attiya	Bashar	8-9-1	IMECE2019-10899	83
Appolloni	Matteo	3-4-1	IMECE2019-10577	29	Audivet Duran	Cinthia	6-10-1	IMECE2019-11316	72
Araque	Leonardo	1-12-2	IMECE2019-13653	6	Augsburger	Michael J.	17-6-1	IMECE2019-12357	207
Araque	Leonardo	1-12-2	IMECE2019-13669	6	aus der Wiesche	Stefan	8-4-2	IMECE2019-11417	90
Araque	Leonardo	1-12-2	IMECE2019-13691	6	Austin	Brittany L.	4-2-3	IMECE2019-10641	40
Araujo	Jorge	4-14-1	IMECE2019-11221	41	Avila	Samuel	8-6-3	IMECE2019-13730	90
Araujo	Jorge	6-16-2	IMECE2019-11593	69	Avitabile	Peter	16-1-1	IMECE2019-13078	194
Arava	Leela	6-11-1	IMECE2019-12871	68	Avitabile	Peter	16-1-1	IMECE2019-13178	195
Arava	Leela	6-11-2	IMECE2019-13092	70	Awasthi	Amnaya	11-14-2	IMECE2019-10212	147
Arcieri	Emanuele Vincenzo	14-2-2	IMECE2019-11296	183	Ayyub	Bilal	13-12-1	IMECE2019-14010	175
Ardalani	Elaheh	10-26-6	IMECE2019-13569	121	Azad	Saeed	14-3-2	IMECE2019-10632	184
Ardebili	Haleh	10-9-1	IMECE2019-12502	122	Azari	Fatemeh	11-25-1	IMECE2019-13889	142
Ardila Acuña	Victor A.	8-9-4	IMECE2019-12038	85	Azari	Fatemeh	17-15-1	IMECE2019-11971	211
Arellano-Gonzalez	Juan Carlos	4-8-1	IMECE2019-10140	37	Azarnoosh	Jamasp	4-9-1	IMECE2019-12159	42
Arif	Abul Fazal M.	10-10-1	IMECE2019-11720	113	Azese	Martin	8-2-2	IMECE2019-13465	87
Arif	Abul Fazal M.	10-10-3	IMECE2019-10960	116	Aziaka	Duabari	3-14-1	IMECE2019-11339	32
Arif	Tariq	4-3-2	IMECE2019-11088	35	Azin	Bahar	16-1-1	IMECE2019-12683	191
Arif	Waseem	8-3-1	IMECE2019-12222	89	Aziz Mohd.	Rozaiman	11-36-2	IMECE2019-11162	162
Ari-Gur	Judah	11-37-3	IMECE2019-12301	159	Azodo	Kingsley A.	6-1-1	IMECE2019-10072	61
Ari-Gur	Pnina	10-10-1	IMECE2019-11957	113	Azouz	Aurelie	11-1-5	IMECE2019-13116	153
Ari-Gur	Pnina	10-26-4	IMECE2019-11532	118	Azzouz	Salim	7-10-1	IMECE2019-11751	77
Ari-Gur	Pnina	16-1-1	IMECE2019-13145	195	B K	Gnanavel	10-17-1	IMECE2019-11290	120
Arima	Toshihiko	5-11-2	IMECE2019-11176	57	B K	Gnanavel	11-17-1	IMECE2019-10004	135
Armand	Mehran	4-10-2	IMECE2019-12023	41	B M	Umeshgowda	2-6-2	IMECE2019-11168	11
Armand	Mehran	4-10-4	IMECE2019-12142	44	Babaei	Hamed	11-44-2	IMECE2019-12786	143
					Babaei	Hamed	11-37-2	IMECE2019-12787	156

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Babaei	Hasan	9-29-2	IMECE2019-13625	105	Banerjee	Sourav	11-23-3	IMECE2019-11660	155
Babaei	Mahnoush	16-1-1	IMECE2019-12902	193	Baniassadi	Majid	10-4-1	IMECE2019-13457	113
Babaei	Mahnoush	16-1-1	IMECE2019-13187	195	Banisaheed	Mohammad	5-4-1	IMECE2019-10234	54
Babbitt	Callie	16-2-1	IMECE2019-13295	203	Bao	Dafei	5-8-2	IMECE2019-10810	49
Baber	Forrest	17-11-2	IMECE2019-13419	211	Bao	Guangyu	11-3-2	IMECE2019-12562	166
Baboly	M.G.	12-7-1	IMECE2019-11690	169	Bao	Hua	1-1-6	IMECE2019-10817	4
Babuska	Tomas	16-1-1	IMECE2019-13862	202	Bao	Hua	9-20-1	IMECE2019-12753	94
Baby	Binoy	9-51-2	IMECE2019-10078	111	Bao	Hua	9-25-1	IMECE2019-10688	98
Baccouche	Mohamed Ridha	11-10-1	IMECE2019-12729	134	Bao	Hua	9-25-2	IMECE2019-13409	100
Baccouche	Mohamed Ridha	13-10-1	IMECE2019-10240	177	Bao	Jinsong	2-10-1	IMECE2019-10020	7
Bachtiar	Emilio	11-3-2	IMECE2019-13394	166	Baobaid	Nada	9-64-1	IMECE2019-11498	97
Badoud	Tanner	2-8-1	IMECE2019-12926	17	Baoning	Ji	14-1-1	IMECE2019-11144	183
Badr	Elie	11-12-4	IMECE2019-10353	166	Baragetti	Sergio	14-2-2	IMECE2019-11296	183
Badr	Hussein	16-1-1	IMECE2019-13093	194	Barak	Yali	11-8-2	IMECE2019-13674	137
Baek	So Young	17-4-3	IMECE2019-12996	207	Barari	Bamdad	9-2-1	IMECE2019-12772	104
Bag	Swarup	9-64-1	IMECE2019-10152	97	Barbat	Saeed	6-11-1	IMECE2019-12871	68
Bagchi	Amit	4-2-4	IMECE2019-10903	41	Barbat	Saeed	11-10-1	IMECE2019-12729	134
Bagchi	Soumendu	11-26-1	IMECE2019-13547	158	Barbat	Saeed	13-10-1	IMECE2019-10240	177
Baghaei Lakeh	Reza	17-6-1	IMECE2019-13834	208	Barbato	Michele	16-1-1	IMECE2019-12752	192
Bagheri	Mostafa	16-1-1	IMECE2019-13567	199	Barbosa	Flavia	9-36-2	IMECE2019-11652	99
Baghirzade	Mammadbaghir	9-53-1	IMECE2019-10679	112	Barchet	Laurel	7-1-1	IMECE2019-12649	77
Bahadori	Amir	12-5-1	IMECE2019-11534	171	Barclay	Paul	9-18-2	IMECE2019-13809	108
Bahadur	Vaibhav	6-10-3	IMECE2019-11707	74	Bardaweel	Hamzeh	5-7-1	IMECE2019-10174	55
Bahadur	Vaibhav	8-1-1	IMECE2019-10483	87	Barez	Fred	1-2-1	IMECE2019-10096	1
Bahan	Dogancan	5-3-2	IMECE2019-12218	51	Barez	Fred	1-2-2	IMECE2019-13053	4
Bahga	Supreet Singh	12-8-2	IMECE2019-10426	172	Barez	Fred	17-9-1	IMECE2019-13933	210
Bahl	Gaurav	5-15-1	IMECE2019-10668	48	Bari	Saiful	4-2-3	IMECE2019-10945	40
Bahr	Behnam	5-11-1	IMECE2019-10189	55	Bari	Saiful	9-39-1	IMECE2019-10120	100
Bahrololoumi	Amir	11-1-9	IMECE2019-11873	163	Barker	Richard	9-45-1	IMECE2019-10359	96
Bai	Shengyuan	2-2-2	IMECE2019-13670	15	Barlat	Frederic	11-7-2	IMECE2019-10275	137
Bai	Xin	5-13-1	IMECE2019-12796	59	Barner	Lindsey	16-1-1	IMECE2019-13009	194
Bai	Yu	2-5-3	IMECE2019-10802	17	Barnwal	Vivek K.	11-7-2	IMECE2019-10275	137
Baibhav	Vibhu	15-1-1	IMECE2019-10754	187	Barreto	Darius Diogo	11-5-1	IMECE2019-12844	155
Baibhav	Vibhu	15-1-1	IMECE2019-11303	187	Barreto	Deybis	6-2-2	IMECE2019-10410	65
Baibhav	Vibhu	15-1-1	IMECE2019-11376	187	Barrett	Christopher	11-33-2	IMECE2019-12248	150
Bair	Jacob	10-27-3	IMECE2019-12899	131	Barros	Daniel	10-26-3	IMECE2019-11356	117
Baker	Shefford	9-25-2	IMECE2019-12963	100	Barros de Moraes	Eduardo A.	11-5-3	IMECE2019-13533	161
Baker	Shefford	16-1-1	IMECE2019-12929	193	Barros de Moraes	Eduardo A.	11-5-4	IMECE2019-13690	164
Bakhtiari Nejad	Mahsan	4-10-4	IMECE2019-12142	44	Barry	Lucas	15-1-1	IMECE2019-13910	188
Balakrishnan	Sowmya	16-2-1	IMECE2019-13384	203	Barry	Lucas	16-1-1	IMECE2019-13904	202
Balant	Anne	17-1-1	IMECE2019-12269	205	Barsoum	Michel	11-18-2	IMECE2019-13622	138
Balasubramanian	Ganesh	10-5-1	IMECE2019-11878	126	Barsoum	Michel	16-1-1	IMECE2019-13093	194
Balasubramanian	Ganesh	11-33-2	IMECE2019-11883	150	Barsoum	Roshdy	11-22-1	IMECE2019-13070	141
Balasubramanian	Ganesh	16-1-1	IMECE2019-13002	194	Bartlett	Michael D.	10-4-4	IMECE2019-13820	118
Balasubramanian	Ganesh	17-6-1	IMECE2019-11834	207	Bartlett	Michael D.	11-2-2	IMECE2019-13510	160
Balasubramanian	Ganesh	17-10-1	IMECE2019-11858	210	Bartolomei	Erika	17-6-1	IMECE2019-13463	208
Balasubramanian	Ganesh	17-15-1	IMECE2019-12546	212	Bartolomej	Rudas	5-5-1	IMECE2019-10861	47
Balasubramanian	Ganesh	17-15-1	IMECE2019-12547	212	Barton	Kira	16-1-1	IMECE2019-13027	194
Balasubramanian	Prabakaran	4-5-2	IMECE2019-11520	36	Bartsch	Adam	4-2-5	IMECE2019-13428	43
Balasubramanian	Prabakaran	5-5-1	IMECE2019-10663	47	Bartsch	Adam	4-2-5	IMECE2019-13506	43
Balasubramanian	Prabakaran	11-42-1	IMECE2019-10339	136	Barua	Nirmalaya	17-15-1	IMECE2019-12717	213
Balasubramanian	Prabakaran	11-1-3	IMECE2019-10667	148	Barut	Atila	3-12-2	IMECE2019-13205	31
Balla	Srinivasa Prasad	17-10-1	IMECE2019-10423	210	Baruwa	Akinsanya Damilare	2-7-4	IMECE2019-10715	25
Balonji	Serge	9-2-1	IMECE2019-11182	104	Baruwa	Akinsanya Damilare	11-7-3	IMECE2019-10721	140
Balu	Aditya	16-1-1	IMECE2019-13522	198	Basak	Anup	11-34-1	IMECE2019-12776	167
Balueva	Alla V.	12-4-1	IMECE2019-10059	172	Basaran	Cemal	11-14-2	IMECE2019-10165	147
Bamasag	Ahmad	6-1-2	IMECE2019-11486	62	Basaran	Cemal	11-12-1	IMECE2019-10042	158
Bamberger	Judith	8-2-3	IMECE2019-11841	88	Basaran	Cemal	11-12-1	IMECE2019-10204	158
Bame	Aaron T.	6-10-3	IMECE2019-13550	74	Basaran	Cemal	11-26-4	IMECE2019-10208	167
Ban	Heng	10-9-1	IMECE2019-12212	122	Basaran	Cemal	11-26-4	IMECE2019-10244	167
Bancroft	Carl	1-12-1	IMECE2019-12093	5	Basaran	Cemal	11-26-4	IMECE2019-10245	167
Banda	Ganesh	3-2-1	IMECE2019-11091	28	Basoglu	Muhammed Fatih	3-12-1	IMECE2019-13171	29
Bandyopadhyay	Akash	5-2-3	IMECE2019-12080	59	Bassani	John L.	11-47-1	IMECE2019-13523	146
Bandyopadhyay	Arkasama	6-10-2	IMECE2019-11068	73	Bassani	John L.	11-47-1	IMECE2019-13526	146
Bandyopadhyay	Arkasama	6-10-3	IMECE2019-11707	74	Bassindowah	Hussein	1-6-2	IMECE2019-12377	5
Banerjee	Amit	14-3-3	IMECE2019-11438	84	Basu	Manan	8-12-1	IMECE2019-10841	86
Banerjee	Anjishnu	4-2-4	IMECE2019-11860	42	Baszczynski	Piotr	17-9-1	IMECE2019-12959	209
Banerjee	Arindam	16-1-1	IMECE2019-13274	196	Batailly	Alain	5-3-1	IMECE2019-10300	49
Banerjee	Deb	8-12-1	IMECE2019-10461	86	Bataineh	Ahmad	5-4-1	IMECE2019-10234	54
Banerjee	Debjyoti	16-2-1	IMECE2019-13620	203	Batayneh	Wafa	5-4-1	IMECE2019-10234	54
Banerjee	Debjyoti	16-2-1	IMECE2019-13623	204	Bathula	Vishwanadh	10-27-2	IMECE2019-13624	128
Banerjee	Debjyoti	16-2-1	IMECE2019-13628	204	Battaile	Corbett	11-7-1	IMECE2019-10269	133
Banerjee	Sarbajit	11-46-2	IMECE2019-13257	143	Battistoni	Michele	6-2-1	IMECE2019-11485	64
Banerjee	Sourav	6-4-1	IMECE2019-10749	64	Batzler	Stephen	13-8-1	IMECE2019-10238	178

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Bauer	Jens	10-19-2	IMECE2019-13718	130	Berry	Joseph D.	8-7-1	IMECE2019-13372	84
Bauer	Jens	10-19-2	IMECE2019-13865	130	Bertino	Alexander	16-1-1	IMECE2019-13567	199
Bauer	Siegfried	11-2-1	IMECE2019-13121	157	Bertoldi	Katia	1-1-4	IMECE2019-13354	3
Baughman	Ray	11-7-3	IMECE2019-12544	140	Bertoldi	Katia	10-4-3	IMECE2019-13791	116
Baxevanis	Theocharis	11-7-6	IMECE2019-13639	149	Bertolino	Antonio C.	3-4-1	IMECE2019-10713	29
Baxter	Joshua	8-1-1	IMECE2019-10790	87	Bertolino	Antonio C.	5-9-2	IMECE2019-10709	50
Bayat	Hamidreza	4-6-2	IMECE2019-11565	37	Bestle	Dieter	2-10-3	IMECE2019-10294	12
Bayly	P.V.	16-1-1	IMECE2019-13629	200	Beyerlein	Irene	10-31-2	IMECE2019-14005	118
Bayly	P.V.	16-1-1	IMECE2019-13733	201	Beyerlein	Irene	16-1-1	IMECE2019-13068	194
Bayly	P.V.	16-2-1	IMECE2019-13087	203	Bhale	Pranav	16-1-1	IMECE2019-13145	195
Bayod-Lopez	Javier	4-8-1	IMECE2019-11085	37	Bhama	Jay K.	4-6-2	IMECE2019-10922	37
Bayomy	Ayman M.	6-9-2	IMECE2019-12005	73	Bhargava	Aarushi	5-3-2	IMECE2019-13693	51
Bayyuk	Sami	17-4-3	IMECE2019-12541	206	Bharti	Saurabh Kumar	5-3-3	IMECE2019-11092	47
Bazant	Zdenek P.	11-47-2	IMECE2019-13739	148	Bhattacharya	Kaushik	11-49-1	IMECE2019-14006	133
Bazilevs	Yuri	11-44-2	IMECE2019-13660	143	Bhattacharya	Kaushik	11-1-4	IMECE2019-13168	152
Bazilevs	Yuri	11-44-2	IMECE2019-13662	143	Bhattacharyya	Ranjan	5-3-3	IMECE2019-11092	47
Bear	Julie	4-7-1	IMECE2019-10992	34	Bhattacharyya	Ranjan	5-3-2	IMECE2019-11172	51
Beatriz	Julio	5-10-1	IMECE2019-11207	52	Bhattacharyya	Kondalarao	5-11-1	IMECE2019-11170	55
Beatriz	Julio	5-6-1	IMECE2019-11192	56	Bhovad	Priyanka	16-1-1	IMECE2019-12948	193
Beatty	Danielle N.	16-2-1	IMECE2019-13295	203	Bi	Sirui	11-46-1	IMECE2019-13253	137
Beaudoin	Armand	11-47-3	IMECE2019-13059	151	Bian	Chunlei	5-10-2	IMECE2019-12087	50
Beaulieu	Melanie	17-4-3	IMECE2019-12996	207	Bian	Linkan	2-3-1	IMECE2019-10323	24
Becerro de Bengoa Vallejo	Ricardo	4-8-1	IMECE2019-11085	37	Bici	Michele	14-2-1	IMECE2019-11325	181
Beck	B. Terry	8-7-1	IMECE2019-12236	84	Bielski	Michael	6-1-3	IMECE2019-10751	63
Becker	Bill	17-6-1	IMECE2019-13924	208	Bietresato	Marco	5-11-2	IMECE2019-11507	57
Becker	Jared M.	17-6-1	IMECE2019-12357	207	Bijlenga	Philippe	4-4-1	IMECE2019-11125	33
Behdinan	Kamran	1-6-1	IMECE2019-10773	2	Bilionis	Ilias	16-1-1	IMECE2019-13341	197
Behdinan	Kamran	5-9-1	IMECE2019-10167	48	Bilionis	Ilias	16-1-1	IMECE2019-13619	200
Behdinan	Kamran	11-2-2	IMECE2019-10796	160	Bilton	Amy M.	6-4-1	IMECE2019-11514	64
Behera	Deepak Kumar	3-12-2	IMECE2019-13399	31	Bin Jamal M	Noushad	11-14-2	IMECE2019-10165	147
Behera	Dipankar	16-2-1	IMECE2019-13549	203	Bin Shahadat	Muhammad Rubayat	9-29-1	IMECE2019-11794	104
Behzadinasab	Masoud	11-38-2	IMECE2019-12841	148	Bindon	David	8-11-1	IMECE2019-11764	86
Behzadinasab	Masoud	17-11-2	IMECE2019-13220	211	Biniyazan	F.	17-10-1	IMECE2019-13185	210
Behzadirad	Mahmoud	16-1-1	IMECE2019-13597	199	Bird	Eric	9-18-1	IMECE2019-12219	106
Bekar	Ali Can	3-12-1	IMECE2019-13202	29	Bischof	Daniel	16-2-1	IMECE2019-13800	204
Bell	Savannah B.	7-6-1	IMECE2019-11447	78	Bischof	John	9-69-2	IMECE2019-14003	102
Bellingher	Steven L.	12-5-1	IMECE2019-11534	171	Bisharia	Parul	11-12-1	IMECE2019-10559	158
Belotti	Roberto	5-11-1	IMECE2019-10569	55	Bishop	Joseph	11-7-1	IMECE2019-10269	133
Belotti	Roberto	5-11-2	IMECE2019-11507	57	Bishop	Joseph	11-7-1	IMECE2019-13771	133
Belwafa	Jamel	13-10-1	IMECE2019-10240	177	Bishop	Joseph	11-22-1	IMECE2019-13058	141
Benet	Eduard	11-37-5	IMECE2019-13339	165	Bitsikas	Panagiotis	6-2-1	IMECE2019-10076	64
Benitez Lopez	Mario A.	4-13-2	IMECE2019-11788	45	Bitsikas	Panagiotis	6-2-1	IMECE2019-10077	64
Benker	Bernd	11-42-1	IMECE2019-12782	136	Bizzo	Waldir A.	16-1-1	IMECE2019-12742	192
Ben-Mansour	Rached	6-4-2	IMECE2019-11046	66	Black	Kayla	7-10-1	IMECE2019-10540	77
Benner	Jingru	8-12-1	IMECE2019-11039	86	Blacutt	Jacob	16-1-1	IMECE2019-13502	198
Bennett	James	3-14-1	IMECE2019-11377	32	Blair	Andrew C.	7-6-1	IMECE2019-11447	78
Bennett	William	3-12-2	IMECE2019-11691	31	Blakeney	Erin	7-1-1	IMECE2019-12649	77
Benoit-Marechal	Lucas	11-37-2	IMECE2019-13826	156	Blank	Jack	4-5-1	IMECE2019-11944	34
Benson	Michael	8-11-1	IMECE2019-11764	86	Blankenship	Morgan	17-9-1	IMECE2019-13661	209
Benvenuto	Michael	5-11-2	IMECE2019-11882	57	Blochberger	Joseph	1-2-2	IMECE2019-10259	4
Benz	August	6-3-1	IMECE2019-10270	61	Blomerus	Paul	9-9-1	IMECE2019-11885	101
Benzel	Edward	4-2-5	IMECE2019-13506	43	Blomquist	Matthew	9-64-1	IMECE2019-12174	97
Benzing	Jake	11-32-1	IMECE2019-13677	156	Blourchian	Aryan	11-3-1	IMECE2019-13842	163
Berger	Jonathan	10-19-2	IMECE2019-13865	130	Blumberg	Timo	6-4-3	IMECE2019-10587	67
Bergeron	Logan P.	11-5-3	IMECE2019-13519	160	Bobaru	Florin	11-38-1	IMECE2019-13934	146
Berke	Ryan	11-18-1	IMECE2019-12912	135	Bobaru	Florin	11-38-2	IMECE2019-13883	148
Berke	Ryan	11-18-1	IMECE2019-13785	135	Bobaru	Florin	11-38-2	IMECE2019-13935	148
Berke	Ryan	11-18-3	IMECE2019-13169	141	Bobaru	Florin	11-38-3	IMECE2019-12830	150
Berke	Ryan	11-18-3	IMECE2019-13328	141	Bobaru	Florin	11-38-3	IMECE2019-13899	150
Berke	Ryan	11-18-3	IMECE2019-13477	141	Bodelot	Laurence	11-37-1	IMECE2019-12999	154
Berke	Ryan	11-7-5	IMECE2019-13469	147	Bodelot	Laurence	11-1-8	IMECE2019-12998	160
Berke	Ryan	11-14-3	IMECE2019-13100	149	Bodepudi	Revanth	11-23-2	IMECE2019-13268	153
Berke	Ryan	11-14-3	IMECE2019-13349	149	Bodepudi	Revanth	11-26-2	IMECE2019-13138	162
Berke	Ryan	15-1-1	IMECE2019-13326	188	Bodepudi	Revanth	11-26-2	IMECE2019-13141	162
Berke	Ryan	15-1-1	IMECE2019-13515	188	Boetcher	Sandra	8-3-1	IMECE2019-10453	89
Berke	Ryan	15-1-1	IMECE2019-13979	189	Boetcher	Sandra	8-3-1	IMECE2019-10454	89
Berke	Ryan	17-15-1	IMECE2019-13108	211	Boggess	Brian	13-5-1	IMECE2019-12285	178
Berke	Ryan	17-15-1	IMECE2019-13329	211	Boggess	Brian	13-9-1	IMECE2019-11479	179
Berke	Ryan	17-15-1	IMECE2019-13511	211	Bohnstedt	Bradley	4-6-2	IMECE2019-10514	37
Berman	Arielle	10-10-5	IMECE2019-12773	120	Bolyukh	Vladimir F.	2-11-1	IMECE2019-10388	8
Berman	Daina	16-1-1	IMECE2019-13163	191	Boman	Neal	9-7-1	IMECE2019-12558	99
Bernardoni	Federico	16-1-1	IMECE2019-13240	196	Boman	Neal	17-15-1	IMECE2019-12551	212
Berndt	Aaron	1-1-6	IMECE2019-10449	4	Bommisetty	Hemanth	6-4-4	IMECE2019-10728	69
					Bommisetty	Hemanth	6-4-4	IMECE2019-11637	69

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Bonassar	Lawrence J.	11-37-4	IMECE2019-13649	163	Brown	Andrew	12-10-1	IMECE2019-13106	173
Bondar	Alex	2-13-1	IMECE2019-11023	8	Brown	Christine	17-7-1	IMECE2019-13944	208
Bondar	Alex	2-13-2	IMECE2019-10889	11	Brown	Eliot	7-7-1	IMECE2019-10469	80
Bondarenko	Yevhen	2-13-1	IMECE2019-10583	8	Brown	Joseph D.	4-8-1	IMECE2019-11238	38
Bondo	Geovani	5-12-1	IMECE2019-11401	53	Brown	Judith	11-35-1	IMECE2019-13658	159
Bonhomme	Elodie	2-10-2	IMECE2019-10635	10	Brown	Rylie	16-2-1	IMECE2019-13281	203
Bonnecaze	Roger	11-23-2	IMECE2019-13268	153	Brownlee	Benjamin J.	12-5-1	IMECE2019-13188	171
Bonnema	Michael	8-4-3	IMECE2019-11449	91	Bruche	Stefan	6-4-5	IMECE2019-11519	71
Bontoux	Luc	15-1-1	IMECE2019-13989	189	Bruck	Hugh	11-8-1	IMECE2019-10337	133
Bonyadi	Shabnam	16-1-1	IMECE2019-13562	199	Brueck	S.R.J	16-1-1	IMECE2019-13544	198
Boorugu	Manish	10-4-4	IMECE2019-13449	118	Brunner	Ryan	17-6-1	IMECE2019-12764	208
Bootwala	Yousuf	9-4-1	IMECE2019-13306	106	Bu	Xiongzhu	3-4-1	IMECE2019-10492	29
Bootwala	Yousuf	16-1-1	IMECE2019-13318	197	Bu	Xiongzhu	3-8-1	IMECE2019-10948	30
Bootwala	Yousuf	16-1-1	IMECE2019-13325	197	Bu	Xiongzhu	5-6-1	IMECE2019-10702	57
Borden	Michael	11-34-1	IMECE2019-13450	167	Buddhiraju	Siddharth	9-30-1	IMECE2019-12708	108
Borenstein	Arie	9-5-1	IMECE2019-13086	111	Buelvas	Ana	6-3-1	IMECE2019-10642	61
Borg	John	11-14-1	IMECE2019-10459	145	Buendia	Ali R.	7-6-1	IMECE2019-11447	78
Borrás Pinilla	Carlos	5-3-1	IMECE2019-11516	49	Bula	Antonio	6-10-1	IMECE2019-11316	72
Borrás Pinilla	Carlos	5-3-2	IMECE2019-11505	51	Bulla	Marian	10-15-1	IMECE2019-11429	129
Bosch	Stephen	9-45-1	IMECE2019-10613	96	Bungatavula	Aakash	11-10-3	IMECE2019-11721	141
Bosch	Stephen	17-9-1	IMECE2019-12900	209	Bunyak	Filiz	2-4-1	IMECE2019-13312	14
Bose	Pritom	10-26-6	IMECE2019-12109	121	Buonomo	Bernardo	9-35-1	IMECE2019-11650	94
Bose	Pritom	12-7-3	IMECE2019-12129	174	Buonomo	Bernardo	9-5-1	IMECE2019-11575	110
Bosnjak	Nikola	11-1-1	IMECE2019-13383	144	Burgess	Gary	9-2-1	IMECE2019-10161	104
Bosnjak	Nikola	11-1-2	IMECE2019-13367	146	Burkan	Hamed	6-1-2	IMECE2019-10283	62
Bosnjak	Nikola	11-5-4	IMECE2019-13368	164	Burn	Katharine	11-18-1	IMECE2019-13785	135
Bouchitte	Guy	1-1-1	IMECE2019-10644	1	Burns	Samuel	9-53-1	IMECE2019-10679	112
Bouklas	Nikolaos	11-37-1	IMECE2019-13508	154	Burton	Samantha D.	11-18-3	IMECE2019-13477	141
Bouklas	Nikolaos	11-1-9	IMECE2019-13518	163	Burton	Samantha D.	15-1-1	IMECE2019-13515	188
Bouklas	Nikolaos	11-37-4	IMECE2019-13649	163	Burton	Samantha D.	17-15-1	IMECE2019-13511	211
Bouklas	Nikolaos	11-34-1	IMECE2019-13520	167	Busani	Tito	16-1-1	IMECE2019-13597	199
Boutaous	M'Hamed	8-2-1	IMECE2019-11675	86	Bustamante	Michele	16-2-1	IMECE2019-13295	203
Bouzid	Abdel-Hakim	3-5-1	IMECE2019-10019	27	Butcher	Eric A.	16-1-1	IMECE2019-13599	199
Bouzid	Abdel-Hakim	11-7-2	IMECE2019-10103	137	Butter	Dorien	17-4-3	IMECE2019-13839	207
Bower	Drew	6-1-3	IMECE2019-10751	63	Buxton	Ashley	15-1-1	IMECE2019-13962	189
Boyce	Brad	11-18-2	IMECE2019-13673	138	Byrd	Larry	9-32-1	IMECE2019-10651	93
Boyce	Brad	12-7-3	IMECE2019-12790	174	Bzymek	Zbigniew	7-7-1	IMECE2019-10469	80
Boyd	Dusty	13-9-1	IMECE2019-11479	179	Caceres	Kevin	5-12-1	IMECE2019-11557	53
Boyd	I'Shea	14-4-1	IMECE2019-11539	181	Caceres	Kevin	14-1-2	IMECE2019-11647	183
Boyd	James G.	1-1-5	IMECE2019-11302	4	Cai	Jie	6-3-1	IMECE2019-12662	61
Boyd	Nathan	10-14-1	IMECE2019-10400	122	Cai	Shengqiang	11-1-4	IMECE2019-12679	152
Boyina	Kalyan	9-45-1	IMECE2019-10613	96	Cai	Shengqiang	11-1-5	IMECE2019-12951	153
Boyina	Kalyan	9-45-1	IMECE2019-12017	96	Calabria	Alfonso	6-5-1	IMECE2019-10039	62
Boyina	Kalyan	17-9-1	IMECE2019-12900	209	Calado	Jorge	2-8-4	IMECE2019-10985	22
Boyina	Kalyan	17-15-1	IMECE2019-13334	214	Calicchia	Michael	4-11-2	IMECE2019-12024	44
Bozzo	Isabella	11-1-3	IMECE2019-10667	148	Callahan	Will	9-30-2	IMECE2019-13270	109
Bradshaw	Alexander J.	17-4-2	IMECE2019-13474	206	Callanan	Jesse	1-1-3	IMECE2019-12852	2
Brady	Hayden	12-8-1	IMECE2019-13401	170	Callanan	Jesse	16-1-1	IMECE2019-13133	195
Brahme	Abhijit	11-47-4	IMECE2019-13590	153	Calvin	Matthew	11-18-3	IMECE2019-13169	141
Braman	Todd	12-10-1	IMECE2019-13106	173	Calyam	Prasad	2-4-1	IMECE2019-13312	14
Brambley	Michael	6-9-3	IMECE2019-12026	74	Camargo	Jonathan	4-13-2	IMECE2019-11788	45
Brandyberry	David	11-44-1	IMECE2019-12559	139	Cameron	Kenneth	4-11-2	IMECE2019-11948	44
Brandyberry	David	11-44-1	IMECE2019-12560	140	Campana	Francesca	14-2-1	IMECE2019-11325	181
Brar	Gurinder Singh	2-5-5	IMECE2019-10188	88	Campbell	Chasen	12-4-1	IMECE2019-10059	172
Braun	Robert	6-12-1	IMECE2019-13747	73	Campi	Federico	14-1-2	IMECE2019-11587	183
Braun	Robert	6-12-1	IMECE2019-13781	73	Campillo	Javier	6-2-2	IMECE2019-10410	65
Braun	Robert	17-6-1	IMECE2019-13736	208	Campos	Ricardo	4-14-1	IMECE2019-11221	41
Braun	Robert	17-6-1	IMECE2019-13924	208	Cândido	Silvio	8-4-3	IMECE2019-11747	91
Braytee	Ali	8-9-4	IMECE2019-10553	85	Cando	María Gabriela	6-9-1	IMECE2019-11472	72
Breslavskiy	Ivan	11-1-3	IMECE2019-10667	148	Cano	Sebastian	9-51-1	IMECE2019-10324	110
Bress	Thomas	13-8-1	IMECE2019-11432	178	Canova	Marcello	16-1-1	IMECE2019-13950	203
Bress	Thomas	13-8-1	IMECE2019-11451	178	Cao	Changyong	10-25-1	IMECE2019-13804	123
Brgoch	Jakoah	10-26-6	IMECE2019-13854	121	Cao	Changyong	11-5-2	IMECE2019-13798	158
Briden	Julia	15-1-1	IMECE2019-10527	187	Cao	Changyong	11-5-3	IMECE2019-13416	160
Bridges	Michael M.	9-63-1	IMECE2019-10272	95	Cao	Dongyang	11-7-3	IMECE2019-12544	140
Brisk	Philip	16-1-1	IMECE2019-13643	200	Cao	Lei	9-26-1	IMECE2019-13723	102
Britton	Doug	9-63-1	IMECE2019-11428	95	Cao	Lei	9-26-1	IMECE2019-13787	102
Brix Nerenst	Tim	2-10-1	IMECE2019-11251	7	Cao	Lei	17-15-1	IMECE2019-13817	215
Broberg	Dallin	12-8-1	IMECE2019-13401	170	Cao	Meigen	5-15-1	IMECE2019-10852	48
Broderick	Jim	12-10-1	IMECE2019-13106	173	Cao	Ni	2-10-3	IMECE2019-10539	12
Broderick	Neil	12-6-1	IMECE2019-12531	172	Cao	Yihan	3-4-1	IMECE2019-10492	29
Brojo	Francisco	3-3-1	IMECE2019-11229	32	Cao	Yihan	3-8-1	IMECE2019-10948	30
Brojo	Francisco	3-3-1	IMECE2019-11712	32	Cao	Yihan	5-6-1	IMECE2019-10702	57
Brouwer	Jacob	6-10-3	IMECE2019-12445	74	Capata	Roberto	6-5-1	IMECE2019-10039	62

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Capela	Pauline	10-26-3	IMECE2019-11356	117	Chadwick	Michelle	11-3-2	IMECE2019-13435	166
Capper	Weston	15-1-1	IMECE2019-13981	189	Chaeibakhsh	Sarvenaz	17-4-3	IMECE2019-13839	207
Caputi	Antonio	14-3-1	IMECE2019-10699	182	Chaharlang	Marzieh	11-42-2	IMECE2019-13851	139
Carapellucci	Roberto	6-4-3	IMECE2019-10848	67	Chaharlang	Marzieh	12-8-1	IMECE2019-13401	170
Carbajal	Gerardo	6-12-2	IMECE2019-12018	74	Chakrabarti	Debalay	2-12-1	IMECE2019-12238	10
Carbajal	Gerardo	17-9-1	IMECE2019-13893	209	Chakraborty	Goutam	5-3-2	IMECE2019-11172	51
Carbaugh	Scott	5-2-3	IMECE2019-11346	59	Chakraborty	Goutam	5-4-5	IMECE2019-11113	60
Cardona	Andres	7-10-1	IMECE2019-10540	77	Chakraborty	Pranay	9-26-1	IMECE2019-13723	102
Cardona	Carolina	5-4-5	IMECE2019-11062	60	Chakraborty	Pranay	17-15-1	IMECE2019-12942	213
Cardone	Salvatore	3-4-1	IMECE2019-10577	29	Chakraborty	Pratyaya	5-3-2	IMECE2019-11172	51
Cardozo	Eloisa	14-1-3	IMECE2019-11826	184	Chakravarty	Uttam	2-7-3	IMECE2019-11630	24
Carey	Zachary	12-3-1	IMECE2019-10629	169	Chakravarty	Uttam	3-8-1	IMECE2019-11084	31
Carpenter	Kevin	11-19-1	IMECE2019-11713	161	Chakravarty	Uttam	3-8-1	IMECE2019-11087	31
Carrato	Peter	6-3-1	IMECE2019-10270	61	Chakravarty	Uttam	3-8-1	IMECE2019-11455	31
Carrell	Douglas	12-8-1	IMECE2019-13401	170	Chakravarty	Uttam	3-8-1	IMECE2019-11477	31
Carreon	Hector	1-12-1	IMECE2019-10194	5	Chakravarty	Uttam	3-8-1	IMECE2019-11581	31
Carrera	Erasm	1-1-3	IMECE2019-12607	2	Chakravarty	Uttam	16-1-1	IMECE2019-13881	202
Carrera	Erasm	1-6-2	IMECE2019-12608	5	Chalgham	Wadie	13-6-1	IMECE2019-11806	175
Carrera	Erasm	2-9-2	IMECE2019-11261	9	Chalgham	Wadie	13-6-1	IMECE2019-11825	175
Carrera	Erasm	3-6-1	IMECE2019-10296	27	Chalgham	Wadie	13-6-1	IMECE2019-11861	175
Carrera	Erasm	3-14-1	IMECE2019-11281	32	Challa	Akhil	5-5-1	IMECE2019-12070	47
Carrera	Erasm	3-14-1	IMECE2019-11314	32	Challa	Akhil	5-8-3	IMECE2019-12082	51
Carrera	Erasm	3-14-1	IMECE2019-11364	32	Chalmers	Andrew N.	4-4-2	IMECE2019-10405	35
Carrillo Peña	Andrés L.	8-9-4	IMECE2019-12038	85	Chamani	Alireza	4-10-4	IMECE2019-12142	44
Carrillo Peña	Andrés L.	15-1-1	IMECE2019-13932	188	Chamouni	Hussein	16-1-1	IMECE2019-13594	199
Carrillo-Munoz	Maria J.	1-1-1	IMECE2019-13695	1	Champagne	Victor	10-26-5	IMECE2019-11689	120
Carrion	Luis	9-51-1	IMECE2019-10324	110	Chan	Jessica	3-10-1	IMECE2019-13483	31
Carroll	Jay	11-7-1	IMECE2019-13771	133	Chan	WaiLam	11-38-1	IMECE2019-12811	146
Carroll	Jay	11-35-1	IMECE2019-13658	159	Chancey	Valeta Carol	4-11-2	IMECE2019-12173	44
Carta	Giorgio	1-1-1	IMECE2019-12500	1	Chandler	Mei	11-7-7	IMECE2019-13024	152
Carter	Kristen C.	2-2-2	IMECE2019-13226	15	Chandola	Nitin	11-7-1	IMECE2019-12777	133
Carter	Rachel E.	6-11-1	IMECE2019-12131	68	Chandra	Namas	4-2-2	IMECE2019-13542	39
Caruntu	Dumitru	4-7-1	IMECE2019-11233	34	Chandrasekaran	Lokesh	5-6-1	IMECE2019-11986	56
Caruntu	Dumitru	5-3-1	IMECE2019-11198	49	Chandratre	Vaishali	9-36-2	IMECE2019-10203	99
Caruntu	Dumitru	5-10-1	IMECE2019-11207	52	Chang	Chih-Hao	2-4-2	IMECE2019-13698	16
Caruntu	Dumitru	5-6-1	IMECE2019-11192	56	Chang	Chih-Hao	10-13-1	IMECE2019-12165	129
Caruntu	Dumitru	11-42-1	IMECE2019-11187	136	Chang	Chih-Hao	10-13-1	IMECE2019-12718	129
Carvalho	Jessica	12-10-1	IMECE2019-13608	173	Chang	Chih-Hao	17-15-1	IMECE2019-12519	212
Carvalho	Joana	4-14-1	IMECE2019-11221	41	Chang	Chih-Hao	17-15-1	IMECE2019-12687	213
Carvalho	Joana	6-16-2	IMECE2019-11593	69	Chang	Chih-Hao	17-15-1	IMECE2019-13870	215
Casari	Daniele	4-5-1	IMECE2019-13127	34	Chang	Chih-Hung	16-1-1	IMECE2019-12771	192
Casari	Daniele	16-1-1	IMECE2019-13688	200	Chang	Fu-kuo	3-1-2	IMECE2019-13994	27
Casavant	Ethan	1-1-6	IMECE2019-11338	4	Chang	Ho Chan	2-8-1	IMECE2019-10621	17
Cascetta	Furio	9-35-1	IMECE2019-11650	94	Chang	Ho Chan	9-36-1	IMECE2019-11421	96
Castaneda	Pedro Ponte	11-47-1	IMECE2019-12848	146	Chang	Jiyoung	2-4-2	IMECE2019-13114	16
Castaneda	Pedro Ponte	11-37-1	IMECE2019-12816	154	Chang	Jiyoung	12-4-1	IMECE2019-13115	172
Castillo	Eduardo	6-10-4	IMECE2019-10643	75	Chang	Jiyoung	12-7-2	IMECE2019-13353	173
Castro	Elaine	13-9-1	IMECE2019-11479	179	Chang	Jiyoung	17-2-1	IMECE2019-13119	205
Castro	Juan	4-10-2	IMECE2019-10627	41	Chang	Jiyoung	17-15-1	IMECE2019-12874	211
Castro	Livingston D.	6-10-4	IMECE2019-10643	75	Chang	Pengliang	8-6-2	IMECE2019-10519	89
Catalano	Pietro	8-3-2	IMECE2019-10618	90	Chang	Y.	2-7-1	IMECE2019-10341	23
Catbas	Fikret N.	16-1-1	IMECE2019-13656	200	Chang	Young B.	10-9-2	IMECE2019-11361	124
Cavazos	Omar	4-14-1	IMECE2019-11406	41	Chang	Yuhe	5-6-1	IMECE2019-13112	56
Cazacu	Oana	11-7-1	IMECE2019-12777	133	Chanut	Raphael A.	11-14-3	IMECE2019-12819	149
Cazacu	Oana	11-7-4	IMECE2019-12471	144	Chao	Jeremy	9-7-1	IMECE2019-12558	99
Cazacu	Oana	11-7-4	IMECE2019-12858	144	Chao	Jeremy	17-15-1	IMECE2019-12551	212
Cazacu	Oana	11-7-7	IMECE2019-12778	152	Chaput	John	16-1-1	IMECE2019-13643	200
Cecil	J.	16-1-1	IMECE2019-13246	196	Charalambides	Panos	11-12-4	IMECE2019-11018	166
Cedar	Gebrand	16-2-1	IMECE2019-13295	203	Charara	Mohammad	3-5-1	IMECE2019-11467	27
Celik	Emrah	2-2-7	IMECE2019-12215	18	Charmchi	Majid	4-3-2	IMECE2019-12514	35
Celli	Dino A.	11-18-3	IMECE2019-13477	141	Charmchi	Majid	6-7-2	IMECE2019-10457	67
Celli	Dino A.	15-1-1	IMECE2019-13515	188	Charvat	Pavel	17-6-1	IMECE2019-10438	207
Celli	Dino A.	17-15-1	IMECE2019-13511	211	Charvat	Pavel	17-9-1	IMECE2019-10381	208
Celli	Paolo	1-1-3	IMECE2019-12607	2	Chatterjee	Kamalika	11-47-3	IMECE2019-13059	151
Cen	Mingjing	11-14-3	IMECE2019-10928	150	Chattopadhyay	Abhijit	5-4-5	IMECE2019-10763	60
Cen	Zewei	2-7-2	IMECE2019-10349	23	Chattopadhyay	Aditi	3-4-1	IMECE2019-10142	29
Cereceda	David	11-47-1	IMECE2019-13836	146	Chattopadhyay	Aditi	11-19-1	IMECE2019-11529	161
Cereceda	David	17-15-1	IMECE2019-13534	214	Chattopadhyay	Himadri	9-63-1	IMECE2019-12645	95
Cerik	Burak Can	3-15-1	IMECE2019-13175	30	Chattopadhyay	Somnath	7-10-2	IMECE2019-11494	79
Cerqueira	Maria	10-26-3	IMECE2019-11356	117	Chattopadhyay	Xanthippi	4-5-4	IMECE2019-13841	39
Cervantes-Sanchez	J. Jesus	4-8-1	IMECE2019-10140	37	Chaudhary	Usamah	4-2-4	IMECE2019-10675	41
Cesnik	Carlos	3-1-1	IMECE2019-13993	29	Chaudhuri	Reaz	3-5-1	IMECE2019-10325	27
Cha	George	8-6-1	IMECE2019-10209	88	Chaudhuri	Reaz	3-5-1	IMECE2019-10823	27
Chabot	Jordan	2-2-7	IMECE2019-12215	18	Chaudhuri	Reaz	11-19-1	IMECE2019-10322	161

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Chaudhuri	Reaz	11-26-3	IMECE2019-10320	164	Chen	Qianying	10-14-1	IMECE2019-11021	122
Chauhan	Bhupendra Singh	6-16-2	IMECE2019-11122	69	Chen	Qiming	9-49-1	IMECE2019-11386	109
Chauhan	Tushar Jashvantbhai	16-2-1	IMECE2019-13878	204	Chen	Renkun	9-31-1	IMECE2019-13437	111
Chavez	Rodrigo	11-10-1	IMECE2019-12249	134	Chen	Renkun	17-15-1	IMECE2019-13445	214
Chebolu	Lakshmana Rao	11-14-2	IMECE2019-10165	147	Chen	Renzhe	16-1-1	IMECE2019-13189	195
Cheikh	Mohamad I.	12-7-3	IMECE2019-11349	174	Chen	Ruyi	4-2-5	IMECE2019-10918	43
Cheikh	Mohamad I.	16-1-1	IMECE2019-12728	192	Chen	Shoue	11-5-3	IMECE2019-13416	160
Chekurov	Sergei	14-2-1	IMECE2019-11209	181	Chen	Shuqing	9-39-1	IMECE2019-11118	100
Chekurov	Sergei	14-4-2	IMECE2019-11354	181	Chen	Si	11-1-1	IMECE2019-13284	144
Chekurov	Sergei	14-4-1	IMECE2019-11480	181	Chen	Si	11-1-1	IMECE2019-13725	144
Chen	Anlin	3-4-2	IMECE2019-11129	30	Chen	Siwei	16-1-1	IMECE2019-12632	191
Chen	Bo	4-2-2	IMECE2019-12809	39	Chen	Siwei	16-1-1	IMECE2019-13604	199
Chen	Bolin	4-12-1	IMECE2019-13895	45	Chen	T.Z.	2-7-1	IMECE2019-10341	23
Chen	Bolin	10-25-2	IMECE2019-13872	126	Chen	Tao	9-39-1	IMECE2019-11051	100
Chen	Chao	2-6-2	IMECE2019-11297	11	Chen	Timothy	2-4-2	IMECE2019-13698	16
Chen	Chen	2-5-3	IMECE2019-10801	17	Chen	Timothy	17-15-1	IMECE2019-13870	215
Chen	Chen	2-5-3	IMECE2019-10802	17	Chen	Weimin	5-16-1	IMECE2019-12673	54
Chen	Cheng-An	9-49-1	IMECE2019-11083	109	Chen	Weiqiu	1-1-4	IMECE2019-12616	3
Chen	Chia-hung	11-5-4	IMECE2019-13351	164	Chen	Wenxiu	4-13-1	IMECE2019-10435	44
Chen	Chuyang	9-14-1	IMECE2019-12744	102	Chen	Wenxiu	4-13-1	IMECE2019-10477	44
Chen	Chuyang	10-25-1	IMECE2019-13379	123	Chen	Xiaolin	8-6-1	IMECE2019-10209	88
Chen	Chuyang	16-1-1	IMECE2019-13382	197	Chen	Xiaolin	8-6-2	IMECE2019-10519	89
Chen	De-Shiou	5-15-1	IMECE2019-12925	48	Chen	Xiaoming	11-26-1	IMECE2019-13547	158
Chen	Diaohao	11-10-1	IMECE2019-12321	134	Chen	Xiaoming	11-26-2	IMECE2019-12277	162
Chen	Enze	11-46-1	IMECE2019-13253	137	Chen	Xiaoping	1-12-1	IMECE2019-12199	5
Chen	Fangkang	4-13-2	IMECE2019-10471	45	Chen	Xin	10-13-1	IMECE2019-11694	129
Chen	Gang	9-20-1	IMECE2019-13586	94	Chen	Yabin	2-10-2	IMECE2019-10566	10
Chen	Gang	9-24-1	IMECE2019-13587	107	Chen	Yan	10-10-3	IMECE2019-10433	116
Chen	Gang	9-15-1	IMECE2019-13355	109	Chen	Yangyang	1-1-1	IMECE2019-13891	1
Chen	Gang	17-15-1	IMECE2019-13361	214	Chen	Yanyu	11-36-2	IMECE2019-10443	162
Chen	Gang	17-15-1	IMECE2019-13575	214	Chen	Yao	6-12-1	IMECE2019-11946	73
Chen	Gang	17-15-1	IMECE2019-13580	214	Chen	Yaolong	2-8-1	IMECE2019-10541	17
Chen	Gaoxiang	2-9-2	IMECE2019-10730	9	Chen	Yi-An	10-13-1	IMECE2019-12718	129
Chen	Hailong	3-12-2	IMECE2019-13399	31	Chen	Yi-An	17-15-1	IMECE2019-12687	213
Chen	Hailong	11-38-1	IMECE2019-12811	146	Chen	Youping	9-26-1	IMECE2019-13290	102
Chen	Hailong	11-39-4	IMECE2019-12684	151	Chen	Youping	11-39-1	IMECE2019-13612	136
Chen	Haodong	4-13-1	IMECE2019-10435	44	Chen	Youping	11-39-3	IMECE2019-13192	142
Chen	Haoyu	10-10-2	IMECE2019-12447	115	Chen	Youping	16-1-1	IMECE2019-13208	196
Chen	Haoyu	10-10-2	IMECE2019-12448	115	Chen	Youping	16-1-1	IMECE2019-13317	196
Chen	I-Te	2-4-2	IMECE2019-13698	16	Chen	Youping	16-1-1	IMECE2019-13406	197
Chen	I-Te	10-13-1	IMECE2019-12718	129	Chen	Yucheng	9-5-1	IMECE2019-13086	111
Chen	I-Te	17-15-1	IMECE2019-12687	213	Chen	Yunfei	8-6-4	IMECE2019-10886	92
Chen	I-Te	17-15-1	IMECE2019-13870	215	Chen	Yunfei	9-25-2	IMECE2019-10572	100
Chen	James	12-7-3	IMECE2019-11349	174	Chen	Yushu	5-3-3	IMECE2019-12488	47
Chen	James	16-1-1	IMECE2019-12728	192	Chen	Yuzhen	10-4-3	IMECE2019-13147	116
Chen	Jinwei	6-12-1	IMECE2019-11946	73	Chen	Ze-Guo	1-1-4	IMECE2019-13645	3
Chen	Jiun-Shyan	11-28-1	IMECE2019-12651	135	Chen	Zeyao	10-4-5	IMECE2019-10865	119
Chen	Jiun-Shyan	11-28-1	IMECE2019-13703	135	Chen	Zhangwei	14-3-1	IMECE2019-11199	182
Chen	Jiun-Shyan	11-10-2	IMECE2019-11726	138	Chen	Zhiliang	8-9-2	IMECE2019-11896	83
Chen	Jiun-Shyan	11-10-2	IMECE2019-11733	138	Chen	Zhitong	4-6-2	IMECE2019-12549	37
Chen	Kaifeng	9-30-1	IMECE2019-12708	108	Chen	Zhiwei	16-1-1	IMECE2019-12747	192
Chen	Ke	9-20-1	IMECE2019-13586	94	Chen	Zhiyang	7-5-1	IMECE2019-10282	81
Chen	Ke	9-15-1	IMECE2019-13355	109	Chen	Zi	10-25-1	IMECE2019-13897	123
Chen	Ke	16-1-1	IMECE2019-13607	199	Chen	Zi	11-37-4	IMECE2019-13848	163
Chen	Ke	17-15-1	IMECE2019-13361	214	Chen	Zi	11-5-4	IMECE2019-13351	164
Chen	Ke	17-15-1	IMECE2019-13580	214	Chen	Ziguang	11-38-1	IMECE2019-13934	146
Chen	Ken	3-14-1	IMECE2019-10827	32	Chen	Ziguang	11-38-2	IMECE2019-13883	148
Chen	Ken	4-7-1	IMECE2019-10584	34	Chen	Ziguang	11-38-2	IMECE2019-13935	148
Chen	Ken	8-9-2	IMECE2019-11896	83	Chen	Ziguang	11-38-3	IMECE2019-12830	150
Chen	Kun	2-3-1	IMECE2019-10822	24	Chen	Ziguang	11-38-3	IMECE2019-13899	150
Chen	Lei	11-39-1	IMECE2019-13026	136	Cheng	Marvin	4-13-1	IMECE2019-12296	43
Chen	Lei	11-7-6	IMECE2019-10672	149	Cheng	Xianwen	17-6-1	IMECE2019-12434	207
Chen	Lei	15-1-1	IMECE2019-13961	189	Cheng	Yang	11-2-1	IMECE2019-13137	157
Chen	Lei	16-1-1	IMECE2019-13207	195	Chester	Shawn	11-1-1	IMECE2019-13383	144
Chen	Leitao	8-11-1	IMECE2019-11732	85	Chester	Shawn	11-1-2	IMECE2019-13367	146
Chen	Li	5-9-2	IMECE2019-10498	50	Chester	Shawn	11-1-8	IMECE2019-12917	160
Chen	Li	5-9-2	IMECE2019-10835	50	Chester	Shawn	11-5-4	IMECE2019-13368	164
Chen	Lianyi	16-1-1	IMECE2019-13772	201	Chew	Huck Beng	11-26-1	IMECE2019-13547	158
Chen	Lingen	6-2-2	IMECE2019-10115	65	Chhabra	R.P.	8-2-3	IMECE2019-11258	88
Chen	Lingen	6-2-3	IMECE2019-10116	66	Chi	Sheng-Wei	11-28-1	IMECE2019-12501	136
Chen	Lingen	9-51-2	IMECE2019-10117	112	Chi	Sheng-Wei	11-34-1	IMECE2019-11909	167
Chen	Liyuan	1-1-4	IMECE2019-13354	3	Chi	Yinding	10-14-2	IMECE2019-13407	124
Chen	Miannuo	2-8-1	IMECE2019-10541	17	Chi	Yinding	17-15-1	IMECE2019-13504	214
Chen	Peng	4-13-3	IMECE2019-11318	46	Chiarot	Paul R.	12-8-2	IMECE2019-11903	172

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Chiarot	Paul R.	16-1-1	IMECE2019-12930	193	Coemert	Suat	14-2-2	IMECE2019-10105	183
Chiarot	Paul R.	16-1-1	IMECE2019-13083	194	Coetzee	Rigardt	2-4-2	IMECE2019-10693	15
Chiashi	Shohei	9-29-1	IMECE2019-10276	103	Coetzee	Rigardt	2-14-1	IMECE2019-10692	21
Chiasson	Andrew	6-10-4	IMECE2019-10909	75	Cognasi	Johnny P.	15-1-1	IMECE2019-11602	187
Chiddarwar	Vikrant	5-15-1	IMECE2019-12925	48	Cohen	Itai	11-37-4	IMECE2019-13649	163
Chikte	Rufaidah	5-2-3	IMECE2019-12080	59	Cola	Baratunde	9-30-1	IMECE2019-12887	108
Chiloyan	Vazrik	9-15-1	IMECE2019-13355	109	Cola	Baratunde	16-1-1	IMECE2019-12895	193
Chiloyan	Vazrik	17-15-1	IMECE2019-13361	214	Coletta	Jarrod	8-12-1	IMECE2019-11039	86
Chiou	Richard Y.	7-10-1	IMECE2019-11912	77	Colombo	Giorgio	14-4-1	IMECE2019-11480	181
Chiu	Edwin	11-11-1	IMECE2019-13879	134	Colombo	Giorgio	14-4-2	IMECE2019-11497	182
Cho	Haeng Muk	6-16-2	IMECE2019-11122	69	Colombo	Paolo	16-1-1	IMECE2019-12758	192
Cho	Heejin	6-9-3	IMECE2019-13783	74	Colombo	Paolo	16-1-1	IMECE2019-13203	195
Cho	Jaeyoung	5-13-1	IMECE2019-13333	59	Colombo Zefinetti	Filippo	14-2-1	IMECE2019-10491	181
Cho	Jeong-Hyun	10-11-1	IMECE2019-13833	116	Compere	Marc	5-3-3	IMECE2019-10682	47
Cho	Jeong-Hyun	10-5-1	IMECE2019-13837	127	Compere	Marc	5-8-2	IMECE2019-10936	49
Cho	Michael	4-2-2	IMECE2019-12809	39	Compere	Marc	5-2-1	IMECE2019-10464	56
Chodankar	Abhijeet D.	5-10-1	IMECE2019-10783	52	Compere	Marc	14-1-3	IMECE2019-10595	184
Chodankar	Abhijeet D.	9-53-1	IMECE2019-10085	112	Compton	Beau	8-6-3	IMECE2019-13393	91
Choi	Byunghee	6-14-1	IMECE2019-11800	75	Conger	Julia P.	6-10-2	IMECE2019-11068	73
Choi	Chang-Hwan	8-6-3	IMECE2019-13285	90	Consolini	Jack	17-4-3	IMECE2019-13321	207
Choi	Hongseok	11-12-3	IMECE2019-13846	164	Consolini	Jack	17-4-3	IMECE2019-13327	207
Choi	Jae-Won	11-3-1	IMECE2019-12969	163	Conti	Sergio	11-47-3	IMECE2019-12642	151
Choi	Junseo	12-6-1	IMECE2019-12058	171	Cook	Douglas	4-10-5	IMECE2019-13757	45
Choi	Sungho	6-9-1	IMECE2019-13054	72	Cook	Douglas	4-10-5	IMECE2019-13812	45
Choudhary	Naman	9-36-1	IMECE2019-10432	95	Cook	Douglas	15-1-1	IMECE2019-13926	187
Choudhury	Sounak Kumar	2-9-1	IMECE2019-10440	7	Cook	Douglas	15-1-1	IMECE2019-13928	187
Choudhury	Sounak Kumar	2-5-1	IMECE2019-10376	15	Cook	Douglas	17-4-2	IMECE2019-13882	206
Chowdhury	Tonoy	16-1-1	IMECE2019-13163	191	Cook	Jason	11-43-1	IMECE2019-10171	139
Christ	Kevin	12-10-1	IMECE2019-13106	173	Cook	Robert	12-7-3	IMECE2019-12790	174
Christodoulou	Jule	10-20-1	IMECE2019-13109	114	Cooke	Ian	5-5-2	IMECE2019-10791	53
Chu	Hao-Chuan	4-13-1	IMECE2019-12296	43	Cooper	Cody	17-4-3	IMECE2019-13359	207
Chu	Tiankuo	2-2-7	IMECE2019-12523	18	Cooper	Mattias	8-11-1	IMECE2019-11764	86
Chu	Yu-Cheng	9-18-2	IMECE2019-10689	107	Cooper	Nathanial	6-1-3	IMECE2019-11399	63
Chun	Du Hwan	12-3-1	IMECE2019-12791	170	Coote	David	3-3-1	IMECE2019-12919	32
Chung	Daniel	8-14-1	IMECE2019-11729	84	Corado	Margarita	4-11-2	IMECE2019-11789	44
Chung	Haseung	2-5-6	IMECE2019-13150	22	Cordova	Gustavo	9-51-1	IMECE2019-10324	110
Churilova	Maria	2-10-2	IMECE2019-10635	10	Córdova Aquino	Jacobo	4-10-3	IMECE2019-12124	42
Çiçek	Gökçen	3-13-1	IMECE2019-11483	30	Corman	R.E.	8-2-2	IMECE2019-13370	87
Ciero	Ashley	8-12-1	IMECE2019-11649	86	Cornish	Dan	17-4-3	IMECE2019-12974	206
Cieslinski	Benjamin	7-9-1	IMECE2019-10352	81	Cornwall	Joseph	15-1-1	IMECE2019-13789	187
Cieslinski	Benjamin	7-9-1	IMECE2019-10360	81	Corona	Edmundo	11-7-6	IMECE2019-12856	149
Cigeroglu	Ender	5-3-2	IMECE2019-12218	51	Corona	Edmundo	11-7-6	IMECE2019-12910	149
Cimpuiaru	Mihai	5-5-2	IMECE2019-13265	53	Corona-Lira	Ma. Pilar	10-26-5	IMECE2019-11919	120
Cinefra	Maria	1-1-3	IMECE2019-12607	2	Costa	Ana Helena	14-1-3	IMECE2019-11826	184
Cinefra	Maria	1-6-2	IMECE2019-12608	5	Costa	Carlos A.P.	2-8-2	IMECE2019-11582	19
Cioban	Max	10-4-2	IMECE2019-13186	114	Costa	Carlos A.P.	9-36-2	IMECE2019-11652	99
Ciobanescu Husanu	Irina	7-10-1	IMECE2019-11912	77	Costa	João Filipe Seabra	1-2-2	IMECE2019-11513	4
Ciocanel	Constantin	16-1-1	IMECE2019-13814	191	Costa	Michael	10-14-1	IMECE2019-10400	122
Cioncolini	Andrea	11-43-1	IMECE2019-10393	139	Costa	Ruben	2-8-3	IMECE2019-11362	20
Cioncolini	Andrea	11-43-1	IMECE2019-10404	139	Costa	Ruben	2-8-3	IMECE2019-11415	21
Cipollone	Roberto	6-4-3	IMECE2019-10848	67	Costa	Ruben	2-8-4	IMECE2019-11711	22
Ciri	Umberto	16-1-1	IMECE2019-13240	196	Costa Linhares	Cassiano	1-2-2	IMECE2019-11513	4
Citarella	Roberto	4-11-1	IMECE2019-11774	43	Costa-Greger	Justin	6-9-1	IMECE2019-10768	72
Clark	Jason	12-6-1	IMECE2019-12529	171	Cotter	John	17-2-1	IMECE2019-11525	205
Clark	Margaret	16-1-1	IMECE2019-13267	196	Couper	Samantha	10-26-6	IMECE2019-13854	121
Claussen	Jonathan	4-12-1	IMECE2019-13895	45	Coutinho	Cristiano Pereira	1-2-2	IMECE2019-11513	4
Claussen	Jonathan	10-25-2	IMECE2019-13194	126	Couto	Diogo	6-16-2	IMECE2019-11593	69
Claussen	Jonathan	10-25-2	IMECE2019-13872	126	Cox	Daniel	2-11-1	IMECE2019-12460	8
Claussen	Jonathan	12-5-1	IMECE2019-13188	171	Cox	Lee	15-1-1	IMECE2019-13982	189
Claussen	Jonathan	16-1-1	IMECE2019-13081	194	Craig	Weston	11-18-3	IMECE2019-13328	141
Claussen	Jonathan	16-1-1	IMECE2019-13494	198	Craig	Weston	15-1-1	IMECE2019-13326	188
Clement	Arul	16-1-1	IMECE2019-12902	193	Craig	Weston	17-15-1	IMECE2019-13329	211
Clement	Arul	16-1-1	IMECE2019-13187	195	Crane	Nathan	2-12-1	IMECE2019-11810	10
Clemon	Lee	2-2-2	IMECE2019-13224	15	Crane	Nathan	8-6-2	IMECE2019-11966	89
Clemon	Lee	2-2-7	IMECE2019-13365	18	Crane	Nathan	9-14-1	IMECE2019-13640	102
Clemon	Lee	4-12-1	IMECE2019-13225	45	Crane	Nathan	17-2-1	IMECE2019-11525	205
Clemon	Lee	17-2-1	IMECE2019-13371	206	Craw	Bryan	17-6-1	IMECE2019-13834	208
Closson	Andrew	10-25-1	IMECE2019-13897	123	Creel	Brady	7-9-1	IMECE2019-10352	81
Clulow	Joseph	2-2-6	IMECE2019-12774	21	Creel	Brady	7-9-1	IMECE2019-10360	81
Co	Cynthia	17-4-2	IMECE2019-13592	206	Criollo	Nancy Paulina	7-4-1	IMECE2019-10676	80
Coats	Brittany	4-10-4	IMECE2019-12313	44	Crist	Riley	9-4-1	IMECE2019-13130	106
Coats	Brittany	4-10-4	IMECE2019-13221	44	Crist	Riley	17-9-1	IMECE2019-13135	209
Coday	Eric	6-4-4	IMECE2019-10804	69	Cristillo	Domenico	3-4-1	IMECE2019-10577	29
Coday	Eric	15-1-1	IMECE2019-13849	188	Cristillo	Domenico	5-2-2	IMECE2019-11150	58

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Crook	Cameron	10-19-2	IMECE2019-13718	130	Daryadel	Seyed Soheil	2-2-2	IMECE2019-12807	15
Crook	Cameron	10-19-2	IMECE2019-13865	130	Das	Ranjan	6-7-3	IMECE2019-11117	70
Croom	Brendan	11-18-2	IMECE2019-13673	138	Das	Shraman	8-4-2	IMECE2019-11319	90
Croom	Brendan	11-35-1	IMECE2019-13658	159	Das	Shuvra	7-10-2	IMECE2019-12412	79
Crosby	Karen	16-1-1	IMECE2019-13499	198	Das	Shuvrangsuo	11-47-1	IMECE2019-12848	146
Crossley	Jacob	9-15-1	IMECE2019-10175	108	DasGupta	Anirvan	5-10-2	IMECE2019-12372	50
Crowe	Mary	17-4-2	IMECE2019-13096	206	DasGupta	Anirvan	5-10-2	IMECE2019-12567	50
Cuccato	Riccardo	16-1-1	IMECE2019-12758	192	Dashevskiy	Iliia	12-4-1	IMECE2019-10059	172
Cui	Haitao	10-23-2	IMECE2019-10408	130	Daskiran	Cosan	8-9-1	IMECE2019-10899	83
Cui	Haitao	10-23-2	IMECE2019-11461	130	Dathathreya	K.	12-3-1	IMECE2019-11921	170
Cui	Haitao	11-10-3	IMECE2019-10698	141	Datta	Anisha	16-1-1	IMECE2019-13659	200
Cui	Jin	9-49-1	IMECE2019-11386	109	Datta	Siddhant	3-4-1	IMECE2019-10142	29
Cui	Shuang	10-30-1	IMECE2019-13922	117	Dauer	Edward	2-2-7	IMECE2019-12215	18
Cui	Zheng	6-16-1	IMECE2019-13402	65	Dayeshova	Bagdagul	8-7-1	IMECE2019-10876	84
Cui	Zhiming	10-4-1	IMECE2019-13249	113	Dauyeshova	Bagdagul	8-7-1	IMECE2019-10921	84
Cui	Zhiwei	14-3-1	IMECE2019-10488	182	Davenport	Patrick	6-4-3	IMECE2019-10637	67
Cuitino	Alberto	10-26-6	IMECE2019-13569	121	Davenport	Patrick	17-6-1	IMECE2019-12957	208
Cullinan	Michael	9-6-1	IMECE2019-11994	98	Davis	Steven	16-1-1	IMECE2019-13832	202
Cullinan	Michael	16-2-1	IMECE2019-13549	203	Dawan	Fareed	16-1-1	IMECE2019-13571	199
Cullingsworth	Zachary	17-4-2	IMECE2019-13775	206	Dayal	Kaushik	11-1-4	IMECE2019-13875	152
Cummings	Missy	16-2-1	IMECE2019-13793	204	Dayal	Kaushik	16-1-1	IMECE2019-13068	194
Cunha	Adriana	2-8-4	IMECE2019-11659	22	Dayal	Kaushik	16-1-1	IMECE2019-13187	195
Cunha Jr.	Americo	13-4-1	IMECE2019-11862	178	De Angelo	Michele	16-1-1	IMECE2019-13756	201
Cunha Jr.	Americo	13-4-1	IMECE2019-11872	178	De Angelo	Michele	17-15-1	IMECE2019-13762	215
Cunningham	Seth	5-2-3	IMECE2019-11846	59	de Araújo Barbosa	Maria Lilian	14-1-3	IMECE2019-11826	184
Curet	Oscar	16-1-1	IMECE2019-13863	202	De La Torre	B.	3-3-1	IMECE2019-11968	32
Curran	David	9-6-1	IMECE2019-11792	98	De Las Casas	Humberto	16-2-1	IMECE2019-13296	203
Currier	Patrick	10-15-1	IMECE2019-11429	129	De Martin	Andrea	3-4-1	IMECE2019-10713	29
Curtiss	Larry A.	6-11-1	IMECE2019-11804	68	De Rosa	Sergio	1-6-2	IMECE2019-12608	5
Curtiss	Larry A.	10-30-1	IMECE2019-11705	117	de Vasconcelos	Luize Scalco	16-1-1	IMECE2019-13607	199
Cusatis	Gianluca	11-47-2	IMECE2019-13739	148	DeAgostino	Thomas	13-9-1	IMECE2019-11279	179
Cutright	Paige	2-7-1	IMECE2019-10032	23	Dean	Leon	2-9-3	IMECE2019-13415	12
Cutrina Vilalta	Pau	9-35-1	IMECE2019-11936	94	Dean	Matthew R.	4-8-1	IMECE2019-11238	38
Cutrina Vilalta	Pau	15-1-1	IMECE2019-11855	187	Deb	Dipan	11-42-2	IMECE2019-13915	139
Cwiekala	Nils M.	11-12-4	IMECE2019-12802	166	Deb Maumder	Samarpan	15-1-1	IMECE2019-12331	188
Czaplewski	David	1-1-6	IMECE2019-10449	4	DeBlock	Ryan H.	9-5-1	IMECE2019-13086	111
D A	Subramani	5-6-1	IMECE2019-11986	56	Declerck	Brendon	5-5-2	IMECE2019-10791	53
D S	Rakshith Gowda	2-5-3	IMECE2019-11188	17	Deepak	Dharmpal	2-5-5	IMECE2019-10188	88
Dabetwar	Shweta	13-6-1	IMECE2019-11851	175	DeGiorgi	Virginia	2-9-2	IMECE2019-10608	9
Dagman	Andreas	2-10-2	IMECE2019-10285	10	Dehghanydahaj	Mohammad	11-1-1	IMECE2019-12256	144
Dai	Chunhui	10-11-1	IMECE2019-13833	116	Dehner	Ricky	8-12-1	IMECE2019-10461	86
Dai	Chunhui	10-5-1	IMECE2019-13837	127	Dei Rossi	Joseph	2-2-6	IMECE2019-11698	21
Dai	Jianchuan	5-9-3	IMECE2019-11012	51	Deierling	Phillip	15-1-1	IMECE2019-11499	187
Dai	Xianming	16-1-1	IMECE2019-12626	191	Deierling	Phillip	15-1-1	IMECE2019-13213	188
Dai	Xianming	17-15-1	IMECE2019-13072	213	Delgado	Antonio	8-4-3	IMECE2019-11572	91
Dai	Yifan	16-1-1	IMECE2019-13941	202	Delgado	Hector	5-9-1	IMECE2019-10290	48
Dai	Zongmiao	5-11-2	IMECE2019-11185	57	Dell	Robert	6-6-1	IMECE2019-12250	68
Dalessandro	Luke	11-23-1	IMECE2019-13811	152	Dell	Robert	6-6-1	IMECE2019-12252	68
Dalessandro	Luke	17-11-2	IMECE2019-13815	211	Dell	Robert	6-6-1	IMECE2019-12254	68
Daluga	Peter	9-19-2	IMECE2019-10799	104	DelRio	Frank	11-32-1	IMECE2019-13677	156
Daluga	Peter	9-51-1	IMECE2019-13229	110	DelRio	Frank	12-7-3	IMECE2019-12790	174
Dames	Chris	9-15-1	IMECE2019-10977	108	DeMille	Karen J.	11-12-3	IMECE2019-13161	164
Dametew	Alie Wube	2-7-3	IMECE2019-12693	24	Deming	Zhao	4-13-3	IMECE2019-10887	46
Damodara	Priyadarsini	2-2-4	IMECE2019-11615	18	Demir	Teyfik	2-2-7	IMECE2019-12215	18
Damone	Angelo	11-26-3	IMECE2019-13212	165	Demirkir	Cayan	9-25-1	IMECE2019-11230	98
Danas	Kostas	11-37-1	IMECE2019-12999	154	Demirkoparan	Hasan	11-1-7	IMECE2019-12625	157
Danas	Kostas	11-1-8	IMECE2019-12998	160	Demitz	Jack	6-3-1	IMECE2019-10270	61
Danas	Kostas	11-3-2	IMECE2019-12997	166	Demmler	Matthias	2-7-2	IMECE2019-10390	23
Danawe	Hrishikesh Gajanan	5-9-3	IMECE2019-11128	51	Dempster	William	8-9-3	IMECE2019-10607	84
Daneji	Ali	2-5-3	IMECE2019-10973	17	Deng	Bolei	1-1-4	IMECE2019-13354	3
Daneshazarian	Reza	6-9-2	IMECE2019-12005	73	Deng	Chu-quan	10-24-1	IMECE2019-10901	123
Dang	Bin	14-1-1	IMECE2019-10346	183	Deng	Fanghang	10-4-4	IMECE2019-12898	118
Dang	Bin	14-1-2	IMECE2019-10348	183	Deng	Shikai	16-1-1	IMECE2019-13136	195
Dannenhoffer	Joan	7-1-2	IMECE2019-13584	78	Deng	Xingqiao	14-1-1	IMECE2019-11332	183
Danso	Larry A.	10-4-2	IMECE2019-13235	114	Deng	Yuanchen	1-1-3	IMECE2019-13051	2
Darabi	Amir	1-1-2	IMECE2019-13605	2	Dentinger	Bryn T.M.	17-4-2	IMECE2019-13474	206
Daraio	Chiara	11-3-1	IMECE2019-12698	163	Deo	Ankit	3-4-2	IMECE2019-13585	30
Dardeno	Tina	16-1-1	IMECE2019-13178	195	DePalma	Jude L.	10-14-1	IMECE2019-10084	122
Dargazany	Roosbeh	11-1-2	IMECE2019-12253	146	Depcik	Christopher	7-6-1	IMECE2019-10028	78
Dargazany	Roosbeh	11-1-9	IMECE2019-11771	163	Depcik	Christopher	9-41-1	IMECE2019-10031	96
Dargazany	Roosbeh	11-1-9	IMECE2019-11873	163	Depcik	Christopher	13-9-1	IMECE2019-11279	179
Dargazany	Roosbeh	11-1-9	IMECE2019-11931	163	Desavale	R.G.	5-4-4	IMECE2019-10424	59
Dargie	Andrea	4-11-2	IMECE2019-12173	44	Deshmukh	Nikhil	10-27-3	IMECE2019-12899	131
Darrow	Rebecca	17-4-3	IMECE2019-13595	207	Desmidt	Hans	5-10-1	IMECE2019-11054	52

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Desutter	John	9-30-2	IMECE2019-12911	109	Dong	Peng	14-1-2	IMECE2019-11286	183
Desutter	John	9-30-2	IMECE2019-13031	109	Dong	Qian	5-5-2	IMECE2019-13430	53
DeVogel	Nicholas	4-2-4	IMECE2019-11860	42	Dong	Wenxiang	4-2-5	IMECE2019-10918	43
DeVos	Amanda	4-5-1	IMECE2019-11944	34	Dong	Xiangyang	9-49-1	IMECE2019-11050	109
Devries	Matthew	11-14-2	IMECE2019-10212	147	Dong	Yuanzhe	14-1-2	IMECE2019-11286	183
Dewangan	Dhanendra	10-29-2	IMECE2019-12617	131	Dong	Zhe	6-14-1	IMECE2019-10372	75
Dewangan	Dhanendra	10-29-2	IMECE2019-12618	131	Dong	Zhe	6-14-2	IMECE2019-10489	76
Dhaka	Pankaj	10-24-2	IMECE2019-11222	125	Dong	Zhizhong	10-11-1	IMECE2019-13853	117
Dhamshala	Prakash	17-6-1	IMECE2019-13665	208	Dong	Zhizhong	11-25-1	IMECE2019-13900	142
Dhanasekaran	Vinoth	5-2-4	IMECE2019-12198	60	Dong	Zulong	8-4-1	IMECE2019-10669	89
Dhir	Vijay	17-9-1	IMECE2019-13196	209	Dongare	Avinash	11-11-1	IMECE2019-13946	134
Dhir	Vijay	17-9-1	IMECE2019-13807	209	Donmez	Abdullah	11-47-2	IMECE2019-13739	148
Dhir	Vijay	17-9-1	IMECE2019-13931	209	Donnell	Kristen M.	16-1-1	IMECE2019-13524	198
Dhole	Sourabh	9-4-1	IMECE2019-11656	106	Donnell	Kristen M.	16-2-1	IMECE2019-13800	204
Di Battista	Davide	6-4-3	IMECE2019-10848	67	Doshi	Parshwanath	8-3-3	IMECE2019-10828	91
Di Benedetto	Sara	3-4-1	IMECE2019-10577	29	Dostine	Anthony D.	11-5-3	IMECE2019-13519	160
Di Caprio	Francesco	5-2-2	IMECE2019-11150	58	Doude	Haley	2-3-1	IMECE2019-10323	24
di Pasqua	Anna	9-35-1	IMECE2019-11650	94	Douglas	Tim	10-10-5	IMECE2019-12340	119
di Pasqua	Anna	9-5-1	IMECE2019-11575	110	Dow	Douglas E.	4-8-1	IMECE2019-11238	38
Diab	Nadim	14-3-1	IMECE2019-10262	182	Dowding	Kevin	9-23-1	IMECE2019-13957	93
Diaconeasa	Mihai	13-6-1	IMECE2019-11806	175	Dowell	Earl	16-1-1	IMECE2019-13737	201
Diaconeasa	Mihai	13-6-1	IMECE2019-11825	175	Dower	Steven K.	8-7-1	IMECE2019-13372	84
Diaconeasa	Mihai	13-6-1	IMECE2019-11861	175	Doyle	Christopher	8-9-3	IMECE2019-10607	84
Diaconeasa	Mihai	13-1-1	IMECE2019-12288	176	Doyle	John	2-2-3	IMECE2019-10805	16
Diamantides	Nicole	11-37-4	IMECE2019-13649	163	Drakunov	Sergey	5-2-1	IMECE2019-10464	56
Dias	Joao	13-6-1	IMECE2019-11851	175	Dressel	Andrew	15-1-1	IMECE2019-12167	187
Dias	Joao	13-4-1	IMECE2019-11862	178	Drew	Christopher	9-7-1	IMECE2019-11620	99
Dias	Joao	13-4-1	IMECE2019-11872	178	Drew	Stuart	4-2-3	IMECE2019-10641	40
Diaz	Adrian	11-39-3	IMECE2019-13192	142	Dryden	Alec	4-3-1	IMECE2019-10806	33
Diaz	Adrian	16-1-1	IMECE2019-13317	196	Dryden	Alec	6-5-1	IMECE2019-10808	62
Diaz	Miguel	4-11-2	IMECE2019-12024	44	Dryden	Alec	15-1-1	IMECE2019-13324	188
Dickel	Doyle	11-33-2	IMECE2019-12248	150	D'Silva	Glen	16-1-1	IMECE2019-13814	191
Dickens	Tarik	11-32-1	IMECE2019-11790	155	D'Souza	Nandika	16-1-1	IMECE2019-13163	191
Dickerson	Matthew	2-2-5	IMECE2019-12981	20	D'Souza	Nandika	16-1-1	IMECE2019-13719	201
Diehl	Martin	11-47-1	IMECE2019-13836	146	Du	Fei	1-12-1	IMECE2019-10495	5
Dienemann	Lara	10-1-1	IMECE2019-11655	119	Du	Fei	5-16-1	IMECE2019-12216	54
Diep Ton	Thea	16-1-1	IMECE2019-13234	196	Du	Haodong	10-4-2	IMECE2019-13420	114
Dillon	Heather	6-9-1	IMECE2019-10222	72	Du	Nanye	17-4-3	IMECE2019-12974	206
Dillon	Heather	6-14-1	IMECE2019-10221	75	Du	Xianping	10-15-1	IMECE2019-11429	129
DiLoreto	Edward	10-10-5	IMECE2019-12773	120	Duan	Chang	5-12-1	IMECE2019-11401	53
Ding	Junjun	2-11-1	IMECE2019-11577	8	Duan	Chang	7-10-2	IMECE2019-11424	78
Ding	Siyi	2-10-1	IMECE2019-10020	7	Duan	Huiling	10-14-1	IMECE2019-11021	122
Ding	Wei	16-1-1	IMECE2019-12943	193	Duan	Jianyu	5-11-2	IMECE2019-11185	57
Ding	Yifu	16-1-1	IMECE2019-13146	195	Duan	Jianyu	13-10-2	IMECE2019-10703	177
Ding	Zhiwei	9-15-1	IMECE2019-13355	109	Duan	Pengji	2-11-1	IMECE2019-11577	8
Ding	Zhiwei	17-15-1	IMECE2019-13361	214	Duan	Shawn	4-3-1	IMECE2019-10806	33
Dion	Scott	5-11-2	IMECE2019-11892	57	Duan	Shawn	5-9-3	IMECE2019-11752	51
Dixit	Marm	6-11-1	IMECE2019-13323	68	Duan	Shawn	6-5-1	IMECE2019-10808	62
Dixit	Marm	9-4-1	IMECE2019-13306	106	Duan	Shawn	6-4-4	IMECE2019-10804	69
Dixit	Marm	16-1-1	IMECE2019-13318	197	Duan	Shawn	15-1-1	IMECE2019-13324	188
Dixit	Marm	16-1-1	IMECE2019-13325	197	Duan	Shawn	15-1-1	IMECE2019-13849	188
Diyaroglu	Cagan	3-12-1	IMECE2019-13204	29	Duan	Xudong	10-15-1	IMECE2019-12410	129
Dmuchowski	Christopher	11-26-3	IMECE2019-12278	164	Duan	Xudong	10-23-2	IMECE2019-12409	130
Doan	Phuong	7-12-1	IMECE2019-11978	79	Duarte	Jorge	9-39-2	IMECE2019-10122	101
Dodaran	Mohammad	2-7-4	IMECE2019-11521	25	Duarte Forero	Natalia	9-39-2	IMECE2019-10122	101
Dogan	Oguz	2-8-1	IMECE2019-11554	17	Dubey	Devendra	11-23-3	IMECE2019-13557	155
Dogan	Oguz	4-10-2	IMECE2019-11530	41	Dubey	Kaushlendra	12-8-2	IMECE2019-10426	172
Dogan	Oguz	11-12-4	IMECE2019-11510	166	Dubey	Rahul	3-4-2	IMECE2019-10931	30
Domenikos	George-Rafael	6-2-1	IMECE2019-10076	64	Duc Truong	Binh	16-1-1	IMECE2019-13104	194
Domenikos	George-Rafael	6-2-1	IMECE2019-10077	64	Duffy	Patrick	12-10-1	IMECE2019-13106	173
Dondeti	Sivareddy	11-10-1	IMECE2019-11664	134	Duhaime	Benjamin	8-11-1	IMECE2019-11764	86
Dondeti	Sivareddy	11-10-1	IMECE2019-11676	134	Dumesh	Mike A.	9-63-1	IMECE2019-10272	95
Dong	Bensi	6-4-3	IMECE2019-11149	67	Dumitrescu	Cosmin	6-2-1	IMECE2019-11485	64
Dong	Chuanhe	2-5-3	IMECE2019-10801	17	Dumitrescu	Cosmin	6-4-4	IMECE2019-10728	69
Dong	Chuanzhi	16-1-1	IMECE2019-13656	200	Dumitrescu	Cosmin	6-4-4	IMECE2019-10735	69
Dong	De	4-13-3	IMECE2019-11318	46	Dumitrescu	Cosmin	6-4-4	IMECE2019-11637	69
Dong	Haibo	4-10-1	IMECE2019-11697	40	Dun	Chaochao	16-1-1	IMECE2019-11980	191
Dong	Janet	2-8-2	IMECE2019-11785	19	Duncan	Michael	13-9-1	IMECE2019-11279	179
Dong	Janet	4-13-2	IMECE2019-11716	45	Duncan	Ryan	9-20-1	IMECE2019-13586	94
Dong	Janet	5-4-3	IMECE2019-11762	58	Duncan	Ryan	9-15-1	IMECE2019-13355	109
Dong	Lin	10-25-1	IMECE2019-13897	123	Duncan	Ryan	17-15-1	IMECE2019-13361	214
Dong	Lin	11-37-4	IMECE2019-13848	163	Duncan	Ryan	17-15-1	IMECE2019-13580	214
Dong	Peng	2-6-2	IMECE2019-11297	11	Dunn	Alison C.	16-1-1	IMECE2019-13230	196
Dong	Peng	6-4-2	IMECE2019-11044	66	Dunn	Alison C.	16-1-1	IMECE2019-13562	199

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Dunn	Ashley	13-9-1	IMECE2019-11479	179	El-Morsi	Mohamed	6-4-1	IMECE2019-11285	64
Dunn	Bruce	9-5-1	IMECE2019-13086	111	Elqussas	Nader	6-5-2	IMECE2019-12706	63
Dunn	Bruce	9-5-1	IMECE2019-13919	111	Elsayed	Abdelrahman	15-1-1	IMECE2019-13901	188
Dunn	Christian	8-4-3	IMECE2019-11462	91	Elsayed	Abdelrahman	15-1-1	IMECE2019-13910	188
Dunn	Julia	15-1-1	IMECE2019-13984	189	Elsayed	Abdelrahman	16-1-1	IMECE2019-13904	202
Dunn	Morgan	16-1-1	IMECE2019-13589	199	Saeed A.	Saeed A.	3-2-1	IMECE2019-11047	28
Dunn	Morgan	16-1-1	IMECE2019-13596	199	El-Shahat	Saeed A.	6-5-2	IMECE2019-10686	63
Dunn	Morgan	16-1-1	IMECE2019-13600	199	Elsharafi	Mahmoud	6-1-2	IMECE2019-10043	62
Dunstan	David E.	8-7-1	IMECE2019-13372	84	Elsharafi	Mahmoud	6-1-2	IMECE2019-10283	62
Dutta	Prasun	9-63-1	IMECE2019-12645	95	Elsharqawy	Mostafa	9-59-1	IMECE2019-11786	110
Dutta Majumdar	J.	2-7-4	IMECE2019-10715	25	Elwany	Alaa	2-12-2	IMECE2019-12784	13
Dwibedi	Subhasankar	10-10-3	IMECE2019-11116	116	Elwany	Alaa	16-1-1	IMECE2019-12674	191
Dwibedi	Subhasankar	10-9-3	IMECE2019-11098	127	Elzarka	Hazem	2-8-2	IMECE2019-11785	19
Dwivedi	Arpit	6-7-2	IMECE2019-11731	67	Elzarka	Hazem	5-4-3	IMECE2019-11762	58
Dworkin	Seth B.	6-4-3	IMECE2019-10542	67	Emblom	William	2-7-1	IMECE2019-10032	23
Dworkin	Seth B.	6-9-2	IMECE2019-12005	73	Emdadi	Arash	6-2-3	IMECE2019-10739	66
Dzenis	Yuris	11-42-2	IMECE2019-13917	139	Emdadi	Simin	6-2-3	IMECE2019-10739	66
Dzenis	Yuris	15-1-1	IMECE2019-13910	188	Emery	John	11-7-1	IMECE2019-13771	133
Dzenis	Yuris	16-1-1	IMECE2019-13904	202	Emon	Asif	17-9-1	IMECE2019-13358	209
Eastridge	Jonathan R.	8-3-3	IMECE2019-12726	91	Emon	Md. Omar Faruk	11-3-1	IMECE2019-12969	163
Eaton	Tara	7-1-1	IMECE2019-10494	77	Emori	Kanako	10-10-4	IMECE2019-11099	118
Ebermann	Marko	14-1-1	IMECE2019-10179	183	Emori	Kanako	10-10-4	IMECE2019-11141	118
Ebrahimi	Hossein	11-1-7	IMECE2019-11930	157	Emori	Kanako	10-10-4	IMECE2019-11143	118
Ebro	Martin	2-10-1	IMECE2019-11251	7	Endean	Dan	12-10-1	IMECE2019-13106	173
Eckels	Steven	3-2-1	IMECE2019-10460	28	Engeda	Abraham	6-2-2	IMECE2019-11357	65
Edwards	Micael	11-7-7	IMECE2019-13697	152	Engler-Pinto	Carlos	11-10-3	IMECE2019-10698	141
Effati	Salar	17-9-1	IMECE2019-13933	210	Enriquez	Luis	8-4-3	IMECE2019-11462	91
Efstathiou	Chara	2-9-1	IMECE2019-12611	7	Eppele	Philipp	8-5-1	IMECE2019-11761	88
Efstathiou	Chara	2-9-1	IMECE2019-12883	7	Eppele	Philipp	8-4-2	IMECE2019-11417	90
Egbo	Munonyedi	17-9-1	IMECE2019-13057	209	Eppele	Philipp	8-4-3	IMECE2019-11572	91
Egboiyi	Benedict	11-7-3	IMECE2019-11700	140	Ercole	Davide	9-5-1	IMECE2019-11575	110
Eia	Maren Eriksen	5-9-1	IMECE2019-10436	48	Erickson	Gregory M.	4-5-1	IMECE2019-13127	34
Eifler	Tobias	2-10-1	IMECE2019-11251	7	Erickson	Gregory M.	16-1-1	IMECE2019-13688	200
Ekanayake	Nilanka I.K.	8-7-1	IMECE2019-13372	84	Erickson	Gregory M.	16-1-1	IMECE2019-13862	202
Ekkad	Srinath	9-41-1	IMECE2019-11283	96	Erol	Ozan	11-3-2	IMECE2019-13394	166
Ekkad	Srinath	9-64-1	IMECE2019-10760	97	Ertekin	Elif	12-7-1	IMECE2019-11867	169
Ekkad	Srinath	9-46-1	IMECE2019-10660	102	Ertekin	Elif	12-7-2	IMECE2019-11830	173
Ekkad	Srinath	9-19-1	IMECE2019-10748	103	Erturk	Hakan	9-25-1	IMECE2019-11230	98
Ekkad	Srinath	9-10-1	IMECE2019-13972	103	Erturk	Hakan	9-7-1	IMECE2019-11611	99
Ekstrom	Thomas C.	10-26-5	IMECE2019-12096	120	Erturk	Hakan	9-14-1	IMECE2019-11595	102
Ekuase	Okunzuwa	16-1-1	IMECE2019-13571	199	Ervin	Eric	12-6-1	IMECE2019-13047	172
Ekwaro-Osire	Stephen	13-6-1	IMECE2019-11851	175	Escandon	Juan P.	12-8-2	IMECE2019-10466	172
Ekwaro-Osire	Stephen	13-4-1	IMECE2019-11862	178	Escano	Luis I.	16-1-1	IMECE2019-13772	201
Ekwaro-Osire	Stephen	13-4-1	IMECE2019-11872	178	Eschweido	Abdelkareem	6-1-2	IMECE2019-10283	62
El Khoury	Tracy	16-1-1	IMECE2019-13799	202	Escobedo	Gilberto	2-13-1	IMECE2019-11023	8
Elahi	A.N.M. Taufiq	6-4-5	IMECE2019-10671	71	Esfahani	S.E.	10-27-1	IMECE2019-12780	126
Elahi	A.N.M. Taufiq	16-1-1	IMECE2019-12663	191	Esfahani	S.E.	11-34-1	IMECE2019-12781	167
Elahi	Fazle	10-9-1	IMECE2019-12828	122	Eshed	Anat	15-1-1	IMECE2019-10659	187
Elahi	Fazle	10-2-1	IMECE2019-12827	126	Esmaeeli	Roja	2-3-2	IMECE2019-10986	25
Elapolu	Mohan Surya Raja	16-1-1	IMECE2019-13937	202	Esmaeeli	Roja	6-1-1	IMECE2019-11949	61
Elatar	Ahmed	6-1-1	IMECE2019-11616	61	Esmaeeli	Roja	6-1-2	IMECE2019-10755	62
Elatar	Ahmed	9-35-1	IMECE2019-13366	94	Esmaeeli	Roja	6-11-3	IMECE2019-10479	71
Elbadry	Mohamed	11-39-2	IMECE2019-13021	138	Esmaeilpour	Mehdi	4-6-2	IMECE2019-10922	37
El-Bagory	Tarek	10-24-1	IMECE2019-10298	123	Esmaeilzadeh	Hamed	4-3-2	IMECE2019-12514	35
Elbanna	Ahmed	11-46-2	IMECE2019-12647	143	Esmaeilzadeh	Hamed	6-7-2	IMECE2019-10457	67
El-Batsh	Hesham M.	3-2-1	IMECE2019-11047	28	Esmailie	Fateme	4-9-1	IMECE2019-13034	42
El-Batsh	Hesham M.	6-5-2	IMECE2019-10686	63	Esmailie	Fateme	17-9-1	IMECE2019-13035	209
Elbing	Brian	8-2-1	IMECE2019-13905	86	Esquivel	Amanda	17-4-3	IMECE2019-12996	207
El-Borgi	Sami	1-1-5	IMECE2019-11302	4	Esteban Linares	Alberto	8-6-4	IMECE2019-13565	92
Eldaly	Mamdouh	6-6-1	IMECE2019-12254	68	Esteban Linares	Alberto	17-15-1	IMECE2019-13593	212
Eldredge	Thomas	8-14-1	IMECE2019-12492	84	Esteban Villegas	Helio	5-12-1	IMECE2019-11450	53
El-Gabry	Lamyaa	9-46-1	IMECE2019-10974	103	Estlack	Zachary	8-6-3	IMECE2019-13393	91
Elgazzar	Khalid	13-6-1	IMECE2019-11825	175	Estrada	Tyler	11-1-5	IMECE2019-13116	153
Elhussein	Amr	4-5-1	IMECE2019-11944	34	Esworthy	Timothy	10-23-2	IMECE2019-11461	130
Eliasson	Veronica	3-10-1	IMECE2019-13483	31	Eto	Ryosuke	5-9-2	IMECE2019-10781	50
Eliasson	Veronica	11-10-1	IMECE2019-12249	134	Eto	Ryosuke	5-4-1	IMECE2019-10780	54
Eliiseeva	Olga	10-19-1	IMECE2019-13155	127	Eugenio Barroso	Jeffer S.	8-9-4	IMECE2019-12038	85
Elishakoff	Isaac	5-13-1	IMECE2019-12145	58	Eugenio Barroso	Jeffer S.	15-1-1	IMECE2019-13932	188
Elkholy	Ahmed	9-9-1	IMECE2019-11777	101	Evans	Benjamin	10-13-1	IMECE2019-12165	129
Elkins	Christopher	8-11-1	IMECE2019-11764	86	Evans	Benjamin	17-15-1	IMECE2019-12519	212
Elliott	Ryan S.	11-33-1	IMECE2019-12720	147	Ewoldt	Randy H.	8-2-2	IMECE2019-13370	87
Elliott	Ryan S.	11-37-3	IMECE2019-13019	159	Fabiyi	Victor	16-1-1	IMECE2019-13769	201
Elliott	Ryan S.	11-37-5	IMECE2019-12988	165	Fadeel	Abdalsalam	10-9-1	IMECE2019-11898	122
Elis	Nathan	5-4-4	IMECE2019-10299	59	Faezi	Sina	16-1-1	IMECE2019-13643	200

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Fagan	Brian	4-2-4	IMECE2019-12650	42	Ferguson	Gehn	10-26-5	IMECE2019-11689	120
Fagan	Diana	4-2-3	IMECE2019-10641	40	Ferguson	Kyle	17-6-1	IMECE2019-13736	208
Fajardo	Juan	6-3-1	IMECE2019-10642	61	Ferkul	Paul	9-39-1	IMECE2019-11908	100
Fajardo	Juan	6-2-2	IMECE2019-10410	65	Fernandes	Ralston	1-1-5	IMECE2019-11302	4
Fan	Gary (Yue-Long)	12-3-1	IMECE2019-11181	170	Ferrari	Giovanni	4-5-2	IMECE2019-11520	36
Fan	Jiang	2-9-2	IMECE2019-10730	9	Ferrari	Giovanni	5-5-1	IMECE2019-10663	47
Fan	Mu	5-15-1	IMECE2019-10852	48	Ferrari	Giovanni	11-42-1	IMECE2019-10339	136
Fan	Rang-lin	1-6-2	IMECE2019-12470	5	Ferrari	Giovanni	11-1-3	IMECE2019-10667	148
Fan	Shanhui	9-30-1	IMECE2019-12708	108	Ferreira	Ana C.	6-4-2	IMECE2019-11542	66
Fan	Shanhui	9-30-1	IMECE2019-12709	108	Ferreira	Manuel Eduardo	6-16-2	IMECE2019-11593	69
Fan	Shanhui	9-5-1	IMECE2019-12710	110	Ferreira	Placid	2-8-1	IMECE2019-10621	17
Fan	Shanhui	9-31-1	IMECE2019-12916	111	Ferreira	Placid	9-36-1	IMECE2019-11421	96
Fan	Zheyong	9-25-2	IMECE2019-13409	100	Ferriera	Jarod	14-3-2	IMECE2019-11561	184
Fang	Jie	16-1-1	IMECE2019-12656	191	Feser	Joseph	9-25-2	IMECE2019-13705	100
Fang	Lezheng	1-1-2	IMECE2019-13605	2	Feser	Joseph	9-29-2	IMECE2019-13709	105
Fang	Lichen	2-2-5	IMECE2019-13113	20	Feser	Joseph	17-15-1	IMECE2019-13706	214
Fang	Lichen	11-32-1	IMECE2019-13123	155	Feser	Joseph	17-15-1	IMECE2019-13727	214
Fang	Lichen	16-1-1	IMECE2019-13118	194	Fezzaa	Kamel	16-1-1	IMECE2019-13772	201
Fang	Wenqiang	11-37-4	IMECE2019-12909	162	Fialkova	Svitlana	10-26-5	IMECE2019-11783	120
Fang	Xiaomin	11-12-4	IMECE2019-11018	166	Fialkova	Svitlana	16-1-1	IMECE2019-13427	197
Fang	Ziwen	13-10-2	IMECE2019-12310	177	Fialkova	Svitlana	16-1-1	IMECE2019-13473	198
Fang	Ziwen	13-10-2	IMECE2019-12446	177	Figueiras	Paulo	2-8-3	IMECE2019-11362	20
Farfan	Eduardo	6-14-1	IMECE2019-11025	75	Figueiras	Paulo	2-8-3	IMECE2019-11415	21
Farfan	Eduardo	6-14-2	IMECE2019-11027	76	Filippi	Matteo	3-14-1	IMECE2019-11281	32
Farfan	Eduardo	10-26-4	IMECE2019-11411	118	Filippi	Matteo	3-14-1	IMECE2019-11314	32
Farhad	Siamak	2-3-2	IMECE2019-10986	25	Filippi	Matteo	3-14-1	IMECE2019-11364	32
Farhad	Siamak	6-1-1	IMECE2019-11949	61	Fincher	Cole	11-46-2	IMECE2019-13257	143
Farhad	Siamak	6-1-2	IMECE2019-10755	62	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farhad	Siamak	6-11-3	IMECE2019-10479	71	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farhat	Charbel	5-1-1	IMECE2019-13995	47	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farina	Jordan	6-9-1	IMECE2019-10222	72	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farina	Jordan	6-14-1	IMECE2019-10221	75	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farouk	Bakhtier	1-6-2	IMECE2019-12377	5	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farouk	Tanvir	9-43-2	IMECE2019-11065	95	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farraj M. Alsahli	Mohammad	10-26-1	IMECE2019-10308	114	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farsiani	Yasaman	8-2-1	IMECE2019-13905	86	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Faruque	Omar	6-11-1	IMECE2019-12871	68	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farvardin	Amirhossein	4-10-2	IMECE2019-12023	41	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farvardin	Amirhossein	4-10-4	IMECE2019-12142	44	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farwaha	Harnam Singh	2-5-5	IMECE2019-10188	88	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farzad	Milad	8-2-3	IMECE2019-11404	88	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Farzobod	Farhad	12-1-1	IMECE2019-12270	171	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Fatahi	A.	6-10-2	IMECE2019-11859	73	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Fatoba	Samuel	10-27-2	IMECE2019-12513	13	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Faull	Raymond	8-9-1	IMECE2019-10101	83	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Favi	Claudio	14-1-2	IMECE2019-11587	183	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Fayed	Mohamed	6-5-2	IMECE2019-10332	63	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Fazelpour	Mohammad	14-4-1	IMECE2019-11539	181	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Fazle Rabbi	Kazi	9-45-1	IMECE2019-10613	96	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Fazle Rabbi	Kazi	9-45-1	IMECE2019-12017	96	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Fazle Rabbi	Kazi	17-9-1	IMECE2019-12900	209	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Fazle Rabbi	Kazi	17-15-1	IMECE2019-13334	214	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Fear	Conner	6-11-1	IMECE2019-12131	68	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feigenbaum	Heidi	16-1-1	IMECE2019-13814	191	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Felhofer	Samantha	7-4-1	IMECE2019-10467	80	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Felmler	Robert	17-4-2	IMECE2019-13096	206	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Biao	11-7-7	IMECE2019-12736	152	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Bin	16-1-1	IMECE2019-12989	191	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Dehua	8-3-1	IMECE2019-10079	88	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Dudong	9-30-1	IMECE2019-12610	108	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Dudong	9-30-2	IMECE2019-13270	109	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Dudong	17-15-1	IMECE2019-12609	212	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Gang	17-15-1	IMECE2019-12584	212	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Gang	17-15-1	IMECE2019-12587	212	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Haidong	12-8-1	IMECE2019-13401	170	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Haidong	12-8-1	IMECE2019-13884	170	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Haidong	12-6-1	IMECE2019-13047	172	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Huijun	6-2-2	IMECE2019-10115	65	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Huijun	6-2-3	IMECE2019-10116	66	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Huijun	9-51-2	IMECE2019-10117	112	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Feng	Sheng	5-5-1	IMECE2019-11370	47	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Ferguson	Andrew	9-30-2	IMECE2019-13270	109	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Ferguson	Donald	9-39-2	IMECE2019-11728	101	Fischer	Bryan	2-10-3	IMECE2019-10711	12
Ferguson	Frederick	8-3-1	IMECE2019-10079	88	Fischer	Bryan	2-10-3	IMECE2019-10711	12

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Francoeur	Mathieu	9-30-2	IMECE2019-13031	109	Gale	Bruce	12-6-1	IMECE2019-13047	172
Francoeur	Mathieu	9-30-2	IMECE2019-13470	109	Gale	Bruce	17-15-1	IMECE2019-12874	211
Francoeur	Mathieu	16-1-1	IMECE2019-12895	193	Galich	Pavel	1-1-5	IMECE2019-13647	3
Francoeur	Mathieu	17-9-1	IMECE2019-13035	209	Gallant	Nathan	2-12-1	IMECE2019-11810	10
Francoeur	Mathieu	17-9-1	IMECE2019-13135	209	Gallman	Benjamin	8-7-1	IMECE2019-12236	84
Frankel	Zelda	4-11-1	IMECE2019-10650	43	Galvanetto	Ugo	11-38-1	IMECE2019-13301	145
Fratto	Edward	6-7-2	IMECE2019-10457	67	Galvez	Robert	6-1-2	IMECE2019-12059	62
Frazier	Michael	1-1-2	IMECE2019-11782	2	Ganesan	Sriram	10-2-1	IMECE2019-12699	126
Frazier	Michael	1-1-4	IMECE2019-12106	3	Gangstad	Daniel	5-11-1	IMECE2019-10434	55
Frecker	Mary	10-9-2	IMECE2019-13385	124	Gao	Ce	2-8-2	IMECE2019-11785	19
Freed	Alan	17-4-2	IMECE2019-13592	206	Gao	Ce	5-4-3	IMECE2019-11762	58
Freedman	Dror	11-8-2	IMECE2019-13674	137	Gao	Fei	1-12-2	IMECE2019-13653	6
Freeman	Benny	11-26-2	IMECE2019-13141	162	Gao	Huajian	11-1-3	IMECE2019-12391	149
Freisinger	Gregory M.	4-11-2	IMECE2019-11948	44	Gao	Junfeng	16-1-1	IMECE2019-12902	193
Freisinger	Gregory M.	15-1-1	IMECE2019-13976	189	Gao	Junfeng	16-1-1	IMECE2019-13187	195
Freitas	Sierra	16-2-1	IMECE2019-13631	204	Gao	Peng	5-3-3	IMECE2019-12488	47
Frey	Sean T.	10-4-4	IMECE2019-13820	118	Gao	Xin-Lin	11-36-1	IMECE2019-11094	159
Fricke	Brian	6-1-1	IMECE2019-11616	61	Gao	Xin-Lin	11-36-1	IMECE2019-11528	159
Fricke	Brian	9-35-1	IMECE2019-13366	94	Gao	Xin-Lin	11-36-2	IMECE2019-12458	162
Fridlyand	Alex	8-4-3	IMECE2019-11449	91	Gao	Yang	8-3-1	IMECE2019-10079	88
Fritsche	Manuel	8-4-2	IMECE2019-11417	90	Gao	Yuan	6-5-2	IMECE2019-11382	63
Fritsche	Manuel	8-4-3	IMECE2019-11572	91	Gao	Yuan	6-4-2	IMECE2019-10403	66
Frolov	Konstantin	17-4-2	IMECE2019-13775	206	Gao	Yuan	6-4-2	IMECE2019-13939	66
Fronk	Matthew	1-1-2	IMECE2019-13564	2	Gao	Yuan	8-6-1	IMECE2019-10533	88
Frostig	Yeoshua	3-6-1	IMECE2019-12725	27	Gao	Yuan	8-6-1	IMECE2019-10535	92
Frostig	Yeoshua	3-6-1	IMECE2019-13065	27	Gao	Yuan	9-24-1	IMECE2019-12940	107
Frostig	Yeoshua	3-6-2	IMECE2019-13071	27	Gao	Yuan	11-25-1	IMECE2019-12939	142
Frybarger	Michelle	4-2-3	IMECE2019-13157	40	Gao	Yuan	16-1-1	IMECE2019-12719	192
Fu	Chenglong	4-7-1	IMECE2019-10584	34	Gao	Yuan	16-1-1	IMECE2019-13015	194
Fu	Gang	2-14-1	IMECE2019-10383	21	Garavitto	Oguier A.	6-10-4	IMECE2019-10643	75
Fu	Gen	16-1-1	IMECE2019-12765	192	Garcia	Chad	17-7-1	IMECE2019-13944	208
Fu	Kun	2-4-1	IMECE2019-12640	14	Garcia	Cristian	15-1-1	IMECE2019-13965	189
Fu	Kun	2-2-7	IMECE2019-12523	18	Garcia	David	16-1-1	IMECE2019-13633	200
Fu	Kun	10-19-2	IMECE2019-12522	130	Garcia	Gisela	2-8-3	IMECE2019-11362	20
Fu	Lei	3-2-1	IMECE2019-11047	28	Garcia	Jesus	6-10-1	IMECE2019-11316	72
Fu	Lei	6-5-2	IMECE2019-10686	63	Garcia	Martin	7-5-1	IMECE2019-10235	81
Fu	Shichen	16-1-1	IMECE2019-12632	191	Garcia	Nicole	17-6-1	IMECE2019-13834	208
Fu	Shichen	16-1-1	IMECE2019-13604	199	Garcia De Miguel	Alberto	1-1-3	IMECE2019-12607	2
Fu	Xiang	4-4-2	IMECE2019-10405	35	Garcia-Perez	Manuel	17-6-1	IMECE2019-13463	208
Fu	Xinkai	16-2-1	IMECE2019-13295	203	Gardner	John	6-9-3	IMECE2019-10456	74
Fu	Xuwei	16-1-1	IMECE2019-12735	192	Gardner	John	6-9-3	IMECE2019-10522	74
Fu	Yiqin	5-16-1	IMECE2019-12673	54	Gardner	John	6-9-3	IMECE2019-10523	74
Fuckner	Julia	14-2-2	IMECE2019-10105	183	Gardone	Frank	10-26-1	IMECE2019-10303	114
Fujita	Katsuhide	5-2-2	IMECE2019-11055	58	Garg	Utkarsh	8-4-2	IMECE2019-11319	90
Fujita	Shohei	10-1-1	IMECE2019-11816	119	Garimella	Harsha T.	4-2-1	IMECE2019-13531	36
Fukuda	Shuichi	14-1-4	IMECE2019-10864	185	Garland	Nate	4-12-1	IMECE2019-13895	45
Fukuda	Shuichi	14-1-4	IMECE2019-13376	185	Garland	Nate	10-25-2	IMECE2019-13872	126
Fukui	Shigeru	5-11-2	IMECE2019-11176	57	Garmestani	Hamid	16-1-1	IMECE2019-12982	194
Fumikura	Tomoya	12-7-2	IMECE2019-10558	173	Garratt	Elias	2-2-2	IMECE2019-13670	15
Furer	Joshua	11-37-1	IMECE2019-12816	154	Garreton	Gonzalo Garcia	16-1-1	IMECE2019-13863	202
Furman	Brandon	11-18-3	IMECE2019-13169	141	Garretson	Sam	15-1-1	IMECE2019-13958	188
Furman	Brandon	11-18-3	IMECE2019-13477	141	Garrett	Brian	8-9-1	IMECE2019-13953	83
Furman	Brandon	15-1-1	IMECE2019-13515	188	Garrido	Gianina	5-12-1	IMECE2019-11557	53
Furman	Brandon	17-15-1	IMECE2019-13511	211	Garrido	Gianina	14-1-2	IMECE2019-11647	183
Furner	Joseph	6-10-3	IMECE2019-13550	74	Garrison	Peter	8-9-4	IMECE2019-10257	85
Furukawa	Taichi	17-15-1	IMECE2019-13377	212	Gasbarro	Lorenzo	6-2-1	IMECE2019-11485	64
Furukawa	Taichi	17-15-1	IMECE2019-13380	212	Gast	Stefan	8-4-3	IMECE2019-11572	91
Furukawa	Tomonari	5-4-2	IMECE2019-12030	56	Gaurkar	Pavel Vijay	5-5-1	IMECE2019-12070	47
Futamura	Muneo	8-2-1	IMECE2019-12755	86	Gaustad	Gabrielle	16-2-1	IMECE2019-13295	203
Futamura	Muneo	8-2-2	IMECE2019-10550	87	Gawade	Sanjaykumar	5-4-4	IMECE2019-10424	59
Futamura	Muneo	8-2-3	IMECE2019-10683	88	Gawande	S.H.	10-29-1	IMECE2019-10163	128
Gaben	Mahdi	3-15-1	IMECE2019-13211	30	Gay	Jasmine	11-32-1	IMECE2019-11790	155
Gad	Ahmad	11-36-1	IMECE2019-11528	159	Gaynor	Andrew	10-20-2	IMECE2019-13572	115
Gad	Ahmad	11-36-2	IMECE2019-12458	162	Gaynor	Andrew	10-20-2	IMECE2019-13942	115
Gadalla	Mohamed	9-16-1	IMECE2019-12083	111	Gaynor	Andrew	10-20-4	IMECE2019-12891	124
Gadelmoula	Ali	10-26-3	IMECE2019-11120	117	Gaynor	Andrew	10-19-1	IMECE2019-13022	127
Gahan	Kevan	11-10-3	IMECE2019-11680	141	Ge	Conghui	4-3-2	IMECE2019-11001	35
Gaitanaros	Stavros	11-46-1	IMECE2019-13253	137	Gearba	Raluca	11-26-2	IMECE2019-13138	162
Gaitanaros	Stavros	11-37-4	IMECE2019-13258	162	Gearhart	Jhana S.	11-22-2	IMECE2019-10521	145
Gaitonde	Datta	8-3-3	IMECE2019-10828	91	Gebhardt	Rose	7-5-1	IMECE2019-10282	81
Galarza	Jose	4-7-1	IMECE2019-11233	34	Gebresenbet	Tafesse	2-7-3	IMECE2019-12693	24
Gale	Bruce	12-2-1	IMECE2019-14008	169	Geder	Jason	11-5-1	IMECE2019-11244	155
Gale	Bruce	12-8-1	IMECE2019-13401	170	Gee	David	6-1-3	IMECE2019-10751	63
Gale	Bruce	12-8-1	IMECE2019-13884	170	Genc	Mehmet Onur	14-3-2	IMECE2019-10965	184

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Genc	Mehmet Onur	14-3-2	IMECE2019-12299	184	Godinez	Joel	8-4-3	IMECE2019-11462	91
Gendelman	Oleg	5-3-1	IMECE2019-11218	49	Goebel	Kai	18-1-1	IMECE2019-14012	217
Geng	Hui	13-6-1	IMECE2019-11193	175	Goel	Leela	4-4-2	IMECE2019-12208	35
George	Edison	9-51-2	IMECE2019-10078	111	Goggans	Paul	12-1-1	IMECE2019-12270	171
George	Paige	7-9-1	IMECE2019-12451	81	Gohil	Rajpalsinh	11-12-1	IMECE2019-10559	158
Georgiadis	John	4-4-1	IMECE2019-12182	33	Gokhale	Omkar	8-7-1	IMECE2019-10670	84
Georgiou	Ioannis	5-15-1	IMECE2019-13927	49	Goldberg	Nathaniel	11-5-2	IMECE2019-12511	157
German	Emma	11-18-3	IMECE2019-13169	141	Goldfeld	Yiska	3-6-1	IMECE2019-12641	27
German	Emma	15-1-1	IMECE2019-13979	189	Goldfeld	Yiska	3-15-1	IMECE2019-13211	30
German	Emma E.	11-18-3	IMECE2019-13477	141	Goldschmidt	Margalit	1-2-1	IMECE2019-11381	1
German	Emma E.	15-1-1	IMECE2019-13515	188	Goli	Elyas	16-1-1	IMECE2019-12715	192
German	Emma E.	17-15-1	IMECE2019-13511	211	Goli	Elyas	16-1-1	IMECE2019-12867	193
German	Sean	12-6-1	IMECE2019-13047	172	Gomes	Carmen L.	4-12-1	IMECE2019-13895	45
Germani	Michele	14-1-2	IMECE2019-11587	183	Gomes	Carmen L.	10-25-2	IMECE2019-13194	126
Germann	Timothy	11-38-3	IMECE2019-12767	150	Gomes	Carmen L.	10-25-2	IMECE2019-13872	126
Gernand	Jeremy	13-4-1	IMECE2019-11857	177	Gomes	Carmen L.	16-1-1	IMECE2019-13081	194
Gerstberger	Ulf	2-10-3	IMECE2019-10294	12	Gomes	Carmen L.	16-1-1	IMECE2019-13494	198
Geubelle	Philippe	2-9-3	IMECE2019-13415	12	Gomez	Connie	7-12-1	IMECE2019-11978	79
Geubelle	Philippe	11-44-1	IMECE2019-12559	139	Gomez	Humberto	6-11-3	IMECE2019-11725	71
Geubelle	Philippe	11-44-1	IMECE2019-12560	140	Gomez	Humberto	6-12-2	IMECE2019-11875	74
Geubelle	Philippe	16-1-1	IMECE2019-12715	192	Gomez	Humberto	13-1-1	IMECE2019-11241	176
Geubelle	Philippe	16-1-1	IMECE2019-12867	193	Gonçalves	Maria M.	6-16-2	IMECE2019-11593	69
Gevinski	Jakerson	5-2-4	IMECE2019-12179	60	Gonchikar	Ugrasen	2-6-2	IMECE2019-11168	11
Ghaemi	Zahra	6-8-1	IMECE2019-13871	71	Gonella	Stefano	1-1-2	IMECE2019-12949	2
Ghag	Pratik	3-7-1	IMECE2019-10070	28	Gonella	Stefano	16-1-1	IMECE2019-12947	193
Ghahremani	Kasra	6-1-3	IMECE2019-10751	63	GONG	Liang	10-17-2	IMECE2019-12271	123
Ghankutkar	Prathamesh	1-2-1	IMECE2019-10096	1	Gong	Ningtao	4-13-2	IMECE2019-10471	45
Ghankutkar	Prathamesh	1-2-2	IMECE2019-13053	4	Gong	W.W.	2-7-1	IMECE2019-10341	23
Gharbia	Yusef	6-5-2	IMECE2019-10332	63	Gonzalez	Kevin	11-46-2	IMECE2019-12810	143
Ghareeb	Ahmed	11-46-2	IMECE2019-12647	143	Gonzalez	Vanessa	15-1-1	IMECE2019-11405	187
Gharehdaghi	Samad	11-25-1	IMECE2019-13889	142	González	Hernando	15-1-1	IMECE2019-13932	188
Gharehdaghi	Samad	11-26-3	IMECE2019-12039	165	Gonzalez-Mendivil	Jorge A.	7-10-2	IMECE2019-11813	79
Gharehdaghi	Samad	17-15-1	IMECE2019-11971	211	Goodman	Erica M.	10-26-5	IMECE2019-12096	120
Gharib	Mohamed	7-9-1	IMECE2019-10352	81	Gordon	Vernita	16-1-1	IMECE2019-13502	198
Gharib	Mohamed	7-9-1	IMECE2019-10360	81	Gorgitattanagul	Patcharapol	9-18-1	IMECE2019-12432	106
Gharib	Mohamed	10-10-3	IMECE2019-10433	116	Gorguluarslan	Recep Muhammet	2-2-7	IMECE2019-12215	18
Ghashami	Mohammad	6-4-5	IMECE2019-10671	71	Gorodkov	Alexander	4-9-1	IMECE2019-11298	42
Ghashami	Mohammad	16-1-1	IMECE2019-12663	191	Gorothala	Ravi	6-9-2	IMECE2019-11941	73
Ghelmani	M.	17-2-1	IMECE2019-13247	205	Goryu	Akihiro	12-7-2	IMECE2019-10558	173
Gholivand	Hamed	9-25-1	IMECE2019-11692	98	Gorzkowski	Edward	2-9-2	IMECE2019-10608	9
Ghoniem	Ahmed	9-41-1	IMECE2019-10500	96	Gorzkowski	Edward	2-9-2	IMECE2019-10930	9
Ghoreishi	Seyede F.	16-1-1	IMECE2019-13766	201	Goss	Donald L.	15-1-1	IMECE2019-13976	189
Ghosh	Abhijit	5-10-2	IMECE2019-12567	50	Gossage	Lily	7-3-1	IMECE2019-11394	79
Ghosh	Anup	10-2-1	IMECE2019-10913	126	Goswami	D. Yogi	6-7-1	IMECE2019-10606	66
Ghosh	Ranjay	11-1-7	IMECE2019-11930	157	Goswami	D. Yogi	16-1-1	IMECE2019-13782	201
Ghosh	Somnath	10-20-3	IMECE2019-13454	121	Gottumukkala	Raju	13-6-1	IMECE2019-11861	175
Ghosh	Somnath	11-44-1	IMECE2019-12555	139	Gou	Feilin	11-26-2	IMECE2019-12277	162
Ghosh	Somnath	11-33-1	IMECE2019-13952	148	Gou	Feilin	11-26-3	IMECE2019-12278	164
Ghosh	Suhash	7-1-2	IMECE2019-11954	78	Gou	Feilin	11-26-3	IMECE2019-12318	164
Ghosh	Suhash	7-4-1	IMECE2019-11937	80	Goudarzi	Navid	6-5-1	IMECE2019-13039	62
Ghosh	Susanta	11-33-2	IMECE2019-13410	150	Goulbourne	Nakhiah	11-2-1	IMECE2019-13431	157
Ghosh	Susanta	11-23-2	IMECE2019-13671	153	Goulbourne	Nakhiah	11-2-1	IMECE2019-13459	157
Ghoshal	Abhishek	2-5-4	IMECE2019-10961	19	Gouma	Perena	17-15-1	IMECE2019-13858	215
Gibbons	Melissa	11-17-1	IMECE2019-13029	135	Goundar	Jowesh	12-1-1	IMECE2019-11076	171
Gibbons	Nathaniel	8-14-1	IMECE2019-10972	83	Goyne	Christopher	8-14-1	IMECE2019-10972	83
Gibbons	Sean	2-12-2	IMECE2019-12784	13	Graca	Diogo	2-8-3	IMECE2019-11362	20
Gifford	Jeffrey	6-4-3	IMECE2019-10637	67	Gracheva	Alena	11-47-4	IMECE2019-13590	153
Gifford	Jeffrey	17-6-1	IMECE2019-12957	208	Gracias	David	11-3-2	IMECE2019-13394	166
Gil	Ludovic	11-1-6	IMECE2019-12557	154	Gradi	Paul	11-14-3	IMECE2019-13100	149
Gilaki	Mehdi	10-15-1	IMECE2019-13686	129	Graf	Erin	17-4-3	IMECE2019-13595	207
Gilavdary	Igor	10-29-1	IMECE2019-10137	128	Graham	Ian	14-1-4	IMECE2019-10674	185
Gillette	Rhanor	4-9-1	IMECE2019-12849	42	Granger	Andrew	2-7-1	IMECE2019-10032	23
Gilligan	Ryan	3-12-2	IMECE2019-11691	31	Granlund	Kenneth	9-41-1	IMECE2019-11283	96
Gima	Emily	16-1-1	IMECE2019-13305	196	Grau Bartual	Sandra	4-6-1	IMECE2019-11049	36
Ginetti	Piera	9-35-1	IMECE2019-11650	94	Graves	Roy	1-2-1	IMECE2019-11024	1
Giorges	Akliu G.	9-63-1	IMECE2019-11428	95	Graves	Aubrey	4-3-2	IMECE2019-12769	35
Giovanniello	Francesco	5-5-1	IMECE2019-10663	47	Gray	Cooper	10-9-1	IMECE2019-12794	122
Gislason	Gudmundur	6-6-1	IMECE2019-12250	68	Green	Carmen	2-2-1	IMECE2019-10256	14
Giusto	Giovan Giuseppe	5-2-2	IMECE2019-11150	58	Green	Christopher	16-1-1	IMECE2019-13857	202
Glaser	Adam K.	16-1-1	IMECE2019-13009	194	Green	Micah J.	10-9-1	IMECE2019-12502	122
Glaser	Adam K.	17-4-2	IMECE2019-13107	206	Grejtak	Tomas	16-1-1	IMECE2019-13862	202
Glasmacher	Birgit	4-10-5	IMECE2019-10447	45	Greve	Erik	14-4-1	IMECE2019-10497	181
Glass	Emma	16-2-1	IMECE2019-13091	203	Griffiths	R. Joey	16-1-1	IMECE2019-13633	200
Godart	Peter	6-12-1	IMECE2019-10478	73	Grigoriadis	Karolos	16-1-1	IMECE2019-13689	200

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Grigoriu	Mircea	11-7-1	IMECE2019-13771	133	Gupta	Amit Kumar	2-7-4	IMECE2019-11126	25
Grimm	Tyler	2-5-4	IMECE2019-11375	19	Gupta	Amit Kumar	3-13-1	IMECE2019-10958	30
Grimm	Tyler	2-7-2	IMECE2019-11231	23	Gupta	Amit Kumar	10-26-2	IMECE2019-10939	115
Grimm	Tyler	2-7-3	IMECE2019-11255	24	Gupta	Kalpana	9-35-1	IMECE2019-12459	94
Grimm	Tyler	17-2-1	IMECE2019-13037	205	Gupta	Kalpana	9-36-1	IMECE2019-10432	95
Grimm	Tyler	17-2-1	IMECE2019-13038	205	Gupta	Priyam	8-4-2	IMECE2019-10846	90
Grimmer	Peter W	11-22-2	IMECE2019-10521	145	Gupta	Santosh Kumar	2-12-1	IMECE2019-12238	10
Grogan	Paul T.	16-1-1	IMECE2019-13708	200	Gurganus	James	4-2-4	IMECE2019-11566	42
Gross	Andrew	2-2-6	IMECE2019-13903	21	Gursoy	Mehmetcan	6-4-4	IMECE2019-10110	69
Gross	Andrew	11-35-1	IMECE2019-13898	159	Gurupatham	Sathish	9-16-1	IMECE2019-10034	111
Grosse	Ian	10-26-5	IMECE2019-11689	120	Gutkowski	Artur	17-9-1	IMECE2019-12959	209
Grover	William	16-1-1	IMECE2019-13643	200	Guttag	Mark	13-8-1	IMECE2019-11432	178
Grubbs	Rachel	4-7-1	IMECE2019-10984	34	Guttag	Mark	13-8-1	IMECE2019-11451	178
Gruber	Emily	16-2-1	IMECE2019-13384	203	Guven	Ibrahim	17-11-2	IMECE2019-13419	211
Grunlan	Melissa A.	17-4-2	IMECE2019-13731	206	Guzik	Monica	3-12-2	IMECE2019-11691	31
Gryshkov	Oleksander	4-10-5	IMECE2019-10447	45	Gwesha	Ammar	6-10-2	IMECE2019-10391	73
Gu	Boyang	11-39-3	IMECE2019-13192	142	Gzal	Majdi	5-3-1	IMECE2019-11218	49
Gu	Hongfang	9-45-1	IMECE2019-10260	96	H R	Gurupavan	2-5-5	IMECE2019-13117	20
Gu	Tingting	10-26-2	IMECE2019-10512	115	Haaland	Kevin M.	10-26-5	IMECE2019-12096	120
Gu	Xiaokun	9-25-2	IMECE2019-13409	100	Haas	Franz	2-2-6	IMECE2019-11134	21
Gu	Zhiyoung	6-7-2	IMECE2019-10457	67	Hacker	Annika	6-9-2	IMECE2019-11941	73
Gualter Dos Santos	Erivelton	16-2-1	IMECE2019-13296	203	Hader	Grzegorz	12-10-1	IMECE2019-13446	173
Guan	Peng	5-10-1	IMECE2019-11054	52	Hader	Grzegorz	12-10-1	IMECE2019-13608	173
Guduru	Pradeep	11-47-4	IMECE2019-13210	153	Hader	Grzegorz	12-10-1	IMECE2019-13616	173
Guell Izard	Anna	10-19-2	IMECE2019-13718	130	Hadi	Fatemeh	6-2-3	IMECE2019-10994	66
Guell Izard	Anna	10-19-2	IMECE2019-13865	130	Hadi	Fatemeh	6-16-2	IMECE2019-10996	69
Guenther	Ethan	16-2-1	IMECE2019-12653	203	Hagan	John	2-14-1	IMECE2019-10040	21
Guerra-Zubiaga	David	2-13-1	IMECE2019-11023	8	Hagani	Fouad	8-2-1	IMECE2019-11675	86
Guerra-Zubiaga	David	2-13-2	IMECE2019-10889	11	Haghshenas-Jaryani	Mahdi	4-2-4	IMECE2019-10675	41
Guerreiro	Guilherme	2-8-3	IMECE2019-11362	20	Haile	Biya	10-26-4	IMECE2019-11411	118
Guertler	C.A.	16-1-1	IMECE2019-13733	201	Haj-Ali	Rami	11-19-1	IMECE2019-13779	161
Guevara	Mauricio	12-10-1	IMECE2019-13616	173	Hajighasemi	Mohammad Reza	10-4-1	IMECE2019-13457	113
Guggilla	Ganesh	9-18-2	IMECE2019-11212	108	Hajilounezhad	Taher	2-4-1	IMECE2019-13312	14
Guidetti	Martina	16-1-1	IMECE2019-13710	200	Hajimirza	Shima	6-10-1	IMECE2019-13273	72
Guillen	Diego	6-7-1	IMECE2019-10606	66	Hajimirza	Shima	17-6-1	IMECE2019-13276	208
Guillen	Diego	6-8-1	IMECE2019-11852	71	Hajj	Muhammad	5-3-2	IMECE2019-13693	51
Guin	Laurent	11-37-2	IMECE2019-12681	156	Hajj	Muhammad	16-1-1	IMECE2019-13395	197
Guin	Laurent	11-37-2	IMECE2019-13826	156	Hakeem	Abbas Saeed	10-10-1	IMECE2019-11720	113
Guiza	Ruben	5-3-2	IMECE2019-11505	51	Hakeem	Abbas Saeed	10-10-3	IMECE2019-10960	116
Gulbrandsen	Eystein	5-11-1	IMECE2019-10434	55	Halberstadt	Jaret	13-9-1	IMECE2019-11279	179
Guldiken	Rasim	8-6-2	IMECE2019-11966	89	Hale	Jared	15-1-1	IMECE2019-13928	187
Guldiken	Rasim	17-1-1	IMECE2019-11517	205	Hale	John	16-1-1	IMECE2019-13596	199
Guldiken	Rasim	17-2-1	IMECE2019-11525	205	Hale	Nathan	15-1-1	IMECE2019-13928	187
Guldiken	Rasim	17-7-1	IMECE2019-13944	208	hale	Pranav	10-26-4	IMECE2019-11532	118
Gulen	John	6-3-1	IMECE2019-10270	61	Hales	Brady	9-6-1	IMECE2019-13654	98
Gunderson	Grant	17-6-1	IMECE2019-12764	208	Hall	Benjamin	4-4-2	IMECE2019-12282	35
Guo	Biao	2-5-4	IMECE2019-11036	19	Hall	Lucas	4-12-1	IMECE2019-13895	45
Guo	Dun	11-27-1	IMECE2019-13232	154	Hall	Lucas	10-25-2	IMECE2019-13872	126
Guo	Fangzhou	6-9-2	IMECE2019-11579	73	Hallett	Jesse	5-5-2	IMECE2019-10791	53
Guo	Fangzhou	17-6-1	IMECE2019-13152	208	Ham	Sang W.	16-1-1	IMECE2019-13619	200
Guo	Hong	10-29-1	IMECE2019-10645	128	Hamad	Aamir	12-1-1	IMECE2019-10962	171
Guo	Hong	10-29-1	IMECE2019-10647	128	Hamad	Aamir	12-1-1	IMECE2019-11686	171
Guo	Junkang	2-14-1	IMECE2019-10919	21	Hamdy	Sarah	6-6-1	IMECE2019-10712	68
Guo	Junkang	2-3-1	IMECE2019-11184	24	Hamel	Craig	11-2-1	IMECE2019-13176	157
Guo	Linchuan	1-6-2	IMECE2019-12470	5	Hamidzadeh	Hamid R.	5-9-3	IMECE2019-11301	51
Guo	Meiying	1-6-1	IMECE2019-10836	2	Hammad	Khaled	8-3-3	IMECE2019-13460	91
Guo	Meiying	5-2-2	IMECE2019-11008	58	Hammil	Jacob	15-1-1	IMECE2019-13975	189
Guo	Ming	11-1-3	IMECE2019-12961	149	Hammond	Maxwell	15-1-1	IMECE2019-11499	187
Guo	Qilin	16-1-1	IMECE2019-13772	201	Hampel	Chris	17-6-1	IMECE2019-13924	208
Guo	Qiwei	9-45-1	IMECE2019-10260	96	Han	Daehoon	10-4-4	IMECE2019-13449	118
Guo	Ruiqiang	9-29-2	IMECE2019-13625	105	Han	Daehoon	11-5-4	IMECE2019-13368	164
Guo	Ruiqiang	9-29-2	IMECE2019-13641	105	Han	Edmund	12-7-1	IMECE2019-11867	169
Guo	Shuangxi	5-16-1	IMECE2019-12673	54	Han	Edmund	12-7-2	IMECE2019-11830	173
Guo	Siyu	5-8-2	IMECE2019-11489	49	Han	Jinchen	9-29-2	IMECE2019-13448	105
Guo	Wei	1-6-1	IMECE2019-12200	2	Han	Jitian	2-9-3	IMECE2019-10578	12
Guo	Wei	1-12-1	IMECE2019-12199	5	Han	Jiwan	17-4-2	IMECE2019-13731	206
Guo	Wei-Jian	10-25-1	IMECE2019-13379	123	Han	Miaoling	5-7-1	IMECE2019-10831	55
Guo	Wei-Jian	16-1-1	IMECE2019-13382	197	Han	Mingli	7-10-2	IMECE2019-11424	78
Guo	Yang	2-5-2	IMECE2019-13390	16	Han	Pan	4-10-1	IMECE2019-11697	40
Guo	Yu	5-8-1	IMECE2019-10772	48	Han	Sangwoo	6-11-2	IMECE2019-13293	70
Guo	Zhanhu	1-1-6	IMECE2019-10449	4	Han	Wei	2-3-2	IMECE2019-10280	25
Guo	Zhanhu	1-1-6	IMECE2019-11866	4	Han	Wei	3-4-1	IMECE2019-10492	29
Guo	Zongqi	16-1-1	IMECE2019-12626	191	Han	Wei	5-6-1	IMECE2019-10702	57
Guo	Zongqi	17-15-1	IMECE2019-13072	213	Han	Xiaolan	2-5-6	IMECE2019-11235	22

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Han	Xiaolan	14-1-2	IMECE2019-11286	183	Hatzell	Kelsey B.	9-4-1	IMECE2019-13306	106
Han	Xiaomin	11-37-4	IMECE2019-13848	163	Hatzell	Kelsey B.	16-1-1	IMECE2019-13318	197
Han	Xiaomin	11-5-4	IMECE2019-13351	164	Hatzell	Kelsey B.	16-1-1	IMECE2019-13325	197
Han	Yen-Lin	10-2-1	IMECE2019-11013	126	Hatzell	Marta	9-4-1	IMECE2019-13306	106
Han	Yueyang	5-5-1	IMECE2019-12263	47	Hatzell	Marta	16-1-1	IMECE2019-13318	197
Han	Yulong	11-1-3	IMECE2019-12961	149	Hatzell	Marta	16-1-1	IMECE2019-13325	197
Han	Zhongwu	2-10-3	IMECE2019-10539	12	Hausotte	Tino	2-10-3	IMECE2019-11328	12
Haning	Evan J.	16-1-1	IMECE2019-12771	192	Hawaladar	Sai Srinivas Akhil	13-10-1	IMECE2019-10680	177
Hanks	Brad	10-9-2	IMECE2019-13385	124	Hawaladar	Sai Srinivas Akhil	13-10-2	IMECE2019-13685	177
Hann	Sung Yun	10-23-2	IMECE2019-10408	130	Hawkes	Grant	6-14-2	IMECE2019-12821	76
Hann	Sung Yun	10-23-2	IMECE2019-11461	130	Hawrylak	Peter	16-1-1	IMECE2019-13589	199
Hansen	Christopher	10-19-1	IMECE2019-13467	127	Hawrylak	Peter	16-1-1	IMECE2019-13600	199
Hansen	Joseph	15-1-1	IMECE2019-13926	187	Hay	Akara	5-9-3	IMECE2019-11752	51
Hansen	Robert	11-14-3	IMECE2019-13349	149	Hayashi	Yasuhiko	17-10-1	IMECE2019-13319	210
Hansen	Robert	17-15-1	IMECE2019-13108	211	He	Bang	11-12-3	IMECE2019-13488	164
Hansen	Robert S.	11-18-1	IMECE2019-12912	135	He	Cunfu	3-15-1	IMECE2019-10717	30
Hansen	Robert S.	11-7-5	IMECE2019-13469	147	He	Cunfu	6-4-1	IMECE2019-10824	64
Hansen	Shane	16-1-1	IMECE2019-13002	194	He	Ge	14-1-1	IMECE2019-11332	183
Hanson	David R.	9-43-1	IMECE2019-11902	94	He	Jixiong	9-25-2	IMECE2019-13012	100
Hao	Qing	17-15-1	IMECE2019-12837	213	He	Jixiong	9-24-1	IMECE2019-13013	107
Hao	Zhili	4-6-1	IMECE2019-11389	36	He	Jixiong	17-15-1	IMECE2019-12581	212
Hao	Zhili	4-6-1	IMECE2019-11416	36	He	Jixiong	17-15-1	IMECE2019-12582	212
Hao	Zhili	4-14-1	IMECE2019-10654	41	He	Jixiong	17-15-1	IMECE2019-12585	212
Haque	A.B.M. Tahidul	10-4-4	IMECE2019-13820	118	He	Junyan	4-10-4	IMECE2019-12313	44
Haque	A.B.M. Tahidul	11-2-2	IMECE2019-13510	160	He	Junyan	4-10-4	IMECE2019-13221	44
Haque	Md.	11-18-2	IMECE2019-11378	138	He	Kai	2-13-2	IMECE2019-10537	11
Haque	Md.	12-7-2	IMECE2019-11491	173	He	Li	16-1-1	IMECE2019-13207	195
Haque	Md.	16-1-1	IMECE2019-13466	197	He	Liang	13-5-1	IMECE2019-10803	178
Haque	Md. Imrul Reza	10-1-1	IMECE2019-11509	119	He	Qiguang	11-1-5	IMECE2019-12951	153
Haratoka	Cagatay	9-7-1	IMECE2019-11611	99	He	Ruihua	2-14-1	IMECE2019-10383	21
Hareyama	Soichi	2-6-1	IMECE2019-10524	9	He	Tian	1-6-2	IMECE2019-12973	5
Harman	Todd	9-51-2	IMECE2019-13101	112	He	Tian	14-1-2	IMECE2019-10348	183
Harman	Todd	17-9-1	IMECE2019-13102	209	He	Yuhang	4-13-1	IMECE2019-10477	44
Harmon	Katelynn	11-1-5	IMECE2019-13116	153	He	Zhelong	7-1-2	IMECE2019-12965	78
Harnish	Cale	11-23-1	IMECE2019-13811	152	He	Zhelong	10-2-1	IMECE2019-12864	126
Harnish	Cale	17-11-2	IMECE2019-13815	211	He	Zhelong	11-23-3	IMECE2019-12865	155
Harraz	Omar	4-13-3	IMECE2019-10616	46	He	Zilu	3-4-1	IMECE2019-10492	29
Harris	John	16-2-1	IMECE2019-13417	203	He	Zilu	3-8-1	IMECE2019-10948	30
Hart	Douglas	6-12-1	IMECE2019-10478	73	Healey	Timothy J.	11-37-3	IMECE2019-13019	159
Hartman	Amiel	4-13-3	IMECE2019-10463	46	Healey	Timothy J.	11-37-5	IMECE2019-12988	165
Hartog	Tess	16-1-1	IMECE2019-13271	196	Heckert	Blaze	10-10-3	IMECE2019-11502	116
Hartwich	Tobias	14-4-1	IMECE2019-10497	181	Hefzy	Mohamed Samir	4-2-3	IMECE2019-11814	40
Harvie	Dalton J.E.	8-7-1	IMECE2019-13372	84	Heighes	Michael	10-26-2	IMECE2019-10364	115
Hasan	Fuad	4-2-2	IMECE2019-13923	39	Heim	Mark	13-9-1	IMECE2019-11279	179
Hasan	Fuad	11-1-6	IMECE2019-13918	154	Helguero	Carlos G.	4-10-2	IMECE2019-10627	41
Hasan	Mohammad Nasim	9-63-1	IMECE2019-10150	95	Heling	Bjoern	2-10-1	IMECE2019-11225	7
Hasan Roni	Md. Rakibul	9-16-1	IMECE2019-11781	111	Heling	Bjoern	2-10-3	IMECE2019-11328	12
Hasanyan	Armanj	11-37-1	IMECE2019-13363	154	Helmer	David	8-11-1	IMECE2019-11764	86
Hashem	Mohammad Abul	8-6-2	IMECE2019-10519	89	Hemamalini	Shyam Sundar	6-2-3	IMECE2019-11079	67
Hashemi	Amirreza	9-29-2	IMECE2019-13625	105	Hemker	Kevin	11-32-1	IMECE2019-13123	155
Hashemi	Mohammad Saber	10-4-1	IMECE2019-13457	113	Hemmat	Zahra	9-25-1	IMECE2019-11719	98
Hashemi	Nicole	4-2-1	IMECE2019-12885	36	Hendriks	Stephen K.	16-1-1	IMECE2019-13862	202
Hashemi	Nicole	4-5-3	IMECE2019-12903	37	Hendrix	Douglas	16-1-1	IMECE2019-13949	203
Hashemi	Nicole	12-8-1	IMECE2019-12904	170	Heng	Xing	5-2-4	IMECE2019-12265	60
Hashemi	Nicole	12-5-1	IMECE2019-12901	171	Henneke	Michael	8-9-2	IMECE2019-12020	83
Hashemi	Nicole	17-2-1	IMECE2019-12915	205	Hennessey	Michael	5-11-1	IMECE2019-10241	55
Hashemi	Seyed Reza	2-3-2	IMECE2019-10986	25	Henninger	Augustus	12-10-1	IMECE2019-13616	173
Hashemi	Seyed Reza	6-1-1	IMECE2019-11949	61	Henrikson	Katrina	7-1-1	IMECE2019-12649	77
Hashemi	Seyed Reza	6-1-2	IMECE2019-10755	62	Henry	Nathan E.	15-1-1	IMECE2019-13976	189
Hashemi	Seyed Reza	6-11-3	IMECE2019-10479	71	Hentges	Nicholas	6-16-2	IMECE2019-10917	69
Hassan	Edris	10-12-1	IMECE2019-11042	129	Hentges	Nicholas	8-9-4	IMECE2019-10258	85
Hassan	Hafsa	6-1-2	IMECE2019-10283	62	Heras Segura	Mariona	5-2-4	IMECE2019-12214	60
Hassan	Kyle	9-43-1	IMECE2019-11902	94	Herber	Dan	5-2-4	IMECE2019-13707	60
Hassan	Nouray N.	4-4-1	IMECE2019-10347	33	Heredia Juesas	Juan	1-6-1	IMECE2019-11943	2
Hassan	Salah E.K.	5-2-3	IMECE2019-11295	59	Herlim	Ega	17-6-1	IMECE2019-13834	208
Hassan	Yassin	6-14-1	IMECE2019-11800	75	Hernmez	Munther	8-9-1	IMECE2019-11433	83
Hassan	Yassin	6-14-2	IMECE2019-11811	76	Hernandez	Brando	9-39-2	IMECE2019-10122	101
Hassani	Ferri	11-18-2	IMECE2019-12000	138	Hernandez	Martin	11-12-1	IMECE2019-10042	158
Hassanipour	Fatemeh	4-9-1	IMECE2019-12159	42	Herre	John	4-14-1	IMECE2019-10654	41
Hassanipour Asl	Pezhman	5-10-2	IMECE2019-11924	50	Herren	Blake	10-26-2	IMECE2019-10512	115
Hasse	Alexander	14-1-1	IMECE2019-10179	183	Herrington	Paul	2-7-3	IMECE2019-11630	24
Hatamipour	Vahid	9-29-1	IMECE2019-12958	104	Herrington	Paul	3-8-1	IMECE2019-11087	31
Hatch	Serah E.	15-1-1	IMECE2019-13492	188	Herrington	Paul	16-1-1	IMECE2019-13881	202
Hatzell	Kelsey B.	6-11-1	IMECE2019-13323	68	Hersam	Mark C.	16-1-1	IMECE2019-13081	194

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Hettervik	Andreas Fosså	5-11-1	IMECE2019-10434	55	Hossain	Md.	17-11-2	IMECE2019-13277	211
Hewlin	Rodward	8-12-1	IMECE2019-11649	86	Hossain	Shekh	9-39-1	IMECE2019-10120	100
Heym	Jason	17-4-3	IMECE2019-12541	206	Hossain	Mohammad	7-1-1	IMECE2019-11372	77
Hibino	Narutoshi	11-3-2	IMECE2019-13394	166	Hossain	Mohammad	8-6-1	IMECE2019-11979	88
Hidalgo-León	Ruben	6-9-1	IMECE2019-11472	72	Hossain	Mohammad	8-6-1	IMECE2019-11989	88
Hieber	Tyler	12-7-1	IMECE2019-11690	169	Hossain	Mohammad	15-1-1	IMECE2019-13966	189
Hieber	Tyler	12-5-1	IMECE2019-11534	171	Hosseini Farid	Mohammad	4-5-2	IMECE2019-10742	35
Hieber	Tyler	12-7-3	IMECE2019-11349	174	Hosseini Farid	Mohammad	4-5-2	IMECE2019-10743	36
Hieber	Tyler	16-1-1	IMECE2019-12728	192	Hosseini Farid	Mohammad	4-5-2	IMECE2019-11549	36
Hill	Benjamin	11-18-3	IMECE2019-13169	141	Hosseini Farid	Mohammad	11-1-3	IMECE2019-11829	149
Hillman	Mike	11-28-1	IMECE2019-12540	135	Hotaling	Brittany	4-11-2	IMECE2019-11948	44
Hills	David A.	11-11-1	IMECE2019-12783	134	Hotaling	Jim	12-8-1	IMECE2019-13401	170
Hills	David A.	11-12-4	IMECE2019-12802	166	Hou	Chenggang	5-9-3	IMECE2019-11012	51
Hilton	Ethan	16-1-1	IMECE2019-12818	192	Hou	Chenggang	13-6-1	IMECE2019-10700	175
Hines	Kristen M.	9-63-1	IMECE2019-10272	95	Hou	Lei	5-3-3	IMECE2019-12488	47
Hirata	Hotaka	17-15-1	IMECE2019-13380	212	Hou	Senhao	14-3-1	IMECE2019-10488	182
Hiroaki	Miyoshi	11-37-5	IMECE2019-13056	165	Hough	Loren	11-1-10	IMECE2019-13269	165
Hirohata	Kenji	12-7-2	IMECE2019-10558	173	Hrabe	Nikolas	11-32-1	IMECE2019-13677	156
Hirokazu	Matsui	5-11-2	IMECE2019-11176	57	Hripko	Brad	2-2-4	IMECE2019-11615	18
Hirono	Ryo	2-5-2	IMECE2019-11100	16	Hsieh	M. Ani	16-1-1	IMECE2019-13432	197
Hirsch	Sven	4-4-1	IMECE2019-11125	33	Hsu	Ming-Chen	16-1-1	IMECE2019-13522	198
Hisaji	Naruki	17-10-1	IMECE2019-13319	210	Hu	Guiping	16-1-1	IMECE2019-12859	191
Hitschrich	Niklas	4-4-1	IMECE2019-10347	33	Hu	Jianxing	11-10-1	IMECE2019-12321	134
Hixon	Ray	16-1-1	IMECE2019-13543	198	Hu	Jianxing	11-10-4	IMECE2019-12322	145
Hjort	Robert	10-25-2	IMECE2019-13194	126	Hu	Min	2-10-2	IMECE2019-10566	10
Ho	Yin-hsiang	9-41-1	IMECE2019-11283	96	Hu	Min	2-10-3	IMECE2019-10539	12
Hoag	Ian	6-10-3	IMECE2019-13550	74	Hu	Ming	6-1-1	IMECE2019-13124	61
Hoar	Eric	16-1-1	IMECE2019-12982	194	Hu	Ming	9-29-1	IMECE2019-12842	104
Hoelzle	David	16-1-1	IMECE2019-13027	194	Hu	Ming	9-29-1	IMECE2019-13120	104
Hoffmeister	Brent K.	4-3-2	IMECE2019-12769	35	Hu	Ming	17-15-1	IMECE2019-12840	213
Hohl	Andreas	5-3-1	IMECE2019-10576	49	Hu	Ming	17-15-1	IMECE2019-13122	213
Hojjatzadeh	S. Mohammad H.	16-1-1	IMECE2019-13772	201	Hu	Ming	17-15-1	IMECE2019-13125	213
Holden	Garrett	5-8-2	IMECE2019-10936	49	Hu	Nan	11-2-1	IMECE2019-13137	157
Holey	Ajay	2-13-3	IMECE2019-12309	13	Hu	Pan	16-1-1	IMECE2019-13282	196
Höller	Christian	2-2-6	IMECE2019-11134	21	Hu	Shanshan	13-5-1	IMECE2019-10803	178
Hollingsworth	Justin	5-9-1	IMECE2019-10290	48	Hu	Wei	11-28-1	IMECE2019-12293	135
Holman	Jonathan	2-8-1	IMECE2019-12926	17	Hu	Xiaofang	5-2-4	IMECE2019-12265	60
Holycross	Casey M.	11-18-3	IMECE2019-13477	141	Hu	Xiaolei	2-10-3	IMECE2019-10843	12
Holycross	Casey M.	15-1-1	IMECE2019-13515	188	Hu	Xidong	8-9-3	IMECE2019-10200	84
Holycross	Casey M.	17-15-1	IMECE2019-13511	211	Hu	Yingning	13-5-1	IMECE2019-10803	178
Homayounpour	Mohammad	4-10-3	IMECE2019-11932	42	Hu	Yongjie	9-25-1	IMECE2019-13535	98
Homayounpour	Mohammad	17-4-2	IMECE2019-11796	206	Hu	Yongjie	9-24-1	IMECE2019-13548	107
Homer	John	13-5-1	IMECE2019-10592	178	Hu	Yuhang	11-1-1	IMECE2019-12256	144
Honarmandi	Peyman	2-2-4	IMECE2019-11997	18	Hu	Yuhang	11-1-2	IMECE2019-12235	146
Honarmandi	Peyman	4-11-2	IMECE2019-12024	44	Hu	Yuwei	11-5-4	IMECE2019-13351	164
Hondred	John	4-12-1	IMECE2019-13895	45	Hua	Xiaotong	8-9-2	IMECE2019-11896	83
Hondred	John	10-25-2	IMECE2019-13872	126	Hua	Zilong	9-15-1	IMECE2019-11699	108
Honein	Elie	11-36-1	IMECE2019-12051	159	Hua	Zilong	9-15-1	IMECE2019-12258	108
Honein	Tony	11-36-1	IMECE2019-12051	159	Huai	Zhouyu	3-4-2	IMECE2019-11129	30
Hong	Christopher X.	10-4-2	IMECE2019-13186	114	Huang	Da	16-1-1	IMECE2019-12855	193
Hong	Haifeng	13-10-2	IMECE2019-12310	177	Huang	Guoliang	1-1-1	IMECE2019-13891	1
Hong	Haifeng	13-10-2	IMECE2019-12446	177	Huang	Jianliang	5-16-1	IMECE2019-12153	54
Hong	Jun	2-8-2	IMECE2019-11807	19	Huang	Jianyong	10-14-1	IMECE2019-11021	122
Hong	Jun	2-14-1	IMECE2019-10919	21	Huang	Kevin	5-4-4	IMECE2019-10193	59
Hong	Jun	2-3-2	IMECE2019-11791	25	Huang	Li	11-10-3	IMECE2019-10698	141
Hong	Yaoye	11-1-7	IMECE2019-13503	157	Huang	Ming	5-4-2	IMECE2019-11522	56
Hong	Yaoye	17-15-1	IMECE2019-13507	214	Huang	Pei-Chen	12-7-2	IMECE2019-10450	173
Hoover	Luke	2-2-4	IMECE2019-11615	18	Huang	Pinshane	12-7-1	IMECE2019-11867	169
Horn	Joseph	1-2-1	IMECE2019-11381	1	Huang	Pinshane	12-7-2	IMECE2019-11830	173
Horner	Hunter	6-14-1	IMECE2019-11025	75	Huang	Po-Lin	4-13-1	IMECE2019-12296	43
Horner	Hunter	6-14-2	IMECE2019-11027	76	Huang	Qiyu	17-6-1	IMECE2019-12434	207
Horstemeyer	Mark	11-39-1	IMECE2019-13026	136	Huang	Rong	11-5-3	IMECE2019-13048	160
Hortance	Nicholas	16-1-1	IMECE2019-13318	197	Huang	Rui	11-17-1	IMECE2019-13134	134
Horton	Ryan	11-1-7	IMECE2019-11930	157	Huang	Rui	11-1-1	IMECE2019-13284	144
Hosaka	Hiroshi	5-7-1	IMECE2019-10474	55	Huang	Rui	11-1-2	IMECE2019-13278	146
Hosaka	Hiroshi	5-7-1	IMECE2019-11115	55	Huang	Rui	11-23-2	IMECE2019-13268	153
Hosni	Mohammad	3-14-1	IMECE2019-11377	32	Huang	Rui	11-35-1	IMECE2019-13348	159
Hosni	Mohammad	8-7-1	IMECE2019-12236	84	Huang	Rui	12-7-1	IMECE2019-11749	169
Hosoi	Atsushi	10-5-1	IMECE2019-13320	127	Huang	Shiyao	11-10-3	IMECE2019-10698	141
Hosoi	Atsushi	17-10-1	IMECE2019-13319	210	Huang	Shouyuan	9-25-2	IMECE2019-12964	100
Hossain	Md.	10-9-1	IMECE2019-12828	122	Huang	Shouyuan	16-1-1	IMECE2019-12968	193
Hossain	Md.	10-2-1	IMECE2019-12827	126	Huang	Sichuan	16-1-1	IMECE2019-13539	198
Hossain	Md.	11-23-3	IMECE2019-13190	155	Huang	Tian-Yun	10-14-1	IMECE2019-11021	122
Hossain	Md.	11-12-2	IMECE2019-13195	161	Huang	Tsung-Hui	11-28-1	IMECE2019-12651	135

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Huang	Tsung-Hui	11-10-2	IMECE2019-11726	138	Irzhak	A.V.	10-26-4	IMECE2019-11532	118
Huang	Tsung-Hui	11-10-2	IMECE2019-11733	138	Ishak	Joanne	11-12-4	IMECE2019-10353	166
Huang	Weicai	5-12-1	IMECE2019-11203	53	Ishihara	Kenta	11-7-1	IMECE2019-11210	133
Huang	Xiaojin	6-14-1	IMECE2019-10372	75	Islam	Mahmudul	9-63-1	IMECE2019-10150	95
Huang	Xiaojin	6-14-2	IMECE2019-10489	76	Islam	Md. Didarul	1-1-6	IMECE2019-10449	4
Huang	Xiaonan	11-5-2	IMECE2019-12511	157	Islam	Md. Didarul	1-1-6	IMECE2019-11866	4
Huang	Xiyong	4-4-2	IMECE2019-10405	35	Islam	Md. Farhadul	16-1-1	IMECE2019-13543	198
Huang	Yonggang	11-8-2	IMECE2019-12905	137	Islam	Md. Saiful	11-7-5	IMECE2019-10035	147
Huang	Yonggang	11-8-2	IMECE2019-12936	137	Islam	Md. Zahirul	10-10-5	IMECE2019-12934	120
Huang	Yonggang	11-47-4	IMECE2019-12835	153	Islam	Nazmul	7-1-1	IMECE2019-11372	77
Huang	Yuping	8-6-3	IMECE2019-13285	90	Islam	Nazmul	12-8-2	IMECE2019-11734	172
Huang-Zhang	Pablo	16-1-1	IMECE2019-13501	198	Islam	Rabiul	6-11-3	IMECE2019-10998	71
Huber	Zachary	11-8-1	IMECE2019-13381	133	Islam	Zahabul	10-1-1	IMECE2019-11509	119
Huberman	Samuel	9-15-1	IMECE2019-13355	109	Islam	Zahabul	11-18-2	IMECE2019-11378	138
Huberman	Samuel	17-15-1	IMECE2019-13361	214	Islam	Zahabul	12-7-2	IMECE2019-11491	173
Hudak	Yuri	17-4-3	IMECE2019-13595	207	Islam	Zahabul	16-1-1	IMECE2019-13466	197
Hudson	Jennifer	16-1-1	IMECE2019-13272	196	Islam	Hesham	5-2-3	IMECE2019-12080	59
Huebner	Erica	17-4-2	IMECE2019-13592	206	Islam	Abdel Hamid	6-7-3	IMECE2019-10326	70
Huhmann	Brianna M.	4-3-1	IMECE2019-10806	33	Itami	Taku	4-6-1	IMECE2019-10382	36
Huhmann	Brianna M.	6-5-1	IMECE2019-10808	62	Itani	Omar	14-3-1	IMECE2019-10262	182
Huhmann	Brianna M.	15-1-1	IMECE2019-13324	188	Itoh	Akira	10-5-1	IMECE2019-13320	127
Hukeri	Payal	16-1-1	IMECE2019-13629	200	Iverson	Sondre	7-5-1	IMECE2019-10282	81
Hummel	Andrew	6-14-1	IMECE2019-11025	75	Iverson	Brian D.	6-10-3	IMECE2019-13550	74
Hummel	Andrew	6-14-2	IMECE2019-11027	76	Iverson	Brian D.	8-6-3	IMECE2019-13730	90
Hunter	Abigail	16-1-1	IMECE2019-13068	194	Iverson	Brian D.	9-7-1	IMECE2019-13845	99
Huo	Ran	17-4-2	IMECE2019-13142	206	Iverson	Brian D.	9-14-1	IMECE2019-13745	102
Huo	Yongzhong	11-1-5	IMECE2019-12623	153	Iverson	Brian D.	9-14-1	IMECE2019-13778	102
Hurley	David	9-15-1	IMECE2019-11699	108	Iverson	Brian D.	12-5-1	IMECE2019-13188	171
Hurley	David	9-15-1	IMECE2019-12258	108	Iwenofu	Sunday Ifeanyi Chukwu	6-1-1	IMECE2019-10072	61
Hussein	Arab	11-25-1	IMECE2019-13900	142	Iwuoha	A.U.	6-1-1	IMECE2019-10072	61
Hussein	Mahmoud	1-1-2	IMECE2019-13300	1	J	Joel	10-26-1	IMECE2019-10162	114
Huston	Lane G.	2-4-2	IMECE2019-11456	16	J	Vijay Amirtha Rayan	11-17-1	IMECE2019-10004	135
Huynh	Austin	4-13-2	IMECE2019-11802	45	J	Vijayamirtha Rayan	10-17-1	IMECE2019-11290	120
Huynh	B. Phuoc	8-9-4	IMECE2019-10553	85	Jabbour	Michel	11-1-6	IMECE2019-12557	154
Huynh	Nha Uyen	10-1-1	IMECE2019-13835	119	Jabbour	Michel	11-37-2	IMECE2019-12681	156
Huynh	Nha Uyen	11-3-1	IMECE2019-13842	163	Jabbour	Michel	11-37-2	IMECE2019-13826	156
Hwang	Doh-Gyu	10-4-4	IMECE2019-13820	118	Jacazio	Giovanni	3-4-1	IMECE2019-10713	29
Hwang	Gisuk	17-9-1	IMECE2019-13057	209	Jacazio	Giovanni	5-9-2	IMECE2019-10709	50
Hwang	Jehwan	1-1-6	IMECE2019-10449	4	Jackowitz	Noah	15-1-1	IMECE2019-13964	189
Iakimovitch	Vasil	11-5-1	IMECE2019-11244	155	Jacobi	Anthony	9-36-2	IMECE2019-13030	99
Ibekwe	Samuel	16-1-1	IMECE2019-13499	198	Jacobs	Georg	8-3-1	IMECE2019-10351	89
Ibekwe	Samuel	16-1-1	IMECE2019-13525	198	Jadhav	Vishwas	10-23-1	IMECE2019-11441	125
Ibekwe	Samuel	16-1-1	IMECE2019-13753	201	Jadhav	Vishwas	17-15-1	IMECE2019-13423	214
Ibrahim	Qusai	6-11-3	IMECE2019-10580	71	Jafari	S.M.	17-2-1	IMECE2019-13251	205
Ibru	Timothy	11-18-2	IMECE2019-13322	138	Jafari Nodoushan	Emad	12-8-1	IMECE2019-12990	170
Idris	Awang	15-1-1	IMECE2019-10006	187	Jafarzadeh	Sivash	11-38-2	IMECE2019-13883	148
Iezzi	Brian	16-1-1	IMECE2019-13027	194	Jafek	Alex	12-8-1	IMECE2019-13401	170
Igie	Uyigohosa	3-14-1	IMECE2019-11339	32	Jafek	Alex	12-8-1	IMECE2019-13884	170
Iglesias	Patricia	10-29-1	IMECE2019-10645	128	Jahan	Muhammad	2-5-5	IMECE2019-10940	20
Iglesias	Patricia	10-29-1	IMECE2019-10647	128	Jahan	Muhammad	2-5-5	IMECE2019-10944	20
Ihsan	Mustafa	6-4-1	IMECE2019-11972	64	Jahan	Muhammad	2-5-5	IMECE2019-10946	20
Iino	Kenji	7-7-1	IMECE2019-10217	80	Jain	Aditya	5-4-5	IMECE2019-11113	60
Ikebudu	Kingsley Okechukwu	6-1-1	IMECE2019-10072	61	Jain	Ankur	11-32-1	IMECE2019-13912	156
Ilksoy	Erhan	6-2-2	IMECE2019-11947	65	Jain	Manish	4-5-1	IMECE2019-13127	34
Illera Perozo	Danny	6-11-3	IMECE2019-11725	71	Jain	Manish	16-1-1	IMECE2019-13688	200
Illera Perozo	Danny	6-12-2	IMECE2019-11875	74	Jain	Manish	16-1-1	IMECE2019-13862	202
Impelluso	Thomas	5-8-1	IMECE2019-10250	48	Jaksic	Nebojsa	10-10-5	IMECE2019-10083	119
Impelluso	Thomas	5-2-1	IMECE2019-10249	56	Jaksic	Nebojsa	10-14-1	IMECE2019-10084	122
Impelluso	Thomas	6-4-5	IMECE2019-10266	70	Jakupca	Ian	3-12-2	IMECE2019-11691	31
Impelluso	Thomas	7-9-1	IMECE2019-10248	81	Jaladi	Divya	9-59-1	IMECE2019-12189	110
Impelluso	Thomas	7-5-1	IMECE2019-10282	81	Jalali	Mohammad Hadi	5-10-1	IMECE2019-11504	52
Inal	Kaan	11-47-4	IMECE2019-13590	153	James	Sagil	2-13-2	IMECE2019-12050	11
Incer	Jimena	6-6-1	IMECE2019-10712	68	James	Sagil	10-27-2	IMECE2019-12045	128
Ingram	Shannon	17-4-2	IMECE2019-13657	206	James	Thomas P.	4-5-1	IMECE2019-10180	34
Ingram	Shannon	17-4-3	IMECE2019-13651	207	Jankauski	Mark	5-5-2	IMECE2019-13292	53
Inoue	Hiroataka	17-10-1	IMECE2019-13319	210	Jardim-Goncalves	Ricardo	2-8-3	IMECE2019-11362	20
Intisar	Aseer	8-6-1	IMECE2019-11989	88	Jardim-Goncalves	Ricardo	2-8-3	IMECE2019-11393	20
Inyang	Edidiong	4-2-2	IMECE2019-12809	39	Jardim-Goncalves	Ricardo	2-8-3	IMECE2019-11415	21
Iqbal	Sajid	4-11-1	IMECE2019-10228	43	Jardim-Goncalves	Ricardo	2-8-4	IMECE2019-10985	22
Iqbal	Samir M.	12-8-2	IMECE2019-11734	172	Jardim-Goncalves	Ricardo	2-8-4	IMECE2019-11711	22
Ira	Jiri	5-5-1	IMECE2019-10861	47	Jariwala	Vishal	8-9-2	IMECE2019-11265	83
Irani	Nilgoon	11-17-1	IMECE2019-13064	135	Jarzembski	Amun	9-20-1	IMECE2019-13468	94
Iranpour	Mohammad [Sasan]	11-7-5	IMECE2019-13925	147	Jarzembski	Amun	9-15-1	IMECE2019-10175	108
Irlinger	Franz	2-2-7	IMECE2019-11277	18	Jarzembski	Amun	9-30-2	IMECE2019-13470	109

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Jasim	Firas H.	16-1-1	IMECE2019-13790	201	Jin	Helena (Huiqing)	11-35-1	IMECE2019-13658	159
Jasim	Muhammad	9-16-1	IMECE2019-12083	111	Jin	Lihua	10-4-3	IMECE2019-13147	116
Jasiuk	Iwona	11-26-1	IMECE2019-13890	158	Jin	Siyuan	2-10-2	IMECE2019-10566	10
Jasko	Attila	3-4-1	IMECE2019-10577	29	Jin	Sun	2-9-1	IMECE2019-10832	7
Jativa Cervantes	Hugo	6-10-4	IMECE2019-10643	75	Jin	Sun	2-10-2	IMECE2019-10871	10
Jawad	Badih	8-9-1	IMECE2019-11433	83	Jin	Sun	2-3-1	IMECE2019-10822	24
Jawad	Badih	8-4-1	IMECE2019-10669	89	Jin	Xin	4-2-5	IMECE2019-10918	43
Jayaganthan	R.S.	3-4-2	IMECE2019-10931	30	Jin	Zhiyi	2-6-1	IMECE2019-11104	9
Jayaraman	Ambalavanan	8-4-3	IMECE2019-11449	91	Jindal	Manu	6-16-2	IMECE2019-11122	69
Jaypuria	Sanjib	2-12-1	IMECE2019-12238	10	Jing	Wuming	12-3-1	IMECE2019-10629	169
Jazaei	Robabeh	11-25-1	IMECE2019-13889	142	Jing	Yang	4-13-3	IMECE2019-10887	46
Jazaei	Robabeh	11-26-3	IMECE2019-12039	165	Jing	Yun	1-1-3	IMECE2019-13051	2
Jazaei	Robabeh	17-15-1	IMECE2019-11971	211	Joachim	Jeanne	5-3-1	IMECE2019-10300	49
Jebieshia	T.R.	11-43-1	IMECE2019-11123	139	Jog	Milind A.	8-7-1	IMECE2019-10670	84
Jen	Tien-Chien	2-9-3	IMECE2019-10578	12	Jog	Milind A.	9-32-1	IMECE2019-13717	93
Jen	Tien-Chien	2-4-2	IMECE2019-10693	15	Jog	Milind A.	9-32-1	IMECE2019-13754	93
Jen	Tien-Chien	2-14-1	IMECE2019-10692	21	Johnny	Blevins	7-10-1	IMECE2019-11751	77
Jen	Tien-Chien	6-11-3	IMECE2019-10580	71	Johnson	Christopher	16-1-1	IMECE2019-13230	196
Jen	Tien-Chien	10-30-1	IMECE2019-11152	117	Johnson	Damion	6-16-2	IMECE2019-10917	69
Jenkins	Timothy	12-8-1	IMECE2019-13884	170	Johnson	Haden	4-2-2	IMECE2019-13209	39
Jennings	Jeffrey	10-26-1	IMECE2019-10051	114	Johnson	Kyle	11-7-1	IMECE2019-13771	133
Jensen	Colby	9-15-1	IMECE2019-12258	108	Johnson	Makenzie	7-10-1	IMECE2019-11751	77
Jensen	Devon	6-4-5	IMECE2019-10671	71	Johnson	Randall	6-4-4	IMECE2019-10804	69
Jensen	Devon	16-1-1	IMECE2019-12663	191	Johnson	Randall	15-1-1	IMECE2019-13849	188
Jensen	Henrik M.	11-37-2	IMECE2019-12801	156	Johnson	Scooter	2-9-2	IMECE2019-10930	9
Jenson	Sean	11-35-1	IMECE2019-10752	158	Johnson	Shane	4-5-1	IMECE2019-13127	34
Jenson	Sean	11-35-1	IMECE2019-10753	159	Johnson	Shane	16-1-1	IMECE2019-13688	200
Jeon	Seung-Yeol	11-1-4	IMECE2019-13397	152	Johnston	Kirk	17-6-1	IMECE2019-13834	208
Jeon	Yootaek	5-13-1	IMECE2019-13333	59	Johnston	Stephen	9-53-1	IMECE2019-10679	112
Jeong	Chanseok	16-1-1	IMECE2019-13850	202	Jones	Amanda	11-7-6	IMECE2019-12910	149
Jeong	Jihoon	17-9-1	IMECE2019-12224	209	Jones	Byron	3-14-1	IMECE2019-11377	32
Jeong	Kwangkook	6-11-3	IMECE2019-10998	71	Jones	Casey	17-15-1	IMECE2019-12678	213
Jeong	Yunjo	2-4-1	IMECE2019-11868	14	Jones	Ian S.	1-1-1	IMECE2019-12500	1
Jeong	Yunjo	2-4-2	IMECE2019-11327	15	Jones	Logan	16-1-1	IMECE2019-13596	199
Jeong	Yunjo	17-2-1	IMECE2019-11360	205	Jones	Matthew	9-6-1	IMECE2019-13654	98
Jerkovic	Boris	5-4-4	IMECE2019-10299	59	Jones	Matthew	9-7-1	IMECE2019-13845	99
Jha	Bablu Kumar	10-10-1	IMECE2019-12569	113	Jones	Matthew	9-14-1	IMECE2019-13640	102
Jha	Mahanand	2-12-1	IMECE2019-12238	10	Jones	Matthew	9-14-1	IMECE2019-13745	102
Jha	Swarn	10-10-3	IMECE2019-10433	116	Jones	Matthew	9-14-1	IMECE2019-13778	102
Ji	Siqi	4-3-2	IMECE2019-12514	35	Jonson	Michael	1-2-1	IMECE2019-11381	1
Ji	Zhiming	4-3-2	IMECE2019-11088	35	Joo	Sung-hwan	7-12-1	IMECE2019-13403	79
Jia	Kang	2-14-1	IMECE2019-10383	21	Jordan	Nathan J.	16-1-1	IMECE2019-13429	197
Jia	Kang	2-3-2	IMECE2019-11791	25	Joseph	Paul	11-12-3	IMECE2019-13846	164
Jia	Qianru	17-9-1	IMECE2019-12954	209	Joshi	Mihir	2-8-3	IMECE2019-11266	20
Jia	Xiao	2-12-1	IMECE2019-11970	10	Joshi	Sanjay	2-8-1	IMECE2019-13245	17
Jia	Xiao	16-1-1	IMECE2019-13159	195	Joshi	Sanjay	16-1-1	IMECE2019-13246	196
Jia	Xiu	10-2-2	IMECE2019-12890	128	Joshi	Shailendra	11-11-1	IMECE2019-12565	134
Jia	Xiu	16-1-1	IMECE2019-13862	202	Joshi	Shailendra	11-8-3	IMECE2019-12566	140
Jia	Zheng	12-6-1	IMECE2019-12058	171	Joshi	Yogendra	10-17-2	IMECE2019-12271	123
Jia	Zhenyuan	2-5-3	IMECE2019-10801	17	Josyula	Tejaswi	9-18-2	IMECE2019-11256	108
Jia	Zhenyuan	2-5-3	IMECE2019-10802	17	Ju	Jaehyung	10-4-1	IMECE2019-13249	113
Jianfeng	Yu	2-13-2	IMECE2019-11160	11	Ju	Jaehyung	10-4-2	IMECE2019-13069	114
Jianfeng	Yu	14-1-1	IMECE2019-11144	183	Ju	Jaehyung	10-4-4	IMECE2019-12798	118
Jiang	Di	6-14-1	IMECE2019-10372	75	Juarez	Ezequiel	11-42-1	IMECE2019-11187	136
Jiang	Di	6-14-2	IMECE2019-10489	76	Juchler	Norman	4-4-1	IMECE2019-11125	33
Jiang	Li	12-6-1	IMECE2019-12529	171	Jung de Andrade	Monica	11-7-3	IMECE2019-12544	140
Jiang	Menghan	2-3-1	IMECE2019-10993	24	K	Arul	2-5-2	IMECE2019-10056	16
Jiang	Ruisong	2-12-1	IMECE2019-11002	10	K	Kamesh	10-17-1	IMECE2019-11290	120
Jiang	Ruisong	2-7-3	IMECE2019-11034	24	K	Kamesh	11-17-1	IMECE2019-10004	135
Jiang	Ruisong	10-24-1	IMECE2019-10901	123	K B	Devika	5-8-3	IMECE2019-12082	51
Jiang	Rui-song	2-5-4	IMECE2019-11036	19	K G	Dwaraknath	8-6-2	IMECE2019-11270	89
Jiang	Rui-song	10-26-2	IMECE2019-10837	115	K. Oudah	Saad	9-36-1	IMECE2019-11847	96
Jiang	Taizhi	11-23-2	IMECE2019-13268	153	Kabbani	Hussameddine	1-2-1	IMECE2019-10096	1
Jiang	Taizhi	11-26-2	IMECE2019-13138	162	Kabir	M.M.	9-36-1	IMECE2019-10697	95
Jiang	Xiaoning	4-4-2	IMECE2019-12208	35	Kacher	Henry	3-12-2	IMECE2019-11691	31
Jiang	Yijie	11-3-2	IMECE2019-12993	165	Kaczka	David	4-1-1	IMECE2019-12478	33
Jiao	Weijian	1-1-2	IMECE2019-12949	2	Kadambi	Jaikrishnan	8-11-1	IMECE2019-11995	86
Jiao	Weijian	16-1-1	IMECE2019-12947	193	Kadau	Kai	11-38-3	IMECE2019-12767	150
Jin	Cheng-cheng	2-12-1	IMECE2019-11002	10	Kadowaki	Hiroko	4-3-1	IMECE2019-10548	33
Jin	Congran	11-37-4	IMECE2019-13848	163	Kadowaki	Hiroko	4-3-1	IMECE2019-11837	33
Jin	Feng	1-1-5	IMECE2019-13364	3	Kaishian	Emma	4-11-2	IMECE2019-12024	44
Jin	Helena (Huiqing)	11-18-2	IMECE2019-13673	138	Kajiwara	Kotaro	10-5-1	IMECE2019-13320	127
Jin	Helena (Huiqing)	11-7-5	IMECE2019-12992	147	Kakaliios	James	17-15-1	IMECE2019-12837	213
Jin	Helena (Huiqing)	11-7-6	IMECE2019-12856	149	Kakanuru	Padmalatha	2-2-4	IMECE2019-11627	18

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Kakikoshi	Takanobu	17-10-1	IMECE2019-12675	210	Karim	Mohammad Rezaul	11-38-3	IMECE2019-12767	150
Kalaitezidou	Kyriaki	10-10-5	IMECE2019-12773	120	Karimi	Amir	7-3-1	IMECE2019-10812	79
Kalantar	Negar	16-1-1	IMECE2019-13189	195	Karimi	Amir	7-3-1	IMECE2019-13877	79
Kalay	Onur Can	2-8-1	IMECE2019-11554	17	Karng	Sarng Woo	6-9-1	IMECE2019-13054	72
Kalay	Onur Can	4-10-2	IMECE2019-11530	41	Karpat	Esin	11-12-4	IMECE2019-11510	166
Kalay	Onur Can	11-12-4	IMECE2019-11510	166	Karpat	Fatih	2-8-1	IMECE2019-11554	17
Kalista	Robert	6-5-1	IMECE2019-10267	62	Karpat	Fatih	4-10-2	IMECE2019-11530	41
kalluri	Anil	10-26-5	IMECE2019-12102	120	Karpat	Fatih	11-12-4	IMECE2019-11510	166
Kalnaus	Sergiy	6-11-2	IMECE2019-12469	70	Karpat	Fatih	13-9-1	IMECE2019-11478	179
Kamat	Shardul	10-27-2	IMECE2019-12689	128	Karpov	Eduard	10-4-2	IMECE2019-12335	114
Kamel	Hisham	4-13-3	IMECE2019-10616	46	Karpov	Eduard	17-10-1	IMECE2019-13237	210
Kamel	Hisham	13-10-1	IMECE2019-10227	177	Karpov	Eduard	17-10-1	IMECE2019-13238	210
Kamel	Hisham	13-10-1	IMECE2019-10598	177	Karrech	Ali	11-7-5	IMECE2019-10035	147
Kameraman	David	11-7-5	IMECE2019-13469	147	Karriem	Zain	9-15-1	IMECE2019-12258	108
Kampouris	Myrto	15-1-1	IMECE2019-13943	190	Kasa	Temesgen Takele	11-1-7	IMECE2019-12397	157
Kamrani	Mehdi	10-27-1	IMECE2019-12737	126	Kashani	Reza	1-10-1	IMECE2019-10153	3
Kamrani	Mehdi	11-7-7	IMECE2019-12736	152	Kataoka	Shunji	8-9-3	IMECE2019-10200	84
Kan	Fan	2-8-1	IMECE2019-10541	17	Katbeh	Tala	7-9-1	IMECE2019-10352	81
Kanamori	Kohei	10-10-4	IMECE2019-11081	118	Katbeh	Tala	7-9-1	IMECE2019-10360	81
Kanamori	Kohei	10-24-2	IMECE2019-11145	125	Katihar	Tarun	11-47-3	IMECE2019-12775	151
Kanani	Yousef	9-46-1	IMECE2019-13500	103	Katko	Benjamin J.	3-10-1	IMECE2019-13483	31
Kaneko	Mitsugu	5-2-2	IMECE2019-11055	58	Katkov	Igor	2-11-1	IMECE2019-10388	8
Kaneko	Yoshiyuki	2-5-2	IMECE2019-11100	16	Katkov	Igor	4-10-5	IMECE2019-10447	45
Kaner	Richard	9-5-1	IMECE2019-13086	111	Kato	Mitsuaki	12-7-2	IMECE2019-10558	173
Kang	Joonsang	9-25-1	IMECE2019-13535	98	Kato	Yuya	4-10-2	IMECE2019-10530	41
Kang	Joonsang	9-24-1	IMECE2019-13548	107	Kaufmann	Joshua	16-1-1	IMECE2019-12948	193
Kang	Kyungnam	16-1-1	IMECE2019-12632	191	Kaul	Sanjay	11-12-1	IMECE2019-10559	158
Kang	Kyungnam	16-1-1	IMECE2019-13604	199	Kaul	Sudhir	5-2-1	IMECE2019-10021	56
Kang	Soyoung	7-1-1	IMECE2019-12649	77	Kaur	Sumanjeet	9-15-1	IMECE2019-10977	108
Kang	Soyoung	17-4-3	IMECE2019-12974	206	Kausar	Katalin	4-5-1	IMECE2019-11661	34
Kang	Soyoung	17-4-2	IMECE2019-13107	206	Kaushik	Adithya	2-8-2	IMECE2019-11785	19
Kang	Soyoung	17-4-3	IMECE2019-13359	207	Kaushik	Adithya	5-4-3	IMECE2019-11762	58
Kang	Soyoung	17-4-3	IMECE2019-13595	207	Kauwe	Kaai	16-1-1	IMECE2019-13170	195
Kang	Sung Hoon	2-2-5	IMECE2019-13113	20	Kawabata	Hironori	11-1-8	IMECE2019-12917	160
Kang	Sung Hoon	10-12-1	IMECE2019-12639	128	Kawada	Hiroyuki	10-5-1	IMECE2019-13320	127
Kang	Sung Hoon	11-1-4	IMECE2019-13397	152	Kawada	Hiroyuki	17-10-1	IMECE2019-13319	210
Kang	Sung Hoon	11-32-1	IMECE2019-13123	155	Kay	Ian	6-1-1	IMECE2019-11949	61
Kang	Sung Hoon	11-3-2	IMECE2019-13394	166	Kaya	Mine	6-10-1	IMECE2019-13273	72
Kang	Sung Hoon	16-1-1	IMECE2019-13118	194	Kaya	Necmettin	14-3-2	IMECE2019-10965	184
Kang	Wonmo	11-1-6	IMECE2019-13918	154	Kaya	Necmettin	14-3-2	IMECE2019-12299	184
Kang	Yijie	12-3-1	IMECE2019-11921	170	Kaye	Sophie	1-1-6	IMECE2019-11338	4
Kang	YounKil	11-22-2	IMECE2019-11110	145	Kayki	M. Ömer	2-5-2	IMECE2019-11439	16
Kanj	Ali	5-15-1	IMECE2019-10668	48	Kayki	M. Ömer	10-17-2	IMECE2019-11998	122
Kannan	Sathish	2-5-2	IMECE2019-10952	16	Kayran	Altan	3-6-1	IMECE2019-11153	27
Kannan	Sathish	2-5-3	IMECE2019-10973	17	Kayran	Altan	3-13-1	IMECE2019-11483	30
Kannan	Sathish	2-5-4	IMECE2019-10961	19	Kazemi	Hezahneh	16-1-1	IMECE2019-13803	202
Kao	Victor	15-1-1	IMECE2019-13988	189	Kazemi-Lari	Mohammad A.	11-5-3	IMECE2019-13519	160
Kar	Bandana	16-1-1	IMECE2019-13611	200	Kazemzadeh	Mohammadrahim	12-6-1	IMECE2019-12531	172
Kar	Koushik	16-1-1	IMECE2019-13033	194	Kazinakis	Karlos	11-37-3	IMECE2019-12636	159
Karakouzian	Moses	11-26-3	IMECE2019-12039	165	Ke	Changhong	11-26-1	IMECE2019-13547	158
Karaman	Ibrahim	2-12-2	IMECE2019-12784	13	Ke	Changhong	11-26-2	IMECE2019-12277	162
Karaman	Ibrahim	10-19-1	IMECE2019-13155	127	Ke	Changhong	11-26-3	IMECE2019-12278	164
Karaman	Ibrahim	16-1-1	IMECE2019-12674	191	Ke	Changhong	11-26-3	IMECE2019-12318	164
Karami	Ghodrat	4-5-2	IMECE2019-10742	35	Ke	Renjie	8-11-1	IMECE2019-11995	86
Karami	Ghodrat	4-5-2	IMECE2019-10743	36	Kear	Bernard	11-25-1	IMECE2019-13900	142
Karami	Ghodrat	4-5-2	IMECE2019-11549	36	Kebschull	Scott	13-9-1	IMECE2019-12178	179
Karami	Ghodrat	11-1-3	IMECE2019-11829	149	Kecskes	Laszlo	10-26-4	IMECE2019-11612	119
Karami	M. Amin	1-1-5	IMECE2019-13716	3	Keegan	Jon	10-29-2	IMECE2019-11895	131
Karami	M. Amin	4-3-1	IMECE2019-13712	33	Kefal	Adnan	1-12-2	IMECE2019-13177	6
Karami	M. Amin	5-4-4	IMECE2019-13830	59	Kefal	Adnan	3-12-1	IMECE2019-13171	29
Karami	M. Amin	11-42-1	IMECE2019-13721	136	Kefal	Adnan	3-15-1	IMECE2019-13175	30
Karami	M. Amin	16-1-1	IMECE2019-13552	199	Kejela	Ephrem	16-2-1	IMECE2019-13878	204
Karami	M. Amin	16-1-1	IMECE2019-13687	200	Keles	Ozgur	2-2-6	IMECE2019-11698	21
Karami	M. Amin	16-1-1	IMECE2019-13694	200	Kelkar	Ajit	10-23-1	IMECE2019-11441	125
Karami	M. Amin	16-1-1	IMECE2019-13728	201	Kelkar	Ajit	10-23-1	IMECE2019-11639	125
Karami	M. Amin	16-1-1	IMECE2019-13734	201	Kelkar	Ajit	17-15-1	IMECE2019-12897	213
Karami	M. Amin	17-4-3	IMECE2019-13735	207	Kelkar	Ajit	17-15-1	IMECE2019-13423	214
Karami Mohammadi	Neda	1-1-5	IMECE2019-13647	3	Kelsall	Colin	6-7-1	IMECE2019-12667	66
Karava	Panagiota	16-1-1	IMECE2019-13619	200	Kelsall	Colin	9-2-1	IMECE2019-12772	104
Karazis	Kostas	5-5-1	IMECE2019-10663	47	Kempers	Roger	9-9-1	IMECE2019-11777	101
Kardomateas	George	3-6-2	IMECE2019-13681	28	Kempf	Nick	16-1-1	IMECE2019-11980	191
Kardomateas	George	3-6-2	IMECE2019-13684	28	Kennedy	Eugenia	13-8-1	IMECE2019-11432	178
Kardomateas	George	3-6-2	IMECE2019-13704	28	Kennedy	Eugenia	13-8-1	IMECE2019-11451	178
Karim	Anwarul	9-18-1	IMECE2019-11015	106	Kennedy	Scott	5-10-1	IMECE2019-11506	52

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Keppanan	Malarmohan	5-2-4	IMECE2019-12198	60	Kim	Salla	3-3-1	IMECE2019-11968	32
Kermani	E.	17-10-1	IMECE2019-13185	210	Kim	Sangyeop	17-11-2	IMECE2019-13167	211
Kermani	Golriz	10-15-1	IMECE2019-13692	129	Kim	Seokjoon	5-2-2	IMECE2019-10997	58
Kerrigan	Jason	7-1-2	IMECE2019-12965	78	Kim	Seung	16-1-1	IMECE2019-13720	191
Kesari	Haneesh	11-37-4	IMECE2019-12909	162	Kim	Sunphil	12-7-1	IMECE2019-11867	169
Keste	A.A.	9-36-2	IMECE2019-10203	99	King	Alexander	16-1-1	IMECE2019-13429	197
Keyvan	Golshid	10-26-6	IMECE2019-13569	121	King	Rylan	11-5-1	IMECE2019-11244	155
Khabaz	Fardin	11-23-2	IMECE2019-13268	153	King	William	9-36-2	IMECE2019-13030	99
Khajehtourian	Romik	1-1-2	IMECE2019-13300	1	Kingsley	Bryce	16-1-1	IMECE2019-13083	194
Khajehtourian	Romik	1-1-4	IMECE2019-12106	3	Kingstedt	Owen	11-18-1	IMECE2019-12906	135
Khajehtourian	Romik	10-4-5	IMECE2019-12884	119	Kingstedt	Owen	11-18-1	IMECE2019-13442	135
Khajehvand	Milad	16-1-1	IMECE2019-13610	199	Kingstedt	Owen	11-18-3	IMECE2019-13328	141
Khalil	Mohamad	9-36-1	IMECE2019-11523	96	Kingstedt	Owen	11-14-3	IMECE2019-12819	149
Khalili-Araghi	Fatemeh	9-25-1	IMECE2019-11692	98	Kingstedt	Owen	15-1-1	IMECE2019-13326	188
Khalilollahi	Amir	9-2-1	IMECE2019-10161	104	Kingstedt	Owen	15-1-1	IMECE2019-13962	189
Khan	Adnan	2-5-4	IMECE2019-10961	19	Kingstedt	Owen	16-2-1	IMECE2019-13631	204
Khan	Fazeel	5-2-4	IMECE2019-12214	60	Kingstedt	Owen	17-15-1	IMECE2019-13329	211
Khan	Jamil	9-43-2	IMECE2019-11065	95	Kinnison	Rachel	15-1-1	IMECE2019-13967	189
Khan	Jamil	9-36-1	IMECE2019-11847	96	Kiran Sagar	Chithajalu	3-13-1	IMECE2019-10958	30
Khan	Jamil	9-29-1	IMECE2019-11794	104	Kirane	Kedar	11-46-2	IMECE2019-12810	143
Khan	Jamil	9-51-1	IMECE2019-11624	110	Kirane	Kedar	11-7-5	IMECE2019-12669	147
Khan	Jamil	9-16-1	IMECE2019-11781	111	Kirchain	Randolph	16-2-1	IMECE2019-13295	203
Khan	Kamran	9-36-1	IMECE2019-11523	96	Kiriakos	Joseph	17-6-1	IMECE2019-13834	208
Khan	Kamran	9-64-1	IMECE2019-11498	97	Kirk	Tanner	10-19-1	IMECE2019-13155	127
Khan	M. Nazmuzzaman	5-2-2	IMECE2019-11077	58	Kishimoto	Takuya	4-3-1	IMECE2019-11837	33
Khan	M.H.	3-10-1	IMECE2019-12750	31	Kitamura	Ko	4-10-3	IMECE2019-10866	42
Khan	Md. I.	4-2-3	IMECE2019-13906	40	Kitowski	Zach	1-2-1	IMECE2019-11024	1
Khan	Mohammad	6-5-2	IMECE2019-10949	63	Kivisalu	Michael	16-1-1	IMECE2019-13471	198
Khan	Mohid	16-1-1	IMECE2019-13432	197	Kizaki	Takeshi	10-5-1	IMECE2019-13320	127
Khan	Sanan H.	2-9-1	IMECE2019-10440	7	Klasuner	Adam	17-4-2	IMECE2019-13775	206
Khan	Shaheryar Atta	17-2-1	IMECE2019-12851	205	Klatt	Dieter	16-1-1	IMECE2019-13710	200
Khanal	Damodar	11-10-2	IMECE2019-11740	138	Klein	John T.	10-4-2	IMECE2019-13235	114
Khandagale	Pratik	11-1-4	IMECE2019-13875	152	Klein	John T.	17-10-1	IMECE2019-13237	210
Khandaker	Morshed	4-10-2	IMECE2019-11530	41	Klimes	Lubomir	17-6-1	IMECE2019-10438	207
Khandaker	Morshed	8-6-1	IMECE2019-11979	88	Klimes	Lubomir	17-9-1	IMECE2019-10381	208
Khanna	Kshitiz	2-2-1	IMECE2019-10745	14	Knikker	Ronnie	8-2-1	IMECE2019-11675	86
Khayyati	Ahmad	13-1-1	IMECE2019-10342	176	Ko	Han Seo	6-9-1	IMECE2019-13054	72
Khiu	Axconny	1-6-2	IMECE2019-12470	5	Ko	Youngmok	6-4-1	IMECE2019-11514	64
Khodayari Bavil	Ali	16-1-1	IMECE2019-13720	191	Kobayashi	Satoshi	2-6-1	IMECE2019-10524	9
Khurana	Jivtresh	10-9-2	IMECE2019-13385	124	Kochaver	Lauren M.	16-2-1	IMECE2019-13631	204
Kielb	Robert	5-5-2	IMECE2019-13265	53	Kochmann	Dennis M.	1-1-4	IMECE2019-12106	3
Kiknadze	Gennadiy	4-9-1	IMECE2019-11298	42	Kochmann	Dennis M.	10-4-5	IMECE2019-12884	119
Kikuchi	Ryo	11-7-1	IMECE2019-11210	133	Kodama	Hiroyuki	2-14-1	IMECE2019-12509	21
Kim	Ara	16-1-1	IMECE2019-13105	194	Koester	Jacob	11-28-1	IMECE2019-13703	135
Kim	Bongjoong	16-1-1	IMECE2019-12847	193	Koguchi	Hideo	11-26-2	IMECE2019-12315	162
Kim	Byumsu	11-37-4	IMECE2019-13649	163	Koh	Heeyuen	9-29-1	IMECE2019-10276	103
Kim	Byungki	17-11-1	IMECE2019-10757	210	Koh	Yee Rui	9-25-2	IMECE2019-12964	100
Kim	Changgi	17-6-1	IMECE2019-13388	208	Kohl	James	11-17-1	IMECE2019-13029	135
Kim	Chang-jin	12-2-2	IMECE2019-14009	169	Koledov	V.V.	10-26-4	IMECE2019-11532	118
Kim	Dongsu	6-9-3	IMECE2019-13783	74	Kolluri	Aruna Prabha	17-2-1	IMECE2019-10416	205
Kim	H.D.	11-43-1	IMECE2019-11123	139	Kolluri	Aruna Prabha	17-2-1	IMECE2019-10417	205
Kim	Howuk	4-4-2	IMECE2019-12208	35	Kolluri	Aruna Prabha	17-10-1	IMECE2019-10423	210
Kim	Huijeong	16-1-1	IMECE2019-13619	200	Kolluri	Aruna Prabha	17-15-1	IMECE2019-12878	211
Kim	Hyundeok	5-13-1	IMECE2019-13333	59	Komatsuzaki	Toshihiko	1-2-2	IMECE2019-10776	4
Kim	Jiho	16-1-1	IMECE2019-13230	196	Konakci	Süleyman	14-3-2	IMECE2019-10965	184
Kim	Jong-Hoon	9-18-1	IMECE2019-11015	106	Konduri	Teja	3-6-2	IMECE2019-13678	27
Kim	Jong-Hoon	12-8-1	IMECE2019-11708	170	Kong	Benjamin	17-6-1	IMECE2019-13834	208
Kim	JongHyun (Joe)	2-4-2	IMECE2019-13114	16	Kong	Wilson	9-51-2	IMECE2019-12526	111
Kim	JongHyun (Joe)	12-4-1	IMECE2019-13115	172	Konica	Shabnam	11-39-1	IMECE2019-13215	136
Kim	JongHyun (Joe)	12-7-2	IMECE2019-13353	173	Konlan	John	16-1-1	IMECE2019-13499	198
Kim	JongHyun (Joe)	17-2-1	IMECE2019-13119	205	Koo	Kanghyeon	11-1-10	IMECE2019-13269	165
Kim	Jungkyu	8-6-3	IMECE2019-13393	91	Koohbor	Behrad	2-9-3	IMECE2019-13415	12
Kim	Jungkyu	16-1-1	IMECE2019-13720	191	Kooistra-Manning	Emily A.	2-4-2	IMECE2019-11456	16
Kim	Ki-Joong	16-1-1	IMECE2019-12771	192	Kopmaz	Osman	11-12-4	IMECE2019-11510	166
Kim	Kwanghwa	5-13-1	IMECE2019-13333	59	Koppisetty	D.V. Suresh	2-7-1	IMECE2019-10600	23
Kim	Kyunghoon	9-25-2	IMECE2019-13011	100	Koppisetty	D.V. Suresh	2-7-4	IMECE2019-10602	25
Kim	Kyunghoon	9-25-2	IMECE2019-13012	100	Koppisetty	D.V. Suresh	13-10-1	IMECE2019-10680	177
Kim	Kyunghoon	9-24-1	IMECE2019-13013	107	Koppisetty	D.V. Suresh	13-10-2	IMECE2019-13685	177
Kim	Kyunghoon	17-15-1	IMECE2019-12581	212	Koretsky	Milo	7-1-2	IMECE2019-13584	78
Kim	Kyung-Suk	11-47-2	IMECE2019-13559	148	Korgel	Brian	11-23-2	IMECE2019-13268	153
Kim	Kyung-Suk	11-2-2	IMECE2019-13536	160	Korgel	Brian	11-26-2	IMECE2019-13138	162
Kim	Moon Ki	17-11-2	IMECE2019-13167	211	Korgel	Brian	11-26-2	IMECE2019-13141	162
Kim	Namwon	12-3-1	IMECE2019-12791	170	Korivi	Naga S.	12-6-1	IMECE2019-12529	171
Kim	Namwon	12-8-1	IMECE2019-12990	170	Kornguth	Steven	4-2-4	IMECE2019-12650	42

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Koronaki	Irene	6-2-1	IMECE2019-10725	64	Kulkarni	Shank S.	11-38-3	IMECE2019-10069	150
Koronaki	Irene	6-2-2	IMECE2019-10736	65	Kulkarni	Shank S.	17-11-2	IMECE2019-12508	210
Koronaki	Irene	6-2-3	IMECE2019-10738	67	Kulkarni	Shubhamkar	2-7-2	IMECE2019-11231	23
Korpas	Lucia M.	10-4-5	IMECE2019-13764	119	Kulke	Vincent	5-3-1	IMECE2019-10576	49
Korsen	Ryan	14-1-4	IMECE2019-10674	185	Kumar	Abhishek	6-7-3	IMECE2019-11117	70
Korsvik	Håkon Bakke	6-4-5	IMECE2019-10266	70	Kumar	Abhishek	6-11-2	IMECE2019-12469	70
Kosaraju	Satyanarayana	10-26-5	IMECE2019-12102	120	Kumar	Aditya	11-1-6	IMECE2019-13582	154
Kotagama	Praveen	9-36-2	IMECE2019-12527	99	Kumar	Ajeet	11-23-1	IMECE2019-12676	152
Kotagama	Praveen	16-1-1	IMECE2019-12654	191	Kumar	Ajeet	11-5-1	IMECE2019-12844	155
Kothari	Anmol	11-12-3	IMECE2019-13846	164	Kumar	Aman	5-10-2	IMECE2019-12372	50
Kothari	Mriyujay	11-2-2	IMECE2019-13536	160	Kumar	Dhananjay	16-1-1	IMECE2019-13427	197
Kotikalapudi	Sai Tharun	10-10-3	IMECE2019-12259	116	Kumar	Dhananjay	16-1-1	IMECE2019-13473	198
Kotikalapudi	Sai Tharun	10-9-3	IMECE2019-13005	127	Kumar	Jatin	4-10-5	IMECE2019-10800	45
Kotkunde	Nitin	2-7-4	IMECE2019-11126	25	Kumar	Kuldeep	3-2-1	IMECE2019-11091	28
Kotobuki	Fumika	1-12-2	IMECE2019-13691	6	Kumar	Navin	16-2-1	IMECE2019-13628	204
Koumlis	Stylianios	16-1-1	IMECE2019-13093	194	Kumar	Nitin	16-1-1	IMECE2019-12752	192
Kouraytem	Nadia	11-14-3	IMECE2019-12819	149	Kumar	Raghav	3-2-1	IMECE2019-10938	28
Kowalski	Gregory	6-2-3	IMECE2019-10739	66	Kumar	Raghav	15-1-1	IMECE2019-10935	187
Koya	Olufemi	11-14-2	IMECE2019-10978	147	Kumar	Santosh	8-6-3	IMECE2019-13285	90
Koz	Mustafa	9-32-1	IMECE2019-11374	93	Kumar	Sunil	3-2-1	IMECE2019-10938	28
Kozaki	Shingo	17-15-1	IMECE2019-13377	212	Kumar	Sunil	15-1-1	IMECE2019-10935	187
Kozubik	Lukas	17-9-1	IMECE2019-10381	208	Kumar	Sushrut	8-12-1	IMECE2019-10841	86
Kraft	Kaleigh	7-4-1	IMECE2019-10467	80	Kumar	Sushrut	8-4-2	IMECE2019-10846	90
Kraft	Reuben	4-2-1	IMECE2019-13531	36	Kumar	Sushrut	8-4-2	IMECE2019-11273	90
Kraft	Reuben	4-2-5	IMECE2019-13428	43	Kumar	Sushrut	8-4-2	IMECE2019-11319	90
Kramer	Sharlotte L.	11-7-6	IMECE2019-12856	149	Kummareashvar	P.J.	6-7-3	IMECE2019-10951	70
Kramer	Sharlotte L.	11-7-6	IMECE2019-12910	149	Kumpaty	Subha	7-4-1	IMECE2019-10467	80
Kratschun	Filipp	8-3-2	IMECE2019-11343	90	Kumpaty	Subha	7-4-1	IMECE2019-11926	80
Krause	Dieter	14-4-1	IMECE2019-10497	181	Kumpaty	Subha	7-9-1	IMECE2019-10465	81
Kremer	Gul	7-5-1	IMECE2019-10747	81	Kunene	Thokozani	10-30-1	IMECE2019-11152	117
Kresh	J. Yasha	16-1-1	IMECE2019-13501	198	Kunis	Christian	1-6-2	IMECE2019-13266	5
Kretzschmar	Niklas	14-4-1	IMECE2019-11480	181	Kunkel	Robert	4-6-2	IMECE2019-10514	37
Krick	Brandon A.	4-5-1	IMECE2019-13127	34	Kunnel	Maria	8-6-1	IMECE2019-11979	88
Krick	Brandon A.	16-1-1	IMECE2019-13688	200	Kuntumalla	Gowtham	2-8-1	IMECE2019-10621	17
Krick	Brandon A.	16-1-1	IMECE2019-13862	202	Kuntumalla	Gowtham	9-36-1	IMECE2019-11421	96
Krieger	Yannick	2-2-6	IMECE2019-10022	21	Kunz	Robert	9-43-1	IMECE2019-11902	94
Krippene	Brett C.	6-5-1	IMECE2019-13039	62	Kuo	Jim	6-10-4	IMECE2019-12075	75
Krishna	Ankur	2-3-2	IMECE2019-10571	25	Kuo	Jim Y.	6-10-2	IMECE2019-11859	73
Krishna	S.	2-7-4	IMECE2019-10715	25	Kuramochi	Shota	5-3-3	IMECE2019-12629	47
Krishna	S.	5-4-4	IMECE2019-10424	59	Kuts	Vladimir	2-13-1	IMECE2019-10583	8
Krishnamurthy	Adarsh	16-1-1	IMECE2019-13522	198	Kuwada	Jason	6-9-3	IMECE2019-10522	74
Krishnan	A.S.	6-7-3	IMECE2019-10951	70	Kuwada	Jason	6-9-3	IMECE2019-10523	74
Krishnan	Atindra	17-9-1	IMECE2019-13931	209	Kvalvik	Morten	5-11-1	IMECE2019-10434	55
Krolick	William	3-13-1	IMECE2019-11333	29	Kwak	Jan	10-12-1	IMECE2019-11042	129
Krovvidi	Sai	3-4-2	IMECE2019-11544	30	Kwarteng	Vanessa	16-1-1	IMECE2019-13619	200
Krstic	Miroslav	16-1-1	IMECE2019-13567	199	Kwon	Beomjin	9-36-2	IMECE2019-13030	99
Krueger	Paul	4-6-2	IMECE2019-11565	37	Kwon	Patrick	2-5-2	IMECE2019-13390	16
Kruger	Silvio	1-12-2	IMECE2019-13621	6	Kwon	Patrick	2-5-6	IMECE2019-13150	22
Kruger	Sunita	9-57-1	IMECE2019-11420	107	Kwon	Suk Bum	16-1-1	IMECE2019-13538	198
Krupa	Mike	12-6-1	IMECE2019-13047	172	Kyriakides	Stelios	11-37-3	IMECE2019-12636	159
Krushynska	Anastasiia	1-1-5	IMECE2019-13647	3	Kyriakides	Stelios	11-37-4	IMECE2019-12672	162
Kruttschnitt	Michael	4-4-1	IMECE2019-10347	33	Kysar	Jeffrey	11-47-3	IMECE2019-12803	151
Kruzic	Jamie J.	11-12-3	IMECE2019-12987	164	Kysar	Jeffrey	11-26-1	IMECE2019-12305	158
Kruzic	Jamie J.	16-2-1	IMECE2019-13631	204	Ladani	Leila	2-2-1	IMECE2019-10256	14
Krysko	Robert M.	8-9-2	IMECE2019-10723	83	Ladani	Leila	2-2-3	IMECE2019-11863	16
Krysko	Robert M.	8-9-3	IMECE2019-10727	84	Ladani	Leila	2-2-5	IMECE2019-12371	20
Ku	Jentung	9-7-1	IMECE2019-12491	99	Ladani	Leila	4-4-1	IMECE2019-11765	33
Ku	Zahyun	1-1-6	IMECE2019-10449	4	Ladani	Leila	4-4-1	IMECE2019-11760	34
Ku	Zahyun	1-1-6	IMECE2019-11866	4	Lagoudas	Dimitris	1-1-5	IMECE2019-11302	4
Kuang	Wenzheng	16-1-1	IMECE2019-11980	191	Lagoudas	Dimitris	11-7-6	IMECE2019-13639	149
Kuang	Xiao	11-2-2	IMECE2019-13527	160	Lai	Heather	2-2-4	IMECE2019-10496	18
Kuang	Xiao	11-2-2	IMECE2019-13529	160	Lai	Heather	7-1-1	IMECE2019-10494	77
Kubota	Sho	17-15-1	IMECE2019-13380	212	Lai	Heather	17-1-1	IMECE2019-12269	205
Kudo	Takuya	12-1-1	IMECE2019-11076	171	Lai	Ming-Chia	6-11-1	IMECE2019-10369	68
Kudo	Takuya	12-4-1	IMECE2019-11107	172	Lakshmanan	Aaditya	10-2-1	IMECE2019-12699	126
Kuhlenhoelter	Jonathan D.	4-5-1	IMECE2019-11661	34	Lalitha Sridhar	Raghuvveer	17-4-2	IMECE2019-13592	206
Kularatne	Dhanushka	16-1-1	IMECE2019-13432	197	Lalitha Sridhar	Shankar	11-39-3	IMECE2019-13279	142
Kulbago	Benjamin	16-1-1	IMECE2019-12728	192	Lalitha Sridhar	Shankar	11-1-10	IMECE2019-13269	165
Kulhanek	Chris	5-9-1	IMECE2019-10290	48	Lamberson	Leslie	11-18-2	IMECE2019-13622	138
Kulikowski	John	5-15-1	IMECE2019-10668	48	Lamberson	Leslie	16-1-1	IMECE2019-13093	194
Kulkarni	Shank S.	3-7-1	IMECE2019-10070	28	Lanba	Asheesh	4-4-2	IMECE2019-12282	35
Kulkarni	Shank S.	11-25-1	IMECE2019-11843	142	Lande	Micah	14-1-4	IMECE2019-11671	185
Kulkarni	Shank S.	11-14-1	IMECE2019-10071	145	Landis	Chad	11-1-1	IMECE2019-13284	144
Kulkarni	Shank S.	11-38-1	IMECE2019-10136	146	Landis	Chad	11-1-2	IMECE2019-13278	146

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Landis	Chad	11-37-3	IMECE2019-13452	159	Lee	Kun-Lin	12-5-1	IMECE2019-11618	171
Landis	Chad	11-34-1	IMECE2019-13450	167	Lee	Kyung-Chang	11-3-1	IMECE2019-12969	163
Landry	Christopher	8-6-1	IMECE2019-10209	88	Lee	Michael	16-1-1	IMECE2019-13737	201
Lane	Ryan	2-9-3	IMECE2019-13613	12	Lee	Ming-Tsang	9-49-1	IMECE2019-11083	109
Lane	Ryan	10-2-2	IMECE2019-13683	128	Lee	Moo Yeon	12-3-1	IMECE2019-12791	170
Lang	Allen	7-1-2	IMECE2019-12965	78	Lee	Olivia	15-1-1	IMECE2019-13943	190
Lang	Ji	16-1-1	IMECE2019-13156	195	Lee	Sang	1-1-6	IMECE2019-10449	4
Lang	Ji	17-15-1	IMECE2019-13154	214	Lee	Sangsoo	9-36-1	IMECE2019-10697	95
Langer	Joshua	9-36-2	IMECE2019-10617	99	Lee	Sangyeop	9-29-2	IMECE2019-13625	105
Languri	Ethan	6-7-3	IMECE2019-12185	70	Lee	Sangyeop	9-29-2	IMECE2019-13641	105
Languri	Ethan	9-59-1	IMECE2019-12189	110	Lee	Se Jun	10-23-2	IMECE2019-11461	130
Lankarani	Hamid	2-7-1	IMECE2019-10600	23	Lee	Seokwhan	17-6-1	IMECE2019-13388	208
Lankarani	Hamid	2-7-4	IMECE2019-10602	25	Lee	Seok-Woo	11-39-2	IMECE2019-13255	138
Lankarani	Hamid	13-10-1	IMECE2019-10680	177	Lee	Seok-Woo	11-39-2	IMECE2019-13352	139
Lankarani	Hamid	13-10-2	IMECE2019-13685	177	Lee	Seul-Yi	9-26-1	IMECE2019-11553	102
Lapinska	Kaja	17-9-1	IMECE2019-12959	209	Lee	Seunghyun	11-8-2	IMECE2019-13254	137
Lara	Paul	11-8-1	IMECE2019-10337	133	Lee	Sunyoup	17-6-1	IMECE2019-13388	208
Lara-Velazquez	Carlos	4-8-1	IMECE2019-11085	37	Lee	Won-Kyu	16-1-1	IMECE2019-13136	195
Larkey	Andrew	3-3-1	IMECE2019-12881	32	Lee	Yi T.	16-1-1	IMECE2019-13862	202
Larosiliere	Louis	8-9-2	IMECE2019-11265	83	Lee	Yi Teng	4-5-1	IMECE2019-13127	34
Larson	Ryan	4-10-5	IMECE2019-13757	45	Lee	Yi Teng	16-1-1	IMECE2019-13688	200
Larson	Ryan	4-10-5	IMECE2019-13812	45	Lee	Yong Hoon	8-2-2	IMECE2019-13370	87
Larson	Ryan	15-1-1	IMECE2019-13926	187	Lee	Yongho	8-3-2	IMECE2019-12300	90
Larson	Ryan	15-1-1	IMECE2019-13928	187	Lee	Young Duk	6-4-3	IMECE2019-10587	67
Lash	Zachary	10-26-1	IMECE2019-10303	114	Lee	Young Ju	12-8-1	IMECE2019-12990	170
Lattanzio	Frank A.	4-6-1	IMECE2019-11416	36	Lefevre	Victor	11-46-2	IMECE2019-13174	143
Latulippe	Andrew	9-7-1	IMECE2019-11620	99	Lefevre	Victor	11-37-1	IMECE2019-13173	154
Lau	Jonathan	9-5-1	IMECE2019-13086	111	Lefevre	Victor	11-1-8	IMECE2019-13172	160
Lau	Jonathan	9-5-1	IMECE2019-13919	111	Legault	Xavier	11-7-2	IMECE2019-10103	137
Laubscher	Curt A.	5-4-1	IMECE2019-10503	54	Legon	Otto	5-8-2	IMECE2019-10936	49
Laudani	Rossella	10-17-1	IMECE2019-10538	120	Legorburu	Gabriel	17-6-1	IMECE2019-13885	208
Laurito	Mark	14-3-2	IMECE2019-11563	184	Lei	Jianyin	10-15-1	IMECE2019-11429	129
Lavadiya	Dayakar Naik	11-18-3	IMECE2019-13283	141	Leibowicz	Benjamin D.	6-10-2	IMECE2019-11068	73
Law	Deify	9-43-2	IMECE2019-13362	95	Leibowicz	Benjamin D.	6-10-3	IMECE2019-11707	74
Lawlor	Barry	3-10-1	IMECE2019-13483	31	Leighty	William	6-10-3	IMECE2019-12572	74
Lawrimore	William	11-7-7	IMECE2019-13024	152	Leighty	William	14-1-4	IMECE2019-13001	185
Lawson	Zachary	17-4-2	IMECE2019-13731	206	Leighty	William	17-6-1	IMECE2019-12575	207
Lazoglu	Ismail	17-2-1	IMECE2019-12851	205	Leiss	Peter (PJ)	13-9-1	IMECE2019-11854	179
Le	Xiaobin	13-1-1	IMECE2019-10224	175	Leite Ribeiro Okimoto	Maria Lucia	14-1-3	IMECE2019-11826	184
Leamy	Michael	1-1-2	IMECE2019-13564	2	Lek	Devanda	12-3-1	IMECE2019-12791	170
Leamy	Michael	1-1-2	IMECE2019-13605	2	Lemont	Florent	9-9-1	IMECE2019-13375	101
Leanna	Andrew J.	6-12-2	IMECE2019-12757	74	Leonardi	Stefano	16-1-1	IMECE2019-13240	196
Lebensohn	Ricardo A.	11-39-1	IMECE2019-13026	136	Leseman	Zayd C.	12-7-1	IMECE2019-11466	169
LeBoeuf	Catherine	14-3-2	IMECE2019-11563	184	Leseman	Zayd C.	12-7-1	IMECE2019-11690	169
Leborte	Cameryn C.	10-26-5	IMECE2019-12096	120	Leseman	Zayd C.	12-5-1	IMECE2019-11534	171
Lee	Andrew	17-15-1	IMECE2019-12584	212	Leseman	Zayd C.	12-7-3	IMECE2019-11349	174
Lee	Anthony P.	4-7-1	IMECE2019-10984	34	Leseman	Zayd C.	16-1-1	IMECE2019-12728	192
Lee	Chang-Chun	12-7-2	IMECE2019-10450	173	Leseman	Zayd C.	17-15-1	IMECE2019-12648	213
Lee	Chi Hwan	16-1-1	IMECE2019-12847	193	Lester	Brian	11-7-3	IMECE2019-12770	140
Lee	Chung-Hao	4-6-2	IMECE2019-10514	37	Lester	Brian	11-7-4	IMECE2019-12806	144
Lee	D.	6-10-2	IMECE2019-11859	73	Lester	Brian	11-7-4	IMECE2019-12808	144
Lee	D.	17-5-1	IMECE2019-13825	207	Letelier	Mario	8-2-1	IMECE2019-11548	86
Lee	David	1-6-2	IMECE2019-13266	5	Letelier	Mario	8-2-1	IMECE2019-12062	86
Lee	Dongchan	10-14-1	IMECE2019-11340	122	Levendis	Yiannis	6-16-1	IMECE2019-13402	65
Lee	Dongchan	10-9-2	IMECE2019-11361	124	Leveni	Martina	6-8-1	IMECE2019-11852	71
Lee	Ernest T.	9-14-1	IMECE2019-13745	102	Leventis	Nicholas	10-11-1	IMECE2019-11590	116
Lee	Ernest T.	9-14-1	IMECE2019-13778	102	Levesque	Julie	11-47-4	IMECE2019-13590	153
Lee	Eungkyu	9-29-2	IMECE2019-13650	105	Leyne	Lyle	2-1-2	IMECE2019-13992	14
Lee	Eungkyu	17-15-1	IMECE2019-13664	214	Levitas	Valery	10-27-3	IMECE2019-12749	131
Lee	Heon Joo	11-22-2	IMECE2019-11110	145	Levitas	Valery	11-34-1	IMECE2019-12776	167
Lee	Ho-Hoon	5-4-1	IMECE2019-10989	54	Levitas	Valery I.	10-27-1	IMECE2019-12737	126
Lee	Howon	10-4-4	IMECE2019-13449	118	Levitas	Valery I.	10-27-3	IMECE2019-12763	131
Lee	Howon	11-1-6	IMECE2019-12187	154	Levitas	Valery I.	11-37-2	IMECE2019-12787	156
Lee	Howon	11-5-4	IMECE2019-13368	164	Levitas	Valery I.	11-34-1	IMECE2019-12781	167
Lee	Howon	11-3-2	IMECE2019-13435	166	Lewis	Aaron	15-1-1	IMECE2019-13926	187
Lee	Jaeheon	5-2-2	IMECE2019-10997	58	Lewis	Alexis	10-20-2	IMECE2019-13275	115
Lee	Jae-Hwang	16-1-1	IMECE2019-13105	194	Lewis	Chase	15-1-1	IMECE2019-13983	189
Lee	James	11-7-2	IMECE2019-12950	137	Lewis	Jennifer A.	10-4-3	IMECE2019-13791	116
Lee	Jeonghyun	16-1-1	IMECE2019-13234	196	Lewis	Randy	9-6-1	IMECE2019-13654	98
Lee	Jeonghyun	16-1-1	IMECE2019-13556	199	Li	Bin	11-1-9	IMECE2019-13518	163
Lee	Jeongkyu	5-4-4	IMECE2019-10193	59	Li	Bin	11-34-1	IMECE2019-13520	167
Lee	Jeongwoo	17-6-1	IMECE2019-13388	208	Li	Bing	17-15-1	IMECE2019-12678	213
Lee	Joosik	11-22-2	IMECE2019-11110	145	Li	Bo	2-9-2	IMECE2019-10730	9
Lee	Juho	11-22-2	IMECE2019-11110	145	Li	Bo	10-25-2	IMECE2019-13153	125

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Li	Bo	17-15-1	IMECE2019-12518	212	Li	Xiaodong	11-18-2	IMECE2019-13673	138
Li	Bowen	6-14-1	IMECE2019-10372	75	Li	Xiaodong	11-35-1	IMECE2019-13658	159
Li	Bowen	6-14-2	IMECE2019-10489	76	Li	Xiaolong	4-13-1	IMECE2019-10845	44
Li	Buxuan	9-24-1	IMECE2019-13587	107	Li	Xiaopeng	16-1-1	IMECE2019-12746	192
Li	Changsong	9-45-1	IMECE2019-10260	96	Li	Xiaopeng	16-1-1	IMECE2019-12747	192
Li	Chao	11-39-4	IMECE2019-12466	150	Li	Xiaoyan	10-4-1	IMECE2019-12113	113
Li	Chen	9-25-2	IMECE2019-12963	100	Li	Xin	3-4-2	IMECE2019-11129	30
Li	Chen	16-1-1	IMECE2019-12929	193	Li	Xin	5-4-3	IMECE2019-10896	58
Li	Chen	16-1-1	IMECE2019-13840	202	Li	Xin	5-4-3	IMECE2019-11206	58
Li	Darren	17-4-3	IMECE2019-13595	207	Li	Xinxin	2-9-1	IMECE2019-10832	7
Li	Deyu	8-6-4	IMECE2019-13565	92	Li	Xinxin	2-10-2	IMECE2019-10871	10
Li	Deyu	9-25-1	IMECE2019-13606	98	Li	Xinxin	2-10-2	IMECE2019-11060	10
Li	Deyu	17-9-1	IMECE2019-13618	209	Li	Xinxin	11-5-4	IMECE2019-13222	163
Li	Deyu	17-15-1	IMECE2019-13593	212	Li	Xueying	13-6-1	IMECE2019-10700	175
Li	Gang	11-12-3	IMECE2019-13846	164	Li	Xuxiao	2-12-2	IMECE2019-10286	13
Li	Guojun	3-2-1	IMECE2019-11047	28	Li	Yan	11-8-3	IMECE2019-12658	140
Li	Guojun	6-5-2	IMECE2019-10686	63	Li	Yanbin	10-4-4	IMECE2019-13509	118
Li	Guoqiang	11-18-3	IMECE2019-11845	141	Li	Yanbin	17-15-1	IMECE2019-13513	214
Li	Guoqiang	16-1-1	IMECE2019-13499	198	Li	Yang	9-26-1	IMECE2019-13290	102
Li	Guoqiang	16-1-1	IMECE2019-13525	198	Li	Yang	11-39-1	IMECE2019-13612	136
Li	Guoqiang	16-1-1	IMECE2019-13753	201	Li	Yang	16-1-1	IMECE2019-13208	196
Li	Hang	11-36-1	IMECE2019-13838	159	Li	Yanjun	9-39-1	IMECE2019-11908	100
Li	Hang	16-1-1	IMECE2019-13243	196	Li	Yanxiao	11-25-1	IMECE2019-12536	142
Li	Honggang	10-15-1	IMECE2019-10128	129	Li	Yanxiao	11-39-4	IMECE2019-12535	150
Li	Hui	5-9-2	IMECE2019-10498	50	Li	Yanxiao	11-27-1	IMECE2019-12533	153
Li	Hui	5-9-2	IMECE2019-10835	50	Li	Yanxiao	11-23-3	IMECE2019-12538	155
Li	Jia Cheng	5-16-1	IMECE2019-12216	54	Li	Yanxiao	15-1-1	IMECE2019-13981	189
Li	Jianyu	11-1-3	IMECE2019-12589	149	Li	Yanxiao	17-15-1	IMECE2019-13843	215
Li	Jianyu	11-3-2	IMECE2019-12562	166	Li	Yibin	4-13-1	IMECE2019-10845	44
Li	Jianyu	17-4-2	IMECE2019-13142	206	Li	Yibin	4-13-3	IMECE2019-12652	46
Li	Jiaoyan	11-7-2	IMECE2019-12950	137	Li	Yilun	5-16-1	IMECE2019-12673	54
Li	Junfeng	11-10-1	IMECE2019-12729	134	Li	Ying	11-39-2	IMECE2019-13255	138
Li	Junhong	2-11-1	IMECE2019-10851	8	Li	Ying	11-39-2	IMECE2019-13352	139
Li	Ke	11-12-1	IMECE2019-11061	158	Li	Ying	11-5-5	IMECE2019-13259	166
Li	Ke	11-12-1	IMECE2019-11066	158	Li	Ying	16-1-1	IMECE2019-13331	197
Li	Lijun	5-11-2	IMECE2019-11185	57	Li	Yongtong	10-17-2	IMECE2019-12271	123
Li	Lijun	13-10-2	IMECE2019-10703	177	Li	Yue	2-5-3	IMECE2019-10802	17
Li	Man	9-25-1	IMECE2019-13535	98	Li	Yujie	5-4-3	IMECE2019-10896	58
Li	Man	9-24-1	IMECE2019-13548	107	Li	Yumeng	10-13-1	IMECE2019-11694	129
Li	Mingyang	3-12-1	IMECE2019-10049	29	Li	Zheng	2-13-2	IMECE2019-10537	11
Li	Mingyang	3-15-1	IMECE2019-13175	30	Li	Zhengjie	11-5-3	IMECE2019-13048	160
Li	Mingzhe	3-7-1	IMECE2019-12730	28	Li	Zhenxing	1-6-1	IMECE2019-10836	2
Li	Mingzhe	3-7-1	IMECE2019-13128	28	Li	Zhenxing	5-2-2	IMECE2019-11008	58
Li	Mingzhe	11-10-1	IMECE2019-12729	134	Li	Zhimin	2-9-1	IMECE2019-10832	7
Li	Mingzhe	13-10-1	IMECE2019-10240	177	Li	Zhimin	2-10-2	IMECE2019-10871	10
Li	Mingzhe	16-1-1	IMECE2019-12719	192	Li	Zhimin	2-10-2	IMECE2019-11060	10
Li	Mingzhi	3-15-1	IMECE2019-10717	30	Li	Zixuan	2-7-2	IMECE2019-10349	23
Li	Ni	3-3-1	IMECE2019-11968	32	Li	Zixuan	2-7-2	IMECE2019-10486	23
Li	Ni	6-10-2	IMECE2019-11859	73	Lian	Jianming	6-9-3	IMECE2019-12026	74
Li	Ni	6-10-4	IMECE2019-12075	75	Liang	Hong	10-10-3	IMECE2019-10433	116
Li	Ni	17-5-1	IMECE2019-13825	207	Liang	Tongfen	10-25-1	IMECE2019-13379	123
Li	Peiwen	6-10-2	IMECE2019-10391	73	Liang	Tongfen	16-1-1	IMECE2019-13382	197
Li	Peiwen	9-10-1	IMECE2019-13971	103	Liang	Xiaotian	5-5-1	IMECE2019-12263	47
Li	Qi	4-13-1	IMECE2019-10435	44	Liang	Xiaotian	5-2-4	IMECE2019-12265	60
Li	Richard L.	11-26-1	IMECE2019-12305	158	LIANG	Yan	11-7-1	IMECE2019-11186	133
Li	Ronghui	1-6-1	IMECE2019-12200	2	Liang	Zhi	9-18-1	IMECE2019-12219	106
Li	Ruijie	6-5-2	IMECE2019-11382	63	Liao	Chung Shan	17-4-2	IMECE2019-13882	206
Li	Ruijie	6-4-2	IMECE2019-10403	66	Liao	Daniel	16-2-1	IMECE2019-13549	203
Li	Ruijie	6-4-2	IMECE2019-13939	66	Liao	Huming	2-9-2	IMECE2019-10730	9
Li	Ruiyang	9-29-2	IMECE2019-13650	105	Liao	Y. Gene	6-11-1	IMECE2019-10369	68
Li	Ruiyang	17-15-1	IMECE2019-13664	214	Liao	Ya-Ting	9-39-1	IMECE2019-11908	100
Li	Shouhang	1-1-6	IMECE2019-10817	4	Liberatore	Federico	9-41-1	IMECE2019-11283	96
Li	Shouhang	9-20-1	IMECE2019-12753	94	Liebenberg	Leon	9-36-2	IMECE2019-13030	99
Li	Suyi	16-1-1	IMECE2019-12948	193	Liechti	Kenneth	11-17-1	IMECE2019-13134	134
Li	Tianyang	16-1-1	IMECE2019-13840	202	Liechti	Kenneth	11-23-2	IMECE2019-13268	153
Li	Tianyun	5-5-1	IMECE2019-12263	47	Liechti	Kenneth	11-26-2	IMECE2019-13138	162
Li	Tianyun	5-2-4	IMECE2019-12265	60	Liechti	Kenneth	11-26-2	IMECE2019-13141	162
Li	Wei	9-5-1	IMECE2019-12710	110	Liechti	Kenneth	12-7-1	IMECE2019-11749	169
Li	Wei	9-31-1	IMECE2019-12916	111	Lienhard	John	9-19-1	IMECE2019-12812	103
Li	Weixin	11-47-2	IMECE2019-13739	148	Lienhard	John	9-19-1	IMECE2019-12813	103
Li	Weixuan	11-39-1	IMECE2019-13612	136	Liew	Li-Anne	11-32-1	IMECE2019-13677	156
Li	Willow Yangliu	1-10-1	IMECE2019-10197	3	Likitchatchawankuna	Ampol	9-5-1	IMECE2019-13086	111
Li	Xiang	1-6-1	IMECE2019-12200	2	Likitchatchawankuna	Ampol	9-5-1	IMECE2019-13919	111
Li	Xiang	1-12-1	IMECE2019-12199	5	Lim	Hojun	11-7-1	IMECE2019-10269	133

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Lim	Ronell	17-6-1	IMECE2019-13834	208	Liu	Jun	17-15-1	IMECE2019-12585	212
Limbacher	Jeffrey	11-22-1	IMECE2019-13075	141	Liu	Kuo	2-3-2	IMECE2019-10280	25
Lin	Cheng-xian	9-4-1	IMECE2019-12184	106	Liu	Lanbin	6-9-1	IMECE2019-10310	72
Lin	Cheng-xian	9-59-1	IMECE2019-11982	110	Liu	Liping	8-9-1	IMECE2019-11433	83
Lin	Cheng-xian	9-53-1	IMECE2019-10085	112	Liu	Liping	8-4-1	IMECE2019-10669	89
Lin	Fang-Ming	9-25-1	IMECE2019-10691	98	Liu	Mao	5-16-1	IMECE2019-12156	54
Lin	Fred	2-12-1	IMECE2019-10563	10	Liu	Mengdan	6-9-1	IMECE2019-10310	72
Lin	Hongkuan	5-9-1	IMECE2019-10334	48	Liu	Miao	6-14-1	IMECE2019-10372	75
Lin	Hongkuan	5-4-5	IMECE2019-10067	60	Liu	Miao	6-14-2	IMECE2019-10489	76
Lin	Jason	3-3-1	IMECE2019-11968	32	Liu	Qihang	6-4-3	IMECE2019-11149	67
Lin	Joe (Chih-Nan)	12-3-1	IMECE2019-11181	170	Liu	Qingchang	7-1-2	IMECE2019-12965	78
Lin	Jung-Fu	9-53-1	IMECE2019-12210	112	Liu	Qingchang	10-12-1	IMECE2019-12914	129
Lin	Jung-Fu	17-9-1	IMECE2019-12224	209	Liu	Qingchang	11-37-5	IMECE2019-12861	165
Lin	Jung-Fu	17-15-1	IMECE2019-12795	213	Liu	Shuai-Lin	2-12-1	IMECE2019-10563	10
Lin	Kuan-Ting	9-32-1	IMECE2019-13754	93	Liu	Shun	2-3-1	IMECE2019-10822	24
Lin	Kunyang	2-5-4	IMECE2019-11036	19	Liu	Sipan	1-1-6	IMECE2019-11866	4
Lin	Kunyang	2-7-3	IMECE2019-11034	24	Liu	Tao	2-10-2	IMECE2019-11060	10
Lin	Kunyang	10-26-2	IMECE2019-10837	115	Liu	Xiangdong	1-6-2	IMECE2019-12973	5
Lin	Kunyang	10-24-1	IMECE2019-10901	123	Liu	Xiangdong	11-14-3	IMECE2019-10379	149
Lin	Shaoting	11-1-2	IMECE2019-12268	146	Liu	Xiangdong	14-1-1	IMECE2019-10346	183
Lin	Shaoting	11-5-2	IMECE2019-13287	157	Liu	Xiangdong	14-1-2	IMECE2019-10348	183
Lin	Yang	8-6-1	IMECE2019-10533	88	Liu	Xiaofang	13-10-2	IMECE2019-12446	177
Lin	Yang	8-6-1	IMECE2019-10535	92	Liu	Xiaofen	2-12-1	IMECE2019-11002	10
Lindkvist	Lars	2-10-2	IMECE2019-10285	10	Liu	Xiaofen	2-7-3	IMECE2019-11034	24
Lindsay	Alexandra R.	4-2-4	IMECE2019-10675	41	Liu	Xiaofen	10-26-2	IMECE2019-10837	115
Lingtao	Yu	4-13-3	IMECE2019-10887	46	Liu	Xiaofen	10-24-1	IMECE2019-10901	123
Lingyan	Jin	4-13-3	IMECE2019-10887	46	Liu	Xiaosong	17-15-1	IMECE2019-12587	212
Linjawi	Majid	9-45-1	IMECE2019-10613	96	Liu	Xin	3-4-2	IMECE2019-13574	30
Linjawi	Majid	17-9-1	IMECE2019-12900	209	Liu	Xingjie	3-14-1	IMECE2019-10827	32
Linsey	Julie	16-1-1	IMECE2019-12818	192	Liu	Xingjie	8-9-2	IMECE2019-11896	83
Liszka	Mirosław	8-4-3	IMECE2019-11449	91	Liu	Xinyue	11-5-2	IMECE2019-13287	157
Litardo	Jaqueline	6-9-1	IMECE2019-11472	72	Liu	Xiucheng	3-15-1	IMECE2019-10717	30
Littlefield	Andrew	3-10-1	IMECE2019-10387	31	Liu	Xiucheng	6-4-1	IMECE2019-10824	64
Littlefield	David	11-22-1	IMECE2019-13387	142	Liu	Yanwen	13-10-2	IMECE2019-12446	177
Liu	Bin	16-1-1	IMECE2019-12792	192	Liu	Yeja	1-12-1	IMECE2019-12199	5
Liu	Binghe	10-15-1	IMECE2019-10128	129	Liu	Yi	5-9-2	IMECE2019-10498	50
Liu	Binghe	10-23-2	IMECE2019-12515	130	Liu	Yi	5-9-2	IMECE2019-10835	50
Liu	Chang	1-6-1	IMECE2019-11943	2	Liu	Yin	11-5-2	IMECE2019-13798	158
Liu	Chang	5-13-1	IMECE2019-12797	59	Liu	Yin	11-37-4	IMECE2019-13848	163
Liu	Chen	6-4-2	IMECE2019-11044	66	Liu	Yingtao	3-5-1	IMECE2019-11467	27
Liu	Chen	14-1-2	IMECE2019-11286	183	Liu	Yingtao	3-4-1	IMECE2019-10480	29
Liu	Chong	2-5-5	IMECE2019-10940	20	Liu	Yingtao	4-6-2	IMECE2019-10514	37
Liu	Chong	2-5-5	IMECE2019-10944	20	Liu	Yingtao	7-5-1	IMECE2019-10747	81
Liu	Chung-Chiun	16-1-1	IMECE2019-13941	202	Liu	Yingtao	10-26-2	IMECE2019-10512	115
Liu	Guanyi	2-13-2	IMECE2019-10537	11	Liu	Yinhua	2-10-3	IMECE2019-10843	12
Liu	Haibo	2-3-2	IMECE2019-10280	25	Liu	Yiqun	6-11-1	IMECE2019-10369	68
Liu	Haijun	5-10-2	IMECE2019-13434	50	Liu	Yonglan	16-1-1	IMECE2019-13217	196
Liu	Haijun	5-5-2	IMECE2019-13430	53	Liu	Yu	6-16-1	IMECE2019-13402	65
Liu	Heng	5-9-2	IMECE2019-10498	50	Liu	Yu	6-4-5	IMECE2019-10375	70
Liu	Heng	5-9-2	IMECE2019-10835	50	Liu	Yu	11-11-1	IMECE2019-13792	134
Liu	Hongtao	13-10-2	IMECE2019-12310	177	Liu	Yu	11-14-3	IMECE2019-10379	149
Liu	Huoxing	2-9-2	IMECE2019-10730	9	Liu	Yu Cheng	9-39-1	IMECE2019-11051	100
Liu	I-Han	8-9-1	IMECE2019-10899	83	Liu	Yu Cheng	9-39-1	IMECE2019-11118	100
Liu	Ji	11-1-2	IMECE2019-12268	146	Liu	Yucheng	11-39-1	IMECE2019-13026	136
Liu	Jian	6-16-1	IMECE2019-13402	65	Liu	Yucheng	11-10-3	IMECE2019-12161	141
Liu	Jiaqi	10-25-1	IMECE2019-13379	123	Liu	Yucheng	11-7-6	IMECE2019-10672	149
Liu	Jiaqi	16-1-1	IMECE2019-13382	197	Liu	Yucheng	14-1-1	IMECE2019-11332	183
Liu	Jinlong	6-2-1	IMECE2019-11485	64	Liu	Yucheng	15-1-1	IMECE2019-13961	189
Liu	Jinlong	6-4-4	IMECE2019-10728	69	Liu	Yunpeng	11-38-1	IMECE2019-13934	146
Liu	Jinlong	6-4-4	IMECE2019-10735	69	Liu	Yutong	2-11-1	IMECE2019-11577	8
Liu	Jinlong	6-4-4	IMECE2019-11637	69	Liu	Zhanfeng	2-5-6	IMECE2019-11235	22
Liu	Jinyu	2-9-1	IMECE2019-10832	7	Liu	Zhigang	2-14-1	IMECE2019-10383	21
Liu	Jinyu	2-10-2	IMECE2019-11060	10	Liu	Zhigang	2-3-1	IMECE2019-11184	24
Liu	Jonathan T.C.	7-1-1	IMECE2019-12649	77	Liu	Zhigang	2-3-2	IMECE2019-11791	25
Liu	Jonathan T.C.	16-1-1	IMECE2019-13009	194	Liu	Zishun	11-5-3	IMECE2019-13048	160
Liu	Jonathan T.C.	17-4-3	IMECE2019-12974	206	Liu	Zongfa	3-15-1	IMECE2019-10717	30
Liu	Jonathan T.C.	17-4-2	IMECE2019-13107	206	Livescu	Daniel	11-23-1	IMECE2019-13811	152
Liu	Jonathan T.C.	17-4-3	IMECE2019-13359	207	Livescu	Daniel	16-1-1	IMECE2019-13274	196
Liu	Jonathan T.C.	17-4-3	IMECE2019-13595	207	Livescu	Daniel	17-11-2	IMECE2019-13815	211
Liu	Jun	9-25-2	IMECE2019-13011	100	Lloyd	Evan	16-1-1	IMECE2019-12715	192
Liu	Jun	9-25-2	IMECE2019-13012	100	Lo	Ching-Wen	9-18-2	IMECE2019-10689	107
Liu	Jun	9-24-1	IMECE2019-13013	107	Lo	Hao Wei	6-16-1	IMECE2019-10991	65
Liu	Jun	17-15-1	IMECE2019-12581	212	Lo	Yu-Sheng	11-34-1	IMECE2019-13450	167
Liu	Jun	17-15-1	IMECE2019-12582	212	Loeffler	Colin	11-7-4	IMECE2019-12130	144

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Logan	Patrick	16-1-1	IMECE2019-13078	194	Luo	Jishan	4-6-2	IMECE2019-10514	37
Lokanathan	Manojkumar	8-1-1	IMECE2019-10483	87	Luo	Lei	9-39-1	IMECE2019-11118	100
Lokkebo	Håvard	7-5-1	IMECE2019-10437	81	Luo	Qi	13-10-2	IMECE2019-12310	177
Lombardi	Jack	2-2-3	IMECE2019-12027	16	Luo	Tengfei	9-29-2	IMECE2019-13650	105
Long	Joseph	4-2-1	IMECE2019-13067	36	Luo	Tengfei	17-15-1	IMECE2019-13664	214
Long	Joseph	4-2-2	IMECE2019-13542	39	Luo	Wei	4-1-2	IMECE2019-12490	39
Long	Kevin	11-7-3	IMECE2019-12770	140	Luo	Yifan	11-7-1	IMECE2019-11186	133
Long	Kevin	11-35-1	IMECE2019-13658	159	Luo	Yiming	11-5-4	IMECE2019-13351	164
Long	Linshuang	9-30-1	IMECE2019-12553	108	Luo	Yong	2-13-3	IMECE2019-10732	13
"Long, III"	Henry A.	6-16-1	IMECE2019-10279	65	Luo	Yuting	11-46-2	IMECE2019-13257	143
Lopes	Elio	8-9-4	IMECE2019-10258	85	Luo	Zhiren	10-13-1	IMECE2019-12165	129
Lopes	Fabio	2-8-4	IMECE2019-11711	22	Luo	Zhiren	17-15-1	IMECE2019-12519	212
Lopez-Pamies	Oscar	11-37-1	IMECE2019-13173	154	Lupuleac	Sergey	2-10-2	IMECE2019-10635	10
Lopez-Pamies	Oscar	11-1-6	IMECE2019-13582	154	Lutkenhaus	Jodie L.	10-9-1	IMECE2019-12502	122
Lopez-Pamies	Oscar	11-37-2	IMECE2019-12953	156	Lutkenhaus	Jodie L.	16-2-1	IMECE2019-13417	203
Lopez-Pamies	Oscar	11-1-8	IMECE2019-12955	160	Lv	Hao	4-13-3	IMECE2019-11318	46
Lopez-Pamies	Oscar	11-1-8	IMECE2019-13172	160	Lv	Pengyu	10-14-1	IMECE2019-11021	122
Lostec	Guillaume	11-39-3	IMECE2019-13279	142	Lynch	Finnegan	17-9-1	IMECE2019-13358	209
Lotfi	Nima	6-11-2	IMECE2019-11874	70	Lynch	Stephen	9-36-2	IMECE2019-10617	99
Lou	Jun	10-30-1	IMECE2019-13164	117	Lynett	Patrick	15-1-1	IMECE2019-13046	188
Loutzenhiser	Peter	9-14-1	IMECE2019-12744	102	Lyu	Dandan	11-38-3	IMECE2019-12487	150
Love	Corey	6-11-1	IMECE2019-12131	68	M	Vijayathithan	2-5-3	IMECE2019-11191	17
Loveless	Timmanee	11-14-3	IMECE2019-12819	149	M. Almansour	Mohammed	10-24-1	IMECE2019-10307	123
Lowder	M. Loraine	5-9-1	IMECE2019-10334	48	M. Alomair	Yousef Ali	10-24-1	IMECE2019-10307	123
Lowe	Robert L.	2-2-4	IMECE2019-11615	18	M. Momen	Ayyoub	2-9-3	IMECE2019-13613	12
Lowe	Zachary B.	4-11-2	IMECE2019-11948	44	M. Momen	Ayyoub	10-2-2	IMECE2019-13683	128
Lozowski	Andy	6-4-4	IMECE2019-10110	69	M.A.A. El-Bagory	Tarek	10-26-1	IMECE2019-10308	114
Lu	Bingxiao	5-2-1	IMECE2019-10536	56	Ma	Guohua	4-8-1	IMECE2019-11238	38
Lu	Hongbing	10-11-1	IMECE2019-11590	116	Ma	Guohua	14-1-4	IMECE2019-10674	185
Lu	Hongbing	11-7-3	IMECE2019-12544	140	Ma	Haibo	8-4-1	IMECE2019-10620	89
Lu	Lucas	16-1-1	IMECE2019-13110	194	Ma	Haibo	9-43-2	IMECE2019-11347	95
Lu	Lucas	17-15-1	IMECE2019-13088	213	Ma	Hao	9-25-2	IMECE2019-12963	100
Lu	Ming-Chang	9-18-2	IMECE2019-10689	107	Ma	Hao	16-1-1	IMECE2019-12929	193
Lu	Peng	13-10-2	IMECE2019-12446	177	Ma	Hao	16-1-1	IMECE2019-13840	202
Lu	Sen	5-12-1	IMECE2019-11203	53	Ma	Jianfeng	2-5-5	IMECE2019-10940	20
Lu	Shaopeng	9-46-1	IMECE2019-11237	103	Ma	Jianfeng	2-5-5	IMECE2019-10944	20
Lu	Wei	3-12-1	IMECE2019-10049	29	Ma	Jianfeng	2-5-5	IMECE2019-10946	20
Lu	Wei-yang	11-7-5	IMECE2019-12992	147	Ma	Kang	6-2-2	IMECE2019-10115	65
Lu	Weiyi	3-7-1	IMECE2019-12730	28	Ma	Shixi	13-6-1	IMECE2019-11282	175
Lu	Weiyi	3-7-1	IMECE2019-12937	28	Ma	Tengfei	9-26-1	IMECE2019-13723	102
Lu	Weiyi	3-7-1	IMECE2019-13128	28	Ma	Tengfei	9-26-1	IMECE2019-13787	102
Lu	Weiyi	11-10-1	IMECE2019-12729	134	Ma	Tengfei	17-15-1	IMECE2019-12942	213
Lu	Weiyi	13-10-1	IMECE2019-10240	177	Ma	Tengfei	17-15-1	IMECE2019-13817	215
Lu	Weiyi	16-1-1	IMECE2019-12719	192	Ma	Wei	5-2-1	IMECE2019-10536	56
Lu	Yan	1-1-3	IMECE2019-12850	2	Ma	Xuebin	11-12-1	IMECE2019-12199	5
Lu	Yan	1-1-3	IMECE2019-13566	2	Ma	Yinji	11-47-4	IMECE2019-12835	153
Lu	Yan	16-1-1	IMECE2019-13568	199	Ma	Yunwei	9-25-2	IMECE2019-12963	100
Lu	Yifan	5-7-1	IMECE2019-10831	55	Ma	Yunwei	16-1-1	IMECE2019-12929	193
Lu	Yifan	5-7-1	IMECE2019-10869	55	Ma	Zhenhai	2-10-3	IMECE2019-10539	12
Lu	Zhenhua	6-1-1	IMECE2019-11227	61	Ma	Zhiwen	6-4-3	IMECE2019-10637	67
Lu	Zhenhua	6-12-1	IMECE2019-11946	73	Ma	Zhiwen	17-6-1	IMECE2019-12957	208
Lù	Chaofeng	11-1-7	IMECE2019-12056	157	Maadani	Mohammad	16-1-1	IMECE2019-13599	199
Luan	Shengzhi	11-37-4	IMECE2019-13258	162	Mabrouk	Mohamed Hussien	8-11-1	IMECE2019-10311	85
Luan	Xiaohe	2-4-2	IMECE2019-11327	15	Macalka	Ales	5-5-1	IMECE2019-10861	47
Luan	Xiaohe	17-2-1	IMECE2019-11360	205	Macedo	Francisco	10-26-3	IMECE2019-11356	117
Lucchi	Andrea	8-4-3	IMECE2019-11482	91	Machado	José	2-8-4	IMECE2019-10452	22
Luchtenburg	Dirk M.	7-5-1	IMECE2019-10282	81	Machado	Michael	2-8-2	IMECE2019-11582	19
Lueth	Tim C.	2-2-7	IMECE2019-11277	18	Machado	Michael	2-8-2	IMECE2019-11600	19
Lueth	Tim C.	2-2-6	IMECE2019-10022	21	Machado	Toni	2-8-4	IMECE2019-10452	22
Lueth	Tim C.	4-4-1	IMECE2019-10347	33	Machesa	Mosa Georgina Kristen	9-35-1	IMECE2019-11329	94
Lueth	Tim C.	10-13-1	IMECE2019-10766	129	Macías	José	6-9-1	IMECE2019-11472	72
Lueth	Tim C.	14-2-2	IMECE2019-10105	183	Mack	John Hunter	9-53-1	IMECE2019-10679	112
Luis-Ferreira	Fernando	2-8-3	IMECE2019-11393	20	MacNinch	Douglas	1-12-1	IMECE2019-12093	5
Luis-Ferreira	Fernando	2-8-4	IMECE2019-10985	22	Macri	Michael	3-10-1	IMECE2019-10387	31
Luk	Ting Shan	16-1-1	IMECE2019-13597	199	Madenci	Erdogan	3-12-1	IMECE2019-13202	29
Luker	Kacy	16-1-1	IMECE2019-13589	199	Madenci	Erdogan	3-12-1	IMECE2019-13204	29
Lukes	Jennifer	9-18-2	IMECE2019-13809	108	Madenci	Erdogan	3-12-2	IMECE2019-13205	31
Luo	Albert	5-8-1	IMECE2019-10771	48	Madenci	Erdogan	3-12-2	IMECE2019-13399	31
Luo	Albert	5-8-1	IMECE2019-10772	48	Madhavan	Srivatsan	9-46-1	IMECE2019-10660	102
Luo	Albert	5-8-2	IMECE2019-10983	49	Madhavan	Srivatsan	9-19-1	IMECE2019-10748	103
Luo	Albert	5-8-2	IMECE2019-11489	49	Madhukar	Amit	4-2-2	IMECE2019-11985	39
Luo	Chaoqian	11-3-1	IMECE2019-12815	163	Madra	Anna	11-28-1	IMECE2019-12540	135
Luo	Guohu	9-32-1	IMECE2019-11096	93	Magallanes	Joseph	11-22-1	IMECE2019-13075	141
Luo	Jing	6-6-1	IMECE2019-10588	68	Magee	Thomas C.	9-63-1	IMECE2019-10272	95

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Maggard	Zack	15-1-1	IMECE2019-13966	189	Manoharan	Sanjivan	7-12-1	IMECE2019-13780	79
Mago	Pedro	6-9-3	IMECE2019-13783	74	Manseki	Kazuhiro	6-10-1	IMECE2019-11035	72
Mahajan	Ajay	6-1-1	IMECE2019-11949	61	Mansfield	Ariella	16-1-1	IMECE2019-13432	197
Mahajan	Ajay	6-11-3	IMECE2019-10479	71	Mansouri Tehrani	Aria	10-26-6	IMECE2019-13854	121
Mahajan	Roop	9-26-1	IMECE2019-11553	102	Manzo	Maurizio	4-14-1	IMECE2019-11406	41
Mahajan	Roop	9-19-2	IMECE2019-11591	104	Mao	Haojie	4-2-1	IMECE2019-13067	36
Mahajerin	Enayat	9-2-1	IMECE2019-10161	104	Mao	He	2-13-2	IMECE2019-10537	11
Mahalle	Gauri Rajendra	2-7-4	IMECE2019-11126	25	Mao	Scott	11-8-2	IMECE2019-13491	137
Mahapatra	Pallab Sinha	9-18-2	IMECE2019-11256	108	Mao	Xu	1-6-1	IMECE2019-11943	2
Mahdavi	Ashkan	11-28-1	IMECE2019-12501	136	Maradey Lazaro	Jessica Gissella	5-12-1	IMECE2019-11450	53
Mahdavi	Ashkan	11-34-1	IMECE2019-11909	167	Maradey Lazaro	Jessica Gissella	5-12-1	IMECE2019-11557	53
Mahdavi	Mahboobe	6-7-2	IMECE2019-11414	67	Maradey Lazaro	Jessica Gissella	14-1-2	IMECE2019-11647	183
Mahdavi	Mostafa	16-1-1	IMECE2019-12982	194	Marais	Karen	16-1-1	IMECE2019-13799	202
Mahir	Rafi	4-11-1	IMECE2019-10650	43	Marcelino-Jesus	Elsa	2-8-3	IMECE2019-11527	21
Mahla	Sunil Kumar	6-16-2	IMECE2019-11122	69	Marchak	Robert	12-10-1	IMECE2019-13446	173
Mahmoud	Seif	3-14-1	IMECE2019-11377	32	Marchand	Michael	9-9-1	IMECE2019-13375	101
Mahmud	Khandakar	11-1-6	IMECE2019-13911	154	Marchelli	Timothy	3-13-1	IMECE2019-10274	29
Mahmud	Khandakar	11-1-6	IMECE2019-13918	154	Marchitu	Dan B.	5-6-1	IMECE2019-10047	57
Mahvi	Allison J.	9-18-1	IMECE2019-10371	106	Marian	Jaime	11-47-1	IMECE2019-13836	146
Mahvi	Allison J.	17-15-1	IMECE2019-12723	213	Marie	Hazel	4-2-3	IMECE2019-10641	40
Maier	Franz	16-1-1	IMECE2019-12989	191	Markides	Christos	6-19-2	IMECE2019-13998	64
Majeed	Hamed Abdul	9-18-2	IMECE2019-10318	108	Markiewicz	Mark	5-4-3	IMECE2019-10192	58
Majidi	Carmel	11-1-4	IMECE2019-13875	152	Marlowe	Joseph	7-9-1	IMECE2019-10465	81
Majidi	Carmel	11-5-2	IMECE2019-12511	157	Marques	Maria	2-8-3	IMECE2019-11362	20
Majidi	Leily	10-30-1	IMECE2019-11705	117	Marques	Maria	2-8-4	IMECE2019-11711	22
Makarjian	Kamran	11-22-2	IMECE2019-12040	145	Marquis	Linda	15-1-1	IMECE2019-10659	187
Mäkelä	Ismo	14-2-1	IMECE2019-11209	181	Marsh	Adam C.	4-5-4	IMECE2019-13841	39
Maktabi	Sepehr	12-8-2	IMECE2019-11903	172	Marsh	Andrew	1-2-1	IMECE2019-11024	1
Mal	Ajit	1-12-2	IMECE2019-13653	6	Marshall	Craig	10-26-2	IMECE2019-10364	115
Mal	Ajit	1-12-2	IMECE2019-13669	6	Marshall	Matthew	2-13-1	IMECE2019-11337	8
Mal	Ajit	1-12-2	IMECE2019-13691	6	Marshall	Megan	16-1-1	IMECE2019-13271	196
Mal	Ajit	3-15-1	IMECE2019-13603	30	Martin	Tyler	2-9-2	IMECE2019-10930	9
Malak	Richard	10-19-1	IMECE2019-13155	127	Martinek	Janna	6-4-3	IMECE2019-10637	67
Malakooti	Sadeq	10-11-1	IMECE2019-11590	116	Martinelli	Irene	14-1-2	IMECE2019-11587	183
Malakooti	Sadeq	11-7-3	IMECE2019-12544	140	Martinez	Alexandre	16-1-1	IMECE2019-13832	202
Malawade	Arnav V.	16-1-1	IMECE2019-13643	200	Martinez	Angel	16-1-1	IMECE2019-12902	193
Maldonado	Fausto	4-10-2	IMECE2019-10627	41	Martinez	Jaylene	16-1-1	IMECE2019-13146	195
Maldonado	Gerardo	17-6-1	IMECE2019-13834	208	Martinez Cruz	Roberto	5-8-2	IMECE2019-10936	49
Malempati	Poorna Pruthvi Chandra	7-1-2	IMECE2019-11954	78	Martinez Lorenzo	Jose	1-6-1	IMECE2019-11943	2
Malempati	Poorna Pruthvi Chandra	7-4-1	IMECE2019-11937	80	Martinez Vesga	Alberto A.	8-9-4	IMECE2019-12038	85
Mallakpour	Iman	16-1-1	IMECE2019-13790	201	Martin-Garcia	Oscar	4-3-1	IMECE2019-10806	33
Mallet	Oscar	11-1-5	IMECE2019-13116	153	Martin-Garcia	Oscar	6-5-1	IMECE2019-10808	62
Mamidala	Ramulu	2-5-1	IMECE2019-11436	15	Martin-Garcia	Oscar	15-1-1	IMECE2019-13324	188
Mamidala	Ramulu	2-5-4	IMECE2019-12234	19	Martins	Noah J.	4-8-1	IMECE2019-11238	38
Mamidala	Ramulu	3-4-2	IMECE2019-11544	30	Martins de Souza e Silva	Juliana	10-19-2	IMECE2019-13865	130
Mamidala	Ramulu	17-2-1	IMECE2019-12690	205	Maruo	Shoji	17-15-1	IMECE2019-13377	212
Mamivand	Mahmood	10-27-1	IMECE2019-11695	126	Maruo	Shoji	17-15-1	IMECE2019-13380	212
Man	Timothy	9-36-1	IMECE2019-11421	96	Maruyama	Shigeo	9-29-1	IMECE2019-10276	103
Manabe	Ken-Ichi	2-6-1	IMECE2019-10524	9	Marwin	Donald	15-1-1	IMECE2019-13977	189
Manaf	Syafiq	11-36-2	IMECE2019-11162	162	Maschmann	Matthew	2-4-1	IMECE2019-13312	14
Manahan	Michael P.	9-43-1	IMECE2019-11902	94	Mashhadi Jafarlou	Davoud	10-26-5	IMECE2019-11689	120
Manca	Oronzio	9-35-1	IMECE2019-11650	94	Mason	Nyree	7-5-1	IMECE2019-10747	81
Manca	Oronzio	9-5-1	IMECE2019-11575	110	Mastorakis	George	6-2-3	IMECE2019-10738	67
Mancera Campos	Natali	4-8-1	IMECE2019-11085	37	Masud	Arif	11-33-1	IMECE2019-13955	148
Mancovsky	Justin	14-3-2	IMECE2019-11561	184	Mathew	Bobby	6-7-3	IMECE2019-10326	70
Mandal	Chandana	10-11-1	IMECE2019-11590	116	Mathew	Nithin	16-1-1	IMECE2019-13068	194
Mandolini	Marco	14-1-2	IMECE2019-11587	183	Matic	Peter	4-2-1	IMECE2019-13140	36
Mane	Soham	11-23-2	IMECE2019-13268	153	Matlack	Kathryn	11-46-2	IMECE2019-13726	143
Mane	Soham	11-35-1	IMECE2019-13348	159	Matous	Karel	11-33-2	IMECE2019-13084	150
Manfrida	Giampaolo	6-8-1	IMECE2019-11852	71	Matous	Karel	11-23-1	IMECE2019-13811	152
Mangan	Evan	6-1-3	IMECE2019-10751	63	Matous	Karel	17-11-2	IMECE2019-13815	211
Manghnani	Chandan	9-18-2	IMECE2019-11256	108	Matsuura	Kota	8-9-3	IMECE2019-10200	84
Manglik	Raj M.	8-7-1	IMECE2019-10670	84	Mattei	Ornella	1-1-1	IMECE2019-10644	1
Manglik	Raj M.	9-32-1	IMECE2019-13717	93	Matthysen	Jonathan	2-7-1	IMECE2019-10032	23
Manglik	Raj M.	9-32-1	IMECE2019-13754	93	Mauermann	Reinhard	2-7-2	IMECE2019-10390	23
Manglik	Raj M.	9-23-1	IMECE2019-13957	93	Mauk	Michael	7-10-1	IMECE2019-11912	77
Manikandan	A.	6-7-3	IMECE2019-10951	70	Mauro	Stefano	3-4-1	IMECE2019-10713	29
Mankame	Nilesh	10-4-3	IMECE2019-13818	116	Mauro	Stefano	5-9-2	IMECE2019-10709	50
Mankame	Nilesh	16-1-1	IMECE2019-13827	202	Maxwell	Brian	9-39-1	IMECE2019-13263	100
Manna	Rafiq	9-19-2	IMECE2019-11864	104	Mayeed	Mohammed	5-4-3	IMECE2019-10769	58
Manne	Varun	5-4-4	IMECE2019-10761	59	Maznev	Alexei	9-20-1	IMECE2019-13586	94
Manning	Kenneth C.	9-36-2	IMECE2019-12527	99	Maznev	Alexei	9-15-1	IMECE2019-13355	109
					Maznev	Alexei	17-15-1	IMECE2019-13361	214

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Maznev	Alexei	17-15-1	IMECE2019-13580	214	Meng	Xianghai	17-15-1	IMECE2019-12795	213
Mazon	Talita	16-1-1	IMECE2019-12742	192	Meng	Yuquan	2-8-1	IMECE2019-10621	17
Mazumder	A.K.M. Monayem	8-3-2	IMECE2019-10016	90	Meng	Yuquan	9-36-1	IMECE2019-11421	96
Mazumder	A.K.M. Monayem	8-3-3	IMECE2019-13041	91	Menghani	Ritika	4-2-1	IMECE2019-13531	36
Mazumder	A.K.M. Monayem	9-9-1	IMECE2019-10015	101	Menghani	Ritika	4-2-5	IMECE2019-13428	43
Mazumder	Sandip	9-66-1	IMECE2019-13948	97	Menguc	M. Pinar	9-7-1	IMECE2019-11611	99
Mazumder	Sandip	9-6-1	IMECE2019-12991	98	Mensah	Patrick	16-1-1	IMECE2019-13499	198
Mazza	Marcus	13-9-1	IMECE2019-11854	179	Mensah	Patrick	16-1-1	IMECE2019-13525	198
Mazzeo	Aaron D.	10-25-1	IMECE2019-13379	123	Mensah	Patrick	16-1-1	IMECE2019-13571	199
Mazzeo	Aaron D.	16-1-1	IMECE2019-13382	197	Mensah	Patrick	16-1-1	IMECE2019-13591	199
Mazzeo	Aaron D.	16-2-1	IMECE2019-13384	203	Mensah	Patrick	16-1-1	IMECE2019-13753	201
Mazzetto	Fabrizio	5-11-2	IMECE2019-11507	57	Mérida	Walter	6-8-1	IMECE2019-11891	71
McCreery	Zachary	4-5-4	IMECE2019-11545	39	Mérida	Walter	9-9-1	IMECE2019-11877	101
McCusker	James	4-8-1	IMECE2019-11238	38	Mérida	Walter	9-9-1	IMECE2019-11885	101
McCusker	James	14-1-4	IMECE2019-10674	185	Merino	Paola	8-2-1	IMECE2019-12062	86
McDonell	Vincent	9-41-1	IMECE2019-10792	96	Merryweather	Andrew	4-8-1	IMECE2019-11889	38
McDowell	Dave	11-39-3	IMECE2019-13192	142	Merryweather	Andrew	4-10-3	IMECE2019-11932	42
McDowell	Dave	16-1-1	IMECE2019-13208	196	Merryweather	Andrew	17-4-2	IMECE2019-11796	206
McDowell	Dave	16-1-1	IMECE2019-13406	197	Merryweather	Andrew	17-4-3	IMECE2019-13839	207
McFall	Kevin	5-4-3	IMECE2019-10769	58	Mersch	John	11-22-2	IMECE2019-10521	145
McFall	Kevin	5-4-5	IMECE2019-10291	60	Mertiny	Pierre	10-11-1	IMECE2019-12053	116
McGaughey	Alan	9-29-2	IMECE2019-13448	105	Merzouki	Rochdi	5-4-5	IMECE2019-11113	60
McGloin	David	2-2-7	IMECE2019-13365	18	Mescher	Ann M.	16-1-1	IMECE2019-13795	201
McGloin	David	4-12-1	IMECE2019-13225	45	Mescher	Ann M.	16-1-1	IMECE2019-13808	202
McGloin	David	17-2-1	IMECE2019-13371	206	Meshi	Ido	11-19-1	IMECE2019-12893	161
McGuire	Claire	3-10-1	IMECE2019-13483	31	Meshi	Ido	11-19-1	IMECE2019-13779	161
McKenzie	E.A.	4-13-1	IMECE2019-12296	43	Messimer	Patrick	11-32-1	IMECE2019-11674	155
McKeown	Anne Q.	10-25-1	IMECE2019-13379	123	Messner	Christian	9-30-1	IMECE2019-12553	108
McKeown	Anne Q.	16-1-1	IMECE2019-13382	197	Metwalli	Sayed M.	6-4-1	IMECE2019-11285	64
McKeown	Joseph	10-27-2	IMECE2019-13624	128	Metwally	Hossam	8-4-1	IMECE2019-10669	89
McKercher	Richard	5-10-1	IMECE2019-11504	52	Metzger	Meredith	8-11-1	IMECE2019-13738	86
McLamore	Eric	10-25-2	IMECE2019-13194	126	Metzger	Meredith	15-1-1	IMECE2019-13627	187
McNamara	Marilyn C.	4-5-3	IMECE2019-12903	37	Meza	Abigail	16-2-1	IMECE2019-13623	204
Meacham	John	16-2-1	IMECE2019-13630	204	Mian	Ahsan	10-9-1	IMECE2019-11898	122
Meaker	Kyle S.	9-14-1	IMECE2019-13778	102	Mian	Ahsan	10-9-2	IMECE2019-11628	124
Mears	Laine	2-5-4	IMECE2019-11375	19	Mian	Ahsan	10-9-2	IMECE2019-11646	124
Mears	Laine	2-7-2	IMECE2019-11231	23	Mian	Ahsan	12-1-1	IMECE2019-10962	171
Mears	Laine	2-7-3	IMECE2019-11255	24	Mian	Ahsan	12-1-1	IMECE2019-11686	171
Mears	Laine	17-2-1	IMECE2019-13037	205	Miao	Ruijiao	9-26-1	IMECE2019-10462	102
Mears	Laine	17-2-1	IMECE2019-13038	205	Miao	Wanru	11-5-5	IMECE2019-13553	166
Medellin Castillo	Hugo Ivan	2-7-4	IMECE2019-11422	25	Miazgowicz	Keith	8-12-1	IMECE2019-10461	86
Medellin Castillo	Hugo Ivan	4-8-1	IMECE2019-10140	37	Michael	Robert J.	4-5-4	IMECE2019-10988	39
Medellin Castillo	Hugo Ivan	4-10-3	IMECE2019-12124	42	Michaloski	John	2-13-1	IMECE2019-11345	8
Medikonda	Sandeep	2-2-3	IMECE2019-10805	16	Michelson	Trevor	8-1-1	IMECE2019-10790	87
Medina	Fabian J.	17-15-1	IMECE2019-12837	213	Michler	Johann	4-5-1	IMECE2019-13127	34
Meekins	Andrew D.	9-63-1	IMECE2019-10272	95	Michler	Johann	16-1-1	IMECE2019-13688	200
Meena	Anil	2-5-3	IMECE2019-11191	17	Michna	Gregory	16-2-1	IMECE2019-13281	203
Meena	Anil	10-26-3	IMECE2019-11201	117	Middendorf	Jill	11-37-4	IMECE2019-13649	163
Meesala	Vamsi Chandra	5-3-2	IMECE2019-13693	51	Miele	Vincent	4-2-5	IMECE2019-13506	43
Meesala	Vamsi Chandra	16-1-1	IMECE2019-13395	197	Mignano	Christopher	7-5-1	IMECE2019-10282	81
Mehrmashhadi	Javad	11-10-4	IMECE2019-12209	144	Mihalko	Adam	4-5-4	IMECE2019-10988	39
Mehrmashhadi	Javad	11-38-3	IMECE2019-12830	150	Mikaeili	Fateh	17-15-1	IMECE2019-13858	215
Mehrmashhadi	Javad	11-38-3	IMECE2019-13899	150	Mikata	Yozo	11-23-1	IMECE2019-12319	152
Mehrmohammadi	Mohammad	12-3-1	IMECE2019-10629	169	Mikata	Yozo	11-23-2	IMECE2019-12336	153
Mehrpouyan	Hoda	6-9-3	IMECE2019-10523	74	Mikata	Yozo	11-26-1	IMECE2019-12335	158
Mei	Jianguo	16-1-1	IMECE2019-13607	199	Mikata	Yozo	11-26-2	IMECE2019-12314	161
Mei	Jun	1-1-4	IMECE2019-13645	3	Milani	Massimo	4-11-1	IMECE2019-11774	43
Mekid	Samir	2-13-2	IMECE2019-10158	11	Milani	Massimo	8-4-3	IMECE2019-11482	91
Mekid	Samir	10-29-1	IMECE2019-10137	128	Miljkovic	Nenad	2-8-1	IMECE2019-10621	17
Mekki	Bashir	9-36-2	IMECE2019-10617	99	Miljkovic	Nenad	9-43-1	IMECE2019-10628	93
Melguizo-Gavilanes	Josué	9-39-1	IMECE2019-13263	100	Miljkovic	Nenad	9-45-1	IMECE2019-10613	96
Melo	Andreia	3-3-1	IMECE2019-11229	32	Miljkovic	Nenad	9-36-1	IMECE2019-11421	96
Memon	Shabbir	2-7-1	IMECE2019-10600	23	Miljkovic	Nenad	9-45-1	IMECE2019-12017	96
Memon	Shabbir	2-7-4	IMECE2019-10602	25	Miljkovic	Nenad	9-18-1	IMECE2019-10371	106
Mendes	Hélder Fernando Gonçalves	1-2-2	IMECE2019-11513	4	Miljkovic	Nenad	17-9-1	IMECE2019-12838	209
Mendes	Nathan	9-57-1	IMECE2019-11426	107	Miljkovic	Nenad	17-9-1	IMECE2019-12900	209
Mendonça	Katia Cordeiro	9-57-1	IMECE2019-11426	107	Miljkovic	Nenad	17-15-1	IMECE2019-12723	213
Meng	Dean	2-6-2	IMECE2019-11297	11	Miljkovic	Nenad	17-15-1	IMECE2019-13334	214
Meng	Dean	14-1-2	IMECE2019-11286	183	Millard	Nathan	4-10-3	IMECE2019-11005	42
Meng	Wen	2-7-3	IMECE2019-11630	24	Miller	Joseph	12-3-1	IMECE2019-12791	170
Meng	Wen	2-7-4	IMECE2019-11521	25	Miller	Nathaniel S.	4-8-1	IMECE2019-10622	37
Meng	Xianghai	9-53-1	IMECE2019-12210	112	Miller	Roger	10-13-1	IMECE2019-10395	129
Meng	Xianghai	17-9-1	IMECE2019-12224	209	Miller	Tyler	5-5-2	IMECE2019-10791	53
					Milton	Graeme	1-1-1	IMECE2019-10644	1

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Min	Hequn	5-15-1	IMECE2019-10852	48	Mohan	Vijayakumar	10-26-4	IMECE2019-11408	118
Min	Sangkee	16-1-1	IMECE2019-13538	198	Mohanty	Kishore	8-1-1	IMECE2019-10483	87
Minary	Majid	2-2-2	IMECE2019-12807	15	Mohlala	Lesego	2-4-2	IMECE2019-10693	15
Minary	Majid	10-10-2	IMECE2019-12439	115	Mojahed	Alireza	1-1-2	IMECE2019-13605	2
Minary	Majid	10-25-2	IMECE2019-12440	125	Mokhtari	Amir Ashkan	1-1-3	IMECE2019-12850	2
Minary	Majid	11-39-3	IMECE2019-12007	142	Mokhtari	Amir Ashkan	1-1-3	IMECE2019-13566	2
Minette	Michael	8-2-3	IMECE2019-11841	88	Molaei	Ali	1-6-1	IMECE2019-11943	2
Ming	Hu	4-13-3	IMECE2019-10887	46	Molkeri	Abhilash	16-1-1	IMECE2019-13766	201
Mirala	Ali	16-1-1	IMECE2019-13524	198	Moloney	Francesca	16-1-1	IMECE2019-13782	201
Miran	Sajjad	3-10-1	IMECE2019-12221	31	Monaco	Ernesto	8-7-1	IMECE2019-10876	84
Miran	Sajjad	8-3-1	IMECE2019-12222	89	Monaco	Ernesto	8-7-1	IMECE2019-10921	84
Mirfendereski	Siamak	8-4-1	IMECE2019-13103	89	Mondal	Debabrata	2-7-3	IMECE2019-11630	24
Mir-Haidari	Seyed-Ehsan	1-6-1	IMECE2019-10773	2	Mongeau	Luc	11-3-2	IMECE2019-12562	166
Mirmohammad	Hadi	11-18-1	IMECE2019-12906	135	Monn	Michael	11-37-4	IMECE2019-12909	162
Mirzaeifar	Reza	2-9-3	IMECE2019-13613	12	Monson	Kenneth L.	4-5-1	IMECE2019-11661	34
Mirzaeifar	Reza	10-2-2	IMECE2019-13683	128	Montazami	Reza	12-8-1	IMECE2019-12904	170
Mishra	Ashreet	6-8-1	IMECE2019-12545	71	Montorsi	Luca	4-11-1	IMECE2019-11774	43
Mishra	Mrunal Kanti	5-4-5	IMECE2019-11113	60	Montorsi	Luca	8-4-3	IMECE2019-11482	91
Misra	Anil	10-5-1	IMECE2019-13626	127	Montoya Segnini	Jose	6-12-2	IMECE2019-12018	74
Misra	Anil	11-7-7	IMECE2019-13632	152	Moon	Jaeyun	11-26-3	IMECE2019-12039	165
Misra	Anil	15-1-1	IMECE2019-13975	189	Moon	Young	2-13-3	IMECE2019-10135	13
Misra	Anil	16-1-1	IMECE2019-13480	198	Moon	Young	2-13-3	IMECE2019-10366	13
Misra	Anil	16-1-1	IMECE2019-13490	198	Moon	Young	2-13-3	IMECE2019-10442	13
Misra	Anil	16-1-1	IMECE2019-13756	201	Moore	Jeffrey	2-9-3	IMECE2019-13415	12
Misra	Anil	17-15-1	IMECE2019-13405	214	Moore	Jeffrey	16-1-1	IMECE2019-12715	192
Misra	Anil	17-15-1	IMECE2019-13487	214	Moore	Matthew	8-4-3	IMECE2019-11462	91
Misra	Anil	17-15-1	IMECE2019-13762	215	Moore	Matthew	9-43-2	IMECE2019-11347	95
Misrak	Abel	16-2-1	IMECE2019-13878	204	Moore Jr.	Carl	11-32-1	IMECE2019-11790	155
Mistry	Aashutosh N.	6-11-1	IMECE2019-12131	68	Moradi-Dastjerdi	Rasool	11-2-2	IMECE2019-10796	160
Mitchell	Alexis	5-5-2	IMECE2019-10791	53	Morales	David	9-41-1	IMECE2019-10792	96
Mitchell	Katherine	6-14-1	IMECE2019-11025	75	Morelli	Mathew	10-26-6	IMECE2019-13896	121
Mitchell	Katherine	6-14-2	IMECE2019-11027	76	Moreno	Michael	17-4-2	IMECE2019-13592	206
Mittman	Deven	13-9-1	IMECE2019-11279	179	Moreno	Michael	17-4-2	IMECE2019-13657	206
Mitzi	David	16-1-1	IMECE2019-13840	202	Moreno	Michael	17-4-2	IMECE2019-13731	206
Miura	Hideo	11-7-1	IMECE2019-11186	133	Moreno	Michael	17-4-3	IMECE2019-13651	207
Miura	Hideo	11-7-1	IMECE2019-11210	133	Mori	Koji	4-3-1	IMECE2019-10548	33
Miura	Hideo	12-3-1	IMECE2019-11106	169	Mori	Koji	4-3-1	IMECE2019-11837	33
Miura	Hideo	12-1-1	IMECE2019-11076	171	Mori	Taichi	2-5-2	IMECE2019-11100	16
Miura	Hideo	12-4-1	IMECE2019-11107	172	Moriarty	Ethan	15-1-1	IMECE2019-13980	189
Miura	Tatsuma	10-10-4	IMECE2019-11099	118	Morimoto	Tatsuhiko	5-11-2	IMECE2019-11176	57
Miura	Tatsuma	10-10-4	IMECE2019-11143	118	Morimoto	Yoshitaka	2-5-2	IMECE2019-11100	16
Miyagi	Lowell	10-26-6	IMECE2019-13854	121	Moritoki	Yukihito	17-15-1	IMECE2019-13377	212
Mizuno	Ryota	12-3-1	IMECE2019-11106	169	Morosuk	Tatiana	6-3-1	IMECE2019-10590	61
Mizuochi	Toyohisa	5-11-2	IMECE2019-11176	57	Morosuk	Tatiana	6-3-1	IMECE2019-10850	61
Mo	Chengyang	10-4-5	IMECE2019-12860	119	Morosuk	Tatiana	6-4-3	IMECE2019-10587	67
Mo	Chengyang	10-19-1	IMECE2019-12994	127	Morosuk	Tatiana	6-6-1	IMECE2019-10588	68
Mo	Chengyang	11-3-2	IMECE2019-12993	165	Morosuk	Tatiana	6-6-1	IMECE2019-10712	68
Mo	Wei	2-3-1	IMECE2019-10822	24	Morosuk	Tatiana	7-12-1	IMECE2019-10925	79
Mocko	Gregory	2-7-2	IMECE2019-11231	23	Morovati	Vahid	11-1-2	IMECE2019-12253	146
Modell	Andrew P	17-10-1	IMECE2019-13238	210	Morovati	Vahid	11-1-9	IMECE2019-11931	163
Modha	Sidharth	16-1-1	IMECE2019-13594	199	Morozov	Andrey	13-1-1	IMECE2019-12288	176
Moges	Tesfaye	2-2-1	IMECE2019-11727	14	Morr	Douglas	13-5-1	IMECE2019-12285	178
Mogharrabi	Farshad	4-5-1	IMECE2019-11661	34	Morr	Douglas	13-9-1	IMECE2019-11479	179
Mohamed	Ibrahim	9-45-1	IMECE2019-10359	96	Morris	Clint	4-3-2	IMECE2019-11001	35
Mohamed	Walid	6-14-2	IMECE2019-11547	76	Morris	Jeffrey David	2-7-3	IMECE2019-11630	24
Mohammadi	Hamid	11-1-9	IMECE2019-11771	163	Morris	Joshua	10-19-1	IMECE2019-13467	127
Mohammadi	Kasra	6-10-3	IMECE2019-13550	74	Morsali	Seyedreza	11-39-3	IMECE2019-12007	142
Mohammadi	Seyed Saber	14-2-1	IMECE2019-11325	181	Morse	Edward	2-10-3	IMECE2019-10711	12
Mohammadi	Yousef	16-2-1	IMECE2019-13748	204	Morse	Jan	4-8-1	IMECE2019-11889	38
Mohammed	Obaidur Rahman	2-7-1	IMECE2019-10600	23	Morshed	A.K.M. Monjur	9-29-1	IMECE2019-11794	104
Mohammed	Obaidur Rahman	2-7-4	IMECE2019-10602	25	Morshed	A.K.M. Monjur	9-16-1	IMECE2019-11781	111
Mohammed O. Alharbi	Meshal	10-26-1	IMECE2019-10308	114	Mortazavi	Mehdi	8-12-1	IMECE2019-11039	86
Mohan	Ram	10-23-1	IMECE2019-11492	125	Mortazavian	Ershad	2-2-1	IMECE2019-10758	14
Mohan	Ram	10-23-1	IMECE2019-11556	125	Mortensen	Jonathan Douglas	4-10-3	IMECE2019-11932	42
Mohan	Ram	10-23-1	IMECE2019-11639	125	Mortensen	Jonathan Douglas	17-4-2	IMECE2019-11796	206
Mohan	Ram	10-23-2	IMECE2019-11673	130	Moser	Robert	11-7-7	IMECE2019-13024	152
Mohan	Ram	17-15-1	IMECE2019-12630	212	Moshkelgosha	Ehsan	10-27-1	IMECE2019-11695	126
Mohan	Ram	17-15-1	IMECE2019-12631	213	Mosleh	Ali	13-6-1	IMECE2019-11806	175
Mohan	Ram	17-15-1	IMECE2019-12717	213	Mosleh	Ali	13-1-1	IMECE2019-12288	176
Mohan	Ram	17-15-1	IMECE2019-12897	213	Mostek	James	16-1-1	IMECE2019-13272	196
Mohan	Ram	17-15-1	IMECE2019-13003	213	Mota	Andre	4-14-1	IMECE2019-11221	41
Mohan	Revathi Priyanka	11-39-3	IMECE2019-13279	142	Motalab	Mohammad	10-26-6	IMECE2019-12109	121
					Motalab	Mohammad	12-7-3	IMECE2019-12129	174
					Mousa	Mohamed	9-43-1	IMECE2019-10628	93

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Mousa	Mohamed	17-9-1	IMECE2019-12838	209	Myers	Mike	2-3-1	IMECE2019-10981	24
Movchan	Alexander	1-1-1	IMECE2019-12500	1	N L	Murali Krishna	2-5-3	IMECE2019-11188	17
Movchan	Natasha	1-1-1	IMECE2019-12500	1	Na	Haejoong	12-3-1	IMECE2019-12791	170
Mroz	Max	16-1-1	IMECE2019-13472	198	Nabat B. Altulohi	Fahad	10-24-1	IMECE2019-10307	123
Mroz	Max	16-2-1	IMECE2019-13631	204	Nabutola	Kaloki	8-3-1	IMECE2019-10453	89
Mrozek	Lukas	6-5-1	IMECE2019-10267	62	Nabutola	Kaloki	8-3-1	IMECE2019-10454	89
Muaz	Muhammed	2-9-1	IMECE2019-10440	7	Nachiaapan	Rajarajeswari	10-17-1	IMECE2019-11290	120
Muaz	Muhammed	2-5-1	IMECE2019-10376	15	Nachiaapan	Rajarajeswari	11-17-1	IMECE2019-10004	135
Mucha	Nikhil Reddy	16-1-1	IMECE2019-13427	197	Nacy	Somar	10-17-2	IMECE2019-13794	123
Mucha	Nikhil Reddy	16-1-1	IMECE2019-13473	198	Nadimpali	Siva	11-8-3	IMECE2019-13805	140
Muci-Kuchler	Karim	4-2-3	IMECE2019-13157	40	Nagai	Kota	4-3-2	IMECE2019-11132	35
Mudlaff	Amanda	7-4-1	IMECE2019-10467	80	Nagakura	Takumi	10-10-4	IMECE2019-11099	118
Mueller	Andreas Michael	2-10-3	IMECE2019-11328	12	Nagaraj	Aditya	16-1-1	IMECE2019-13538	198
Mueller	Jochen	10-4-3	IMECE2019-13791	116	Naghdhi	Masoud	12-1-1	IMECE2019-12270	171
Mueller	Robert	6-3-1	IMECE2019-10270	61	Naghdloo	Amin	4-9-1	IMECE2019-13228	42
Mugikura	Shunji	4-10-3	IMECE2019-10866	42	Nain	Preeti	6-16-2	IMECE2019-11122	69
Muhammed	Bilal	2-3-2	IMECE2019-10571	25	Nair	Kalyani	4-5-1	IMECE2019-11944	34
Muir	Ineke L.	8-7-1	IMECE2019-13372	84	Naja	Yahya	6-3-1	IMECE2019-10850	61
Mujib	Shakir Bin	16-1-1	IMECE2019-12742	192	Najafi	Hamidreza	6-9-2	IMECE2019-11644	73
Mujib	Shakir Bin	16-1-1	IMECE2019-12758	192	Najafi	Hamidreza	9-4-1	IMECE2019-11656	106
Mujib	Shakir Bin	16-1-1	IMECE2019-12759	192	Najjar	Michel	11-36-1	IMECE2019-12051	159
Mujib	Shakir Bin	16-1-1	IMECE2019-13203	195	Nakagawa	Kensuke	2-5-2	IMECE2019-11100	16
Mukherjee	Abhijit	9-64-1	IMECE2019-12174	97	Nakao	Masayuki	7-7-1	IMECE2019-10217	80
Mukherjee	Dipayan	11-1-8	IMECE2019-12998	160	Nakarmi	Sushan	11-36-2	IMECE2019-11654	162
Mukherjee	Partha P.	6-11-1	IMECE2019-12131	68	Nakata	Mika	1-2-2	IMECE2019-10776	4
Mukherjee	Partha P.	6-11-2	IMECE2019-12638	70	Nakauchi	Genta	12-3-1	IMECE2019-11106	169
Mukherjee	Partha P.	16-1-1	IMECE2019-13700	200	Naleway	Steven	16-1-1	IMECE2019-13472	198
Mukherjee	Santanu	16-1-1	IMECE2019-12758	192	Naleway	Steven	16-2-1	IMECE2019-13631	204
Mukherjee	Santanu	16-1-1	IMECE2019-12759	192	Naleway	Steven	17-4-2	IMECE2019-13474	206
Mukhopadhyay	Akash	2-6-2	IMECE2019-11445	11	Naleway	Steven	17-4-2	IMECE2019-13887	206
Mukhopadhyay	Subham	9-36-1	IMECE2019-10432	95	Nallanthighall	Arya	9-45-1	IMECE2019-12017	96
Mulchandani	Ashok	16-1-1	IMECE2019-13594	199	Nam	Woongsik	16-1-1	IMECE2019-12968	193
Mulford	Rydge	9-7-1	IMECE2019-13845	99	Nandan	Naveen	17-4-2	IMECE2019-13775	206
Mulford	Rydge	9-14-1	IMECE2019-13745	102	Nandikolla	Vidya	4-13-3	IMECE2019-10463	46
Mulford	Rydge	9-14-1	IMECE2019-13778	102	Nandikolla	Vidya	10-14-1	IMECE2019-10400	122
Muliana	Anastasia	16-1-1	IMECE2019-13189	195	Naqvi	Syed Ahsan Raza	16-1-1	IMECE2019-13033	194
Mullany	Brigid A.	2-1-1	IMECE2019-13991	7	Narain	Amitabh	9-18-1	IMECE2019-12432	106
Mulligan	Christopher	10-29-2	IMECE2019-12892	131	Narain	Amitabh	16-1-1	IMECE2019-13471	198
Munayr	Mahjoub	6-1-2	IMECE2019-10283	62	Narayanawamy	Ramesh	9-18-2	IMECE2019-11212	108
Mundhe	Sanket	6-11-1	IMECE2019-12871	68	Nardi	Aaron	10-26-5	IMECE2019-11689	120
Mundhwa	Mayur	6-12-1	IMECE2019-13781	73	Nardini	Sergio	9-5-1	IMECE2019-11575	110
Munro	Troy	9-15-1	IMECE2019-11699	108	Narvaez	Christian	9-51-1	IMECE2019-10324	110
Munro	Troy	12-5-1	IMECE2019-11470	171	Naseradinmousavi	Peiman	16-1-1	IMECE2019-13567	199
"Munsell, Jr."	William	4-5-3	IMECE2019-10445	37	Nasersharifi	Yahya	17-9-1	IMECE2019-13057	209
Munshi	Joydeep	10-5-1	IMECE2019-11878	126	Nasir	Abdulkarim	3-14-1	IMECE2019-11339	32
Munshi	Joydeep	11-33-2	IMECE2019-11883	150	Nasir	Sabih	2-13-2	IMECE2019-10889	11
Munshi	Joydeep	16-1-1	IMECE2019-13002	194	Nassar	Hussein	1-1-1	IMECE2019-13891	1
Munshi	Joydeep	17-6-1	IMECE2019-11834	207	Nava	Katherine	7-3-1	IMECE2019-11394	79
Munshi	Joydeep	17-10-1	IMECE2019-11858	210	Nawaz	Kashif	6-1-1	IMECE2019-11616	61
Munshi	Joydeep	17-15-1	IMECE2019-12546	212	Nawaz	Kashif	6-7-3	IMECE2019-12185	70
Munshi	Joydeep	17-15-1	IMECE2019-12547	212	Nawaz	Kashif	9-35-1	IMECE2019-13366	94
Munteshari	Obaidallah	9-5-1	IMECE2019-13086	111	Nayeb Hashemi	Hamid	11-10-3	IMECE2019-10213	140
Munteshari	Obaidallah	9-5-1	IMECE2019-13919	111	Nazem Tahmasebi	Kaveh	5-11-1	IMECE2019-10569	55
Murakami	Hidegori	5-9-2	IMECE2019-10781	50	Nazir	Kamran	8-3-1	IMECE2019-12222	89
Murakami	Hidegori	5-9-3	IMECE2019-11435	51	Neba Mforsoh	Irine	11-14-1	IMECE2019-11584	145
Murakami	Hidegori	5-4-1	IMECE2019-10780	54	Neef	James D.	7-6-1	IMECE2019-12374	78
Murali	Nivedha	10-17-1	IMECE2019-11290	120	Neher	Jon	17-4-3	IMECE2019-12974	206
Murdock	Ryan	16-1-1	IMECE2019-13170	195	Nehme	Christopher	4-5-1	IMECE2019-10180	34
Murphy	Alexander	16-1-1	IMECE2019-12818	192	Nejadsadeghi	Nima	10-5-1	IMECE2019-13626	127
Murphy	Michael	10-23-1	IMECE2019-12193	125	Nejadsadeghi	Nima	15-1-1	IMECE2019-13975	189
Murphy	Michael	12-3-1	IMECE2019-11921	170	Nejadsadeghi	Nima	16-1-1	IMECE2019-13480	198
Murphy	Shane	15-1-1	IMECE2019-13986	189	Nejadsadeghi	Nima	17-15-1	IMECE2019-13487	214
Murphy-Leonard	Aeriel	10-2-1	IMECE2019-12699	126	Nelson	Aaron	2-2-4	IMECE2019-10496	18
Murphy-Leonard	Aeriel	11-12-3	IMECE2019-12700	164	Nelson	Isaac	16-1-1	IMECE2019-13472	198
Murray	Rebecca	2-2-2	IMECE2019-13224	15	Nelson	Isaac	16-2-1	IMECE2019-13631	204
Murthy	Jayathi	9-6-1	IMECE2019-11994	98	Nelson	Keith	9-20-1	IMECE2019-13586	94
Musetich	Matthew	16-1-1	IMECE2019-13234	196	Nelson	Keith	9-15-1	IMECE2019-13355	109
Musonda	Vincent	10-9-3	IMECE2019-10690	127	Nelson	Keith	17-15-1	IMECE2019-13361	214
Muthu	Esakki S.	10-24-2	IMECE2019-11174	125	Nelson	Keith	17-15-1	IMECE2019-13580	214
Mutsenko	Vitalii	4-10-5	IMECE2019-10447	45	Nelson	Nathanael	17-4-2	IMECE2019-13882	206
Mwema	F.M	11-7-3	IMECE2019-10721	140	Newacheck	Scott	10-10-1	IMECE2019-13546	113
Mwesigye	Aggrey	6-4-3	IMECE2019-10542	67	Newacheck	Scott	10-10-1	IMECE2019-13776	113
Mwesigye	Aggrey	6-9-2	IMECE2019-12005	73	Newacheck	Scott	10-17-2	IMECE2019-13794	123
Mwita	Wambura Mwiriyeni	10-26-3	IMECE2019-11163	117	Newaz	Golam M.	6-11-1	IMECE2019-12871	68

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Newaz	Golam M.	6-11-2	IMECE2019-13092	70	Oberzan	Declan	16-1-1	IMECE2019-13589	199
Newell	Pania	2-2-5	IMECE2019-12981	20	Obinna	Aronu	9-59-1	IMECE2019-11313	110
Newell	Pania	11-12-3	IMECE2019-13488	164	Obiukwu	Osita	10-26-1	IMECE2019-10313	114
Newell	Pania	11-26-3	IMECE2019-13212	165	Ochoa	Cesar	4-10-2	IMECE2019-10627	41
Newkirk	Justin	11-1-1	IMECE2019-13383	144	O'Connor	Clarke	7-10-1	IMECE2019-11751	77
Newman	Robert	16-1-1	IMECE2019-13501	198	Odendaal	Hendrik	2-9-2	IMECE2019-11232	9
Ngo	Chean Chin	7-3-1	IMECE2019-11511	79	Odessa	Itay	3-6-1	IMECE2019-12725	27
Nguyen	Anh	10-25-1	IMECE2019-13131	123	Odum	Teri W.	16-1-1	IMECE2019-13136	195
Nguyen	Hiep V.	6-9-2	IMECE2019-12005	73	Odufa	Moradeyo	9-31-1	IMECE2019-11183	111
Nguyen	Hieu	5-7-1	IMECE2019-10174	55	Ogasawara	Naoki	8-2-3	IMECE2019-10683	88
Nguyen	Huu Duy	9-24-1	IMECE2019-13548	107	Ogata	Takashi	17-10-1	IMECE2019-12675	210
Nguyen	Kevin	3-10-1	IMECE2019-13483	31	Ogden	Taylor A.	16-1-1	IMECE2019-13472	198
Nguyen	Thanh	16-1-1	IMECE2019-13619	200	Oh	Changyong	5-13-1	IMECE2019-13333	59
Nguyen	Thao	11-1-4	IMECE2019-13397	152	Oh	Gyoko	5-9-1	IMECE2019-10130	48
Nguyen	Thien	6-14-1	IMECE2019-11800	75	Oh	Sang June	7-3-1	IMECE2019-11511	79
Nguyen	Thien	6-14-2	IMECE2019-11811	76	Ohashi	Kazuhito	2-14-1	IMECE2019-12509	21
Nguyen	Tony	8-12-1	IMECE2019-11039	86	Ohioma	Eboreime	11-35-1	IMECE2019-10752	158
Nguyen	Tuan	5-2-1	IMECE2019-10109	56	Ohioma	Eboreime	11-35-1	IMECE2019-10753	159
Ni	Jun	2-10-1	IMECE2019-10231	7	Ohira	Hikaru	2-14-1	IMECE2019-12509	21
Ni	Qing	17-15-1	IMECE2019-12552	212	Ohodnicki	Paul R.	16-1-1	IMECE2019-12771	192
Ni	Tao	11-38-1	IMECE2019-13301	145	Ohta	Makoto	4-4-1	IMECE2019-11125	33
Ni	Xiang	11-1-3	IMECE2019-12589	149	Ohta	Makoto	4-10-3	IMECE2019-10866	42
Niaraki Asli	Amir Ehsan	17-2-1	IMECE2019-12915	205	Ok	Jeong Tae	15-1-1	IMECE2019-11602	187
Nicely	Clint	11-38-1	IMECE2019-12907	146	Okada	Kazuya	8-2-2	IMECE2019-10549	87
Nicely	Clint	17-11-2	IMECE2019-12908	211	Okamoto	R.J.	16-1-1	IMECE2019-13629	200
Nickerson	Ethan	11-18-1	IMECE2019-13785	135	Okamoto	R.J.	16-1-1	IMECE2019-13733	201
Nicola	Lucia	11-17-1	IMECE2019-13064	135	Okoye	Peter Chukwuma	6-1-1	IMECE2019-10072	61
Nie	Xu	11-7-4	IMECE2019-12130	144	Okposio	David	6-8-1	IMECE2019-12545	71
Nielsen	Kim Lau	2-10-1	IMECE2019-11251	7	Okposio	David	9-57-1	IMECE2019-11870	107
Nielsen	Morten	2-10-1	IMECE2019-11251	7	Oktem	A. Sinan	3-5-1	IMECE2019-10325	27
Nielson	Samuel	8-6-3	IMECE2019-11352	90	Okumura	Dai	11-1-8	IMECE2019-12917	160
Niezrecki	Christopher	3-15-1	IMECE2019-13638	30	Okumura	Dai	11-37-5	IMECE2019-13056	165
Nigam	Aman	16-2-1	IMECE2019-13289	203	Okwu	Modestus Okechukwu	9-35-1	IMECE2019-11329	94
Nikhare	Chetan	2-7-2	IMECE2019-10619	23	Okwu	Modestus Okechukwu	12-4-1	IMECE2019-11496	172
Nikhare	Chetan	2-7-3	IMECE2019-10625	24	Oladijo	O.P.	2-7-4	IMECE2019-10715	25
Nikhare	Chetan	10-26-1	IMECE2019-10303	114	Oladijo	O.P.	11-7-3	IMECE2019-10721	140
Nikravesh	Siavash	11-27-1	IMECE2019-13197	154	Olasumboye	Adewale	11-14-2	IMECE2019-10978	147
Ning	Xin	11-46-1	IMECE2019-12779	137	Olayinka	Ayotunde	2-7-1	IMECE2019-10032	23
Nishikawa	Reon	1-2-1	IMECE2019-12748	1	Oleinik	Cesar	17-2-1	IMECE2019-10144	205
Nishimoto	Yutaka	4-6-1	IMECE2019-10382	36	Olia	Masoud	11-10-3	IMECE2019-10213	140
Nispel	Abraham	13-4-1	IMECE2019-11862	178	Oliveira	Pedro	2-8-4	IMECE2019-11711	22
Nitsas	Michail	6-2-1	IMECE2019-10725	64	Oliveira	Ricardo	6-4-2	IMECE2019-11542	66
Nitsas	Michail	6-2-2	IMECE2019-10736	65	Oliver	Kathryn	14-3-3	IMECE2019-11069	184
Nitsas	Michail	6-2-3	IMECE2019-10738	67	Olivett	Anthony	5-4-4	IMECE2019-13830	59
Niu	Hang	5-9-3	IMECE2019-11012	51	Olivett	Anthony	16-1-1	IMECE2019-13552	199
Niu	Xiaoxu	2-10-3	IMECE2019-10539	12	Olivetti	Elsa	16-2-1	IMECE2019-13295	203
Niu	Zhihua	2-9-1	IMECE2019-10832	7	Oliynyk	Anton	10-26-6	IMECE2019-13854	121
Niu	Zhihua	2-10-2	IMECE2019-10871	10	Olson	Derek	5-11-1	IMECE2019-10241	55
Nnanna	A.G. Agwu	6-8-1	IMECE2019-12545	71	Olubambi	Peter	2-4-2	IMECE2019-10693	15
Nnanna	A.G. Agwu	9-57-1	IMECE2019-11870	107	Oluwabunmi	Kayode	15-1-1	IMECE2019-13902	188
Nnanna	A.G. Agwu	9-59-1	IMECE2019-11313	110	Oluwabunmi	Kayode	16-1-1	IMECE2019-13719	201
Noaman	Mohamed	6-3-1	IMECE2019-10590	61	Omid	O.N.	11-1-9	IMECE2019-13079	163
Noebe	Ronald	16-1-1	IMECE2019-13145	195	Omori	Takahiro	12-7-2	IMECE2019-10558	173
Noell	Philip	11-18-2	IMECE2019-13673	138	Ongaro	Greta	11-38-1	IMECE2019-13301	145
Nor Mohd.	Rafiq	11-36-2	IMECE2019-11162	162	Ono	Masashi	9-5-1	IMECE2019-12710	110
Norato	Julian	16-1-1	IMECE2019-13803	202	Ono	Takeyuki	5-9-2	IMECE2019-10781	50
Norberg	Jaclyn	4-11-1	IMECE2019-10980	43	Ono	Takeyuki	5-9-3	IMECE2019-11435	51
Nordin	Greg	12-5-1	IMECE2019-11470	171	Ono	Takeyuki	5-4-1	IMECE2019-10780	54
Nouh	Mostafa	1-1-3	IMECE2019-12852	2	Ookawara	Shinichi	4-5-3	IMECE2019-10425	37
Nouh	Mostafa	16-1-1	IMECE2019-13133	195	Ookawara	Shinichi	4-10-1	IMECE2019-10427	40
Nour	Bakr	4-10-1	IMECE2019-10333	40	Oosthuizen	Patrick	9-66-1	IMECE2019-13947	97
Nouzil	Ibrahim	2-5-2	IMECE2019-10952	16	Oosthuizen	Patrick	9-66-1	IMECE2019-13974	97
Novelia	Alyssa	11-5-2	IMECE2019-12511	157	Oosthuizen	Patrick	9-19-2	IMECE2019-11864	104
Nowicki	Margaret	4-11-2	IMECE2019-11948	44	Oraibi	Zakariya	2-4-1	IMECE2019-13312	14
Nowicki	Margaret	15-1-1	IMECE2019-13967	189	Orea	Daniel	6-14-1	IMECE2019-11800	75
N'souglo	Komi E.	11-7-4	IMECE2019-12858	144	Orea	Daniel	6-14-2	IMECE2019-11811	76
Nwanna	Emeka C.	2-14-1	IMECE2019-10692	21	O'Reilly	Oliver M.	11-5-2	IMECE2019-12511	157
Nwokonkwo	Obinna	16-1-1	IMECE2019-13753	201	Orejon	Daniel	9-43-1	IMECE2019-10628	93
Nygård	Bård Inge	5-2-1	IMECE2019-10249	56	Orejon	Daniel	17-9-1	IMECE2019-12838	209
Nyland	Joakim	6-4-5	IMECE2019-10266	70	Orient	George	11-22-2	IMECE2019-10521	145
Nylen	Rebecca	11-22-2	IMECE2019-13797	145	Ortega	Joseph K.E.	11-39-3	IMECE2019-13279	142
Nyssen	Florence	5-3-1	IMECE2019-10300	49	Ortiz	Jhonatan	15-1-1	IMECE2019-13929	18
Obata	Yoshihiro	11-18-1	IMECE2019-12873	135	Ortiz Rejón	Miguel	11-7-2	IMECE2019-10392	137
Oberoi	Harinder Singh	2-5-4	IMECE2019-12234	19	Orzeszko	Mark	16-2-1	IMECE2019-13384	203

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Osberg	Daniel Vatle	5-11-1	IMECE2019-10434	55	Palleria	Vinay Kumar	4-2-3	IMECE2019-11814	40
Oskay	Caglar	11-19-1	IMECE2019-12893	161	Palmer	Alan	4-11-1	IMECE2019-10228	43
Oslob	Ehsan	11-26-4	IMECE2019-10207	167	Palmore Jr.	John	9-39-2	IMECE2019-12984	101
Osman	M.	10-24-1	IMECE2019-10307	123	Palnitkar	Harish	16-1-1	IMECE2019-13710	200
Osovski	Shmuel	11-8-2	IMECE2019-13674	137	Palou	Carlos	8-6-1	IMECE2019-11979	88
Ospina-Aldana	Gustavo	2-9-2	IMECE2019-11232	9	Palou	Carlos	8-6-1	IMECE2019-11989	88
Ossia	Sepand	11-12-1	IMECE2019-11066	158	Pan	Fangjia	4-10-3	IMECE2019-10866	42
Ostergaard	Halsey	11-12-3	IMECE2019-12987	164	Pan	Heng	9-49-1	IMECE2019-12276	109
Osterman	Kelly	6-7-1	IMECE2019-10606	66	Pan	Liang	9-20-1	IMECE2019-11365	94
Ostermeyer	Georg-Peter	5-3-1	IMECE2019-10576	49	Pan	Liang	9-49-1	IMECE2019-11386	109
Ostien	Jake	11-7-4	IMECE2019-12806	144	Pan	Liang	16-1-1	IMECE2019-12829	193
Ostien	Jake	11-7-4	IMECE2019-12808	144	Pan	Luyan	5-5-1	IMECE2019-12263	47
Ostien	Jake	11-7-5	IMECE2019-12992	147	Pan	Xiaofei	11-28-1	IMECE2019-12293	135
Ostien	Jake	11-7-6	IMECE2019-12856	149	Pan	Ying	17-15-1	IMECE2019-13575	214
Ostien	Jake	11-7-6	IMECE2019-13025	149	Pan	Zhiliang	9-25-1	IMECE2019-13606	98
Ostoja-Starzewski	Martin	4-2-2	IMECE2019-11985	39	Pan	Zhiliang	17-9-1	IMECE2019-13618	209
Ostoja-Starzewski	Martin	5-13-1	IMECE2019-11072	58	Panaccione	Wyatt	2-4-1	IMECE2019-11868	14
Ostoja-Starzewski	Martin	10-17-1	IMECE2019-10538	120	Panaccione	Wyatt	2-4-2	IMECE2019-11327	15
Ostoja-Starzewski	Martin	10-9-3	IMECE2019-12593	127	Panaccione	Wyatt	17-2-1	IMECE2019-11360	205
Oterkus	Erkan	1-12-2	IMECE2019-13177	6	Pandey	K.K.	10-1-1	IMECE2019-12762	119
Oterkus	Erkan	3-12-1	IMECE2019-10049	29	Pandey	K.K.	10-27-3	IMECE2019-12763	131
Oterkus	Erkan	3-12-1	IMECE2019-13171	29	Pandey	Neel	1-10-1	IMECE2019-10197	3
Oterkus	Erkan	3-15-1	IMECE2019-13175	30	Pandurangi	Shrinidhi Shrikant	11-37-3	IMECE2019-13019	159
Oterkus	Selda	3-12-1	IMECE2019-10049	29	Pandurangi	Shrinidhi Shrikant	11-37-5	IMECE2019-12988	165
O'Toole	Brendan	11-22-1	IMECE2019-12960	142	Pandya	Divya	9-18-1	IMECE2019-12432	106
O'Toole	Brendan	11-14-1	IMECE2019-11799	145	Paneri	Bhaskar	4-10-1	IMECE2019-10529	40
O'Toole	Brendan	11-32-1	IMECE2019-11674	155	Pang	Jiazhen	2-13-2	IMECE2019-11160	11
O'Toole	Brendan	11-26-3	IMECE2019-12039	165	Pang	Kaylene	17-4-2	IMECE2019-13107	206
Otremba	Frank	5-5-2	IMECE2019-10030	53	Pang	Yaokun	11-5-3	IMECE2019-13416	160
Otto	Tauno	2-13-1	IMECE2019-10583	8	Panrudkevich	Alexa	16-1-1	IMECE2019-13629	200
Oudah	Saad K.	9-51-1	IMECE2019-11624	110	Panse	Sanskar	9-46-1	IMECE2019-10660	102
Oudah E. Al-Harbi	Mohammed	10-24-1	IMECE2019-10307	123	Pansolin	Denis	3-3-1	IMECE2019-12919	32
Oudich	Mourad	1-1-3	IMECE2019-13051	2	Pant	Anuj	9-4-1	IMECE2019-11656	106
Oviroh	Peter	2-9-3	IMECE2019-10578	12	Pant	Kapil	3-13-1	IMECE2019-11333	29
Oviroh	Peter	6-11-3	IMECE2019-10580	71	Pant	Lalit	6-12-2	IMECE2019-12436	74
Owczarek	Grzegorz	17-9-1	IMECE2019-12959	209	Panteli	Anna	6-1-3	IMECE2019-11399	63
Owolabi	Gbadebo	11-14-2	IMECE2019-10978	147	Papadopolous	Christopher	7-1-2	IMECE2019-13584	78
Oxandale	Samuel	12-7-1	IMECE2019-11690	169	Parab	Niranjan D.	16-1-1	IMECE2019-13772	201
Oxandale	Samuel	12-5-1	IMECE2019-11534	171	Parahovnik	Anatoly	9-19-2	IMECE2019-10470	104
Oyewola	Miracle	9-31-1	IMECE2019-11183	111	Parahovnik	Anatoly	9-51-1	IMECE2019-10045	109
Ozaltun	Hakan	6-14-2	IMECE2019-11547	76	Parate	Kshama	4-12-1	IMECE2019-13895	45
Ozaltun	Hakan	6-14-2	IMECE2019-13773	76	Parate	Kshama	10-25-2	IMECE2019-13194	126
Ozbek	Atay Kaan	9-14-1	IMECE2019-11595	102	Parate	Kshama	10-25-2	IMECE2019-13872	126
Oztan	Cagri	2-2-7	IMECE2019-12215	18	Parate	Kshama	16-1-1	IMECE2019-13081	194
Oztekin	Alparslan	6-7-1	IMECE2019-10734	66	Parate	Kshama	16-1-1	IMECE2019-13494	198
Oztekin	Alparslan	6-7-1	IMECE2019-10740	66	Parikh	Nil	16-1-1	IMECE2019-12715	192
Oztekin	Alparslan	6-7-2	IMECE2019-10956	67	Parikh	Nil	16-1-1	IMECE2019-12867	193
Oztekin	Alparslan	8-9-2	IMECE2019-10723	83	Parisi	James	15-1-1	IMECE2019-12634	188
Oztekin	Alparslan	8-9-1	IMECE2019-10899	83	Park	Cheolwoong	17-6-1	IMECE2019-13388	208
Oztekin	Alparslan	8-9-3	IMECE2019-10727	84	Park	Daniel	10-23-1	IMECE2019-12193	125
P	Ashwath	2-6-2	IMECE2019-10026	11	Park	Daniel	12-3-1	IMECE2019-11921	170
P Thanalakshme	Rhitha	5-15-1	IMECE2019-10668	48	Park	Deokgeun	16-1-1	IMECE2019-13139	195
P.G.	Vibhu	10-26-2	IMECE2019-10384	115	Park	Hong Seok	17-2-1	IMECE2019-10696	205
Pabón Villamizar	Dany	5-4-2	IMECE2019-12160	56	Park	Jae Sung	8-4-1	IMECE2019-13103	89
Pabón Villamizar	Dany	15-1-1	IMECE2019-13929	188	Park	Jin Su	6-9-1	IMECE2019-13054	72
Pacheco	Daniel	1-12-1	IMECE2019-12093	5	Park	Jungkyu	6-14-1	IMECE2019-11025	75
Paci	Jeffrey T.	16-1-1	IMECE2019-13136	195	Park	Jungkyu	6-14-2	IMECE2019-11027	76
Padilla Espinosa	Ingrid	17-15-1	IMECE2019-12717	213	Park	Jungkyu	10-26-4	IMECE2019-11411	118
Padmanaban	Vishnu	6-4-4	IMECE2019-10735	69	Park	Keunhan	6-4-5	IMECE2019-10671	71
Pagan	Darren	11-47-3	IMECE2019-13059	151	Park	Keunhan	9-20-1	IMECE2019-13468	94
Pagani	Alfonso	1-1-3	IMECE2019-12607	2	Park	Keunhan	9-4-1	IMECE2019-13130	106
Pagani	Alfonso	3-14-1	IMECE2019-11281	32	Park	Keunhan	9-15-1	IMECE2019-10175	108
Pagani	Alfonso	3-14-1	IMECE2019-11314	32	Park	Keunhan	9-30-2	IMECE2019-13470	109
Pagani	Alfonso	3-14-1	IMECE2019-11364	32	Park	Keunhan	16-1-1	IMECE2019-12663	191
Page	Geoffrey	10-29-2	IMECE2019-11895	131	Park	Keunhan	17-9-1	IMECE2019-13135	209
Page	Logan	9-15-1	IMECE2019-11699	108	Park	Seongeun	5-2-2	IMECE2019-10997	58
Pahuja	Rishi	17-2-1	IMECE2019-12690	205	Park	Sunggook	12-6-1	IMECE2019-12058	171
Painter	Brian	5-5-1	IMECE2019-10663	47	Parker	Jordan	6-4-4	IMECE2019-10804	69
Pal	Ramendra K.	10-25-1	IMECE2019-13379	123	Parker	Jordan	15-1-1	IMECE2019-13849	188
Pal	Ramendra K.	16-1-1	IMECE2019-13382	197	Parmigiani	John	11-10-3	IMECE2019-11680	141
Pal	Ramendra K.	16-2-1	IMECE2019-13384	203	Parmigiani	John	11-19-1	IMECE2019-11713	161
Palaniappan	Kannappan	2-4-1	IMECE2019-13312	14	Parnell	William J.	1-14-1	IMECE2019-11006	1
Palermo	Antonio	1-6-2	IMECE2019-12608	5	Parry	Marcus	10-26-6	IMECE2019-13854	121
Paley	Derek A.	11-5-2	IMECE2019-12511	157	Parthasarathy	Ramkumar	6-3-1	IMECE2019-12662	61

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Paruchuru	Satya Prasad	17-2-1	IMECE2019-10416	205	Perkins	Edmon	5-10-1	IMECE2019-11506	52
Paruchuru	Satya Prasad	17-2-1	IMECE2019-10417	205	Perkins	Jason	15-1-1	IMECE2019-11602	187
Paruchuru	Satya Prasad	17-10-1	IMECE2019-10423	210	Perlado	Jose Manuel	11-47-1	IMECE2019-13836	146
Paruchuru	Satya Prasad	17-15-1	IMECE2019-12878	211	Perry	Mackenzie	16-1-1	IMECE2019-13633	200
Parvez	Mohammad Salman	12-8-2	IMECE2019-11734	172	Perumal	Venkateswaran	4-10-1	IMECE2019-13476	40
Pascoa Marques	Jose	3-2-1	IMECE2019-11515	28	Peruqui Guidio	Bruno	16-1-1	IMECE2019-13850	202
Pascoa Marques	Jose	3-3-1	IMECE2019-11712	32	Pervaiz	Salman	2-5-2	IMECE2019-10952	16
Pascoa Marques	Jose	8-4-3	IMECE2019-11747	91	Pervaiz	Salman	2-5-3	IMECE2019-10973	17
Pasmann	Sam	6-14-1	IMECE2019-10221	75	Pervaiz	Salman	2-5-4	IMECE2019-10961	19
Pate	Michael	9-66-1	IMECE2019-13947	97	Perveen	Asma	2-5-5	IMECE2019-10946	20
Patel	Anish	16-2-1	IMECE2019-13417	203	Pervez	Tasneem	10-26-3	IMECE2019-11156	117
Patel	Harsh	4-13-2	IMECE2019-11802	45	Peswani	Mohnish	9-39-1	IMECE2019-13263	100
Patel	Hinal	11-1-6	IMECE2019-12187	154	Peterlevitz	Alfredo Carlos	11-39-4	IMECE2019-12820	151
Patel	Swati	8-2-3	IMECE2019-11258	88	Petersen	Kevin	12-8-1	IMECE2019-13401	170
Patel	V.	3-3-1	IMECE2019-11968	32	Peterson	Suzanne	16-1-1	IMECE2019-12715	192
Pathak	Mangesh	5-9-2	IMECE2019-10701	50	Petersson	Hakan	14-2-2	IMECE2019-11550	183
Pathak	Pushparaj Mani	5-4-5	IMECE2019-11113	60	Peto	Marinela	4-14-1	IMECE2019-12260	41
Pathak	Siddhartha	4-5-1	IMECE2019-13127	34	Petralia	Michael Thomas	6-6-1	IMECE2019-12250	68
Pathak	Siddhartha	16-1-1	IMECE2019-13688	200	Petralia	Michael Thomas	6-6-1	IMECE2019-12252	68
Pathak	Siddhartha	16-1-1	IMECE2019-13862	202	Petralia	Michael Thomas	6-6-1	IMECE2019-12254	68
Pathrudkar	Shashank	11-33-2	IMECE2019-13410	150	Petrolo	Marco	2-9-2	IMECE2019-11261	9
Patil	Santosh	5-4-4	IMECE2019-10424	59	Petrolo	Marco	3-6-1	IMECE2019-10296	27
Patnaik	Sansit	16-1-1	IMECE2019-12832	193	Petrova	Vera	11-7-3	IMECE2019-12275	140
Patoto	Michael	1-6-2	IMECE2019-13266	5	Phadnis	Akshay	9-36-2	IMECE2019-12527	99
Pattamatta	Arvind	8-6-2	IMECE2019-11270	89	Phadnis	Akshay	9-18-1	IMECE2019-12525	106
Pattamatta	Arvind	9-18-2	IMECE2019-11212	108	Phan	Emily	2-4-1	IMECE2019-11868	14
Pattamatta	Arvind	9-18-2	IMECE2019-11256	108	Phan	Emily	17-2-1	IMECE2019-11360	205
Paudel	Basil	2-2-3	IMECE2019-13869	16	Phan	Nam	3-4-1	IMECE2019-10142	29
Paul	Koushik	4-4-1	IMECE2019-11765	33	Pharr	Matt	11-8-2	IMECE2019-13254	137
Paul	Koushik	4-4-1	IMECE2019-11760	34	Pharr	Matt	11-46-2	IMECE2019-13257	143
Paul	Ratul	10-26-6	IMECE2019-12109	121	Phelan	Patrick	6-1-2	IMECE2019-11486	62
Paul	Ratul	12-7-3	IMECE2019-12129	174	Philip	Daryl	11-3-1	IMECE2019-12969	163
Paul	Sharad. P	4-4-2	IMECE2019-10405	35	Phillips	David-Michael	17-4-2	IMECE2019-13142	206
Paul	Titan	9-51-1	IMECE2019-11624	110	Phillips	Donald	13-8-1	IMECE2019-10238	178
Paul	Titan C.	9-29-1	IMECE2019-11794	104	Phillips	Stephen A.	17-4-3	IMECE2019-13359	207
Paul	Titan C.	9-16-1	IMECE2019-11781	111	Phoha	Vir	2-13-3	IMECE2019-10442	13
Paulo-Wach	Daniel	16-2-1	IMECE2019-13289	203	Phung	Leon	11-8-3	IMECE2019-12658	140
Pawar	Vivek	6-10-1	IMECE2019-10252	72	Pichler	Rudolf	2-2-6	IMECE2019-11134	21
Pease	Leonard	8-2-3	IMECE2019-11841	88	Pierce	David	16-1-1	IMECE2019-12989	191
Pei	Shaopeng	16-1-1	IMECE2019-13110	194	Pierson	Anthony	15-1-1	IMECE2019-12167	187
Pei	Shaopeng	17-15-1	IMECE2019-13088	213	Pietrzyk	Tobias	8-3-1	IMECE2019-10351	89
Pei	Shiling	16-1-1	IMECE2019-12855	193	Piliadis	Pericles	3-14-1	IMECE2019-11339	32
Pei	Zhijian	2-2-4	IMECE2019-11917	18	Piliptchak	Pavel	2-13-1	IMECE2019-11345	8
Pei	Zhijian	2-2-5	IMECE2019-11999	19	Pilon	Laurent	9-4-1	IMECE2019-13286	106
Pei	Zhijian	4-5-4	IMECE2019-12150	39	Pilon	Laurent	9-5-1	IMECE2019-13086	111
Pei	Zhijian	17-10-1	IMECE2019-12688	210	Pilon	Laurent	9-5-1	IMECE2019-13919	111
Pei	Zhijian	17-10-1	IMECE2019-12721	210	Pindera	Marek-Jerzy	7-1-2	IMECE2019-12965	78
Pelegri	Assimina	4-4-1	IMECE2019-12182	33	Pindera	Marek-Jerzy	10-2-1	IMECE2019-12864	126
Pelegri	Assimina	10-25-1	IMECE2019-13379	123	Pindera	Marek-Jerzy	11-23-3	IMECE2019-12865	155
Pelegri	Assimina	11-25-1	IMECE2019-13900	142	Pintar	Frank	4-2-4	IMECE2019-11860	42
Pelegri	Assimina	11-39-4	IMECE2019-12466	150	Pinto	Brian Alphonse	5-15-1	IMECE2019-11410	48
Pelegri	Assimina	11-1-6	IMECE2019-12187	154	Pinto	Claudia	9-2-1	IMECE2019-10173	104
Pelegri	Assimina	15-1-1	IMECE2019-13989	189	Pinzon	Horacio	6-10-1	IMECE2019-11316	72
Pelegri	Assimina	16-1-1	IMECE2019-13382	197	Piovesan	Davide	4-7-1	IMECE2019-10984	34
Peles	Yoav	9-19-2	IMECE2019-10470	104	Piovesan	Davide	4-7-1	IMECE2019-10992	34
Peles	Yoav	9-51-1	IMECE2019-10045	109	Piovesan	Davide	4-5-4	IMECE2019-10988	39
Pemathilaka	Rajeendra L.	12-5-1	IMECE2019-12901	171	Piovesan	Davide	17-4-2	IMECE2019-13096	206
Pence	Thomas	11-1-7	IMECE2019-12625	157	Piras	Bob	9-59-1	IMECE2019-12189	110
Peng	Bo	10-4-2	IMECE2019-13420	114	Pishahang	Mehdi	6-7-1	IMECE2019-12667	66
Peng	Meng	5-10-1	IMECE2019-11054	52	Pishahang	Mehdi	9-2-1	IMECE2019-12772	104
Peng	Xiaoyao	16-1-1	IMECE2019-13068	194	Placidi	Luca	16-1-1	IMECE2019-13756	201
Peng	Yipeng	11-23-1	IMECE2019-13264	152	Placidi	Luca	17-15-1	IMECE2019-13762	215
Peng	Yipeng	11-36-1	IMECE2019-13838	159	Plechaty	David	11-19-1	IMECE2019-11713	161
Peng	Yipeng	16-1-1	IMECE2019-13223	196	Plimpton	Steve	11-39-3	IMECE2019-13192	142
Peng	Yipeng	16-1-1	IMECE2019-13243	196	Pochiraju	Kishore	2-2-3	IMECE2019-11101	16
Penkova	Anita	4-9-1	IMECE2019-13228	42	Pochiraju	Kishore	2-2-4	IMECE2019-11627	18
Pepler	Daniel	10-19-1	IMECE2019-13801	127	Podder	Chinmoy Kumar	9-49-1	IMECE2019-12276	109
Pereira	Marcelo	9-57-1	IMECE2019-11426	107	Poenot	Martin	17-4-3	IMECE2019-12974	206
Pereira	Tassia	13-4-1	IMECE2019-11872	178	Poenot	Martin	17-4-2	IMECE2019-13107	206
Perera	Inoka E.	13-5-1	IMECE2019-10640	178	Poenot	Martin	17-4-3	IMECE2019-13359	207
Perez Rafols	Francisco	11-17-1	IMECE2019-13064	135	Poerner	Nathan	5-2-3	IMECE2019-11846	59
Pérez-Martínez	Omar	2-7-4	IMECE2019-11422	25	Pokharel	Ashish	6-6-1	IMECE2019-12250	68
Perkins	Allen	11-7-6	IMECE2019-10672	149	Pokharel	Ashish	6-6-1	IMECE2019-12252	68
Perkins	Allen	15-1-1	IMECE2019-13961	189	Pokharel	Ashish	6-6-1	IMECE2019-12254	68

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Pola	Cicero C.	4-12-1	IMECE2019-13895	45	Qian	Zhongjie	11-23-2	IMECE2019-13239	153
Pola	Cicero C.	10-25-2	IMECE2019-13194	126	Qiang	Xiao-Qing	5-2-1	IMECE2019-10536	56
Pola	Cicero C.	10-25-2	IMECE2019-13872	126	Qidwai	Siddiq	10-20-2	IMECE2019-13275	115
Pola	Cicero C.	16-1-1	IMECE2019-13081	194	Qidwai	Siddiq	11-2-1	IMECE2019-13431	157
Pola	Cicero C.	16-1-1	IMECE2019-13494	198	Qidwai	Siddiq	11-2-1	IMECE2019-13459	157
Poler	Raul	2-8-3	IMECE2019-11527	21	Qin	Guangzhao	9-29-1	IMECE2019-12842	104
Poliks	Mark	2-2-3	IMECE2019-12027	16	Qin	Guangzhao	9-29-1	IMECE2019-13120	104
Pollard	Marquese A.	11-32-1	IMECE2019-11790	155	Qin	Guangzhao	17-15-1	IMECE2019-12840	213
Ponnuraj	Balakrishnan	8-9-2	IMECE2019-11090	83	Qin	Guangzhao	17-15-1	IMECE2019-13122	213
Popovic	George	9-45-1	IMECE2019-10613	96	Qin	Guoqiang	10-11-1	IMECE2019-11590	116
Popovic	George	17-9-1	IMECE2019-12900	209	Qin	Hongmin	4-5-4	IMECE2019-12150	39
Porter	Debora Lyn	17-4-2	IMECE2019-13474	206	Qiu	Bin	11-5-5	IMECE2019-13424	166
Porter	Jason	9-6-1	IMECE2019-11792	98	Qiu	Songgang	6-5-2	IMECE2019-11382	63
Posner	Jonathan	7-1-1	IMECE2019-12649	77	Qiu	Songgang	6-4-2	IMECE2019-10403	66
Posner	Matthew	15-1-1	IMECE2019-13967	189	Qiu	Songgang	6-4-2	IMECE2019-13939	66
Post	Scott	8-9-4	IMECE2019-12049	85	Qu	Jianmin	11-47-2	IMECE2019-13528	148
Pothos	Stamatios	8-5-1	IMECE2019-12280	88	Qu	Minglei	16-1-1	IMECE2019-13772	201
Poudel	Bibek	2-5-6	IMECE2019-13150	22	Qu	Wenyang	11-26-1	IMECE2019-13547	158
Poudel	Laxmi	16-1-1	IMECE2019-13299	196	Qu	Wenyang	11-26-2	IMECE2019-12277	162
Pourgol-Mohamad	Mohammad	13-1-1	IMECE2019-10342	176	Quevedo	Fernando	11-42-2	IMECE2019-13915	139
Pourgol-Mohamad	Mohammad	13-8-1	IMECE2019-10344	178	Quigley	Cassidy	17-4-3	IMECE2019-13595	207
Poursartip	Anoush	2-9-2	IMECE2019-11261	9	Quiñones Bolaños	Edgar	9-59-1	IMECE2019-11786	110
Powell	Kody	6-10-3	IMECE2019-13550	74	R	Rajendran	2-6-2	IMECE2019-10026	11
Powles	Jonathan S.	16-2-1	IMECE2019-13630	204	R	Sujith	10-26-2	IMECE2019-10939	115
Prabhu	Raj	4-2-2	IMECE2019-13209	39	R. Vengala	Prasanth	5-6-1	IMECE2019-11986	56
Prabhu	Vinit	6-7-3	IMECE2019-12185	70	Raabe	Dierk	11-47-1	IMECE2019-13836	146
Pradhan	Anvay	15-1-1	IMECE2019-13213	188	Rabinovitch	Oded	3-6-1	IMECE2019-12725	27
Pradhananga	Nipesh	9-59-1	IMECE2019-11982	110	Rabinovitch	Oded	3-6-1	IMECE2019-13065	27
Prakash	Raghu	10-26-2	IMECE2019-10384	115	Racherla	Vikranth	5-9-3	IMECE2019-11128	51
Prakash	Raghu	10-24-1	IMECE2019-10230	123	Radhakrishnan	Ravi	16-2-1	IMECE2019-13091	203
Prakash	Raghu	10-24-2	IMECE2019-11174	125	Raeymaekers	Bart	2-2-2	IMECE2019-13226	15
Prakash	Raghu	10-24-2	IMECE2019-11222	125	Raeymaekers	Bart	16-1-1	IMECE2019-13472	198
Prasad	Arun	5-9-3	IMECE2019-11128	51	Ragab	Tarek	11-26-4	IMECE2019-10205	167
Prase	Björn	14-1-1	IMECE2019-10179	183	Ragab	Tarek	11-26-4	IMECE2019-10207	167
Prasher	Ravi	9-15-1	IMECE2019-10977	108	Ragab	Tarek	11-26-4	IMECE2019-10208	167
Pratihari	Dilip Kumar	2-12-1	IMECE2019-12238	10	Ragab	Tarek	11-26-4	IMECE2019-10244	167
Pratihari	Dilip Kumar	5-11-1	IMECE2019-11170	55	Ragab	Tarek	11-26-4	IMECE2019-10245	167
Pretorius	Leon	9-57-1	IMECE2019-11420	107	Raghuram	Vinay	3-5-1	IMECE2019-11723	27
Prife	Joshua	11-12-3	IMECE2019-12987	164	Rahaman	Ashiqur	17-11-1	IMECE2019-10757	210
Price	Christopher R.	16-1-1	IMECE2019-13139	195	Rahimi Borujerdi	Peyman	9-41-1	IMECE2019-10229	96
Price	Morgan C.	5-10-1	IMECE2019-11506	52	Rahman	Ahm	5-2-3	IMECE2019-11346	59
Price	Scott	11-26-2	IMECE2019-12314	161	Rahman	Ahm	14-1-3	IMECE2019-11057	184
Prichard	Reid	8-14-1	IMECE2019-12492	84	Rahman	Ahm	14-3-3	IMECE2019-11438	184
Primabudi	Eko	6-3-1	IMECE2019-10850	61	Rahman	M. Shafiqur	3-8-1	IMECE2019-11087	31
Prime	Michael	11-22-2	IMECE2019-12740	145	Rahman	M. Shafiqur	3-8-1	IMECE2019-11581	31
Prince	Michael	7-1-2	IMECE2019-13584	78	Rahman	M. Shafiqur	16-1-1	IMECE2019-13881	202
Prisbrey	Milo	16-1-1	IMECE2019-13472	198	Rahman	Mahabubur	12-7-1	IMECE2019-13637	169
Priyadarshini	Amrita	3-13-1	IMECE2019-10958	30	Rahman	Molla Hafizur	16-1-1	IMECE2019-13335	197
Priyadarshini	Amrita	10-26-2	IMECE2019-10939	115	Rahmani	Mohsen	5-9-1	IMECE2019-10167	48
Proctor	Fred	2-13-1	IMECE2019-11345	8	Rahmati	Amir Hossein	11-2-1	IMECE2019-13121	157
Protheroe	Michael D.	4-4-2	IMECE2019-10405	35	Rai	Ashwin	11-19-1	IMECE2019-11529	161
Pruessner	Marius	11-5-1	IMECE2019-11244	155	Rai	Habib	11-36-1	IMECE2019-12051	159
Przekwas	Andrzej J.	4-2-1	IMECE2019-13531	36	Raj Kumar	J.	6-7-3	IMECE2019-10951	70
Pugh	David	14-1-3	IMECE2019-11057	184	Raja	A.H.	8-2-3	IMECE2019-11258	88
Pulok	Mohammad Khairul Habib	3-8-1	IMECE2019-11455	31	Raja	Jayendiran	4-10-1	IMECE2019-10333	40
Pulok	Mohammad Khairul Habib	3-8-1	IMECE2019-11477	31	Rajagopal	Manjunath C.	2-8-1	IMECE2019-10621	17
Purohit	Prashant	10-4-5	IMECE2019-12860	119	Rajagopal	Manjunath C.	4-9-1	IMECE2019-12849	42
Purohit	Prashant	11-47-4	IMECE2019-12731	153	Rajagopal	Manjunath C.	6-7-2	IMECE2019-11731	67
Purohit	Prashant	11-1-10	IMECE2019-12733	165	Rajagopal	Manjunath C.	9-36-1	IMECE2019-11421	96
Puskas	Joseph	15-1-1	IMECE2019-13966	189	Rajput	Pankaj	3-2-1	IMECE2019-10938	28
Puttonen	Tuomas	14-4-2	IMECE2019-11219	181	Rajput	Pankaj	15-1-1	IMECE2019-10935	187
Qi	Bowen	17-2-1	IMECE2019-10696	205	Rakshit	Sourav	5-9-2	IMECE2019-10701	50
Qi	H. Jerry	10-4-1	IMECE2019-13666	113	Rakurty	Chandra Sekhar	2-9-1	IMECE2019-13859	7
Qi	H. Jerry	10-4-1	IMECE2019-13668	113	Rakurty	Chandra Sekhar	2-5-6	IMECE2019-13868	22
Qi	H. Jerry	11-2-1	IMECE2019-13176	157	Rakurty	Chandra Sekhar	2-5-6	IMECE2019-13880	22
Qi	H. Jerry	11-2-2	IMECE2019-13527	160	Rakurty	Chandra Sekhar	10-26-6	IMECE2019-13896	121
Qi	H. Jerry	11-2-2	IMECE2019-13529	160	Ralphs	Matthew	9-51-2	IMECE2019-12526	111
Qian	Dong	11-39-3	IMECE2019-12007	142	Ralston	Harold	13-9-1	IMECE2019-11479	179
Qian	Dong	11-38-1	IMECE2019-12907	146	Ramachandran	Madhumitha	10-29-2	IMECE2019-11895	131
Qian	Dong	17-11-2	IMECE2019-12908	211	Ramadhan	Hadyan	6-8-1	IMECE2019-11891	71
Qian	Shaoliang	8-9-3	IMECE2019-10200	84	Ramakrishnan	Kishore Ranganath	9-41-1	IMECE2019-11283	96
Qian	Yichen	17-15-1	IMECE2019-13534	214	Ramakrishnan	Vinod	1-1-2	IMECE2019-11782	2
					Ramamurti	Ravi	11-5-1	IMECE2019-11244	155

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Raman	S.K.	11-43-1	IMECE2019-11123	139	Regmi	Abiral	12-7-2	IMECE2019-13353	173
Ramarathnam	Krishna Kumar	5-2-3	IMECE2019-11260	59	Regmi	Abiral	17-2-1	IMECE2019-13119	205
Rambaks	Andris	8-3-2	IMECE2019-11343	90	Rehekampff	Christoph	2-2-7	IMECE2019-11277	18
Ramesh	K.T.	10-20-4	IMECE2019-13191	124	Reich	Alton	17-4-3	IMECE2019-12541	206
Ramirez	Angel D.	7-4-1	IMECE2019-10676	80	Reid	John	11-10-4	IMECE2019-12209	144
Ramirez	Emilio A.	4-10-2	IMECE2019-10627	41	Reid	Russell	6-4-5	IMECE2019-11831	71
Ramirez-Cedillo	Erick G.	4-14-1	IMECE2019-11406	41	Reifman	Jaques	4-2-1	IMECE2019-13067	36
Ramirez-Cedillo	Erick G.	4-14-1	IMECE2019-12260	41	Reifman	Jaques	4-2-2	IMECE2019-13542	39
Ramirez-Meyers	Katrina	6-10-3	IMECE2019-11707	74	Reina	Celia	11-47-3	IMECE2019-12642	151
Ramirez-Reivich	Alejandro C.	10-26-5	IMECE2019-11919	120	Reinhall	Per	3-4-2	IMECE2019-11544	30
Ramos	Jennifer	4-7-1	IMECE2019-11233	34	Reinker	Felix	8-4-2	IMECE2019-11417	90
Rampalli	Ihika	11-7-3	IMECE2019-12544	140	Reissman	Timothy	2-2-4	IMECE2019-11615	18
Ramzanpour	Mohammadreza	4-5-2	IMECE2019-10742	35	Reiter	Rolf O.	16-1-1	IMECE2019-13710	200
Ramzanpour	Mohammadreza	4-5-2	IMECE2019-10743	36	Re	Bo	3-12-2	IMECE2019-13308	31
Ramzanpour	Mohammadreza	4-5-2	IMECE2019-11549	36	Ren	Bo	11-38-3	IMECE2019-12487	150
Ramzanpour	Mohammadreza	11-1-3	IMECE2019-11829	149	Ren	Qiao	8-1-1	IMECE2019-10044	87
Ran	Chun	11-10-4	IMECE2019-12264	145	Ren	Xiaohan	6-16-1	IMECE2019-13402	65
Randall	Joseph M.	15-1-1	IMECE2019-11602	187	Rennpferdt	Christopher	14-4-1	IMECE2019-10497	181
Raney	Jordan R.	10-4-2	IMECE2019-13186	114	Repaka	Ramjee	4-10-5	IMECE2019-10800	45
Raney	Jordan R.	10-4-5	IMECE2019-12860	119	Resnick	Alex	6-14-1	IMECE2019-11025	75
Raney	Jordan R.	10-4-5	IMECE2019-13764	119	Resnick	Alex	6-14-2	IMECE2019-11027	76
Raney	Jordan R.	10-19-1	IMECE2019-12994	127	Resnick	Alex	10-26-4	IMECE2019-11411	118
Raney	Jordan R.	11-3-2	IMECE2019-12993	165	Restrepo	David	10-4-3	IMECE2019-13818	116
Range	Bradford	5-4-1	IMECE2019-11709	54	Restrepo	David	16-1-1	IMECE2019-13827	202
Rangnekar	Sonal V.	16-1-1	IMECE2019-13081	194	Revil-Baudard	Benoit	11-7-1	IMECE2019-12777	133
Ranjan	Devesh	9-14-1	IMECE2019-12744	102	Revil-Baudard	Benoit	11-7-7	IMECE2019-12778	152
Ranjan	Rajesh	8-3-3	IMECE2019-10828	91	Reyes	Christopher I.	5-3-1	IMECE2019-11198	49
Rao	Prahalad	2-2-3	IMECE2019-12027	16	Reynolds	Leryn	4-6-1	IMECE2019-11389	36
Rao	Sameer	9-4-1	IMECE2019-13130	106	Reynolds	Leryn	4-14-1	IMECE2019-10654	41
Rao	Sameer	10-26-6	IMECE2019-13413	121	Rezaee	B.	17-10-1	IMECE2019-13185	210
Rao	Sameer	17-9-1	IMECE2019-13135	209	Rezaei	Amirsaman	11-42-2	IMECE2019-13915	139
Rasel	Md. Abu Jafar	9-25-2	IMECE2019-13705	100	Rezaei	H.	2-11-1	IMECE2019-13244	8
Rasel	Md. Abu Jafar	17-15-1	IMECE2019-13706	214	Reznicek	Evan	6-12-1	IMECE2019-13781	73
Rashid	Asif	2-5-5	IMECE2019-10940	20	Rhee	Dongjoon	16-1-1	IMECE2019-13136	195
Rashid	Asif	2-5-5	IMECE2019-10944	20	Rhinehardt	Kristen L.	10-23-1	IMECE2019-11492	125
Rashid	Asif	2-5-5	IMECE2019-10946	20	Rhinehardt	Kristen L.	17-15-1	IMECE2019-12631	213
Rashidi	Majid	8-11-1	IMECE2019-11995	86	Rho	DongGee	16-1-1	IMECE2019-13720	191
Rashidi	Reza	5-5-2	IMECE2019-10791	53	Rhodes	Joshua	6-1-3	IMECE2019-13615	63
Rashidi	Reza	8-1-1	IMECE2019-10790	87	Ribeiro	Andre	4-14-1	IMECE2019-11221	41
Rasmussen	Bryan	6-9-2	IMECE2019-11579	73	Ribeiro	Gustavo	3-3-1	IMECE2019-11712	32
Rasmussen	Bryan	16-1-1	IMECE2019-13139	195	Ribeiro	Pedro	10-26-3	IMECE2019-11356	117
Rasmussen	Bryan	17-6-1	IMECE2019-13152	208	Richard	Courtnei	2-7-1	IMECE2019-10032	23
Rastogi	Shruti	11-26-1	IMECE2019-12305	158	Richardson	Brian	8-6-4	IMECE2019-12368	92
Ratner	Albert	4-6-2	IMECE2019-10922	37	Richter	Christiaan	6-16-1	IMECE2019-10586	65
Ratner	Albert	6-16-2	IMECE2019-10917	69	Richter	Hanz	16-2-1	IMECE2019-13296	203
Ratner	Albert	8-9-4	IMECE2019-10258	85	Riddoch	Daniel J.	11-11-1	IMECE2019-12783	134
Rattner	Alexander	9-10-1	IMECE2019-13969	103	Rideout	Geoff	5-10-1	IMECE2019-11504	52
Rauch	Hunter A.	16-1-1	IMECE2019-13633	200	Rifkin	J.K.	16-1-1	IMECE2019-13733	201
Raval	Jay	16-2-1	IMECE2019-13289	203	Rigby	Cynthia	11-18-1	IMECE2019-13785	135
Ravi-Chandar	Krishanswamy	11-1-1	IMECE2019-13284	144	Riggs	Tamara	16-1-1	IMECE2019-13611	200
Ravi-Chandar	Krishanswamy	11-1-1	IMECE2019-13725	144	Riley	Matthew	15-1-1	IMECE2019-11531	187
Ravi-Chandar	Krishanswamy	11-47-1	IMECE2019-13741	146	Rios	Orlando	2-9-3	IMECE2019-13613	12
Ravichandran	Guruswami	11-8-1	IMECE2019-12691	133	Rios	Orlando	10-2-2	IMECE2019-13683	128
Ravichandran	Guruswami	11-8-1	IMECE2019-12938	133	Ripa	Cameron	9-7-1	IMECE2019-11620	99
Rawal	Atul	10-23-1	IMECE2019-11492	125	Risheim	Inge	7-9-1	IMECE2019-10248	81
Rawal	Atul	17-15-1	IMECE2019-12631	213	Riznoukaya	N.	10-29-1	IMECE2019-10137	128
Rayyan	Naseem	13-5-1	IMECE2019-10640	178	Rizvi	Reza	16-1-1	IMECE2019-13543	198
Raza	Kabeer	10-10-1	IMECE2019-11720	113	Rizvi	Reza	16-1-1	IMECE2019-13768	201
Raza	Kabeer	10-10-3	IMECE2019-10960	116	Rizzi	Caterina	14-2-1	IMECE2019-10491	181
Raza	Muhammad S.	8-9-2	IMECE2019-12020	83	Ro	Uijeong	17-11-2	IMECE2019-13167	211
Raza	Saqib	8-9-4	IMECE2019-12049	85	Roa Prada	Sebastian	5-4-2	IMECE2019-12160	56
Razi	Yazdan	1-2-1	IMECE2019-10096	1	Roa Prada	Sebastian	8-9-4	IMECE2019-12038	85
Razmi	Jafar	2-2-1	IMECE2019-10256	14	Roa Prada	Sebastian	15-1-1	IMECE2019-13929	188
Razmi	Jafar	2-2-5	IMECE2019-12371	20	Roa Prada	Sebastian	15-1-1	IMECE2019-13932	188
Razu	Md. Enayet	8-6-3	IMECE2019-13393	91	Robbins	Andrew	17-4-2	IMECE2019-13592	206
Redaelli	Davide Felice	14-4-1	IMECE2019-11480	181	Robbins	Andrew	17-4-2	IMECE2019-13657	206
Reder	Nicholas	17-4-2	IMECE2019-13107	206	Robbins	Andrew	17-4-2	IMECE2019-13731	206
Redovian	Cameron	2-13-1	IMECE2019-11337	8	Robbins	Andrew	17-4-3	IMECE2019-13651	207
Reed	Nathan A.	16-2-1	IMECE2019-13630	204	Robert	Kerlin	11-7-2	IMECE2019-12950	137
Reeder	Brett	2-2-5	IMECE2019-12981	20	Roberts	Kendric	10-2-1	IMECE2019-11013	126
Regazzoni	Daniele	14-2-1	IMECE2019-10315	181	Robertson	Daniel	15-1-1	IMECE2019-13789	187
Regazzoni	Daniele	14-2-1	IMECE2019-10491	181	Robinson	Joshua	12-7-2	IMECE2019-11491	173
Regmi	Abiral	2-4-2	IMECE2019-13114	16	Roccabianca	Sara	11-5-5	IMECE2019-13751	166
Regmi	Abiral	12-4-1	IMECE2019-13115	172	Roch	Aljoscha	2-2-2	IMECE2019-13670	15

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Roch	Aljoscha	4-5-4	IMECE2019-13841	39	Ruan	Xiulin	9-25-1	IMECE2019-10688	98
Rodrigues	Daniel	2-8-4	IMECE2019-10985	22	Ruan	Xiulin	9-25-2	IMECE2019-12964	100
Rodrigues	Frederico	3-2-1	IMECE2019-11515	28	Rubby	Mohammad Fazlay	12-8-2	IMECE2019-11734	172
Rodriguez	Alejandro	6-1-1	IMECE2019-13124	61	Rubio	Isaac	4-13-2	IMECE2019-11802	45
Rodriguez	Alejandro	9-29-1	IMECE2019-12842	104	Rubio	Jose	4-2-1	IMECE2019-13067	36
Rodriguez	Alejandro	9-29-1	IMECE2019-13120	104	Rubio	Jose	4-2-2	IMECE2019-13542	39
Rodriguez	Alejandro	17-15-1	IMECE2019-12840	213	Rudnick	Joshua	8-1-1	IMECE2019-10790	87
Rodriguez	Alejandro	17-15-1	IMECE2019-13122	213	Rudraksha	S.P.	10-29-1	IMECE2019-10163	128
Rodriguez	Alejandro	17-15-1	IMECE2019-13125	213	Rudraraju	Shiva	10-2-1	IMECE2019-12699	126
Rodriguez	Carlos	4-13-2	IMECE2019-11788	45	Rudykh	Stephan	1-1-5	IMECE2019-13647	3
Rodriguez	Ciro A.	4-14-1	IMECE2019-12260	41	Rue	Matthew	1-12-1	IMECE2019-12093	5
Rodriguez	Mario C.	4-6-1	IMECE2019-11416	36	Rueda Villanoba	Sergio Alberto	5-3-1	IMECE2019-11516	49
Rodríguez-Martínez	Jose A.	11-8-1	IMECE2019-12857	133	Ruesch	Jonathan	11-14-3	IMECE2019-13100	149
Rodríguez-Martínez	Jose A.	11-7-4	IMECE2019-12858	144	Annie	Annie	4-10-1	IMECE2019-10333	40
Rodriguez-Paz	Miguel X.	7-10-2	IMECE2019-11813	79	Ruiz	Brajan	5-12-1	IMECE2019-11450	53
Rogdakis	Emmanouil	6-2-1	IMECE2019-10076	64	Ruiz	Francisco	15-1-1	IMECE2019-10527	187
Rogdakis	Emmanouil	6-2-1	IMECE2019-10077	64	Rumschoettel	Dominik	2-2-7	IMECE2019-11277	18
Rogers	Austin	6-9-2	IMECE2019-11579	73	Runnerstrom	Evan	10-20-1	IMECE2019-13386	114
Rogers	Austin	17-6-1	IMECE2019-13152	208	Russello	Aldo	9-9-1	IMECE2019-13375	101
Rogers	Jeffrey A.	6-5-1	IMECE2019-13039	62	Russo	Davide	14-3-1	IMECE2019-10699	182
Rognsvåg	Even	6-4-5	IMECE2019-10266	70	Ryckaczewski	Konrad	9-36-2	IMECE2019-12527	99
Roh	Hee Seok	6-14-2	IMECE2019-11547	76	Ryckaczewski	Konrad	9-18-1	IMECE2019-12525	106
Roh	Hee Seok	6-14-2	IMECE2019-13773	76	Ryckaczewski	Konrad	9-24-1	IMECE2019-12524	107
Rojas-Solorzano	Luis	8-7-1	IMECE2019-10876	84	Ryckaczewski	Konrad	9-51-2	IMECE2019-12526	111
Rojas-Solorzano	Luis	8-7-1	IMECE2019-10921	84	Ryckaczewski	Konrad	16-1-1	IMECE2019-12654	191
Rokka Chhetri	Sujit	16-1-1	IMECE2019-13643	200	Rykkje	Thorstein R	7-5-1	IMECE2019-10437	81
Romano	Anthony	4-2-1	IMECE2019-12931	36	Rykkje	Thorstein R.	5-8-1	IMECE2019-10250	48
Romer	Lewis H.	11-3-2	IMECE2019-13394	166	Rykkje	Thorstein R.	5-9-1	IMECE2019-10436	48
Romero	Carlos	6-7-1	IMECE2019-10734	66	Rykkje	Thorstein R.	5-11-1	IMECE2019-10434	55
Romero	Elena	6-10-1	IMECE2019-11316	72	Ryou	Heonjune	2-9-2	IMECE2019-10608	9
Romero Navarrete	Jose Antonio	5-5-2	IMECE2019-10030	53	Ryu	Jon	1-1-6	IMECE2019-10449	4
Ronoh	Melanie	7-10-1	IMECE2019-11751	77	Ryu	Jon	1-1-6	IMECE2019-11866	4
Ronoh	Melanie	15-1-1	IMECE2019-11602	187	S	Lakshmi	5-2-3	IMECE2019-11260	59
Rooks	Tyler	4-11-2	IMECE2019-12173	44	S	Prathik Jain	2-6-2	IMECE2019-11168	11
Rooney	Sean	2-2-3	IMECE2019-11101	16	S F	Sulthan	5-11-1	IMECE2019-11170	55
Root	Anna	10-25-1	IMECE2019-13379	123	S M	Suresh	2-6-2	IMECE2019-11168	11
Root	Anna	16-1-1	IMECE2019-13382	197	S.	Boopathy	11-17-1	IMECE2019-10004	135
Root	Joshua	3-10-1	IMECE2019-10387	31	S. Patnaik	Souyma	9-35-1	IMECE2019-11936	94
Rosales Jr.	Gilberto	10-14-1	IMECE2019-10400	122	S. Patnaik	Souyma	15-1-1	IMECE2019-11855	187
Rose	Olivia	4-7-1	IMECE2019-10984	34	S.F.	Sulthan	2-12-1	IMECE2019-12238	10
Rose Cernucan	Katrina	11-42-2	IMECE2019-13851	139	Saad	Idris	9-39-1	IMECE2019-10120	100
Rosen	David	14-6-1	IMECE2019-14011	181	Saadat	Mohammad Ali	11-1-2	IMECE2019-12253	146
Rosenberg	James	11-18-1	IMECE2019-13442	135	Saadatzi	Mohammad Nasser	6-4-1	IMECE2019-10749	64
Rossini	Salvatore	4-11-1	IMECE2019-11774	43	Saadatzi	Mohammadsadegh	6-4-1	IMECE2019-10749	64
Rossoni	Marco	14-4-1	IMECE2019-11480	181	Saadatzi	Mohammadsadegh	11-23-3	IMECE2019-11660	155
Rossoni	Marco	14-4-2	IMECE2019-11497	182	Sabaawy	Hatem	11-3-2	IMECE2019-13435	166
Roters	Franz	11-47-1	IMECE2019-13836	146	Sabbaghi	Payam	9-30-1	IMECE2019-12553	108
Roth	David	8-3-1	IMECE2019-10351	89	Sabbaghi	Payam	17-15-1	IMECE2019-12552	212
Roth	Richard	16-2-1	IMECE2019-13295	203	Sabharwall	Piyush	6-14-1	IMECE2019-11800	75
Rounds	Thomas G.	4-11-2	IMECE2019-11948	44	Sabharwall	Piyush	6-14-2	IMECE2019-11811	76
Roundy	Shadrach	16-1-1	IMECE2019-13104	194	Sable	Peter	11-14-1	IMECE2019-10459	145
Rouse	Zachary W.	9-25-2	IMECE2019-12963	100	Saboori	Parisa	4-11-2	IMECE2019-11789	44
Rouse	Zachary W.	16-1-1	IMECE2019-12929	193	Saboori	Parisa	17-4-3	IMECE2019-13321	207
Rousset	François	9-9-1	IMECE2019-13375	101	Saboori	Parisa	17-4-3	IMECE2019-13327	207
Rousset	Patrick	8-9-1	IMECE2019-10636	83	Sachdeva	Paras	8-4-2	IMECE2019-11273	90
Rowell	Abram	5-4-4	IMECE2019-10299	59	Sadat	Hamid	8-11-1	IMECE2019-11732	85
Rowley	Robert J	17-15-1	IMECE2019-13329	211	Sadegh	Ali	4-10-1	IMECE2019-10529	40
Rowley	Robert J.	11-18-3	IMECE2019-13328	141	Sadegh	Ali	4-11-1	IMECE2019-10650	43
Rowley	Robert J.	15-1-1	IMECE2019-13326	188	Sadhal	Satwindar	4-9-1	IMECE2019-13228	42
Rowley	Robert J.	15-1-1	IMECE2019-13962	189	Sadik	Linda	8-9-1	IMECE2019-11433	83
Rowley	Robert J.	17-15-1	IMECE2019-13108	211	Sadraddin	Hezha	10-10-1	IMECE2019-11957	113
Roy	Ambarneil	10-27-2	IMECE2019-12045	128	Saeed M. Alsaiani	Waleed	10-26-1	IMECE2019-10308	114
Roy	Ankit	16-1-1	IMECE2019-13002	194	Saeedmanesh	Alireza	6-10-3	IMECE2019-12445	74
Roy	Apoorva	11-12-1	IMECE2019-10559	158	Saeidi-Javash	Mortaza	16-1-1	IMECE2019-11980	191
Roy	Arnab	9-39-2	IMECE2019-11728	101	Safarianbana	Sahar	6-16-1	IMECE2019-10586	65
Roy	Manosi	16-1-1	IMECE2019-13427	197	Safarkhani	Salat	16-1-1	IMECE2019-13341	197
Roy	Manosi	16-1-1	IMECE2019-13473	198	Sagar	Amrit	4-5-1	IMECE2019-10180	34
Roy	Samit	11-7-3	IMECE2019-12544	140	Sagir	Gokhan	2-5-2	IMECE2019-11439	16
Roy	Shibayan	16-1-1	IMECE2019-12982	194	Saha	Debajyoti	17-10-1	IMECE2019-13238	210
Roy	Shrabanti	6-16-1	IMECE2019-10991	65	Saha	Mrinal	3-5-1	IMECE2019-11467	27
Roy	Shrabanti	6-2-3	IMECE2019-10994	66	Saha	Mrinal	4-6-2	IMECE2019-10514	37
Roy	Shrabanti	6-16-2	IMECE2019-10996	69	Saha	Mrinal	10-26-2	IMECE2019-10512	115
Royston	Thomas	16-1-1	IMECE2019-13710	200	Saha	Pankaj	9-39-2	IMECE2019-11728	101
Ruan	Xiulin	9-20-1	IMECE2019-12753	94	Saha	Probir	2-6-2	IMECE2019-11445	11

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Saha	Simran	15-1-1	IMECE2019-12331	188	Sandhu	Sukwinder	8-9-3	IMECE2019-10100	84
Saha	Sudipta	9-43-2	IMECE2019-11065	95	Sandhu	Sukwinder	11-27-1	IMECE2019-12480	154
Saha	Utpal	17-15-1	IMECE2019-12874	211	Sandoval	Juan	2-5-2	IMECE2019-13390	16
Sahay	Chittaranjan	7-1-2	IMECE2019-11954	78	Sane	N.K.	9-36-2	IMECE2019-10203	99
Sahay	Chittaranjan	7-4-1	IMECE2019-11937	80	Sanei	Seyed Hamid	1-6-1	IMECE2019-12146	2
Sahin	Iskender	8-9-4	IMECE2019-10257	85	Sanei	Seyed Hamid	10-26-1	IMECE2019-10303	114
Sahinkaya	Alican	5-12-1	IMECE2019-10515	53	Sanjuan	Marco	6-8-1	IMECE2019-11852	71
Sahoo	Souvik	16-1-1	IMECE2019-12982	194	Sanjuan	Marco	6-10-1	IMECE2019-11316	72
Sahraei Esfahani	Elham	10-15-1	IMECE2019-13686	129	Sanjuan	Marco	6-12-2	IMECE2019-11875	74
Sahraei Esfahani	Elham	10-15-1	IMECE2019-13692	129	Sankar	Bhavani	10-9-3	IMECE2019-13005	127
Saigal	Anil	2-2-2	IMECE2019-12213	15	Sankar	Jagannathan	10-26-4	IMECE2019-11612	119
Saigal	Anil	4-5-1	IMECE2019-10180	34	Sankar	Jagannathan	10-26-5	IMECE2019-11783	120
Saigal	Anil	10-26-4	IMECE2019-11608	119	Sankaran	R. Mohan	16-1-1	IMECE2019-13941	202
Saigal	Anil	10-1-1	IMECE2019-11655	119	Sanne	Fredrik	7-9-1	IMECE2019-10248	81
Sain	Trisha	11-39-1	IMECE2019-13215	136	Sanny	Keoni	16-2-1	IMECE2019-13748	204
Sain	Trisha	11-7-3	IMECE2019-11700	140	Sant	Himanshu	17-15-1	IMECE2019-12874	211
Sain	Trisha	15-1-1	IMECE2019-13977	189	Santamaria	Anthony	8-12-1	IMECE2019-11039	86
Saito	Takashi	4-3-1	IMECE2019-10548	33	Santapuri	Sushma	11-5-1	IMECE2019-12844	155
Saito	Takashi	4-3-1	IMECE2019-11643	33	Santhanam	Parthiban	9-30-1	IMECE2019-12708	108
Saito	Takashi	4-3-1	IMECE2019-11837	33	Santhanam	Parthiban	9-5-1	IMECE2019-12710	110
Saito	Takashi	5-2-2	IMECE2019-11055	58	Santhanam	Senthil Kumar	2-5-2	IMECE2019-10056	16
Saito	Yusaku	10-10-4	IMECE2019-11081	118	Santhanam	Sridhar	11-22-2	IMECE2019-12040	145
Saito	Yusaku	10-10-4	IMECE2019-11141	118	Santhanam	Sridhar	16-1-1	IMECE2019-13097	194
Saito	Yusaku	10-24-2	IMECE2019-11145	125	Santhanam	Sridhar	17-15-1	IMECE2019-13098	213
Sajja	V.	4-2-1	IMECE2019-13067	36	Santo	João Pedro Anselmo do Espírito	1-2-2	IMECE2019-11513	4
Sajja	V.	4-2-2	IMECE2019-13542	39	Santos	Stephany	16-1-1	IMECE2019-12989	191
Sakuma	Atsushi	4-14-1	IMECE2019-11881	41	Santos de Oliveira	Cristine	10-19-2	IMECE2019-13865	130
Sakuma	Atsushi	10-1-1	IMECE2019-11816	119	Saqui	Mohammad	11-10-4	IMECE2019-11748	144
Salah Omar Aweimer	Ali	11-7-2	IMECE2019-10103	137	Sarangi	Mihir	10-29-2	IMECE2019-12617	131
Salamah	Samir	9-63-1	IMECE2019-10154	95	Sarangi	Mihir	10-29-2	IMECE2019-12618	131
Salapaka	Srinivasa	2-8-1	IMECE2019-10621	17	Sarfaraz	Ehsan	5-9-3	IMECE2019-11301	51
Salapaka	Srinivasa	9-36-1	IMECE2019-11421	96	Sarigul-Klijn	Nesrin	3-13-1	IMECE2019-10274	29
Salary	Roozbeh Ross	2-2-3	IMECE2019-12027	16	Rizacan	Rizacan	11-7-7	IMECE2019-13632	152
Salas	Daniel	7-4-1	IMECE2019-10676	80	Rizacan	Rizacan	16-1-1	IMECE2019-13490	198
Salazar	Arturo	7-3-1	IMECE2019-11394	79	Rizacan	Rizacan	17-15-1	IMECE2019-13405	214
Salehani	Mohsen	11-17-1	IMECE2019-13064	135	Sarikaya	Martinš	2-13-1	IMECE2019-10583	8
Salehi	Hadi	11-5-4	IMECE2019-13690	164	Sarkans	Dipta	12-7-1	IMECE2019-11690	169
Salehi-Khojin	Amin	6-11-1	IMECE2019-11804	68	Sarkar	Dipta	12-5-1	IMECE2019-11534	171
Salehi-Khojin	Amin	9-25-1	IMECE2019-11692	98	Sarkar	Dipta	17-15-1	IMECE2019-12648	213
Salehi-Khojin	Amin	9-25-1	IMECE2019-11719	98	Sarkar	Soumik	16-1-1	IMECE2019-13522	198
Salehi-Khojin	Amin	10-30-1	IMECE2019-11685	117	Sarkar	Susmita	16-1-1	IMECE2019-13700	200
Salehi-Khojin	Amin	10-30-1	IMECE2019-11705	117	Sarker	Pratik	3-8-1	IMECE2019-11084	31
Salem Cherif	Sadek	17-10-1	IMECE2019-12068	210	Sarker	Pratik	3-8-1	IMECE2019-11455	31
Salerno	Christopher	17-6-1	IMECE2019-13834	208	Sarma	Jyotirmoy	16-1-1	IMECE2019-12626	191
Salihoglu	Hakan	9-30-2	IMECE2019-13400	109	Sarma	Jyotirmoy	17-15-1	IMECE2019-13072	213
Salinas	Samuel	16-1-1	IMECE2019-13267	196	Sarmiento	José Luis	5-3-2	IMECE2019-11505	51
Sallam	Khaled	6-2-1	IMECE2019-12046	64	Sarraipa	Joao	2-8-3	IMECE2019-11393	20
Sallam	Khaled	8-9-2	IMECE2019-12020	83	Sarraipa	Joao	2-8-3	IMECE2019-11527	21
Sallam	Khaled	8-9-4	IMECE2019-12049	85	Sarraipa	Joao	2-8-4	IMECE2019-10985	22
Salman	Azzam	9-36-1	IMECE2019-11847	96	Sasidharan	Vineeth	16-1-1	IMECE2019-13544	198
Salman	Muhammad	4-3-2	IMECE2019-11001	35	Sasmito	Agus P.	9-43-1	IMECE2019-11033	93
Salman	Muhammad	4-11-1	IMECE2019-10228	43	Sasmito	Agus P.	9-43-1	IMECE2019-12081	93
Salman	Muhammad	14-1-3	IMECE2019-11032	184	Sasmito	Agus P.	11-18-2	IMECE2019-12000	138
Salmon	John	14-3-3	IMECE2019-13675	184	Satapathy	Sikhanda	4-2-4	IMECE2019-11566	42
Salunke	Omkar	2-7-4	IMECE2019-11126	25	Satapathy	Sikhanda	4-2-4	IMECE2019-12650	42
Salviato	Marco	11-47-2	IMECE2019-13739	148	Sathi	Harsha	16-1-1	IMECE2019-13471	198
Samajdar	Indradev	2-2-2	IMECE2019-12213	15	Sathyanath	Athul	10-26-3	IMECE2019-11201	117
Samant	Pratik	3-4-1	IMECE2019-10480	29	Satoh	Akira	8-2-1	IMECE2019-12755	86
Samantaray	Arun Kumar	5-3-3	IMECE2019-11092	47	Satoh	Akira	8-2-2	IMECE2019-10549	87
Samantaray	Arun Kumar	5-4-5	IMECE2019-11113	60	Satoh	Akira	8-2-2	IMECE2019-10550	87
Samarasinghe	Chandana D.	4-2-3	IMECE2019-10945	40	Satoh	Akira	8-2-3	IMECE2019-10683	88
Samba	Mohammed	6-1-2	IMECE2019-10283	62	Satoh	Akira	9-2-1	IMECE2019-10173	104
Sambamurthy	Vivek Subramaniam	9-19-1	IMECE2019-10748	103	Sauer	Christopher	2-10-1	IMECE2019-11225	7
Sampson	William W.	10-25-1	IMECE2019-13379	123	Saunders	Amanda	5-3-3	IMECE2019-10682	47
Sampson	William W.	16-1-1	IMECE2019-13382	197	Saunders	Amanda	5-3-3	IMECE2019-10770	47
Samuel	Raheel	12-8-1	IMECE2019-13401	170	Saunders	Robert	2-9-2	IMECE2019-10930	9
Samuelson	Brett	7-4-1	IMECE2019-10467	80	Saunders	Robert	4-2-1	IMECE2019-12931	36
Samykano	Mahendran	10-23-2	IMECE2019-11673	130	Saure	Marius	7-5-1	IMECE2019-10282	81
Samykano	Mahendran	17-15-1	IMECE2019-12630	212	Sawa	Shunichiro	2-6-1	IMECE2019-10567	9
Sanborn	Brett	11-7-4	IMECE2019-12130	144	Sawa	Toshiyuki	2-6-1	IMECE2019-10567	9
Sanchez	Derek	12-5-1	IMECE2019-11470	171	Sawicki	Jerzy T.	5-12-1	IMECE2019-10515	53
Sander	Michael	4-7-1	IMECE2019-11233	34	Sawicki	Jerzy T.	5-4-1	IMECE2019-10503	54
Sanders	Jackson	2-2-5	IMECE2019-11999	19	Sawyer	Carley	6-7-2	IMECE2019-11414	67
Sanders	Jackson	17-10-1	IMECE2019-12721	210					

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Schaefer	Laura	8-11-1	IMECE2019-11732	85	Sengupta	Abhijit	6-11-2	IMECE2019-12469	70
Schaefer	Mathew	7-1-2	IMECE2019-11038	78	Senthilnathan	Arulmurugan	10-19-2	IMECE2019-13032	130
Schatz	George C.	16-1-1	IMECE2019-13136	195	Seok	Ilwoo	1-1-6	IMECE2019-11866	4
Schell	Daniel	6-1-3	IMECE2019-10751	63	Sepahyar	Soroush	9-18-1	IMECE2019-12432	106
Schertzer	Jeffrey W.	12-8-2	IMECE2019-11903	172	Sepahyar	Soroush	16-1-1	IMECE2019-13471	198
Scherzinger	William	11-7-4	IMECE2019-12471	144	Sepehrband	Panthea	16-1-1	IMECE2019-13610	199
Scherzinger	William	11-7-4	IMECE2019-12806	144	Seppala	Jonathan	2-2-5	IMECE2019-13113	20
Scherzinger	William	11-7-4	IMECE2019-12808	144	Seppala	Jonathan	11-32-1	IMECE2019-13123	155
Scherzinger	William	11-7-6	IMECE2019-12856	149	Seppala	Jonathan	16-1-1	IMECE2019-13118	194
Schieck	Frank	2-7-2	IMECE2019-10390	23	Seppänen	Henri	16-1-1	IMECE2019-13610	199
Schiffman	Jacob	17-6-1	IMECE2019-12764	208	Seppacher	Pierre	1-1-1	IMECE2019-10644	1
Schiller	Lars	5-15-1	IMECE2019-11410	48	Serrano Torres	Luis	17-9-1	IMECE2019-13893	209
Schilling	Paul	2-7-3	IMECE2019-11630	24	Servey	Joshua	10-26-1	IMECE2019-10303	114
Schilling	Paul	3-8-1	IMECE2019-11087	31	Sett	Soumyadip	9-45-1	IMECE2019-10613	96
Schilling	Paul	16-1-1	IMECE2019-13881	202	Sett	Soumyadip	9-45-1	IMECE2019-12017	96
Schleich	Benjamin	2-10-1	IMECE2019-11225	7	Sett	Soumyadip	17-9-1	IMECE2019-12900	209
Schleich	Benjamin	2-10-3	IMECE2019-11328	12	Sett	Soumyadip	17-15-1	IMECE2019-13334	214
Schley	Robert	9-15-1	IMECE2019-12258	108	Seyednezhad	Mohadeseh	6-9-2	IMECE2019-11644	73
Schmauder	Siegfried	11-7-3	IMECE2019-12275	140	Sha	Jingjie	8-6-4	IMECE2019-10886	92
Schmitz	Anne	4-11-1	IMECE2019-10980	43	Sha	Jingjie	9-25-2	IMECE2019-10572	100
Schmitz	Katharina	8-3-1	IMECE2019-10351	89	Sha	Zhenghui	16-1-1	IMECE2019-13299	196
Schmitz	Katharina	8-3-2	IMECE2019-11343	90	Sha	Zhenghui	16-1-1	IMECE2019-13335	197
Schmutzler	Simon	2-10-1	IMECE2019-11225	7	Shaabani-Ardali	Leopold	11-37-2	IMECE2019-12681	156
Schnelker	Eric	16-1-1	IMECE2019-13596	199	Shabaka	Mostafa	8-1-1	IMECE2019-10483	87
Schnipke	Jeremy R.	4-11-2	IMECE2019-11948	44	Shabgard	Hamidreza	6-3-1	IMECE2019-12662	61
Schnupf	Udo	6-10-1	IMECE2019-11035	72	Shade	Paul	11-47-3	IMECE2019-13059	151
Schöll	Michael	2-8-3	IMECE2019-11266	20	Shafieezadeh	Abdollah	16-2-1	IMECE2019-13748	204
Schoonover	Magdeline	17-4-3	IMECE2019-13321	207	Shah	Darshil	10-19-1	IMECE2019-13467	127
Schroeffler	Andreas	2-2-6	IMECE2019-10022	21	Shah	Deepak	2-2-1	IMECE2019-11596	14
Schulthess	Jason	10-26-2	IMECE2019-10364	115	Shah	Deepak	16-1-1	IMECE2019-12962	193
Schumacher	Arthur	2-13-1	IMECE2019-11023	8	Shah	Nilay	6-1-3	IMECE2019-11399	63
Schuman	Yue	17-15-1	IMECE2019-12584	212	Shah	Smit A.	10-9-1	IMECE2019-12502	122
Schwaig	Kathy	2-13-2	IMECE2019-10889	11	Shahab	Shima	5-3-2	IMECE2019-13693	51
Schwalb	Edward	14-2-2	IMECE2019-12419	183	Shahab	Shima	16-1-1	IMECE2019-13395	197
Schwalb	Edward	14-2-2	IMECE2019-12418	186	Shahani	Ashwin	10-27-2	IMECE2019-12980	128
Schwartz	Ryan	6-9-3	IMECE2019-10456	74	Shakiba	Maryam	11-44-1	IMECE2019-12559	139
Schweitzer	Emily E.	4-7-1	IMECE2019-10992	34	Shakiba	Maryam	11-44-1	IMECE2019-12560	140
Schwemberger	Philipp	2-2-6	IMECE2019-11134	21	Shakiban	Cheri	5-11-1	IMECE2019-10241	55
Schwiedrzik	Jakob	4-5-1	IMECE2019-13127	34	Shakouri	Ali	9-25-2	IMECE2019-12964	100
Schwiedrzik	Jakob	16-1-1	IMECE2019-13688	200	Shamim	Tariq	9-41-1	IMECE2019-10500	96
Scigliano	Roberto	3-4-1	IMECE2019-10577	29	Shamim	Tariq	9-64-1	IMECE2019-10507	97
Scott	William L.	11-5-2	IMECE2019-12511	157	Shan	Yingchun	1-6-2	IMECE2019-12973	5
Scott-Emuakpor	Onome	11-18-3	IMECE2019-13477	141	Shan	Yingchun	11-14-3	IMECE2019-10379	149
Scott-Emuakpor	Onome	15-1-1	IMECE2019-13515	188	Shan	Yingchun	14-1-1	IMECE2019-10346	183
Scott-Emuakpor	Onome	17-15-1	IMECE2019-13511	211	Shan	Yingchun	14-1-2	IMECE2019-10348	183
Sedlak	Kamil	6-5-1	IMECE2019-10267	62	Shang	Peng	13-4-1	IMECE2019-11161	177
Seede	Raiyan	2-12-2	IMECE2019-12784	13	Shang	Yuanyuan	2-4-1	IMECE2019-12640	14
Segovia	Mauricio	9-25-2	IMECE2019-12964	100	Shang	Yuanyuan	2-2-7	IMECE2019-12523	18
Segura	Luis	9-51-1	IMECE2019-10324	110	Shankar	M. Ravi	16-1-1	IMECE2019-12872	193
Seibel	Arthur	5-15-1	IMECE2019-11410	48	Shankar	M. Ravi	16-1-1	IMECE2019-12902	193
Seibel	Eric	7-1-1	IMECE2019-12649	77	Shankar	M. Ravi	16-1-1	IMECE2019-13187	195
Seibel	Eric	17-4-3	IMECE2019-12974	206	Shanmugasundaram	Sunil Aravind	2-2-5	IMECE2019-12371	20
Seibel	Eric	17-4-3	IMECE2019-13359	207	Shanmugavel	Balasisvanandha Prabu	10-26-4	IMECE2019-11408	118
Seibel	Eric	17-4-3	IMECE2019-13595	207	Shao	Chenhui	2-8-1	IMECE2019-10621	17
Seibi	Abdenmour	5-10-1	IMECE2019-10783	52	Shao	Chenhui	9-36-1	IMECE2019-11421	96
Seibi	Abdenmour	13-6-1	IMECE2019-11825	175	Shao	Huachen	4-13-1	IMECE2019-10477	44
Seibi	Abdenmour	13-6-1	IMECE2019-11861	175	Shao	Jianwang	10-4-5	IMECE2019-10865	119
Seifi	Seyyed H.	2-3-1	IMECE2019-10323	24	Shao	Shuai	2-7-4	IMECE2019-11521	25
Seim Brekke	Gitle	5-8-1	IMECE2019-10250	48	Shao	Xiaoyun	10-10-1	IMECE2019-11957	113
Sekaran	Aarthi	8-9-3	IMECE2019-12889	84	Shao	Zhufeng	2-13-3	IMECE2019-10732	13
Sekiguchi	Yasuhisa	2-6-1	IMECE2019-10567	9	Sharadga	Hussein	17-6-1	IMECE2019-13276	208
Selamet	Ahmet	8-12-1	IMECE2019-10461	86	Sharafian	Amir	6-8-1	IMECE2019-11891	71
Seleson	Pablo	3-12-2	IMECE2019-13308	31	Sharafian	Amir	9-9-1	IMECE2019-11877	101
Seleson	Pablo	11-38-1	IMECE2019-13301	145	Sharafian	Amir	9-9-1	IMECE2019-11885	101
Seleson	Pablo	11-38-2	IMECE2019-13297	148	Sharifi	Farrokh	12-8-1	IMECE2019-12904	170
Self	Brian	7-1-2	IMECE2019-13584	78	Sharma	Ankit	10-26-2	IMECE2019-10939	115
Selimov	Alex	16-1-1	IMECE2019-13406	197	Sharma	Bhisham	1-1-1	IMECE2019-13695	1
Sella	Vignesh	3-3-1	IMECE2019-12881	32	Sharma	Himanshu	8-1-1	IMECE2019-10483	87
Selmani	Sam	17-4-2	IMECE2019-13142	206	Sharma	Pradeep	11-1-5	IMECE2019-13042	153
Selvacanabady	Abinesh	6-10-4	IMECE2019-10909	75	Sharma	Pradeep	11-2-1	IMECE2019-13121	157
Selvaraj	Praveen Kumar	5-6-1	IMECE2019-11986	56	Sharma	Tript	8-12-1	IMECE2019-10841	86
Semper	Cykelle	7-10-1	IMECE2019-11751	77	Sharma	Vishaldeep	6-1-1	IMECE2019-11616	61
Semperlotti	Fabio	16-1-1	IMECE2019-12832	193	Sharp	Phoebe C.	4-3-2	IMECE2019-12769	35
Semperlotti	Fabio	16-1-1	IMECE2019-12943	193	Shaskey	Cedric	9-15-1	IMECE2019-10175	108

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Shaw	John A.	11-5-3	IMECE2019-13519	160	Shrimali	Bhavesh	11-1-8	IMECE2019-13172	160
Shaw	Steven	5-1-2	IMECE2019-13996	53	Shriram	R.S.	6-7-3	IMECE2019-10951	70
She	Zhenyu	17-9-1	IMECE2019-13196	209	Shtein	Max	16-1-1	IMECE2019-13027	194
Sheidaei	Azadeh	10-4-1	IMECE2019-13457	113	Shu	Chang	2-7-1	IMECE2019-10472	23
Shelton	Andrew	16-2-1	IMECE2019-13296	203	Shu	Xuedao	2-7-1	IMECE2019-10341	23
Shelton	Charles	16-2-1	IMECE2019-13417	203	Shu	Xuedao	2-7-2	IMECE2019-10349	23
Shelton	Eben	15-1-1	IMECE2019-11499	187	Shu	Xuedao	2-7-1	IMECE2019-10472	23
Shelton	Timothy	11-7-6	IMECE2019-12856	149	Shu	Xuedao	2-7-2	IMECE2019-10486	23
Shemiao	Qi	5-9-2	IMECE2019-10498	50	Shukla	Arun	11-14-1	IMECE2019-11584	145
shemiao	Qi	5-9-2	IMECE2019-10835	50	Shukla	Diksha	2-13-3	IMECE2019-10442	13
Shen	He	3-3-1	IMECE2019-11968	32	Shukla	Satyam	11-25-1	IMECE2019-11843	142
Shen	He	6-10-2	IMECE2019-11859	73	Shukla	Shrish	8-4-1	IMECE2019-13020	89
Shen	He	6-10-4	IMECE2019-12075	75	Si	Xiuhua	15-1-1	IMECE2019-13964	189
Shen	Hong	2-6-1	IMECE2019-11104	9	Si	Xiuhua	15-1-1	IMECE2019-13965	189
Shen	Hong	9-32-1	IMECE2019-11096	93	Siaw	Kristen	16-1-1	IMECE2019-13305	196
Shen	Tong	11-12-2	IMECE2019-13342	161	Sicree	Teresa	4-7-1	IMECE2019-10984	34
Shen	Tong	11-37-5	IMECE2019-13339	165	Siddgonde	Nagappa	10-2-1	IMECE2019-10913	126
Shen	Tong	11-1-10	IMECE2019-13344	165	Siddique	Anayet	8-6-2	IMECE2019-11500	89
Shen	Yanfeng	1-1-5	IMECE2019-10902	4	Siddique	Zahed	7-5-1	IMECE2019-10747	81
Shen	Yanfeng	1-12-1	IMECE2019-10872	5	Siddique	Zahed	10-29-2	IMECE2019-11895	131
Shen	Yanfeng	11-14-3	IMECE2019-10928	150	Siddique	Zahed	16-1-1	IMECE2019-13271	196
Shen	Yanfeng	11-12-4	IMECE2019-10881	166	Siddiqui	Fatima	11-26-4	IMECE2019-10207	167
Shen	Yenan	16-2-1	IMECE2019-13087	203	Sidnawi	Bchara	16-1-1	IMECE2019-13097	194
Shen	Yu	16-1-1	IMECE2019-13594	199	Sidnawi	Bchara	17-15-1	IMECE2019-13098	213
Shen	Yu-Lin	11-27-1	IMECE2019-13197	154	Siegmund	Thomas	11-12-3	IMECE2019-12987	164
Shen	Yunian	5-4-2	IMECE2019-10789	56	Siegmund	Thomas	16-2-1	IMECE2019-12646	203
Shen	Zhiqiang	11-5-5	IMECE2019-13259	166	Siegmund	Thomas	16-2-1	IMECE2019-12653	203
Shen	Zhiqiang	16-1-1	IMECE2019-13331	197	Sietins	Jennifer M.	16-1-1	IMECE2019-13633	200
Sheng	J.	11-7-2	IMECE2019-12592	137	Sievers	Robert K.	6-12-2	IMECE2019-12757	74
Sheng	J.	11-7-4	IMECE2019-12130	144	Siginer	Dennis	8-2-1	IMECE2019-11548	86
Sheridan	Alex	8-9-2	IMECE2019-12020	83	Siginer	Dennis	8-2-1	IMECE2019-11675	86
Sherif	S.A.	9-10-1	IMECE2019-13970	103	Siginer	Dennis	8-2-1	IMECE2019-12062	86
Shettigar	Nandan	16-2-1	IMECE2019-13620	203	Silaen	Armin	8-4-1	IMECE2019-10620	89
Shettigar	Nandan	16-2-1	IMECE2019-13623	204	Silaen	Armin	9-43-2	IMECE2019-11347	95
Shettigar	Nandan	16-2-1	IMECE2019-13628	204	Siller	Hector R.	4-14-1	IMECE2019-11406	41
Shetty	Anupam	2-13-2	IMECE2019-12050	11	Siller	Hector R.	4-14-1	IMECE2019-12260	41
Shi	Baohui	2-4-1	IMECE2019-12640	14	Silling	Stewart	11-38-2	IMECE2019-12831	148
Shi	Baohui	2-2-7	IMECE2019-12215	18	Silva	Joao	2-8-2	IMECE2019-11582	19
Shi	Baohui	2-2-7	IMECE2019-12523	18	Silva	Joao	2-8-2	IMECE2019-11600	19
Shi	Chuanqian	10-25-1	IMECE2019-13920	123	Silva	Joao	2-8-4	IMECE2019-10452	22
Shi	Chuanqian	11-17-1	IMECE2019-12817	134	Silva	Joao	2-8-4	IMECE2019-11659	22
Shi	Dantong	9-32-1	IMECE2019-13717	93	Silva	Pedro	2-8-4	IMECE2019-10452	22
Shi	Jimeng	9-4-1	IMECE2019-12184	106	Silva	Pedro	15-1-1	IMECE2019-13943	190
Shi	Jing	2-12-2	IMECE2019-12122	13	Silva Junior	Anastacio	9-57-1	IMECE2019-11426	107
Shi	Jing	10-9-2	IMECE2019-12123	124	Silva-Leon	Jorge F.	11-43-1	IMECE2019-10393	139
Shi	Li	17-9-1	IMECE2019-12954	209	Silva-Leon	Jorge F.	11-43-1	IMECE2019-10404	139
Shi	Peng	11-5-4	IMECE2019-13351	164	Simko	Justin	5-8-3	IMECE2019-11848	51
Shi	Yu	9-30-1	IMECE2019-12709	108	Simpson	Timothy W.	10-9-2	IMECE2019-13385	124
Shiave	Ali Imran	10-23-2	IMECE2019-11673	130	Simsek	Eylul	9-4-1	IMECE2019-13286	106
Shiave	Ali Imran	17-15-1	IMECE2019-12630	212	Simunovic	Srdjan	6-11-2	IMECE2019-12469	70
Shibuya	Marissa	17-4-3	IMECE2019-12974	206	Singh	Abhay	3-4-1	IMECE2019-10142	29
Shields	Michael	16-1-1	IMECE2019-13806	202	Singh	Abhishek Kumar	12-8-2	IMECE2019-10426	172
Shields	Michael D.	16-1-1	IMECE2019-13740	201	Singh	Gurjap	4-6-2	IMECE2019-10922	37
Shih	Frank J.	10-26-5	IMECE2019-12096	120	Singh	Gurjap	6-16-2	IMECE2019-10917	69
Shilyuk	Eric	8-12-1	IMECE2019-11039	86	Singh	Gurjap	8-9-4	IMECE2019-10258	85
Shin	Donghyun	9-16-1	IMECE2019-12166	111	Singh	Gurpreet	11-39-4	IMECE2019-12743	151
Shin	Dongwoon	2-4-2	IMECE2019-13114	16	Singh	Gurpreet	11-39-4	IMECE2019-12820	151
Shin	Dongwoon	12-4-1	IMECE2019-13115	172	Singh	Gurpreet	16-1-1	IMECE2019-12728	192
Shin	Dongwoon	12-7-2	IMECE2019-13353	173	Singh	Gurpreet	16-1-1	IMECE2019-12741	192
Shin	Dongwoon	17-2-1	IMECE2019-13119	205	Singh	Gurpreet	16-1-1	IMECE2019-12742	192
Shin	Dongwoon	17-15-1	IMECE2019-12874	211	Singh	Gurpreet	16-1-1	IMECE2019-12758	192
Shin	Doug	9-20-1	IMECE2019-13586	94	Singh	Gurpreet	16-1-1	IMECE2019-12759	192
Shin	Doug	17-15-1	IMECE2019-13580	214	Singh	Gurpreet	16-1-1	IMECE2019-13203	195
Shin	Hosop	6-11-2	IMECE2019-13293	70	Singh	Jaspreet	10-4-5	IMECE2019-12860	119
Shinder	Julia	2-10-2	IMECE2019-10635	10	Singh	Kumar	5-2-4	IMECE2019-12214	60
Shindo	Shuntaro	8-2-3	IMECE2019-10683	88	Singh	Prashant	9-41-1	IMECE2019-11283	96
Shiomi	Junichiro	9-29-1	IMECE2019-10276	103	Singh	Prashant	9-64-1	IMECE2019-10760	97
Shipp	Erin	13-9-1	IMECE2019-11854	179	Singh	Prashant	9-46-1	IMECE2019-10660	102
Shiraishi	Toshihiko	4-3-2	IMECE2019-11132	35	Singh	Prashant	9-26-1	IMECE2019-11553	102
Shishir	Md. Imrul Reza	11-12-2	IMECE2019-11543	161	Singh	Prashant	9-19-1	IMECE2019-10748	103
Shishir	Md. Imrul Reza	17-11-2	IMECE2019-12644	211	Singh	Prashant	9-19-2	IMECE2019-11591	104
Shojaei	Pouya	11-14-1	IMECE2019-11799	145	Singh	Raj Kumar	9-35-1	IMECE2019-12459	94
Shortreed	Alissa	15-1-1	IMECE2019-12167	187	Singh	Rajkumar	8-12-1	IMECE2019-10841	86
Shoukr	David	2-12-2	IMECE2019-12784	13	Singh	Rajkumar	8-4-2	IMECE2019-10846	90

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Singh	Rajkumar	8-4-2	IMECE2019-11273	90	Sohn	Kiwon	5-4-3	IMECE2019-10192	58
Singh	Rajkumar	9-36-1	IMECE2019-10432	95	Sohn	Kiwon	5-4-4	IMECE2019-10193	59
Singh	Raman	10-10-3	IMECE2019-11502	116	Soleimaniamiri	Saeid	16-1-1	IMECE2019-12746	192
Singh	Raman	10-10-3	IMECE2019-12259	116	Soleimanimehr	H.	2-11-1	IMECE2019-13244	8
Singh	Ramesh	2-2-2	IMECE2019-12213	15	Soleimanimehr	H.	17-2-1	IMECE2019-13247	205
Singh	Sanjay R.	5-9-3	IMECE2019-11128	51	Soleimanimehr	H.	17-2-1	IMECE2019-13251	205
Singh	Sidh Nath	8-4-1	IMECE2019-13020	89	Soleimanimehr	H.	17-10-1	IMECE2019-13185	210
Singh	Sudhir Kumar	5-9-3	IMECE2019-11128	51	Somers	Paul	16-1-1	IMECE2019-12829	193
Singh	Sukhjit	16-2-1	IMECE2019-13384	203	Sondur	Sneha	16-1-1	IMECE2019-13795	201
Singh	Swadesh Kumar	2-7-4	IMECE2019-11126	25	Sondur	Sneha	16-1-1	IMECE2019-13808	202
Singh	Swadesh Kumar	10-26-5	IMECE2019-12102	120	Song	Bai	9-15-1	IMECE2019-13355	109
Singh	Swetabh	7-1-2	IMECE2019-11954	78	Song	Bai	17-15-1	IMECE2019-13361	214
Sinha	Alok	9-32-1	IMECE2019-10651	93	Song	Bo	11-7-4	IMECE2019-12130	144
Sinha	Anubhab	5-3-3	IMECE2019-11092	47	Song	Boxiang	16-1-1	IMECE2019-13282	196
Sinha	Sanjiv	2-8-1	IMECE2019-10621	17	Song	Chao	10-4-4	IMECE2019-12798	118
Sinha	Sanjiv	4-9-1	IMECE2019-12849	42	Song	Fei	11-12-1	IMECE2019-11066	158
Sinha	Sanjiv	6-7-2	IMECE2019-11731	67	Song	Guangchao	2-5-6	IMECE2019-13150	22
Sinha	Sanjiv	9-36-1	IMECE2019-11421	96	Song	Han Ho	5-13-1	IMECE2019-13333	59
Sinha	Shahnawaz	6-1-2	IMECE2019-11486	62	Song	Hongwei	5-16-1	IMECE2019-12673	54
Sinton	David	8-13-2	IMECE2019-14001	85	Song	In-Hyouk	12-3-1	IMECE2019-12791	170
Siri	Saeed	16-1-1	IMECE2019-12989	191	Song	Jinwoo	2-13-3	IMECE2019-10366	13
Sishtla	Chakravarthy	8-4-3	IMECE2019-11449	91	Song	Jinwoo	2-13-3	IMECE2019-10442	13
Sivaram	Sriram	5-5-1	IMECE2019-12070	47	Song	Wanbing	4-13-1	IMECE2019-10435	44
Sivaram	Sriram	5-8-3	IMECE2019-12082	51	Song	Xiaolei	5-10-2	IMECE2019-13434	50
Skinner	Jack L.	2-4-2	IMECE2019-11456	16	Song	Xiaolei	5-5-2	IMECE2019-13430	53
Skinner	Travis	11-19-1	IMECE2019-11529	161	Song	Xuan	16-1-1	IMECE2019-13207	195
Skotak	Maciej	4-2-2	IMECE2019-13542	39	Song	Yihao	1-1-5	IMECE2019-10902	4
Slaboch	Paul	1-1-6	IMECE2019-11338	4	Song	Yooseob	11-14-2	IMECE2019-12343	147
Slama	Vaclav	5-5-1	IMECE2019-10861	47	Song	Yooseob	11-23-1	IMECE2019-12342	152
Slama	Vaclav	6-5-1	IMECE2019-10267	62	Soper	Steven	12-3-1	IMECE2019-11921	170
Slavin	Nicholas	16-1-1	IMECE2019-13659	200	Soper	Steven	12-6-1	IMECE2019-12058	171
Slebodnick	Carla	9-25-2	IMECE2019-12963	100	Sorensen	Christopher	3-2-1	IMECE2019-10460	28
Slebodnick	Carla	16-1-1	IMECE2019-12929	193	Soriano	Guillermo	6-9-1	IMECE2019-11472	72
Slewa	Muna	15-1-1	IMECE2019-13978	189	Soriano	Guillermo	6-10-4	IMECE2019-10643	75
Smali	Ahmad	14-3-1	IMECE2019-10262	182	Sorli	Massimo	3-4-1	IMECE2019-10713	29
Smilo	Jordan	11-3-1	IMECE2019-13842	163	Sorli	Massimo	5-9-2	IMECE2019-10709	50
Smirnov	Alexander	2-10-2	IMECE2019-10635	10	Sotiriou-Leventis	Chariklia	10-11-1	IMECE2019-11590	116
Smith	Adam	11-14-3	IMECE2019-13349	149	Sotoudeh	Zahra	3-13-1	IMECE2019-11412	30
Smith	Adam	15-1-1	IMECE2019-13962	189	Sotoudeh	Zahra	7-3-1	IMECE2019-11394	79
Smith	Adam	17-15-1	IMECE2019-13108	211	Sotoudeh	Zahra	15-1-1	IMECE2019-11405	187
Smith	Amanda	6-8-1	IMECE2019-13871	71	Sottos	Nancy	2-9-3	IMECE2019-13415	12
Smith	Amanda	9-57-1	IMECE2019-13545	107	Sottos	Nancy	16-1-1	IMECE2019-12715	192
Smith	Amanda	17-6-1	IMECE2019-13885	208	Sottos	Nancy	16-1-1	IMECE2019-12867	193
Smith	Barton L.	8-5-1	IMECE2019-13990	88	Sousa	João	2-8-2	IMECE2019-11600	19
Smith	Elizabeth J.	11-46-2	IMECE2019-13726	143	Sousa	João	2-8-4	IMECE2019-10452	72
Smith	Jeffrey	11-22-2	IMECE2019-10521	145	Sowmithran	Sowmirajan	7-10-1	IMECE2019-11912	27
Smith	Jeremy J.	14-4-1	IMECE2019-10633	181	Sparks	Taylor D.	10-26-6	IMECE2019-13854	121
Smith	John	7-9-1	IMECE2019-10465	81	Sparks	Taylor D.	16-1-1	IMECE2019-13170	195
Smith	Jordan	17-4-2	IMECE2019-13096	206	Spear	Ashley D.	2-2-2	IMECE2019-13226	15
Smith	Justin	15-1-1	IMECE2019-10659	187	Spear	Ashley D.	4-10-4	IMECE2019-12313	44
Smith	Laura	10-26-1	IMECE2019-10051	114	Spear	Ashley D.	4-10-4	IMECE2019-13221	44
Smith	Lucas	3-10-1	IMECE2019-10387	31	Spear	Ashley D.	11-14-3	IMECE2019-12819	149
Smith	Philip	8-13-1	IMECE2019-14000	85	Spear	Ashley D.	11-12-3	IMECE2019-13161	164
Smith	Phillip J.	3-12-2	IMECE2019-11691	31	Spearot	Douglas	11-1-8	IMECE2019-10211	160
Smith	Tyler D.	15-1-1	IMECE2019-10659	187	Spearot	Douglas	16-1-1	IMECE2019-13588	199
Smriti	Smriti	11-23-1	IMECE2019-12676	152	Speich	John	17-4-2	IMECE2019-13775	206
Sneed	Lesley	16-1-1	IMECE2019-13524	198	Spencer	Benjamin	3-12-2	IMECE2019-13399	31
Sneed	Lesley	16-2-1	IMECE2019-13800	204	Spencer	Benjamin	11-39-4	IMECE2019-12684	151
Snekkevik	Andreas	7-5-1	IMECE2019-10282	81	Sprecher	Jennifer	7-1-1	IMECE2019-12649	77
Snow	Tanner	11-18-1	IMECE2019-13442	135	Sridharan	Sriraghav	2-2-3	IMECE2019-10805	16
Snyder	Mark A.	6-7-1	IMECE2019-10734	66	Srinivasa Sagar	Kalichetty	8-6-2	IMECE2019-11270	89
Soares	Davi Marcelo	11-39-4	IMECE2019-12743	151	Srivastava	Ankit	1-1-3	IMECE2019-12850	2
Soares	Davi Marcelo	11-39-4	IMECE2019-12820	151	Srivastava	Ankit	1-1-3	IMECE2019-13566	2
Soares	Davi Marcelo	16-1-1	IMECE2019-12741	192	Srivastava	Ankit	11-11-1	IMECE2019-13792	134
Soares	Davi Marcelo	16-1-1	IMECE2019-12759	192	Srivastava	Ankit	11-11-1	IMECE2019-13879	134
Soares	Delfim	10-26-3	IMECE2019-11356	117	Srivastava	Ankit	16-1-1	IMECE2019-13568	199
Sobhansarbandi	Sarvenaz	6-10-1	IMECE2019-10252	72	Srivastava	Ankit	16-1-1	IMECE2019-13766	201
SobkowiczKline	Margaret	9-53-1	IMECE2019-10679	112	Srivastava	Anuj	3-2-1	IMECE2019-11091	28
Söderberg	Rikard	2-10-2	IMECE2019-10285	10	Srivastava	Rajiv Kumar	12-8-2	IMECE2019-10426	172
Sodgerel	Misheel	16-2-1	IMECE2019-13793	204	Srivastava	Shivank	8-3-2	IMECE2019-12727	90
Sodian	Ralf	4-4-1	IMECE2019-10347	33	Srivastava	Shivank	8-3-3	IMECE2019-12726	91
Soffer	Gil	3-6-1	IMECE2019-13065	27	Srivastava	Shubham	8-9-2	IMECE2019-12020	83
Soffer	Gil	3-6-2	IMECE2019-13071	27	Sroka	Jacob P.	4-11-2	IMECE2019-11948	44
Sogo	Kazuyoshi	17-10-1	IMECE2019-13319	210	St. Julien	James	1-6-2	IMECE2019-13266	5

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Stacey	Derrick	2-13-1	IMECE2019-11306	8	Suhir	Ephraim	10-17-2	IMECE2019-12262	122
Stajuda	Mateusz	17-9-1	IMECE2019-12959	209	Suhir	Ephraim	13-5-1	IMECE2019-12443	178
Stallings	William	4-11-2	IMECE2019-12024	44	Suhling	Jeffrey C.	10-26-6	IMECE2019-12109	121
Stamo	Dana	10-25-1	IMECE2019-13131	123	Sui	Yongkun	16-1-1	IMECE2019-13941	202
Stamo	Dana	11-5-1	IMECE2019-13129	155	Suleiman	Liana S.	17-6-1	IMECE2019-12357	207
Stampfli	Ryan M.	11-39-3	IMECE2019-13742	142	Sullivan	Anthony	10-26-4	IMECE2019-11608	119
Stand	Ricardo	9-39-2	IMECE2019-10122	101	Sullivan	Daniel	10-25-1	IMECE2019-13379	123
Stanley	Nicholas	8-12-1	IMECE2019-11649	86	Sullivan	Daniel	16-1-1	IMECE2019-13382	197
Stansel	Paul	10-25-1	IMECE2019-13379	123	Sullivan	Marianne	13-8-1	IMECE2019-11432	178
Stansel	Paul	16-1-1	IMECE2019-13382	197	Sullivan	Marianne	13-8-1	IMECE2019-11451	178
Steager	Edward	16-1-1	IMECE2019-13432	197	Sullivan	William	11-23-2	IMECE2019-13268	153
Stebbins	Michael	17-15-1	IMECE2019-13055	211	Sullivan	William	11-26-2	IMECE2019-13141	162
Steer	Michael	11-39-2	IMECE2019-13021	138	Suman	Sawan	8-4-1	IMECE2019-13020	89
Steeves	Craig	10-19-1	IMECE2019-13801	127	Summers	Joshua D.	16-1-1	IMECE2019-13672	200
Stefanopoulou	Anna	6-19-1	IMECE2019-13997	61	Summerside	Nicole	7-1-1	IMECE2019-12649	77
Stegeman	Luke	12-5-1	IMECE2019-11534	171	Sun	Daoheng	11-5-5	IMECE2019-13424	166
Steinbrink	Scott	17-4-2	IMECE2019-13096	206	Sun	Haining	14-3-1	IMECE2019-10488	182
Steinfeld	Aldo	9-4-1	IMECE2019-13286	106	Sun	Hao	16-1-1	IMECE2019-12771	192
Stephen	Jeremy	11-1-7	IMECE2019-11930	157	Sun	Hongwei	4-3-2	IMECE2019-12514	35
Stershic	Andrew	11-7-6	IMECE2019-12856	149	Sun	Hongwei	6-7-2	IMECE2019-10457	67
Stershic	Andrew	11-7-6	IMECE2019-13025	149	Sun	Hongwei	9-7-1	IMECE2019-11620	99
Stewart	Lauren	11-22-2	IMECE2019-13797	145	Sun	Hongwei	9-53-1	IMECE2019-10679	112
Stickland	Anthony D.	8-7-1	IMECE2019-13372	84	Sun	Jingchuan	6-4-3	IMECE2019-11149	67
Stockle	Juan	8-2-1	IMECE2019-11548	86	Sun	Katie	17-6-1	IMECE2019-13834	208
Stockle	Juan	8-2-1	IMECE2019-12062	86	Sun	Lingyu	5-11-2	IMECE2019-11185	57
Stolik	Lis	17-15-1	IMECE2019-12837	213	Sun	Lingyu	13-10-2	IMECE2019-10703	177
Stolinski	Christopher	11-18-3	IMECE2019-13328	141	Sun	Mingjia	2-3-2	IMECE2019-10280	25
Stolinski	Christopher	15-1-1	IMECE2019-13326	188	Sun	Shengnan	6-12-1	IMECE2019-11946	73
Stolinski	Christopher	17-15-1	IMECE2019-13329	211	Sun	Tao	16-1-1	IMECE2019-13772	201
Storaas	Torstein R.	5-8-1	IMECE2019-10250	48	Sun	Xu	5-8-2	IMECE2019-10797	49
Storchi	Gabriele	8-4-3	IMECE2019-11482	91	Sun	Xuze	11-10-3	IMECE2019-10698	141
Stosic	Nikola	6-5-1	IMECE2019-10481	62	Sun	Yanhui	2-14-1	IMECE2019-10919	21
Stout	Christopher	12-10-1	IMECE2019-13616	173	Sun	Yilun	10-13-1	IMECE2019-10766	129
Stoyanov	Stoyan	15-1-1	IMECE2019-10527	187	Sun	Yu	2-10-1	IMECE2019-10231	7
Strakey	Peter	9-39-2	IMECE2019-11728	101	Sun	Yu	2-11-1	IMECE2019-10851	8
Strasser	Wayne	8-14-1	IMECE2019-12492	84	Sun	Zhigang	1-12-2	IMECE2019-13621	6
Stratton	Will	8-9-3	IMECE2019-12889	84	Sundar	Sreenath	2-8-1	IMECE2019-10621	17
Strawbridge	Bryan	13-9-1	IMECE2019-11479	179	Sundar	Sreenath	9-36-1	IMECE2019-11421	96
Stricklin	Isaac	16-1-1	IMECE2019-13597	199	Sundar	Srihari	10-2-1	IMECE2019-12699	126
Struebig	Konstantin	2-2-6	IMECE2019-10022	21	Sundaramurthy	Aravind	4-2-1	IMECE2019-13067	36
Stubbs	Christopher	4-10-5	IMECE2019-13757	45	Sundaramurthy	Aravind	4-2-2	IMECE2019-13542	39
Stubbs	Christopher	4-10-5	IMECE2019-13812	45	Sundararaghavan	Veera	10-2-1	IMECE2019-12699	126
Stubbs	Christopher	17-4-2	IMECE2019-13882	206	Sundararaghavan	Veera	11-12-3	IMECE2019-12700	164
Su	Che-Fu	6-7-2	IMECE2019-10457	67	Sundararajan	Thirumalachari	8-6-2	IMECE2019-11270	89
Su	Junwei	4-3-2	IMECE2019-12514	35	Sunden	Bengt	9-5-1	IMECE2019-12834	110
Su	Shun	8-12-1	IMECE2019-11039	86	Sundram	Raja	11-36-2	IMECE2019-11162	162
Su	Tong	2-3-1	IMECE2019-10993	24	Suo	Zhigang	10-31-1	IMECE2019-14004	113
Su	Vivian S.	16-2-1	IMECE2019-13289	203	Surana	Mitisha	2-4-1	IMECE2019-12011	14
Su	Wenjun	2-8-2	IMECE2019-11807	19	Surana	Mitisha	10-12-1	IMECE2019-12756	129
Su	Wenjun	2-14-1	IMECE2019-10383	21	Suri	Ujjwal	8-4-2	IMECE2019-11273	90
Su	Wenjun	2-3-2	IMECE2019-11791	25	Suri	Ujjwal	8-4-2	IMECE2019-11319	90
Su	Xuming	11-10-3	IMECE2019-10698	141	Surya	Ramakrishna	2-4-1	IMECE2019-13312	14
Su	Yutai	2-12-2	IMECE2019-12122	13	Suryakan	Swapnil	11-32-1	IMECE2019-13912	156
Su	Yutai	10-9-2	IMECE2019-12123	124	Suzuki	Jorge	11-5-3	IMECE2019-13533	161
Subad	Rafsan A.S.I.	10-26-6	IMECE2019-12109	121	Suzuki	Jorge	11-5-5	IMECE2019-13751	166
Subhash	Ghatu	11-14-2	IMECE2019-10212	147	Suzuki	Ken	11-7-1	IMECE2019-11186	133
Subhash	Ghatu	11-1-8	IMECE2019-10211	160	Suzuki	Ken	11-7-1	IMECE2019-11210	133
Subhash	Ghatu	16-1-1	IMECE2019-13588	199	Suzuki	Ken	12-3-1	IMECE2019-11106	169
Subrahmanyam	Munukutla Venkata Sankara	10-26-2	IMECE2019-10939	115	Suzuki	Ken	12-1-1	IMECE2019-11076	171
					Suzuki	Ken	12-4-1	IMECE2019-11107	172
Subramaniam	Dhananjay	4-2-1	IMECE2019-13067	36	Suzuki	Naohiko	2-5-2	IMECE2019-11100	16
Subramaniam	Dhananjay	4-2-2	IMECE2019-13542	39	Suzuki	Seiya	8-2-1	IMECE2019-12755	86
Subramanian	Shankar Coimbatore	5-5-1	IMECE2019-12070	47	Suzuki	Seiya	8-2-2	IMECE2019-10550	87
Subramanian	Shankar Coimbatore	5-8-3	IMECE2019-12082	51	Suzuki	Wataru	11-7-1	IMECE2019-11210	133
Subramanyan	Harish	9-25-2	IMECE2019-13011	100	Sværen	Terje	5-2-1	IMECE2019-10249	56
Subramanyan	Harish	17-15-1	IMECE2019-12582	212	Svanadze	Merab	11-36-1	IMECE2019-10367	159
Sudo	Kosuke	10-10-4	IMECE2019-11081	118	Svitelskiy	Oleksiy	1-6-2	IMECE2019-13266	5
Sugiura	Takashi	6-10-1	IMECE2019-11035	72	Svitelskiy	Oleksiy	16-1-1	IMECE2019-13305	196
Suh	C. Steve	5-8-1	IMECE2019-10778	48	Svitelskiy	Oleksiy	16-1-1	IMECE2019-13429	197
Suh	C. Steve	5-8-1	IMECE2019-10788	48	Sypeck	David	10-15-1	IMECE2019-11429	129
Suh	C. Steve	5-8-2	IMECE2019-10797	49	Tabarraei	Alireza	3-7-1	IMECE2019-10070	28
Suh	C. Steve	5-8-3	IMECE2019-11879	51	Tabarraei	Alireza	11-25-1	IMECE2019-11843	142
Suhir	Ephraim	10-17-1	IMECE2019-10089	120	Tabarraei	Alireza	11-14-1	IMECE2019-10071	145
Suhir	Ephraim	10-17-1	IMECE2019-10544	120	Tabarraei	Alireza	11-38-1	IMECE2019-10136	146

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Tabarraei	Alireza	11-38-3	IMECE2019-10069	150	Tatoglu	Akin	5-8-3	IMECE2019-11848	51
Tabarraei	Alireza	11-12-2	IMECE2019-11543	161	Tatoglu	Akin	5-11-2	IMECE2019-11882	57
Tabarraei	Alireza	16-1-1	IMECE2019-13937	202	Tatoglu	Akin	5-11-2	IMECE2019-11892	57
Tabarraei	Alireza	17-11-2	IMECE2019-12508	210	Tauer	Alec	15-1-1	IMECE2019-13985	189
Tabarraei	Alireza	17-11-2	IMECE2019-12644	211	Tavaf	Vahid	11-23-3	IMECE2019-11660	155
Tabrizi	Mohsen	16-1-1	IMECE2019-12872	193	Tavakkoli Anbarani	Mostafa	1-1-5	IMECE2019-13716	3
Tadmor	Ellad B.	11-33-1	IMECE2019-12720	147	Tavakkoli Anbarani	Mostafa	4-3-1	IMECE2019-13712	33
Taggart	Steven	8-9-3	IMECE2019-10607	84	Tavakkoli Anbarani	Mostafa	5-4-4	IMECE2019-13830	59
Taghipour	Rahil	8-9-4	IMECE2019-10553	85	Tavakkoli Anbarani	Mostafa	16-1-1	IMECE2019-13552	199
Taha	Haitham	11-42-2	IMECE2019-13915	139	Tavakkoli Anbarani	Mostafa	16-1-1	IMECE2019-13687	200
Tähemaa	Toivo	2-13-1	IMECE2019-10583	8	Tavakkoli Anbarani	Mostafa	16-1-1	IMECE2019-13694	200
Tai	Ann	13-1-1	IMECE2019-12288	176	Tavares	Sérgio Manuel Oliveira	1-2-2	IMECE2019-11513	4
Tai	Bruce L.	16-2-1	IMECE2019-13289	203	Tawfick	Sameh	2-4-1	IMECE2019-12011	14
Tai	Steffen	1-12-2	IMECE2019-13653	6	Tawfick	Sameh	5-15-1	IMECE2019-10668	48
Tai	Steffen	1-12-2	IMECE2019-13669	6	Tawfick	Sameh	10-12-1	IMECE2019-12756	129
Tai	Steffen	1-12-2	IMECE2019-13691	6	Taya	Minoru	11-23-2	IMECE2019-13239	153
Tajik	Abdul Raouf	9-41-1	IMECE2019-10500	96	Taya	Minoru	11-26-1	IMECE2019-13231	158
Tajik	Abdul Raouf	9-64-1	IMECE2019-10507	97	Tayeb	Raihan	9-49-1	IMECE2019-11953	109
Takahashi	Kazuhiko	17-10-1	IMECE2019-13319	210	Taylor	Alexandra	16-1-1	IMECE2019-13950	203
Talaat	Mohamed	15-1-1	IMECE2019-13965	189	Taylor	Chris	2-5-1	IMECE2019-11780	15
Talamini	Brandon	11-7-6	IMECE2019-12856	149	Taylor	Curtis	16-1-1	IMECE2019-12932	193
Talamini	Brandon	11-7-6	IMECE2019-13025	149	Taylor	Dorothy	4-8-1	IMECE2019-11889	38
Talluru	Viswajit	11-32-1	IMECE2019-13912	156	Taylor	Sydney	9-7-1	IMECE2019-12558	99
Talygin	Eugeny	4-9-1	IMECE2019-11298	42	Taylor	Sydney	17-15-1	IMECE2019-12551	212
Tamayol	Ali	8-4-1	IMECE2019-13103	89	Teferi	Blen	6-10-1	IMECE2019-11035	72
Tamura	Atsutaka	4-10-2	IMECE2019-10530	41	Teimoori	Khashayar	4-10-1	IMECE2019-10529	40
Tan	George	4-5-3	IMECE2019-13028	37	Teimoori	Khashayar	11-18-2	IMECE2019-12000	138
Tan	Hua	8-6-2	IMECE2019-10519	89	Teixeira	Joel	2-8-3	IMECE2019-11415	21
Tan	Hua	8-6-2	IMECE2019-11500	89	Teixeira	Jose	6-4-2	IMECE2019-11542	66
Tan	Kai Liang	16-1-1	IMECE2019-13522	198	Teixeira	Jose	6-16-2	IMECE2019-11593	69
Tan	Kwek Tze	3-10-1	IMECE2019-12750	31	Teixeira	Jose	9-36-2	IMECE2019-11652	99
Tan	Wenda	2-12-2	IMECE2019-10286	13	Teixeira	Jose	10-26-3	IMECE2019-11356	117
Tan	Wenda	10-27-2	IMECE2019-12689	128	Teixeira	Ricardo Emanuel da Rocha	1-2-2	IMECE2019-11513	4
Tan	X. Gary	4-2-1	IMECE2019-13140	36	Teixeira	Senhorinha	6-4-2	IMECE2019-11542	66
Tan	X. Gary	4-2-4	IMECE2019-10903	41	Teixeira	Senhorinha	9-36-2	IMECE2019-11652	99
Tan	Xu	9-2-1	IMECE2019-12772	104	Teixeira	Senhorinha	10-26-3	IMECE2019-11356	117
Tanaka	Martin L.	14-4-1	IMECE2019-10633	181	Tejada-Martinez	Andres	8-6-2	IMECE2019-11966	89
Tandon	Arjun	1-12-1	IMECE2019-12093	5	Tekes	Ayse	5-9-1	IMECE2019-10334	48
Tang	Alexander	16-1-1	IMECE2019-13589	199	Tekes	Ayse	5-4-3	IMECE2019-10769	58
Tang	Alexander	16-1-1	IMECE2019-13600	199	Tekes	Ayse	5-4-4	IMECE2019-10299	59
Tang	Daniel	4-6-2	IMECE2019-12549	37	Tekes	Ayse	5-4-5	IMECE2019-10067	60
Tang	Haibin	11-10-3	IMECE2019-10698	141	Tekes	Ayse	5-4-5	IMECE2019-10291	60
Tang	Hongqun	13-5-1	IMECE2019-10803	178	Tekes	Ayse	7-5-1	IMECE2019-10235	81
Tang	Jiaqi	9-43-1	IMECE2019-12922	94	Tekes	Coskun	5-9-1	IMECE2019-10334	48
Tang	Lei	9-30-2	IMECE2019-12911	109	Tekes	Coskun	5-4-5	IMECE2019-10291	60
Tang	Lei	9-30-2	IMECE2019-13031	109	Tekweme	Francis Kunzi	9-35-1	IMECE2019-11329	94
Tang	Qinggong	10-26-2	IMECE2019-10512	115	Tendolkar	Mandar Vinayak	9-35-1	IMECE2019-12459	94
Tang	Xiaoqiang	14-3-1	IMECE2019-10488	182	Teng	Hualiang	2-2-1	IMECE2019-10758	14
Tanjil	Md. Rubayat-E	2-4-1	IMECE2019-11868	14	Teng	Jinfang	5-2-1	IMECE2019-10536	56
Tanjil	Md. Rubayat-E	2-4-2	IMECE2019-11327	15	Teng	Jinfang	9-46-1	IMECE2019-11237	103
Tanvirul Islam	Shafquat	8-9-4	IMECE2019-10257	85	Teng	Zhiqiang	4-13-2	IMECE2019-10471	45
Tao	Fei	3-4-2	IMECE2019-13574	30	Tennent	David	15-1-1	IMECE2019-13967	189
Tao	Julian	16-1-1	IMECE2019-13539	198	Tenorio	Max	10-25-1	IMECE2019-13379	123
Tao	Molei	1-1-3	IMECE2019-13051	2	Tenorio	Max	16-1-1	IMECE2019-13382	197
Tao	Runhan	11-3-2	IMECE2019-13394	166	Teoh Rui Ern	Brenda	10-10-4	IMECE2019-11141	118
Tao	Xingtian	8-12-1	IMECE2019-10652	86	Terashima	Osamu	1-2-1	IMECE2019-12748	1
Tao	Yi	9-25-1	IMECE2019-13606	98	Terashima	Osamu	1-2-2	IMECE2019-10776	4
Tao	Yi	17-9-1	IMECE2019-13618	209	Tergeist	Mathias	5-3-1	IMECE2019-10576	49
Tapia	Oscar	16-1-1	IMECE2019-13246	196	Terrill	Evan	17-6-1	IMECE2019-13463	208
Tapoglou	Nikolaos	2-9-1	IMECE2019-12611	7	Terry	Taylor N.	4-2-4	IMECE2019-10675	41
Tapoglou	Nikolaos	2-9-1	IMECE2019-12883	7	Tervo	Eric J.	9-30-1	IMECE2019-12610	108
Tapoglou	Nikolaos	2-5-1	IMECE2019-11780	15	Tervo	Eric J.	9-30-1	IMECE2019-12887	108
Tapoglou	Nikolaos	2-2-6	IMECE2019-12774	21	Tervo	Eric J.	9-30-2	IMECE2019-13270	109
Tarantino	Gabriella	11-3-2	IMECE2019-12997	166	Tervo	Eric J.	16-1-1	IMECE2019-12895	193
Taravella	Brandon M.	8-3-2	IMECE2019-12727	90	Tervo	Eric J.	17-15-1	IMECE2019-12609	212
Taravella	Brandon M.	8-3-3	IMECE2019-12726	91	Terzi	Stefano	8-4-3	IMECE2019-11482	91
Tarr	Joseph A.	2-9-1	IMECE2019-13859	7	Terzis	Alexandros	8-6-4	IMECE2019-12378	92
Tarr	Joseph A.	14-3-3	IMECE2019-13813	184	Thach	Peara	4-13-2	IMECE2019-11802	45
Tartibu	Lagouge	9-35-1	IMECE2019-11329	94	Thinh	Thinh	11-14-3	IMECE2019-13100	149
Tartibu	Lagouge	9-2-1	IMECE2019-11182	104	Thai	Thinh	11-14-3	IMECE2019-13349	149
Tartibu	Lagouge	10-30-1	IMECE2019-11152	117	Thai	Thinh	17-15-1	IMECE2019-13108	211
Tartibu	Lagouge	12-4-1	IMECE2019-11496	172	Thakare	Ketan	4-5-4	IMECE2019-12150	39
Tasan	Cem	10-27-3	IMECE2019-13892	131	Thakur	Md. Shajedul Hoque	9-63-1	IMECE2019-10150	95
Tasoujian	Shahin	16-1-1	IMECE2019-13689	200					

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Thangawng	Abel	11-5-1	IMECE2019-11244	155	Tong	Zhen	1-1-6	IMECE2019-10817	4
Thatte	Amogh	6-12-1	IMECE2019-13747	73	Tong	Zhen	9-20-1	IMECE2019-12753	94
Thirunilath	Naveen	8-6-1	IMECE2019-11989	88	Tonge	Ernuel	7-10-1	IMECE2019-11751	77
Thole	Karen	9-69-1	IMECE2019-14002	98	Toomey	Ryan	2-12-1	IMECE2019-11810	10
Thomas	Dravin	7-9-1	IMECE2019-10465	81	Toro	Ricardo S.	2-8-1	IMECE2019-10621	17
Thomas	Jacob	9-6-1	IMECE2019-13654	98	Torres	David A.	12-8-2	IMECE2019-10466	172
Thomas	Jermy	9-57-1	IMECE2019-13545	107	Tørresen	Tord	7-5-1	IMECE2019-10437	81
Thomas	P. Alen	10-26-2	IMECE2019-10939	115	Tortorelli	Daniel	10-20-3	IMECE2019-13861	120
Thomas	Tyler	7-10-1	IMECE2019-11751	77	Toscano	Lisa	4-11-2	IMECE2019-12024	44
Thompson	Amy	6-9-2	IMECE2019-11941	73	Touahri	Hacene	3-5-1	IMECE2019-10019	27
Thompson	Harvey	9-45-1	IMECE2019-10359	96	Tournat	Vincent	1-1-4	IMECE2019-13354	3
Thompson	Scott	2-2-3	IMECE2019-13869	16	Tovar	Andres	5-4-5	IMECE2019-11062	60
Thomson	Scott L.	2-2-5	IMECE2019-13601	20	Tovar	Andres	14-3-3	IMECE2019-11069	184
Thomson	Scott L.	4-10-4	IMECE2019-13198	44	Toyoshima	Akio	5-7-1	IMECE2019-11115	55
Thomson	Scott L.	15-1-1	IMECE2019-13492	188	Trabia	Mohamed	11-22-1	IMECE2019-12960	142
Thool	Khushahal	2-2-2	IMECE2019-12213	15	Trabia	Mohamed	11-14-1	IMECE2019-11799	145
Thornquist	Ona	8-9-4	IMECE2019-10257	85	Trabia	Mohamed	11-32-1	IMECE2019-11674	155
Thorun	Aaron	9-15-1	IMECE2019-11699	108	Trageser	Jeremy	11-38-2	IMECE2019-13297	148
Thota	Jagadeep	11-22-1	IMECE2019-12960	142	Tran	Tiffany	3-4-1	IMECE2019-10480	29
Thurlow	Ernest	1-2-1	IMECE2019-10096	1	Trancossi	Michele	3-2-1	IMECE2019-11515	28
Thyagarajan	Ashok	16-2-1	IMECE2019-13620	203	Trapuzzano	Matthew	8-6-2	IMECE2019-11966	89
Thyagarajan	Ashok	16-2-1	IMECE2019-13623	204	Traugutt	Nicholas	11-1-4	IMECE2019-13397	152
Thyagarajan	Ashok	16-2-1	IMECE2019-13628	204	Trescher	Matthias	2-2-6	IMECE2019-10022	21
Thyagatur	Anugraha	12-7-3	IMECE2019-13481	174	Triantafyllidis	Nicolas	11-1-6	IMECE2019-12557	154
Kidigannappa					Triantafyllidis	Nicolas	11-37-2	IMECE2019-12681	156
Tian	Ang	2-3-1	IMECE2019-10822	24	Triantafyllidis	Nicolas	11-37-2	IMECE2019-13826	156
Tian	ChenWen	11-38-2	IMECE2019-13935	148	Triantafyllidis	Nicolas	11-37-3	IMECE2019-13019	159
Tian	Chong	6-2-2	IMECE2019-11947	65	Triantafyllidis	Nicolas	11-37-5	IMECE2019-12988	165
Tian	Duanyang	2-7-1	IMECE2019-10472	23	Trnjanin	Almir	16-1-1	IMECE2019-13338	197
Tian	Wenmeng	2-3-1	IMECE2019-10323	24	Trostel	Connor	2-13-1	IMECE2019-11306	8
Tian	Yiran	1-12-1	IMECE2019-10872	5	True	Lawrence	17-4-2	IMECE2019-13107	206
Tian	Yuan	5-2-1	IMECE2019-10464	56	Trung	Duong H.	10-14-1	IMECE2019-10084	122
Tian	Yuan	14-1-3	IMECE2019-10595	184	Truong	Meghan	16-2-1	IMECE2019-13620	203
Tian	Zhiting	9-25-2	IMECE2019-12963	100	Truong	Meghan	16-2-1	IMECE2019-13623	204
Tian	Zhiting	16-1-1	IMECE2019-12929	193	Truong	Meghan	16-2-1	IMECE2019-13628	204
Tian	Zhiting	16-1-1	IMECE2019-13840	202	Truscott	Tadd	11-14-3	IMECE2019-13100	149
Tiari	Saeed	4-7-1	IMECE2019-10984	34	Tsai	Jensen (Ying-Chou)	12-3-1	IMECE2019-11181	170
Tiari	Saeed	6-7-2	IMECE2019-11414	67	Tsatsaronis	George	6-3-1	IMECE2019-10590	61
Tibabisco	Cristian	9-63-1	IMECE2019-10154	95	Tsatsaronis	George	6-3-1	IMECE2019-10850	61
Tiemann	Klaus	4-4-1	IMECE2019-10347	33	Tsatsaronis	George	6-4-3	IMECE2019-10587	67
Tikadar	Amitav	9-43-2	IMECE2019-11065	95	Tsatsaronis	George	6-6-1	IMECE2019-10588	68
Tikadar	Amitav	9-36-1	IMECE2019-11847	96	Tsatsaronis	George	6-6-1	IMECE2019-10712	68
Tikadar	Amitav	9-29-1	IMECE2019-11794	104	Tsatsaronis	George	6-4-5	IMECE2019-11519	71
Tikadar	Amitav	9-51-1	IMECE2019-11624	110	Tsatsaronis	George	7-12-1	IMECE2019-10925	79
Tikadar	Amitav	9-16-1	IMECE2019-11781	111	Tse	Stephen	10-11-1	IMECE2019-13853	117
Tiley	Jaimie	10-20-2	IMECE2019-13572	115	Tse	Stephen	11-25-1	IMECE2019-13900	142
Tilley	Burt	9-43-2	IMECE2019-10123	95	Tseng	Bill	7-10-1	IMECE2019-11912	77
Tilley	Burt	17-9-1	IMECE2019-13298	209	Tsuno	Takaya	5-11-2	IMECE2019-11176	57
Timms	William	8-12-1	IMECE2019-11649	86	Tsutsui	Hideaki	16-1-1	IMECE2019-13594	199
Tippur	Hareesh	11-10-1	IMECE2019-11664	134	Tsuzuki	Ryujji	4-6-1	IMECE2019-10382	36
Tippur	Hareesh	11-10-1	IMECE2019-11676	134	Tu	Ran	9-2-1	IMECE2019-10173	104
Tislevoll	Torgeir Oliver	5-11-1	IMECE2019-10434	55	Tu	Rang	6-9-1	IMECE2019-10310	72
Tiznobaik	Hani	9-16-1	IMECE2019-12166	111	Tubaldi	Eleonora	4-5-2	IMECE2019-11520	36
Tkatch	Colin	16-1-1	IMECE2019-13501	198	Tucker	Garritt	16-1-1	IMECE2019-13093	194
Tlili	Iskander	6-5-2	IMECE2019-10949	63	Tumkor	Serdar	2-8-1	IMECE2019-12926	17
Toberer	Eric	9-30-2	IMECE2019-13270	109	Tung	Fletcher (Cheng-Piao)	12-3-1	IMECE2019-11181	170
Todebush	Patricia	12-4-1	IMECE2019-10059	172	Tupek	Michael R.	11-28-1	IMECE2019-13703	135
Tohmyoh	Hironori	4-5-1	IMECE2019-12800	34	Tupek	Michael R.	11-7-6	IMECE2019-13025	149
Toigo	Federico	16-1-1	IMECE2019-13203	195	Turchi	Craig	6-4-3	IMECE2019-10637	67
Tokunaga	Takeshi	4-3-1	IMECE2019-10548	33	Turlo	Vlad	10-19-2	IMECE2019-13718	130
Tokunaga	Takeshi	4-3-1	IMECE2019-11837	33	Turman	Coby	16-1-1	IMECE2019-13189	195
Tokunaga	Takuro	9-20-1	IMECE2019-13468	94	Turner	Kevin	10-2-2	IMECE2019-13824	128
Tokunaga	Takuro	9-30-2	IMECE2019-13470	109	Tursynkhan	Margulan	8-7-1	IMECE2019-10876	84
Tomar	Ravi Pratap Singh	10-23-1	IMECE2019-11556	125	Tutika	Ravi	11-2-2	IMECE2019-13510	160
Tomar	Ravi Pratap Singh	10-23-1	IMECE2019-11639	125	Tuttle	Tyler	11-5-5	IMECE2019-13751	166
Tomar	Ravi Pratap Singh	17-15-1	IMECE2019-12897	213	Tyagi	Pawan	7-1-1	IMECE2019-12032	77
Tomar	Ravi Pratap Singh	17-15-1	IMECE2019-13003	213	Udaykumar	H.S.	17-6-1	IMECE2019-12357	207
Tomar	Vikas	17-15-1	IMECE2019-12678	213	Uddin	Mohammad Irfan	16-1-1	IMECE2019-13863	202
Tomé	António	8-4-3	IMECE2019-11747	91	Uddin	Mohammad J.	4-14-1	IMECE2019-12260	41
Tomko	Megan	16-1-1	IMECE2019-12818	192	Uddin	Mohammad S.	4-2-3	IMECE2019-10945	40
Tomren	Tore	6-4-5	IMECE2019-10266	70	Uehara	Kenyu	4-3-1	IMECE2019-11643	33
Tong	Wei	11-7-2	IMECE2019-12592	137	Ufnal	Joseph	7-12-1	IMECE2019-11605	79
Tong	Wei	11-7-4	IMECE2019-12130	144	Ul Haq	Ahsan	10-26-5	IMECE2019-12102	120
Tong	Xiao	16-1-1	IMECE2019-12632	191	Ulishney	Christopher	6-2-1	IMECE2019-11485	64

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Ulishney	Christopher	6-4-4	IMECE2019-10728	69	Vargas-Gonzalez	Lionel R.	4-2-4	IMECE2019-11566	42
Ulu	Furkan	10-23-1	IMECE2019-11566	125	Varghese	K. Philip	2-5-4	IMECE2019-10037	19
Ulu	Furkan	10-23-1	IMECE2019-11639	125	Varghese	K. Philip	2-14-1	IMECE2019-10040	21
Ulu	Furkan	17-15-1	IMECE2019-12897	213	Varma	Soumya	4-5-1	IMECE2019-13127	34
Ulu	Furkan	17-15-1	IMECE2019-13003	213	Varma	Soumya	16-1-1	IMECE2019-13688	200
Ulutan	Durul	2-5-1	IMECE2019-13374	15	Varma	Soumya	16-1-1	IMECE2019-13862	202
Ulven	Chad	10-10-5	IMECE2019-12934	120	Varshney	Shikhar	17-4-3	IMECE2019-13359	207
Unnikrishnan	GINU	4-2-1	IMECE2019-13067	36	Vasiliev	Alexander	6-14-1	IMECE2019-10513	75
Unnikrishnan	GINU	4-2-2	IMECE2019-13542	39	Vasquez	Simon	4-7-1	IMECE2019-11233	34
Unnikrishnan	Vinu	11-36-2	IMECE2019-11654	162	Vassigh	Shahin	9-59-1	IMECE2019-11982	110
Unnthorsson	Runar	1-10-1	IMECE2019-12977	3	Vaterlaus	Austin C.	4-10-4	IMECE2019-13198	44
Unnthorsson	Runar	1-10-1	IMECE2019-12978	3	Vazic	Bozo	3-12-1	IMECE2019-10049	29
Unnthorsson	Runar	6-16-1	IMECE2019-10586	65	Vaziri	Ashkan	11-10-3	IMECE2019-10213	140
Unnthorsson	Runar	6-6-1	IMECE2019-12250	68	Vaziri	Ashkan	16-1-1	IMECE2019-13803	202
Unnthorsson	Runar	6-6-1	IMECE2019-12252	68	Vaziri	Reza	2-9-2	IMECE2019-11261	9
Unnthorsson	Runar	6-6-1	IMECE2019-12254	68	Veiga	João	2-8-4	IMECE2019-10452	22
Untaroiu	Alexandrina	16-1-1	IMECE2019-12765	192	Veith	Gabriel M.	6-11-2	IMECE2019-12469	70
Upadhyay	Kshitiz	11-1-8	IMECE2019-10211	160	Velay-Lizancos	Mirian	10-4-3	IMECE2019-13818	116
Upadhyay	Kshitiz	16-1-1	IMECE2019-13588	199	Velay-Lizancos	Mirian	16-1-1	IMECE2019-13827	202
Upot	Nithin Vinod	9-18-1	IMECE2019-10371	106	Vellavalapalli	Satish	4-10-5	IMECE2019-10800	45
Upot	Nithin Vinod	17-15-1	IMECE2019-12723	213	Velmurugan	R.S.	3-4-2	IMECE2019-10931	30
Uppal	Aastha	9-51-2	IMECE2019-12526	111	Venkatadasu	Holalu	2-6-1	IMECE2019-11208	9
Ural	Ani	17-15-1	IMECE2019-12584	212	Ravindra				
Urban	Jeffrey J.	9-25-2	IMECE2019-12963	100	Venkatadasu	Holalu	2-6-2	IMECE2019-11168	11
Urban	Jeffrey J.	16-1-1	IMECE2019-12929	193	Ravindra				
Urbano	Jose	2-10-3	IMECE2019-10294	12	Venkatadasu	Holalu	2-5-3	IMECE2019-11188	17
Urbas	Augustine	1-1-6	IMECE2019-10449	4	Ravindra				
Urbas	Augustine	1-1-6	IMECE2019-11866	4	Venkatadasu	Holalu	2-5-5	IMECE2019-13117	20
Utschig	Tris	7-5-1	IMECE2019-10235	81	Ravindra				
Utz	Robert C.	6-12-2	IMECE2019-12757	74	Venkataraman	Venkatesan	5-2-4	IMECE2019-12198	60
Vachhani	Shraddha J.	4-5-1	IMECE2019-13127	34	Verma	Ankit	6-11-2	IMECE2019-12638	70
Vachhani	Shraddha J.	16-1-1	IMECE2019-13688	200	Vermaak	Natasha	10-20-4	IMECE2019-12891	124
Vafaei	Saeid	6-10-1	IMECE2019-11035	72	Vermaak	Natasha	10-2-2	IMECE2019-12890	128
Vafaei	Saeid	9-19-2	IMECE2019-10799	104	Vermaak	Natasha	16-1-1	IMECE2019-13862	202
Vafaei	Saeid	9-51-1	IMECE2019-13229	110	Vernerey	Franck	11-39-3	IMECE2019-13279	142
Vaghetto	Rodolfo	6-14-2	IMECE2019-11811	76	Vernerey	Franck	11-12-2	IMECE2019-13342	161
Vahala	Linda	4-6-1	IMECE2019-11389	36	Vernerey	Franck	11-1-10	IMECE2019-13269	165
Vahedi	Nasser	6-7-1	IMECE2019-10734	66	Vernerey	Franck	11-37-5	IMECE2019-13339	165
Vahedi	Nasser	6-7-1	IMECE2019-10740	66	Vernerey	Franck	11-1-10	IMECE2019-13344	165
Vahedi	Nasser	6-7-2	IMECE2019-10956	67	Vessalli	Beatriz	16-1-1	IMECE2019-12742	192
Vahedifard	Farshid	16-1-1	IMECE2019-13790	201	Vicente	Adam	4-5-4	IMECE2019-11545	39
Vainchtein	Dmitri	16-1-1	IMECE2019-13501	198	Vicentini	Rafael	11-39-4	IMECE2019-12743	151
Vakakis	Alexander	1-1-2	IMECE2019-13605	2	Vicentini	Rafael	11-39-4	IMECE2019-12820	151
Valdarno	Luca	17-9-1	IMECE2019-13807	209	Vidal-Lesso	Agustin	4-8-1	IMECE2019-11085	37
Valdevit	Lorenzo	10-20-3	IMECE2019-13701	121	Vidoni	Renato	5-11-1	IMECE2019-10569	55
Valdevit	Lorenzo	10-19-2	IMECE2019-13718	130	Viegas	Domingos	9-2-1	IMECE2019-10173	104
Valdevit	Lorenzo	10-19-2	IMECE2019-13865	130	Viglietti	Andrea	3-14-1	IMECE2019-11281	32
Valdez	Eduardo	12-4-1	IMECE2019-10059	172	Vigre	Elise Mari	5-9-1	IMECE2019-10436	48
Valdez	Thomas I.	6-12-2	IMECE2019-12757	74	Vijaya Kumar	Ajay Kumar	4-7-1	IMECE2019-10992	34
Vale	André	2-8-2	IMECE2019-11582	19	R. Vijayakumar		8-4-1	IMECE2019-13020	89
Vale	André	2-8-2	IMECE2019-11600	19	Vilain	Rogério	9-57-1	IMECE2019-11426	107
Valencia	Adriana	6-10-4	IMECE2019-10643	75	Vilarinho	Candida	4-14-1	IMECE2019-11221	41
Valencia-Romero	Ambrosio	16-1-1	IMECE2019-13708	200	Vilarinho	Candida	6-16-2	IMECE2019-11593	69
Valle	Harold	6-3-1	IMECE2019-10642	61	Villada	Andres	10-25-1	IMECE2019-13131	123
Valliyappan Natarajan	David	11-36-2	IMECE2019-11162	162	Villada	Andres	11-5-1	IMECE2019-13129	155
van Albert	Stephen	4-2-1	IMECE2019-13067	36	Virkesdal	Kasper	5-8-1	IMECE2019-10250	48
van Albert	Stephen	4-2-2	IMECE2019-13542	39	Visalli	Thomas	9-32-1	IMECE2019-11374	93
Van Auker	R. Michael	13-9-1	IMECE2019-12178	179	Viswanath	Vishnu	10-24-1	IMECE2019-10230	123
Van Der Giessen	Erik	11-47-3	IMECE2019-12775	151	Viswanathan	Vimal	2-2-6	IMECE2019-11698	21
van der Zande	Arend	12-7-1	IMECE2019-11867	169	Viswanathan	Vimal	4-13-2	IMECE2019-11802	45
van der Zande	Arend	12-7-2	IMECE2019-11830	173	Viswanathan	Vimal	6-4-1	IMECE2019-11972	64
Van Leeuwen	Fiona	15-1-1	IMECE2019-13979	189	Vitali	Andrea	14-2-1	IMECE2019-10491	181
Van Leeuwen	Travis	4-13-3	IMECE2019-10463	46	Vivek	Vibhu	9-18-1	IMECE2019-12432	106
Van Poppel	Bret	8-11-1	IMECE2019-11764	86	Vivekanandan	Gunasekaran	5-5-1	IMECE2019-12070	47
Van Valkenburgh	Owen F.	10-26-5	IMECE2019-12096	120	Vivekanandan	Gunasekaran	5-8-3	IMECE2019-12082	51
Vanasdale	Jared	4-2-3	IMECE2019-10641	40	Vives	Luis	9-59-1	IMECE2019-11786	110
Vandanapu	Lohit	16-1-1	IMECE2019-13740	201	Vlassak	Joost	10-27-1	IMECE2019-12862	126
Vandenbrande	Jan	10-20-2	IMECE2019-13942	115	Vo	Trinh	17-4-3	IMECE2019-12974	206
Vanderbilt	Daniel	4-13-2	IMECE2019-11716	45	Vo	Truong	11-26-3	IMECE2019-13212	165
Vanegas	Marley	9-39-2	IMECE2019-10122	101	Voiculescu	Ioana	12-5-1	IMECE2019-11618	171
VanLandingham	Mark	10-20-1	IMECE2019-13456	114	Volkov	Alexey	2-2-1	IMECE2019-11596	14
VanZant	Lia	16-2-1	IMECE2019-13800	204	Volkov	Alexey	16-1-1	IMECE2019-12962	193
Varga	John	16-2-1	IMECE2019-13631	204	von Ellenrieder	Karl	5-11-1	IMECE2019-10569	55
Vargas-Díaz	Salvador	9-63-1	IMECE2019-10154	95	von Ellenrieder	Karl	5-11-2	IMECE2019-11507	57

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Voyiadjis	George	11-14-2	IMECE2019-12343	147	Wang	Jinxi	5-11-2	IMECE2019-11185	57
Voyiadjis	George	11-23-1	IMECE2019-12342	152	Wang	Jinxi	13-10-2	IMECE2019-10703	177
Vundru	Chaitanya	2-2-2	IMECE2019-12213	15	Wang	Jirui	6-7-2	IMECE2019-10457	67
Vuong	Tung	1-10-1	IMECE2019-10197	3	Wang	Jitai	2-7-2	IMECE2019-10486	23
Waas	Anthony	11-37-1	IMECE2019-13363	154	Wang	Junshi	4-10-1	IMECE2019-11697	40
Wada	Shogo	11-38-1	IMECE2019-12907	146	Wang	Junzhen	11-12-4	IMECE2019-10881	166
Wada	Shogo	17-11-2	IMECE2019-12908	211	Wang	Kefei	13-10-2	IMECE2019-12310	177
Wada	Shouhei	8-2-1	IMECE2019-12755	86	Wang	Leijie	3-4-2	IMECE2019-11129	30
Wadsworth	Paul	16-2-1	IMECE2019-13631	204	Wang	Leijie	5-4-3	IMECE2019-10896	58
Waez	Mir Seliman	3-2-1	IMECE2019-10460	28	Wang	Leijie	5-4-3	IMECE2019-11206	58
Wagner	Lauren N.	7-6-1	IMECE2019-11447	78	Wang	Lifu	1-12-2	IMECE2019-13653	6
Wagner	Nicole	8-9-1	IMECE2019-10101	83	Wang	Lifu	1-12-2	IMECE2019-13669	6
Wagner	Robert	11-1-10	IMECE2019-13344	165	Wang	Lifu	1-12-2	IMECE2019-13691	6
Wagner	Robert	11-1-10	IMECE2019-13345	165	Wang	Lijun	1-6-1	IMECE2019-10836	2
Wagner	Scott	2-7-1	IMECE2019-10032	23	Wang	Lijun	5-2-2	IMECE2019-11008	58
Wahab	Muhammad	2-7-1	IMECE2019-10032	23	Wang	Liping	2-13-3	IMECE2019-10732	13
Wahab	Muhammad	3-5-1	IMECE2019-11723	27	Wang	Liping	5-3-2	IMECE2019-10916	50
Wahls	Benjamin	9-41-1	IMECE2019-11283	96	Wang	Liping	9-7-1	IMECE2019-12558	99
Wahlstrom	David	6-12-1	IMECE2019-13781	73	Wang	Liping	9-30-1	IMECE2019-12553	108
Waldrum	Daniel	11-18-1	IMECE2019-12912	135	Wang	Liping	17-15-1	IMECE2019-12551	212
Walker	Hannah	15-1-1	IMECE2019-13046	188	Wang	Liping	17-15-1	IMECE2019-12552	212
Walker	Jason M.	16-1-1	IMECE2019-13145	195	Wang	Liyun	16-1-1	IMECE2019-13110	194
Walker	Torrance	15-1-1	IMECE2019-13987	189	Wang	Liyun	16-1-1	IMECE2019-13502	198
Wallace	Nicholas	9-14-1	IMECE2019-13640	102	Wang	Liyun	17-15-1	IMECE2019-13088	213
Walmsley	Thayer	8-6-4	IMECE2019-13565	92	Wang	Lizhi	16-1-1	IMECE2019-12854	191
Walmsley	Thayer	17-15-1	IMECE2019-13593	212	Wang	Lizhi	16-1-1	IMECE2019-12859	191
Walter	Lindsay	9-30-1	IMECE2019-12887	108	Wang	Long-Yuan	2-12-1	IMECE2019-10563	10
Walter	Lindsay	16-1-1	IMECE2019-12895	193	Wang	Lubing	10-15-1	IMECE2019-12410	129
Wan	Guangchao	11-37-4	IMECE2019-13848	163	Wang	Lubing	10-23-2	IMECE2019-12409	130
Wan	Hui	9-35-1	IMECE2019-11936	94	Wang	Lulu	4-4-2	IMECE2019-10910	35
Wan	Hui	15-1-1	IMECE2019-11855	187	Wang	Mengyuan	16-1-1	IMECE2019-13146	195
Wan	Justin	16-1-1	IMECE2019-13629	200	Wang	Michael Cai	2-4-1	IMECE2019-11868	14
Wan	Shaoke	2-8-2	IMECE2019-11807	19	Wang	Michael Cai	2-4-2	IMECE2019-11327	15
Wang	Alan X.	16-1-1	IMECE2019-12771	192	Wang	Michael Cai	17-2-1	IMECE2019-11360	205
Wang	Bohan	11-1-2	IMECE2019-12235	146	Wang	Mingsong	16-1-1	IMECE2019-12656	191
Wang	Chengping	5-8-3	IMECE2019-12417	51	Wang	Qi	2-5-3	IMECE2019-10801	17
Wang	Chengyong	13-5-1	IMECE2019-10803	178	Wang	Qiming	2-2-7	IMECE2019-13151	18
Wang	Chi-Wei	12-7-2	IMECE2019-10450	173	Wang	Qiming	11-3-1	IMECE2019-13280	163
Wang	Dan	4-6-1	IMECE2019-11389	36	Wang	Qiming	11-5-5	IMECE2019-13259	166
Wang	Dan	4-6-1	IMECE2019-11416	36	Wang	Qingmiao	4-2-5	IMECE2019-10918	43
Wang	Dianjun	14-3-1	IMECE2019-10488	182	Wang	Qing-Ming	2-3-1	IMECE2019-10993	24
Wang	Fuji	2-5-3	IMECE2019-10801	17	Wang	Qingyang	9-31-1	IMECE2019-13477	111
Wang	Fuji	2-5-3	IMECE2019-10802	17	Wang	Qingyang	17-15-1	IMECE2019-13445	214
Wang	Gang	5-7-1	IMECE2019-10869	55	Wang	Qiuyun	16-1-1	IMECE2019-13110	194
Wang	Guan	13-6-1	IMECE2019-11130	175	Wang	Qiuyun	17-15-1	IMECE2019-13088	213
Wang	Guan	13-6-1	IMECE2019-11193	175	Wang	Rick	10-10-3	IMECE2019-10433	116
Wang	Guolei	3-14-1	IMECE2019-10827	32	Wang	Robert Y.	9-51-2	IMECE2019-12526	111
Wang	Guolei	8-9-2	IMECE2019-11896	83	Wang	Shaoguang	8-4-2	IMECE2019-11355	90
Wang	Hailei	6-9-1	IMECE2019-10768	72	Wang	Shengde	9-32-1	IMECE2019-11096	93
Wang	Hairui	8-4-1	IMECE2019-11434	89	Wang	Shike	14-1-1	IMECE2019-11332	183
Wang	Heng	9-25-2	IMECE2019-12963	100	Wang	Shisong	14-1-1	IMECE2019-11332	183
Wang	Heng	16-1-1	IMECE2019-12929	193	Wang	Shuolun	11-5-4	IMECE2019-13368	164
Wang	Heying	3-15-1	IMECE2019-10717	30	Wang	Ting	6-16-1	IMECE2019-10279	65
Wang	Heying	6-4-1	IMECE2019-10824	64	Wang	Ting	8-9-1	IMECE2019-10636	83
Wang	Hsin	6-11-2	IMECE2019-12469	70	Wang	Ting	9-18-2	IMECE2019-10318	108
Wang	Hua	2-10-1	IMECE2019-10306	7	Wang	Wei	13-6-1	IMECE2019-11193	175
Wang	Hui	11-32-1	IMECE2019-11790	155	Wang	Wei	13-6-1	IMECE2019-11282	175
Wang	Huitian	10-10-2	IMECE2019-12449	115	Wang	Wei	17-6-1	IMECE2019-12434	207
Wang	Ji	5-10-2	IMECE2019-12087	50	Wang	Weidi	10-19-1	IMECE2019-13467	127
Wang	Ji	11-1-7	IMECE2019-12056	157	Wang	Weidi	11-23-2	IMECE2019-13062	153
Wang	Jiahui	9-30-1	IMECE2019-12709	108	Wang	Weidi	16-1-1	IMECE2019-13568	199
Wang	Jian	5-7-1	IMECE2019-10831	55	Wang	Wenhu	2-12-1	IMECE2019-11002	10
Wang	Jian	5-7-1	IMECE2019-10869	55	Wang	Wenhu	2-5-4	IMECE2019-11036	19
Wang	Jianran	13-10-2	IMECE2019-12310	177	Wang	Wenhu	2-7-3	IMECE2019-11034	24
Wang	Jianran	13-10-2	IMECE2019-12446	177	Wang	Wenhu	10-26-2	IMECE2019-10837	115
Wang	Jiarui	11-28-1	IMECE2019-12540	135	Wang	Wenhu	10-24-1	IMECE2019-10901	123
Wang	Jie	14-1-1	IMECE2019-11332	183	Wang	Xia	6-4-5	IMECE2019-10375	70
Wang	Jimi	2-4-1	IMECE2019-13199	14	Wang	Xiaojia	17-15-1	IMECE2019-12837	213
Wang	Jimi	16-1-1	IMECE2019-13200	195	Wang	Xiaokang	16-1-1	IMECE2019-13607	199
Wang	Jin	2-12-2	IMECE2019-12122	13	Wang	Xiaonan	11-38-1	IMECE2019-10136	146
Wang	Jin	10-9-2	IMECE2019-12123	124	Wang	Xiaonan	11-38-3	IMECE2019-10069	150
Wang	Jing	5-4-3	IMECE2019-11206	58	Wang	Xiaonan	17-11-2	IMECE2019-12508	210
Wang	Jingyu	4-6-2	IMECE2019-10514	37	Wang	Xiaoran	1-6-2	IMECE2019-12973	5
Wang	Jingyu	7-5-1	IMECE2019-10747	81	Wang	Xiaoran	11-14-3	IMECE2019-10379	149

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Wang	Xiaoran	14-1-1	IMECE2019-10346	183	Wei	Haoyan	11-10-2	IMECE2019-11726	138
Wang	Xiaoran	14-1-2	IMECE2019-10348	183	Wei	Haoyan	11-10-2	IMECE2019-11733	138
Wang	Xiaotian	16-1-1	IMECE2019-12632	191	Wei	Qiuming	10-26-4	IMECE2019-11612	119
Wang	Xiaotian	16-1-1	IMECE2019-13604	199	Wei	Shaolou	10-27-3	IMECE2019-13892	131
Wang	Xin	6-4-4	IMECE2019-10110	69	Wei	Tingting	6-1-1	IMECE2019-11227	61
Wang	Xin	7-10-1	IMECE2019-10540	77	Wei	Xingjian	2-2-4	IMECE2019-11917	18
Wang	Xiuling	8-6-3	IMECE2019-11352	90	Wei	Xingjian	2-2-5	IMECE2019-11999	19
Wang	Xiuling	8-4-2	IMECE2019-11355	90	Wei	Xingjian	4-5-4	IMECE2019-12150	39
Wang	Xiuling	8-4-3	IMECE2019-11462	91	Wei	Xingjian	17-10-1	IMECE2019-12688	210
Wang	Xu	1-6-2	IMECE2019-12470	5	Wei	Xingjian	17-10-1	IMECE2019-12721	210
Wang	Xuemin	11-7-3	IMECE2019-12544	140	Weibel	Justin	9-49-1	IMECE2019-11386	109
Wang	Y.-Q.	2-3-2	IMECE2019-10280	25	Weigold	Matthias	2-8-3	IMECE2019-11266	20
Wang	Yachao	2-12-2	IMECE2019-12122	13	Weise	Dieter	2-7-2	IMECE2019-10390	23
Wang	Yaguo	9-53-1	IMECE2019-12210	112	Weislogel	Mark	8-6-2	IMECE2019-11500	89
Wang	Yaguo	17-9-1	IMECE2019-12224	209	Weiss Cohen	Miri	14-2-1	IMECE2019-10315	181
Wang	Yaguo	17-15-1	IMECE2019-12795	213	Weissman	Jeffrey G.	6-4-3	IMECE2019-10637	67
Wang	Yan	9-26-1	IMECE2019-13723	102	Welte	Michael	9-4-1	IMECE2019-13286	106
Wang	Yan	9-26-1	IMECE2019-13787	102	Wen	Jie	6-4-3	IMECE2019-11149	67
Wang	Yan	17-15-1	IMECE2019-12942	213	Wen	Yi	1-6-1	IMECE2019-10836	2
Wang	Yan	17-15-1	IMECE2019-13817	215	Wen	Yi	5-2-2	IMECE2019-11008	58
Wang	Yang	11-39-3	IMECE2019-12007	142	Weng	George	10-25-1	IMECE2019-13379	123
Wang	Yaohui	17-15-1	IMECE2019-12584	212	Weng	George	16-1-1	IMECE2019-13382	197
Wang	Yi	3-13-1	IMECE2019-11333	29	Wentzky	Chase	16-1-1	IMECE2019-13672	200
Wang	Yining	16-1-1	IMECE2019-12829	193	Westrick	Richard	4-11-2	IMECE2019-11948	44
Wang	Yixiu	9-25-2	IMECE2019-12964	100	Whang	Grace	9-5-1	IMECE2019-13086	111
Wang	Yongfei	2-6-2	IMECE2019-11297	11	Wheeler	Robert	2-2-5	IMECE2019-12981	20
Wang	Yongfei	14-1-2	IMECE2019-11286	183	Whisner	Bruce	13-5-1	IMECE2019-10592	178
Wang	Yu	2-11-1	IMECE2019-10851	8	White	Allison	4-5-1	IMECE2019-11944	34
Wang	Yu	16-1-1	IMECE2019-12735	192	White	Benjamin A.	5-2-3	IMECE2019-11846	59
Wang	Yunxiang	16-1-1	IMECE2019-13282	196	White	Darris	5-3-3	IMECE2019-10682	47
Wang	Yu-Po	2-12-1	IMECE2019-10563	10	White	Darris	5-3-3	IMECE2019-10770	47
Wang	Yu-Po	12-3-1	IMECE2019-11181	170	White	Hannah	15-1-1	IMECE2019-13967	189
Wang	Yuxiang	14-3-1	IMECE2019-11199	182	White	Philip	6-1-3	IMECE2019-13615	63
Wang	Zeng-qiang	2-5-4	IMECE2019-11036	19	Whitmer	Lucas A.	2-5-6	IMECE2019-13880	22
Wang	Zhi	10-9-1	IMECE2019-12794	122	Whitmer	Lucas A.	10-26-6	IMECE2019-13896	121
Wang	Zhihao	9-9-1	IMECE2019-11877	101	Whitson	Ashley	13-5-1	IMECE2019-10592	178
Wang	Zhiyong	2-2-1	IMECE2019-10758	14	Whitt	Austin	2-12-2	IMECE2019-12784	13
Wang	Zhuo	11-39-1	IMECE2019-13026	136	Whitworth	Horace	11-14-2	IMECE2019-10978	147
Wang	Zhuo	16-1-1	IMECE2019-13207	195	Wiechel	John	13-5-1	IMECE2019-12285	178
Ward	Nicholas J.	13-4-1	IMECE2019-11872	178	Wiezorek	Jorg	10-27-2	IMECE2019-13624	128
Ware	Taylor H.	16-1-1	IMECE2019-12872	193	Wijesundara	Muthu B.J.	4-2-4	IMECE2019-10675	41
Wärmefjord	Kristina	2-10-2	IMECE2019-10285	10	Wiklund	Theodore	13-9-1	IMECE2019-11279	179
Warnix	Trevor	5-9-1	IMECE2019-10334	48	Wikramanayake	Enakshi D.	6-10-3	IMECE2019-11707	74
Warnix	Trevor	5-4-5	IMECE2019-10291	60	Wiles	Carson	9-16-1	IMECE2019-10034	111
Wartzack	Sandro	2-10-3	IMECE2019-11328	12	Wilkerson	Justin	11-8-1	IMECE2019-13381	133
Watanabe	Aya	5-7-1	IMECE2019-10474	55	Wille	Kay	16-1-1	IMECE2019-13949	203
Watanabe	Kazuhiro	4-4-1	IMECE2019-11125	33	Willey	Landon	14-3-3	IMECE2019-13675	184
Waters	Grant M.	2-5-6	IMECE2019-13868	22	Williams	Cyril	11-8-3	IMECE2019-12658	140
Watkins	Thomas R.	6-11-2	IMECE2019-12469	70	Williams	Lakiesha	4-2-2	IMECE2019-13209	39
Watring	Dillon S.	2-2-2	IMECE2019-13226	15	Williams	Todd	9-6-1	IMECE2019-13537	98
Watring	Dillon S.	11-14-3	IMECE2019-12819	149	Williamson	Andrew	6-2-1	IMECE2019-12046	64
Watson	Bryan	16-1-1	IMECE2019-12818	192	Willis	David	4-6-2	IMECE2019-11565	37
Watson-Kassa	Cori	8-14-1	IMECE2019-10972	83	Wilmes	Dominic	11-22-1	IMECE2019-13075	141
Weaver	Caitlin	4-2-5	IMECE2019-11981	43	Wimmer	Stephanie	2-9-2	IMECE2019-10608	9
Webb	Spencer	15-1-1	IMECE2019-13928	187	Wineman	Alan S.	11-5-3	IMECE2019-13519	160
Webber	Michael	6-1-3	IMECE2019-13615	63	Wirz	Richard	4-6-2	IMECE2019-12549	37
Webber	Michael	6-10-2	IMECE2019-11068	73	Wisniewski	Jack	12-6-1	IMECE2019-13047	172
Webber	Michael	6-10-3	IMECE2019-11707	74	Witek	M.	12-3-1	IMECE2019-11921	170
Weber	Adam	6-12-2	IMECE2019-12436	74	Witherell	Paul	2-2-1	IMECE2019-11727	14
Weber	Alfred P.	11-42-1	IMECE2019-12782	136	Witkop	Christian	15-1-1	IMECE2019-13976	189
Weber	Bryan	7-7-1	IMECE2019-10615	80	Wojnar	Charles	10-24-1	IMECE2019-12537	123
Weber	Stefan K.	8-4-3	IMECE2019-11747	91	Woldemariam	Yoseph	7-5-1	IMECE2019-10235	81
Weerawarne	Darshana	2-2-3	IMECE2019-12027	16	Wollmann	Annett	11-42-1	IMECE2019-12782	136
Weers	Martin	11-42-1	IMECE2019-12782	136	Wong	Bob	4-8-1	IMECE2019-11889	38
Wegener	Luca G.	14-2-2	IMECE2019-10105	183	Wong	Joseph	17-4-3	IMECE2019-13595	207
Wei	Congjie	10-24-1	IMECE2019-12537	123	Wong	M.	3-3-1	IMECE2019-11968	32
Wei	Congjie	11-25-1	IMECE2019-12536	142	Wood	David	9-19-1	IMECE2019-12956	103
Wei	Congjie	11-39-4	IMECE2019-12535	150	Wood	Houston G.	8-14-1	IMECE2019-10972	83
Wei	Congjie	11-27-1	IMECE2019-12533	153	Woodhams	Louis G.	16-2-1	IMECE2019-13087	203
Wei	Congjie	11-23-3	IMECE2019-12538	155	Woodings	Robert	8-11-1	IMECE2019-11764	86
Wei	Congjie	11-12-2	IMECE2019-12539	161	Woolley	William	11-18-1	IMECE2019-13442	135
Wei	Donglai	1-1-4	IMECE2019-13354	3	Woon	Wei	2-9-2	IMECE2019-11232	9
Wei	Han	9-25-1	IMECE2019-10688	98	Worl	Bethany	8-6-3	IMECE2019-11352	90
Wei	Haoyan	11-28-1	IMECE2019-12651	135	Wostbrock	Neal	16-1-1	IMECE2019-13597	199

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Wrede	Alex H.	4-2-1	IMECE2019-12885	36	Xiao	Jianliang	10-25-1	IMECE2019-13920	123
Wright	Kamau	6-1-2	IMECE2019-12059	62	Xiao	Jianliang	10-14-2	IMECE2019-13913	124
Wu	Bin	3-15-1	IMECE2019-10717	30	Xiao	Jianliang	11-17-1	IMECE2019-12817	134
Wu	Bin	3-14-1	IMECE2019-11364	32	Xiao	Jianliang	11-27-1	IMECE2019-13916	153
Wu	Bin	5-8-1	IMECE2019-10788	48	Xiao	Jianliang	11-5-1	IMECE2019-13129	155
Wu	Bin	6-4-1	IMECE2019-10824	64	Xiao	Ting	6-4-1	IMECE2019-10824	64
Wu	C.T.	3-12-2	IMECE2019-13308	31	Xiao	Xinyi	2-8-1	IMECE2019-13245	17
Wu	C.T.	11-28-1	IMECE2019-12293	135	Xiao	Xinyi	16-1-1	IMECE2019-13246	196
Wu	C.T.	11-38-3	IMECE2019-12487	150	Xie	Jingjin	10-25-1	IMECE2019-13379	123
Wu	Chao	11-5-5	IMECE2019-13424	166	Xie	Jingjin	16-1-1	IMECE2019-13382	197
Wu	Chenglin	10-24-1	IMECE2019-12537	123	Xie	Longtao	5-10-2	IMECE2019-12087	50
Wu	Chenglin	11-25-1	IMECE2019-12536	142	Xie	Nan	2-3-2	IMECE2019-10280	25
Wu	Chenglin	11-39-4	IMECE2019-12535	150	Xie	Sheng Q.	4-13-1	IMECE2019-10845	44
Wu	Chenglin	11-27-1	IMECE2019-12533	153	Xin	An	2-2-7	IMECE2019-13151	18
Wu	Chenglin	11-23-3	IMECE2019-12538	155	Xin	Shihe	8-2-1	IMECE2019-11675	86
Wu	Chenglin	11-12-2	IMECE2019-12539	161	Xing	Siyuan	5-8-1	IMECE2019-10771	48
Wu	Chenglin	15-1-1	IMECE2019-13981	189	Xiong	Guoping	9-31-1	IMECE2019-13099	111
Wu	Chenglin	17-15-1	IMECE2019-13843	215	Xiong	Lianghua	16-1-1	IMECE2019-13772	201
Wu	Hang	13-6-1	IMECE2019-11282	175	Xiong	Liming	11-23-1	IMECE2019-13264	152
Wu	Huaiyu	4-4-2	IMECE2019-12208	35	Xiong	Liming	11-36-1	IMECE2019-13838	159
Wu	Huan	9-25-1	IMECE2019-13535	98	Xiong	Liming	16-1-1	IMECE2019-13223	196
Wu	Huixuan	8-12-1	IMECE2019-10652	86	Xiong	Liming	16-1-1	IMECE2019-13243	196
Wu	Jingyi	8-6-4	IMECE2019-12378	92	Xiong	Yi-feng	10-26-2	IMECE2019-10837	115
Wu	Jun	5-3-2	IMECE2019-10916	50	Xiong	Yi-feng	10-24-1	IMECE2019-10901	123
Wu	Kai	2-10-1	IMECE2019-10231	7	Xiong	Zhenkai	5-11-2	IMECE2019-11185	57
Wu	Kai	2-11-1	IMECE2019-10851	8	Xiu	Ruixian	13-10-2	IMECE2019-12446	177
Wu	Kang	1-6-1	IMECE2019-10836	2	Xu	Baoxing	7-1-2	IMECE2019-12965	78
Wu	Kang	5-2-2	IMECE2019-11008	58	Xu	Baoxing	10-2-2	IMECE2019-13541	128
Wu	Keo-Yuan	13-6-1	IMECE2019-11806	175	Xu	Baoxing	10-12-1	IMECE2019-12869	129
Wu	Kuo-Ting	1-12-2	IMECE2019-13621	6	Xu	Baoxing	10-12-1	IMECE2019-12914	129
Wu	Lianmei	5-7-1	IMECE2019-10869	55	Xu	Baoxing	11-39-2	IMECE2019-12868	139
Wu	Matthew	9-45-1	IMECE2019-12017	96	Xu	Baoxing	11-37-5	IMECE2019-12861	165
Wu	Matthew	17-15-1	IMECE2019-13334	214	Xu	Baoxing	16-1-1	IMECE2019-12719	192
Wu	Mengren	8-6-1	IMECE2019-10533	88	Xu	Baoxing	16-1-1	IMECE2019-12847	193
Wu	Mengren	8-6-1	IMECE2019-10535	92	Xu	Baoxing	16-1-1	IMECE2019-13015	194
Wu	Miao	5-7-1	IMECE2019-10831	55	Xu	Bingzhe	11-5-4	IMECE2019-13351	164
Wu	Miao	5-7-1	IMECE2019-10869	55	Xu	Chang	2-7-2	IMECE2019-10486	23
Wu	Mingtao	2-13-3	IMECE2019-10135	13	Xu	Changqing	1-1-4	IMECE2019-13645	3
Wu	Mingtao	2-13-3	IMECE2019-10442	13	Xu	Chao	1-12-1	IMECE2019-10495	5
Wu	Qianhong	16-1-1	IMECE2019-13097	194	Xu	Chao	5-16-1	IMECE2019-12216	54
Wu	Qianhong	16-1-1	IMECE2019-13110	194	Xu	Dong	4-13-1	IMECE2019-10845	44
Wu	Qianhong	16-1-1	IMECE2019-13156	195	Xu	Dongchao	17-15-1	IMECE2019-12837	213
Wu	Qianhong	16-1-1	IMECE2019-13160	195	Xu	Dongyan	9-43-1	IMECE2019-12922	94
Wu	Qianhong	17-15-1	IMECE2019-13088	213	Xu	Guoqiang	6-4-3	IMECE2019-11149	67
Wu	Qianhong	17-15-1	IMECE2019-13098	213	Xu	Han	4-13-1	IMECE2019-10845	44
Wu	Qianhong	17-15-1	IMECE2019-13154	214	Xu	Hao	13-6-1	IMECE2019-11193	175
Wu	Qianhong	17-15-1	IMECE2019-13158	214	Xu	Hongbin	2-2-4	IMECE2019-11997	18
Wu	Shuai	11-46-1	IMECE2019-12498	137	Xu	Huijie	4-2-5	IMECE2019-10918	43
Wu	Shuai	11-2-1	IMECE2019-13137	157	Xu	Jiajun	7-6-1	IMECE2019-12437	78
Wu	Wei	16-1-1	IMECE2019-13282	196	Xu	Jiajun	7-4-1	IMECE2019-12438	80
Wu	Wenzhuo	9-25-2	IMECE2019-12964	100	Xu	Jiajun	9-59-1	IMECE2019-12272	110
Wu	Xian	10-4-5	IMECE2019-10865	119	Xu	Jiajun	14-4-2	IMECE2019-12274	182
Wu	Xiangfa	2-9-3	IMECE2019-13763	12	Xu	Jiayi	16-1-1	IMECE2019-12792	192
Wu	Xiangfa	16-1-1	IMECE2019-12713	191	Xu	Jie	8-6-1	IMECE2019-10533	88
Wu	Xiangfa	17-6-1	IMECE2019-13758	208	Xu	Jie	8-6-1	IMECE2019-10535	92
Wu	Xiangfa	17-11-2	IMECE2019-13755	211	Xu	Jun	10-15-1	IMECE2019-10128	129
Wu	Xin	10-9-2	IMECE2019-12123	124	Xu	Jun	10-23-2	IMECE2019-12409	130
Wu	Xuehai	4-4-1	IMECE2019-12182	33	Xu	Jun	10-23-2	IMECE2019-12515	130
Wu	Xuewang	17-15-1	IMECE2019-12837	213	Xu	Jun	11-10-1	IMECE2019-12321	134
Wu	Ying	1-1-4	IMECE2019-13645	3	Xu	Jun	11-10-4	IMECE2019-12322	145
Wyatt Jr.	Brian	15-1-1	IMECE2019-11531	187	Xu	Lei	11-7-6	IMECE2019-13639	149
Wynne	Robert K.	6-12-2	IMECE2019-12757	74	Xu	Lijiang	3-7-1	IMECE2019-13128	28
Xi	Jensen	15-1-1	IMECE2019-13964	189	Xu	Lingji	10-13-1	IMECE2019-10766	129
Xi	Jensen	15-1-1	IMECE2019-13965	189	Xu	Meng	6-4-5	IMECE2019-10375	70
Xi	Jinxiang	4-10-1	IMECE2019-11697	40	Xu	Miaomiao	3-8-1	IMECE2019-10948	30
Xia	Shaojun	6-2-2	IMECE2019-10115	65	Xu	Miaomiao	5-6-1	IMECE2019-10702	57
Xia	Shaojun	6-2-3	IMECE2019-10116	66	Xu	Minghai	10-17-2	IMECE2019-12271	123
Xia	Shaojun	9-51-2	IMECE2019-10117	112	Xu	Minghan	9-43-1	IMECE2019-11033	93
Xia	Yingxiang	2-7-1	IMECE2019-10472	23	Xu	Minghan	9-43-1	IMECE2019-12081	93
Xian	Cory	4-2-3	IMECE2019-10945	40	Xu	Tingge	11-7-3	IMECE2019-12544	140
Xiang	Liangzhong	3-4-1	IMECE2019-10480	29	Xu	Weiliang	12-6-1	IMECE2019-12531	172
Xiang	Xinrui	6-7-2	IMECE2019-10457	67	Xu	Xianchen	1-1-1	IMECE2019-13891	1
Xiang	Yujiang	16-1-1	IMECE2019-13642	200	Xu	Xianfan	9-25-2	IMECE2019-12964	100
Xiao	Jianliang	10-25-1	IMECE2019-13131	123	Xu	Xianfan	9-30-2	IMECE2019-13400	109

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Xu	Xianfan	16-1-1	IMECE2019-12829	193	Yang	Ruiheng	10-10-2	IMECE2019-12447	115
Xu	Xianfan	16-1-1	IMECE2019-12968	193	Yang	Ruiheng	10-10-2	IMECE2019-12448	115
Xu	Yanfei	9-24-1	IMECE2019-13587	107	Yang	Shengyou	11-2-1	IMECE2019-13121	157
Xu	Yaqiong	8-6-4	IMECE2019-13565	92	Yang	Shuo	6-4-1	IMECE2019-10824	64
Xu	Yaqiong	17-15-1	IMECE2019-13593	212	Yang	Tianhao	11-17-1	IMECE2019-13134	134
Xu	Yeyin	5-8-2	IMECE2019-10983	49	Yang	Tianhao	12-7-1	IMECE2019-11749	169
Xu	Yiwei	11-1-5	IMECE2019-12623	153	Yang	Wenhua	11-7-6	IMECE2019-10672	149
Xu	Yuning	4-7-1	IMECE2019-10584	34	Yang	Wenhua	15-1-1	IMECE2019-13961	189
Xu	Zhe	11-37-4	IMECE2019-13848	163	Yang	Wenhua	16-1-1	IMECE2019-13207	195
Xu	Zhibang	6-4-5	IMECE2019-10375	70	Yang	Xianfeng Terry	16-1-1	IMECE2019-12683	191
Xu	Zhigang	10-26-4	IMECE2019-11612	119	Yang	Xiaolong	9-25-2	IMECE2019-12964	100
Xu	Zhigang	10-26-5	IMECE2019-11783	120	Yang	Yingchao	11-39-3	IMECE2019-11573	142
Xue	Hong-liang	2-5-4	IMECE2019-11036	19	Yano	Kenichi	4-6-1	IMECE2019-10382	36
Xue	Jing	11-46-2	IMECE2019-12810	143	Yano	Kenichi	5-11-2	IMECE2019-11176	57
Xue	Jing	11-7-5	IMECE2019-12669	147	Yantek	David	13-5-1	IMECE2019-10592	178
Xue	Xiaowei	1-1-5	IMECE2019-13364	3	Yao	Bojing	9-20-1	IMECE2019-11365	94
Yadav	Upendra	11-33-2	IMECE2019-13410	150	Yao	Guangfa	9-2-1	IMECE2019-10236	104
Yadav	Upendra	11-23-2	IMECE2019-13671	153	Yao	Guangfa	11-43-1	IMECE2019-10237	139
Yadollahi	Aref	2-3-1	IMECE2019-10323	24	Yao	Jiamin	1-6-1	IMECE2019-10836	2
Yaghoobi	Mohammadreza	10-2-1	IMECE2019-12699	126	Yao	Jiamin	5-2-2	IMECE2019-11008	58
Yaghoobi	Mohammadreza	11-12-3	IMECE2019-12700	164	Yao	Kaihan	11-5-5	IMECE2019-13424	166
Yagoobi	Jamal	8-2-3	IMECE2019-11404	88	Yao	Qinbo	6-1-1	IMECE2019-11227	61
Yagoobi	Jamal	9-43-2	IMECE2019-10123	95	Yao	Shouju	11-5-5	IMECE2019-13424	166
Yagoobi	Jamal	17-9-1	IMECE2019-13298	209	Yao	Wei	5-10-1	IMECE2019-11054	52
Yahsi	Mehmet	13-9-1	IMECE2019-11478	179	Yao	Zhenqiang	2-6-1	IMECE2019-11104	9
Yakacki	Christopher	11-1-4	IMECE2019-13397	152	Yao	Zhenqiang	9-32-1	IMECE2019-11096	93
Yalvac	Baturay	14-2-2	IMECE2019-10105	183	Yarmolenko	Sergey	10-26-4	IMECE2019-11612	119
Yamakawa	Junya	5-9-2	IMECE2019-10781	50	Yarmolenko	Sergey	16-1-1	IMECE2019-13427	197
Yamakawa	Junya	5-4-1	IMECE2019-10780	54	Yarmolenko	Sergey	16-1-1	IMECE2019-13473	198
Yamamoto	Tomohisa	4-14-1	IMECE2019-11881	41	Yasuda	Hiroshi	10-4-2	IMECE2019-13186	114
Yamashita	Akira	5-7-1	IMECE2019-10474	55	Yasuda	Hiroshi	10-4-5	IMECE2019-13764	119
Yamashita	Akira	5-7-1	IMECE2019-11115	55	Yasuda	Nathan K.	10-26-5	IMECE2019-12096	120
Yamauchi	Masahiro	2-14-1	IMECE2019-12509	21	Yayoglu	Yahya E.	2-12-1	IMECE2019-11810	10
Yan	Chen	2-10-1	IMECE2019-10306	7	Ye	Peide D.	9-25-2	IMECE2019-12964	100
Yan	Jiawei	4-10-4	IMECE2019-12313	44	Ye	Ruiqian	11-5-5	IMECE2019-13424	166
Yan	Jiawei	4-10-4	IMECE2019-13221	44	Ye	Ward	2-12-1	IMECE2019-10563	10
Yan	Jinhui	11-46-1	IMECE2019-12606	136	Yeager	Jonathan	9-19-2	IMECE2019-10799	104
Yan	Karen Chang	4-5-4	IMECE2019-11545	39	Yeager	Jonathan	9-51-1	IMECE2019-13229	110
Yan	Ming-Han	9-18-2	IMECE2019-10689	107	Yee	Raymond	2-2-1	IMECE2019-10745	14
Yan	Yan	12-3-1	IMECE2019-10629	169	Yee	Raymond	4-10-3	IMECE2019-11005	42
Yan	Yishu	2-2-5	IMECE2019-13113	20	Yee	Raymond	9-25-1	IMECE2019-10691	98
Yan	Yishu	11-32-1	IMECE2019-13123	155	Yee	Shannon K.	9-30-1	IMECE2019-12610	108
Yan	Yishu	16-1-1	IMECE2019-13118	194	Yee	Shannon K.	9-30-2	IMECE2019-13270	109
Yanaga	Koji	6-5-2	IMECE2019-11382	63	Yee	Shannon K.	17-15-1	IMECE2019-12609	212
Yanaga	Koji	6-4-2	IMECE2019-10403	66	Yee	Tien	6-14-1	IMECE2019-11025	75
Yanaga	Koji	6-4-2	IMECE2019-13939	66	Yee	Tien	6-14-2	IMECE2019-11027	76
Yancey	Michael	17-4-2	IMECE2019-13882	206	Yellavajjala	Ravi Kiran	11-18-3	IMECE2019-13283	141
Yang	Baisong	5-5-1	IMECE2019-11370	47	Yenusah	Caleb	11-7-6	IMECE2019-10672	149
Yang	Chen	10-4-4	IMECE2019-13449	118	Yenusah	Caleb	15-1-1	IMECE2019-13961	189
Yang	Chen	11-14-1	IMECE2019-12516	145	Yeom	Junghoon	11-5-4	IMECE2019-13655	164
Yang	Chen	11-1-6	IMECE2019-12187	154	Yeom	Junghoon	17-15-1	IMECE2019-13715	214
Yang	Chen	11-3-2	IMECE2019-13435	166	Yerram	Ravinder	8-9-2	IMECE2019-11090	83
Yang	Chenglin	11-37-4	IMECE2019-12672	162	Yi	Chenglin	11-26-3	IMECE2019-12278	164
Yang	Chulho	10-14-1	IMECE2019-11340	122	Yi	Hang	13-6-1	IMECE2019-11130	175
Yang	Chulho	10-9-2	IMECE2019-11361	124	Yi	Hang	13-6-1	IMECE2019-11193	175
Yang	Chun-Lin	5-8-3	IMECE2019-11879	51	Yi	Taeil	12-8-1	IMECE2019-12990	170
Yang	Eui-Hyeok	16-1-1	IMECE2019-12632	191	Yilbas	Bekir Sami	6-10-1	IMECE2019-10720	72
Yang	Eui-Hyeok	16-1-1	IMECE2019-13604	199	Yilmaz	Nadir	11-14-2	IMECE2019-10978	147
Yang	Fei	5-7-1	IMECE2019-10831	55	Yilmaz	Tufan	2-8-1	IMECE2019-11554	17
Yang	Fei	5-7-1	IMECE2019-10869	55	Yilmaz	Tufan	4-10-2	IMECE2019-11530	41
Yang	Fengyuan	11-2-1	IMECE2019-13137	157	Yilmaz	Tufan	11-12-4	IMECE2019-11510	166
Yang	Guang	8-6-4	IMECE2019-12378	92	Yin	Jie	10-4-4	IMECE2019-13509	118
Yang	Hang	10-10-2	IMECE2019-12476	115	Yin	Jie	10-14-2	IMECE2019-13407	124
Yang	Jingru	10-13-1	IMECE2019-10766	129	Yin	Jie	10-14-2	IMECE2019-13956	124
Yang	Jiongcan	5-4-2	IMECE2019-10789	56	Yin	Jie	11-1-7	IMECE2019-13503	157
Yang	Kaiming	5-12-1	IMECE2019-11203	53	Yin	Jie	11-5-3	IMECE2019-13433	160
Yang	Lianxin	4-7-1	IMECE2019-10584	34	Yin	Jie	11-37-5	IMECE2019-13443	165
Yang	Lin	9-25-1	IMECE2019-13606	98	Yin	Jie	17-15-1	IMECE2019-13504	214
Yang	Lin	17-9-1	IMECE2019-13618	209	Yin	Jie	17-15-1	IMECE2019-13507	214
Yang	Mengqiao	9-43-2	IMECE2019-10123	95	Yin	Jie	17-15-1	IMECE2019-13513	214
Yang	Mengqiao	17-9-1	IMECE2019-13298	209	Yin	Mengtian	7-1-2	IMECE2019-12965	78
Yang	Mijia	5-13-1	IMECE2019-12796	59	Yin	Sha	10-10-2	IMECE2019-12447	115
Yang	Mijia	5-13-1	IMECE2019-12797	59	Yin	Sha	10-10-2	IMECE2019-12448	115
Yang	Ruey-Jen	17-4-3	IMECE2019-12384	207	Yin	Sha	10-10-2	IMECE2019-12449	115

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Yin	Sha	11-10-1	IMECE2019-12321	134	Zaitseva	Nadezhda	2-10-2	IMECE2019-10635	10
Yin	Sha	11-10-4	IMECE2019-12322	145	Zaker Esteghamati	Mohsen	16-1-1	IMECE2019-13234	196
Yin	Tony	17-4-2	IMECE2019-13887	206	Zaker Esteghamati	Mohsen	16-1-1	IMECE2019-13556	199
Yin	Yunlei	4-2-5	IMECE2019-10918	43	Zalesak	Martin	17-6-1	IMECE2019-10438	207
Yin	Zhewen	2-4-1	IMECE2019-11868	14	Zallo	Antonio	5-2-2	IMECE2019-11150	58
Yin	Zhewen	2-4-2	IMECE2019-11327	15	Zaluzec	Severin	17-6-1	IMECE2019-13834	208
Yin	Zhewen	17-2-1	IMECE2019-11360	205	Zaman	Rahid	16-1-1	IMECE2019-13642	200
Ying	Xiaoyan	9-30-1	IMECE2019-12553	108	Zaman	Wahid	16-1-1	IMECE2019-13318	197
Yoganandan	Narayan	4-2-4	IMECE2019-11860	42	Zamora-Garcia	Diego A.	10-26-5	IMECE2019-11919	120
Yonezu	Akio	10-10-4	IMECE2019-11081	118	Zamora-Hernández	Israel	7-10-2	IMECE2019-11813	79
Yonezu	Akio	10-10-4	IMECE2019-11099	118	Zandigohar	Mehrdad	6-11-2	IMECE2019-11874	70
Yonezu	Akio	10-10-4	IMECE2019-11141	118	Zanin	Hudson	11-39-4	IMECE2019-12743	151
Yonezu	Akio	10-10-4	IMECE2019-11143	118	Zanin	Hudson	11-39-4	IMECE2019-12820	151
Yonezu	Akio	10-24-2	IMECE2019-11145	125	Zanteson	Jane	3-10-1	IMECE2019-13483	31
Yonkey	Jeffrey	13-5-1	IMECE2019-10592	178	Zappino	Enrico	1-6-2	IMECE2019-12608	5
Yoon	Hae-Sung	16-1-1	IMECE2019-13538	198	Zappino	Enrico	2-9-2	IMECE2019-11261	9
Yoon	Insun	11-47-4	IMECE2019-13210	153	Zappino	Enrico	3-14-1	IMECE2019-11281	32
Yosef	Lidor	3-6-1	IMECE2019-12641	27	Zappino	Enrico	3-14-1	IMECE2019-11314	32
Yoshioka	Shuhei	10-10-4	IMECE2019-11141	118	Zarate-Garcia	J. Asuncion	7-10-2	IMECE2019-11813	79
You	Byoung Hee	12-3-1	IMECE2019-11921	170	Zare	Saeid	6-16-1	IMECE2019-10991	65
You	Byoung Hee	12-3-1	IMECE2019-12791	170	Zargar	Kamran	12-6-1	IMECE2019-12531	172
You	Jeong Ho	10-9-1	IMECE2019-12794	122	Zarrin	Hadis	6-1-2	IMECE2019-10755	62
You	Jeong Ho	17-6-1	IMECE2019-12764	208	Zavattieri	Pablo	10-4-3	IMECE2019-13818	116
Yough	Matthew	4-7-1	IMECE2019-10984	34	Zavattieri	Pablo	16-1-1	IMECE2019-13827	202
Young	Clayton	2-2-5	IMECE2019-13601	20	Zayenouri	Mohsen	11-5-3	IMECE2019-13533	161
Youssef	George	10-10-1	IMECE2019-13546	113	Zayenouri	Mohsen	11-5-4	IMECE2019-13690	164
Youssef	George	10-10-1	IMECE2019-13776	113	Zayenouri	Mohsen	11-5-5	IMECE2019-13751	166
Youssef	George	10-1-1	IMECE2019-13835	119	Zeki	Ilhan	15-1-1	IMECE2019-11602	187
Youssef	George	10-17-2	IMECE2019-13794	123	Zeng	Danielle	3-12-2	IMECE2019-13308	31
Youssef	George	11-39-3	IMECE2019-13742	142	Zeng	Hongxia	9-24-1	IMECE2019-13587	107
Youssef	George	11-3-1	IMECE2019-13842	163	Zeng	Li	2-2-4	IMECE2019-11917	18
Yousuf	Louay S.	5-6-1	IMECE2019-10047	57	Zeng	Li	17-10-1	IMECE2019-12688	210
Yu	Bo	5-8-2	IMECE2019-10797	49	Zeng	Xianyu	1-6-2	IMECE2019-12973	5
Yu	Edward T.	9-6-1	IMECE2019-11994	98	Zeng	Xianyu	11-14-3	IMECE2019-10379	149
Yu	Hang Z.	16-1-1	IMECE2019-13633	200	Zeng	Xianyu	14-1-1	IMECE2019-10346	183
Yu	Hongyang	8-6-4	IMECE2019-10886	92	Zeng	Xianyu	14-1-2	IMECE2019-10348	183
Yu	Hongyang	9-25-2	IMECE2019-10572	100	Zenouzi	Mansour	6-2-3	IMECE2019-10739	66
Yu	Hongyang	5-7-1	IMECE2019-10869	55	Zerhouni	Othmane	11-3-2	IMECE2019-12997	166
Yu	Jaehyung	12-7-1	IMECE2019-11867	169	Zerin	Zihni	3-12-1	IMECE2019-13171	29
Yu	Jaehyung	12-7-2	IMECE2019-11830	173	Zha	Jun	2-8-1	IMECE2019-10541	17
Yu	Junyang	2-10-1	IMECE2019-10306	7	Zhan	Zhenfei	4-2-5	IMECE2019-10918	43
Yu	Kai	11-3-1	IMECE2019-12815	163	Zhang	Aibing	5-10-2	IMECE2019-12087	50
Yu	Kun Hao	11-3-1	IMECE2019-13280	163	Zhang	Bin	2-7-3	IMECE2019-11630	24
Yu	Lie	5-5-1	IMECE2019-11370	47	Zhang	Bin	2-7-4	IMECE2019-11521	25
Yu	Qingmin	11-27-1	IMECE2019-13232	154	Zhang	Binbin	5-3-2	IMECE2019-10916	50
Yu	Shi Miao	6-4-1	IMECE2019-11514	64	Zhang	Bing	2-12-2	IMECE2019-12784	13
Yu	Wenbin	3-4-2	IMECE2019-13574	30	Zhang	Bing	16-1-1	IMECE2019-12674	191
Yu	Wenbin	3-4-2	IMECE2019-13585	30	Zhang	Chao	10-15-1	IMECE2019-10128	129
Yu	Wenbin	10-4-2	IMECE2019-13420	114	Zhang	Chong	2-5-3	IMECE2019-10801	17
Yu	Yalin	11-1-2	IMECE2019-13278	146	Zhang	Chong	2-5-3	IMECE2019-10802	17
Yu	Zexing	1-12-1	IMECE2019-10495	5	Zhang	Dong	16-1-1	IMECE2019-13217	196
Yuan	Chengzhi	5-12-1	IMECE2019-11401	53	Zhang	Dongxu	17-6-1	IMECE2019-12434	207
Yuan	Li	2-13-2	IMECE2019-11160	11	Zhang	Gongye	11-36-1	IMECE2019-11094	159
Yuan	Li	5-9-2	IMECE2019-10498	50	Zhang	Haitao	11-12-1	IMECE2019-11061	158
Yuan	Li	5-9-2	IMECE2019-10835	50	Zhang	Hao	4-13-1	IMECE2019-10477	44
Yuan	Li	14-1-1	IMECE2019-11144	183	Zhang	Haohui	11-1-1	IMECE2019-12256	14
Yuan	Zelong	2-8-1	IMECE2019-10541	17	Zhang	Honglin	10-26-4	IMECE2019-11612	119
Yuan	Zhangxian	3-6-2	IMECE2019-13681	28	Zhang	Honglin	10-26-5	IMECE2019-11783	120
Yuan	Zhangxian	3-6-2	IMECE2019-13684	28	Zhang	Huisheng	6-1-1	IMECE2019-11227	61
Yuan	Zhangxian	3-6-2	IMECE2019-13704	28	Zhang	Huisheng	6-12-1	IMECE2019-11946	73
Yuan	Zhihao	10-4-2	IMECE2019-13069	114	Zhang	Huisheng	13-6-1	IMECE2019-11282	175
Yuce	Celalettin	11-12-4	IMECE2019-11510	166	Zhang	Ji	11-26-4	IMECE2019-10205	167
Yue	Honghao	5-7-1	IMECE2019-10831	55	Zhang	Ji	11-26-4	IMECE2019-10207	167
Yue	Honghao	5-7-1	IMECE2019-10869	55	Zhang	Ji	11-26-4	IMECE2019-10208	167
Yue	Xiaowei	2-10-3	IMECE2019-10843	12	Zhang	Ji	11-26-4	IMECE2019-10244	167
Yuksel	Anil	9-6-1	IMECE2019-11994	98	Zhang	Ji	11-26-4	IMECE2019-10245	167
Yusef	Moataz	6-1-2	IMECE2019-10283	62	Zhang	Jiadi	11-5-3	IMECE2019-13519	160
Yuyama	Ryousuke	5-7-1	IMECE2019-10474	55	Zhang	Jiansong	10-10-1	IMECE2019-11957	113
Zabala	Michael E.	5-10-1	IMECE2019-11506	52	Zhang	Jiayue	4-13-2	IMECE2019-11716	45
Zaccariotto	Mirco	11-38-1	IMECE2019-13301	145	Zhang	Jichang	2-9-1	IMECE2019-10832	7
Zagrai	Andrei	1-12-1	IMECE2019-12093	5	Zhang	Jie	2-10-1	IMECE2019-10020	7
Zahid	Moosa	2-5-4	IMECE2019-10961	19	Zhang	Jie	2-13-2	IMECE2019-11160	11
Zaidani	Mouna	9-64-1	IMECE2019-10507	97	Zhang	Jie	14-1-1	IMECE2019-11144	183
Zaidi	Sohail	4-13-2	IMECE2019-11802	45	Zhang	Jimin	5-8-3	IMECE2019-12417	51

Author Index

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Zhang	Jimin	8-1-1	IMECE2019-10044	87	Zhang	Yuchen	8-6-4	IMECE2019-13565	92
Zhang	Jitong	8-1-1	IMECE2019-10044	87	Zhang	Yuchen	17-15-1	IMECE2019-13593	212
Zhang	Jiwen	4-7-1	IMECE2019-10584	34	Zhang	Yue	1-6-2	IMECE2019-12973	5
Zhang	John X.J.	10-25-1	IMECE2019-13897	123	Zhang	Yue	9-24-1	IMECE2019-12940	107
Zhang	John X.J.	11-37-4	IMECE2019-13848	163	Zhang	Yue	10-12-1	IMECE2019-12869	129
Zhang	Kaihao	2-4-1	IMECE2019-12011	14	Zhang	Yue	11-39-2	IMECE2019-12868	139
Zhang	Kaihao	10-12-1	IMECE2019-12756	129	Zhang	Yue	11-14-3	IMECE2019-10379	149
Zhang	Lei	6-16-1	IMECE2019-13402	65	Zhang	Yue	14-1-1	IMECE2019-10346	183
Zhang	Lei	16-1-1	IMECE2019-12626	191	Zhang	Yue	14-1-2	IMECE2019-10348	183
Zhang	Lei	17-15-1	IMECE2019-13072	213	Zhang	Yue	16-1-1	IMECE2019-12719	192
Zhang	Liang	10-4-2	IMECE2019-13420	114	Zhang	Yue	16-1-1	IMECE2019-12847	193
Zhang	Lihua	16-1-1	IMECE2019-12632	191	Zhang	Yujing	16-1-1	IMECE2019-12771	192
Zhang	Lijie Grace	10-23-2	IMECE2019-10408	130	Zhang	Yunlan	10-4-3	IMECE2019-13818	116
Zhang	Lijie Grace	10-23-2	IMECE2019-11461	130	Zhang	Yunlan	16-1-1	IMECE2019-13827	202
Zhang	Lin	10-9-1	IMECE2019-12212	122	Zhang	Yuqian	10-11-1	IMECE2019-13853	117
Zhang	Lin	17-15-1	IMECE2019-12584	212	Zhang	Yuwei	11-46-2	IMECE2019-13257	143
Zhang	Ming	3-4-2	IMECE2019-11129	30	Zhang	Yuwen	9-49-1	IMECE2019-11953	109
Zhang	Ming	5-4-3	IMECE2019-10896	58	Zhang	Zetian	13-6-1	IMECE2019-10700	175
Zhang	Ming	5-4-3	IMECE2019-11206	58	Zhang	Zhan-fei	2-12-1	IMECE2019-11002	10
Zhang	Mingming	4-13-1	IMECE2019-10845	44	Zhang	Zhan-fei	2-5-4	IMECE2019-11036	19
Zhang	Mingshao	2-11-1	IMECE2019-11577	8	Zhang	Zhan-fei	2-7-3	IMECE2019-11034	24
Zhang	Mingyang	9-19-2	IMECE2019-11591	104	Zhang	Zhan-fei	10-26-2	IMECE2019-10837	115
Zhang	Ning	8-4-1	IMECE2019-11434	89	Zhang	Zhaocheng	11-23-3	IMECE2019-13190	155
Zhang	Peng	2-6-2	IMECE2019-11297	11	Zhang	Zhaocheng	11-12-2	IMECE2019-13195	161
Zhang	Peng	6-4-2	IMECE2019-11044	66	Zhang	Zhaocheng	17-11-2	IMECE2019-13277	211
Zhang	Peng	8-1-1	IMECE2019-10044	87	Zhang	Zhaokun	2-13-3	IMECE2019-10732	13
Zhang	Peng	14-1-2	IMECE2019-11286	183	Zhang	Zhaoning	13-6-1	IMECE2019-10700	175
Zhang	Ping	2-2-7	IMECE2019-12523	18	Zhang	Zhuolei	9-25-2	IMECE2019-12963	100
Zhang	Pu	10-4-4	IMECE2019-12898	118	Zhang	Zhuolei	16-1-1	IMECE2019-12929	193
Zhang	Qi	10-11-1	IMECE2019-12053	116	Zhang	Zhuomin	9-14-1	IMECE2019-12744	102
Zhang	Qiang	9-46-1	IMECE2019-11237	103	Zhang	Zhuomin	9-30-1	IMECE2019-12610	108
Zhang	Qinqiang	12-1-1	IMECE2019-11076	171	Zhang	Zhuomin	9-30-1	IMECE2019-12887	108
Zhang	Qinqiang	12-4-1	IMECE2019-11107	172	Zhang	Zhuomin	9-30-2	IMECE2019-13270	109
Zhang	Qiuting	11-37-5	IMECE2019-13443	165	Zhang	Zhuomin	16-1-1	IMECE2019-12895	193
Zhang	Rui	11-38-1	IMECE2019-12907	146	Zhang	Zhuomin	17-15-1	IMECE2019-12609	212
Zhang	Rui	17-11-2	IMECE2019-12908	211	Zhang	Zi Han	5-16-1	IMECE2019-12216	54
Zhang	Rundong	11-46-1	IMECE2019-12498	137	Zhang	Zihao	2-14-1	IMECE2019-10919	21
Zhang	Rundong	11-2-1	IMECE2019-13137	157	Zhang	Zihao	17-9-1	IMECE2019-13661	209
Zhang	Sai	5-4-2	IMECE2019-10789	56	Zhang	Zilong	5-8-1	IMECE2019-10778	48
Zhang	Simin	3-14-1	IMECE2019-10827	32	Zhao	Bo	9-30-1	IMECE2019-12708	108
Zhang	Simin	8-9-2	IMECE2019-11896	83	Zhao	Bo	9-30-1	IMECE2019-12709	108
Zhang	Song	2-7-2	IMECE2019-10349	23	Zhao	Bo	9-5-1	IMECE2019-12710	110
Zhang	Song	2-7-2	IMECE2019-10486	23	Zhao	Cang	16-1-1	IMECE2019-13772	201
Zhang	Timothy	4-2-4	IMECE2019-11566	42	Zhao	Changying	9-25-2	IMECE2019-13409	100
Zhang	Weixiang	11-26-4	IMECE2019-10205	167	Zhao	Chenglong	16-1-1	IMECE2019-13439	197
Zhang	Weixiang	11-26-4	IMECE2019-10207	167	Zhao	Feng	8-6-2	IMECE2019-11500	89
Zhang	Weixiang	11-26-4	IMECE2019-10244	167	Zhao	Hanyang	2-8-1	IMECE2019-10621	17
Zhang	Weixiang	11-26-4	IMECE2019-10245	167	Zhao	Hanyang	9-36-1	IMECE2019-11421	96
Zhang	Xiang	2-9-3	IMECE2019-13415	12	Zhao	Huijuan	11-39-1	IMECE2019-13614	136
Zhang	Xiang	11-44-1	IMECE2019-12559	139	Zhao	Huijuan	11-39-1	IMECE2019-13617	136
Zhang	Xiang	11-44-1	IMECE2019-12560	140	Zhao	Huijuan	11-12-3	IMECE2019-13846	164
Zhang	Xiang	14-3-1	IMECE2019-11199	182	Zhao	Huijuan	12-7-1	IMECE2019-13637	169
Zhang	Xiaodong	5-9-3	IMECE2019-11012	51	Zhao	Jiangming	11-38-2	IMECE2019-13935	148
Zhang	Xu	4-13-1	IMECE2019-10845	44	Zhao	Jiangming	11-38-3	IMECE2019-12830	150
Zhang	Xu	10-13-1	IMECE2019-12165	129	Zhao	Jiangming	11-38-3	IMECE2019-13899	150
Zhang	Xu	17-15-1	IMECE2019-12519	212	Zhao	Jinxin	13-4-1	IMECE2019-11161	177
Zhang	Xuan	10-4-1	IMECE2019-12113	113	Zhao	Kangren	4-13-2	IMECE2019-10471	45
Zhang	Yangyang	5-10-2	IMECE2019-12087	50	Zhao	Kejie	16-1-1	IMECE2019-13607	199
Zhang	Yangyang	11-1-7	IMECE2019-12056	157	Zhao	Nathan	9-30-1	IMECE2019-12709	108
Zhang	Yanliang	9-31-1	IMECE2019-13855	111	Zhao	Ping	4-13-1	IMECE2019-10435	44
Zhang	Yanliang	10-25-2	IMECE2019-13864	126	Zhao	Ping	4-13-2	IMECE2019-10471	45
Zhang	Yanliang	16-1-1	IMECE2019-11980	191	Zhao	Ruike	11-46-1	IMECE2019-12498	137
Zhang	Yanxian	16-1-1	IMECE2019-13217	196	Zhao	Ruike	11-2-1	IMECE2019-13137	157
Zhang	Yaozhong	2-2-2	IMECE2019-13670	15	Zhao	Shengdun	2-6-2	IMECE2019-11297	11
Zhang	Yaozhong	4-5-4	IMECE2019-13841	39	Zhao	Shengdun	5-8-2	IMECE2019-10810	49
Zhang	Yaozhong	11-5-4	IMECE2019-13655	164	Zhao	Shengdun	6-4-2	IMECE2019-11044	66
Zhang	Yaozhong	17-15-1	IMECE2019-13715	214	Zhao	Shengdun	14-1-2	IMECE2019-11286	183
Zhang	Yifan	16-1-1	IMECE2019-12932	193	Zhao	Weihuan	16-1-1	IMECE2019-13719	201
Zhang	Yihui	11-46-1	IMECE2019-13050	136	Zhao	Weiqi	8-6-1	IMECE2019-10535	92
Zhang	Yihui	11-8-2	IMECE2019-12905	137	Zhao	Xiaoxiao	10-23-1	IMECE2019-12193	125
Zhang	Yihui	11-8-2	IMECE2019-12936	137	Zhao	Xiaoxiao	12-3-1	IMECE2019-11921	170
Zhang	Yinxun	13-4-1	IMECE2019-11161	177	Zhao	Xiayun	2-3-1	IMECE2019-10993	24
Zhang	Yiqing	11-1-5	IMECE2019-12623	153	Zhao	Xin	2-12-1	IMECE2019-11970	10
Zhang	Yixin	5-8-2	IMECE2019-10797	49	Zhao	Xin	16-1-1	IMECE2019-13159	195

Author Last Name	Author First Name	Session Number	Paper Number	Page #	Author Last Name	Author First Name	Session Number	Paper Number	Page #
Zhao	Xingyuan	11-18-2	IMECE2019-13622	138	Zhou	Zhou	11-5-5	IMECE2019-13424	166
Zhao	Xingyuan	16-1-1	IMECE2019-13093	194	Zhu	Diwei	9-46-1	IMECE2019-11237	103
Zhao	Xuanhe	10-4-3	IMECE2019-12822	116	Zhu	Feng	10-15-1	IMECE2019-11429	129
Zhao	Xuanhe	10-4-3	IMECE2019-12823	116	Zhu	Hengjia	17-4-3	IMECE2019-12974	206
Zhao	Xuanhe	11-8-3	IMECE2019-12824	140	Zhu	Jian	11-5-2	IMECE2019-13356	158
Zhao	Xuanhe	11-8-3	IMECE2019-12825	140	Zhu	Liuxian	4-13-3	IMECE2019-11318	46
Zhao	Xuanhe	11-5-1	IMECE2019-12921	155	Zhu	Min	6-11-1	IMECE2019-12871	68
Zhao	Xuanhe	11-5-1	IMECE2019-12924	155	Zhu	Mingmin	5-2-1	IMECE2019-10536	56
Zhao	Xuanming	4-10-1	IMECE2019-11697	40	Zhu	Muzhi	5-8-2	IMECE2019-10810	49
Zhao	Yan	9-4-1	IMECE2019-10792	96	Zhu	Na	4-8-1	IMECE2019-10622	37
Zhao	Yitong	7-10-1	IMECE2019-10540	77	Zhu	Na	7-7-1	IMECE2019-10624	80
Zhao	Yu	8-6-4	IMECE2019-10886	92	Zhu	Qingzi	9-2-1	IMECE2019-12772	104
Zhao	Yu	9-25-2	IMECE2019-10572	100	Zhu	Weidong	5-16-1	IMECE2019-12153	54
Zhao	Zhexin	9-30-1	IMECE2019-12709	108	Zhu	Weidong	5-16-1	IMECE2019-12156	54
Zhe	Wang	10-4-5	IMECE2019-10865	119	Zhu	Xiang	5-5-1	IMECE2019-12263	47
Zheng	Dezhi	8-4-1	IMECE2019-10620	89	Zhu	Xiang	5-2-4	IMECE2019-12265	60
Zheng	Jie	16-1-1	IMECE2019-13217	196	Zhu	Xiaoxiang	2-12-1	IMECE2019-11002	10
Zheng	Lingzhi	3-10-1	IMECE2019-13483	31	Zhu	Xiaoxiang	2-7-3	IMECE2019-11034	24
Zheng	Qiyue	9-15-1	IMECE2019-10977	108	Zhu	Y.	2-7-1	IMECE2019-10341	23
Zheng	Weikang	2-3-1	IMECE2019-11184	24	Zhu	Yaqun	16-1-1	IMECE2019-12930	193
Zheng	Xiaohu	2-10-1	IMECE2019-10020	7	Zhu	Yu	3-4-2	IMECE2019-11129	30
Zheng	Xin	8-2-1	IMECE2019-11675	86	Zhu	Yu	5-12-1	IMECE2019-11203	53
Zheng	Yanjie	9-4-1	IMECE2019-13306	106	Zhu	Yu	5-4-3	IMECE2019-10896	58
Zheng	Yanjie	16-1-1	IMECE2019-13318	197	Zhu	Yu	5-4-3	IMECE2019-11206	58
Zheng	Yanjie	16-1-1	IMECE2019-13325	197	Zhu	Yunhui	16-1-1	IMECE2019-13633	200
Zheng	Yue	11-10-3	IMECE2019-10213	140	Zhu	Zenghao	16-1-1	IMECE2019-13234	196
Zheng	Yuebing	2-4-1	IMECE2019-13199	14	Zhu	Zenghao	17-15-1	IMECE2019-13158	214
Zheng	Yuebing	16-1-1	IMECE2019-12656	191	Zhu	Zeyu	11-1-4	IMECE2019-13397	152
Zheng	Yuebing	16-1-1	IMECE2019-13200	195	Zhuang	Laihe	6-4-3	IMECE2019-11149	67
Zheng	Zhuoyuan	10-13-1	IMECE2019-11694	129	Zhukova	Natalia	16-1-1	IMECE2019-13234	196
Zhong	Wei-Hong	16-1-1	IMECE2019-12735	192	Zhumatay	Nursultan	8-7-1	IMECE2019-10921	84
Zhong	X. Allan	11-37-3	IMECE2019-10168	159	Zhupanska	Olesya	3-6-2	IMECE2019-13678	27
Zhou	Chenn	8-4-1	IMECE2019-10620	89	Zhupanska	Olesya	3-10-1	IMECE2019-11037	31
Zhou	Chenn	8-4-3	IMECE2019-11462	91	Ziejewski	Mariusz	4-5-2	IMECE2019-10742	35
Zhou	Chenn	9-43-2	IMECE2019-11347	95	Ziejewski	Mariusz	4-5-2	IMECE2019-10743	36
Zhou	Dengji	6-1-1	IMECE2019-11227	61	Ziejewski	Mariusz	4-5-2	IMECE2019-11549	36
Zhou	Dengji	13-6-1	IMECE2019-11130	175	Ziejewski	Mariusz	11-1-3	IMECE2019-11829	149
Zhou	Dengji	13-6-1	IMECE2019-11193	175	Zierler	Brenda	7-1-1	IMECE2019-12649	77
Zhou	Dengji	13-6-1	IMECE2019-11282	175	Zikry	Mohammed	11-39-2	IMECE2019-13021	138
Zhou	Dong	10-25-2	IMECE2019-13153	125	Zimmerman	Michael A.	10-26-4	IMECE2019-11608	119
Zhou	Dong	17-15-1	IMECE2019-12518	212	Zimmerman	Michael A.	10-1-1	IMECE2019-11655	119
Zhou	Guohua	11-28-1	IMECE2019-12540	135	Zivny	Antonin	5-5-1	IMECE2019-10861	47
Zhou	Hechao	8-1-1	IMECE2019-10044	87	Zobeiry	Navid	2-9-2	IMECE2019-11261	9
Zhou	Hong	5-4-4	IMECE2019-10761	59	Zogby	Gregory	15-1-1	IMECE2019-13967	189
Zhou	Hong	5-4-5	IMECE2019-10763	60	Zopf	Philipp	2-2-6	IMECE2019-11134	21
Zhou	Jian	5-5-1	IMECE2019-11370	47	Zorman	Christian	16-1-1	IMECE2019-13941	202
Zhou	Jian	13-4-1	IMECE2019-11161	177	Zou	Guijin	11-1-3	IMECE2019-12391	149
Zhou	Jiawei	9-20-1	IMECE2019-13586	94	Zou	Vincent	7-6-1	IMECE2019-11447	78
Zhou	Jiawei	9-24-1	IMECE2019-13587	107	Zou	Xingxing	16-1-1	IMECE2019-13524	198
Zhou	Jiawei	17-15-1	IMECE2019-13575	214	Zou	Xingxing	16-2-1	IMECE2019-13800	204
Zhou	Jiawei	17-15-1	IMECE2019-13580	214	Zou	Xiyue	10-25-1	IMECE2019-13379	123
Zhou	Qing	9-45-1	IMECE2019-10260	96	Zou	Xiyue	16-1-1	IMECE2019-13382	197
Zhou	Shiwei	10-4-5	IMECE2019-10865	119	Zou	Zhanan	10-25-1	IMECE2019-13920	123
Zhou	Wenchao	16-1-1	IMECE2019-13299	196	Zou	Zhanan	11-17-1	IMECE2019-12817	134
Zhou	Xiang	9-43-2	IMECE2019-11347	95	Zr	Qiji	11-2-1	IMECE2019-13137	157
Zhou	Xuan	10-23-2	IMECE2019-11461	130	Zu	Hongfei	14-3-1	IMECE2019-11199	182
Zhou	Yingge	4-5-3	IMECE2019-13028	37	Zwick	Connor	2-5-6	IMECE2019-13868	22



Committee Meeting Program

Committee Meeting Program

Title	Day	Date	Start Time	End Time	Venue	Room Name
2019 ASME Student Design Competition (SDC) FINALS	SAT	Nov 9	8:00AM	5:00PM	Marriott Hotel	Salons FGHI, 1st Floor
2019 IMECE Feedback Session	WED	Nov 13	10:00AM	11:00AM	Salt Palace Convention Center	Rooms 151 AB, 1st Level
2020 Heat Transfer Division IMECE Planning Meeting	WED	Nov 13	5:00PM	6:00PM	Marriott Hotel	Park City, 2nd Floor
2020 Heat Transfer Division Summer Heat Transfer Conference Planning	TUE	Nov 12	10:00AM	12:00PM	Marriott Hotel	Boardroom, 2nd Floor
2020 IMECE Track Organizers and Co-organizers Meeting	WED	Nov 13	3:00PM	4:00PM	Salt Palace Convention Center	Rooms 151 AB, 1st Level
Advanced Energy Systems Division – Electrochemical Energy Conversion and Storage Technical Committee Meeting	TUE	Nov 12	7:00PM	8:00PM	Marriott Hotel	Salon A, 1st Floor
Advanced Energy Systems Division – Systems Analysis Technical Committee Meeting	TUE	Nov 12	7:00PM	8:00PM	Marriott Hotel	Salon B, 1st Floor
Advanced Energy Systems Division Executive Committee Meeting	TUE	Nov 12	8:00PM	9:00PM	Marriott Hotel	Salon B, 1st Floor
Advanced Energy Systems Division Lecture & Reception	TUE	Nov 12	5:00PM	7:00PM	Marriott Hotel	Solitude, 1st Floor
Applied Mechanics Division Executive Committee Meeting	TUE	Nov 12	7:30AM	4:30PM	Marriott Hotel	Alta, 2nd Floor
Applied Mechanics Division Honors & Awards Banquet	TUE	Nov 12	7:00PM	10:00PM	Marriott Hotel	Salon F, 1st Floor
Applied Mechanics Division Technical Committee Meeting on Composite Materials	TUE	Nov 12	11:00AM	12:00PM	Marriott Hotel	Snowbird, 2nd Floor
Applied Mechanics Division Technical Committee Meeting on Computing in Applied Mechanics	MON	Nov 11	4:00PM	5:00PM	Marriott Hotel	Park City, 2nd Floor
Applied Mechanics Division Technical Committee Meeting on Dynamics and Control of Structures and Systems	TUE	Nov 12	5:30PM	6:30PM	Marriott Hotel	Alta, 2nd Floor
Applied Mechanics Division Technical Committee Meeting on Elasticity	MON	Nov 11	12:00PM	1:00PM	Marriott Hotel	Park City, 2nd Floor
Applied Mechanics Division Technical Committee Meeting on Experimental Mechanics	TUE	Nov 12	10:00AM	11:00AM	Marriott Hotel	Snowbird, 2nd Floor
Applied Mechanics Division Technical Committee Meeting on Fracture and Failure Mechanics	MON	Nov 11	11:00AM	12:00PM	Marriott Hotel	Park City, 2nd Floor
Applied Mechanics Division Technical Committee Meeting on Instabilities in Solids and Structures	TUE	Nov 12	12:00PM	1:00PM	Marriott Hotel	Snowbird, 2nd Floor
Applied Mechanics Division Technical Committee Meeting on Materials Processing and Manufacturing	TUE	Nov 12	2:30PM	3:30PM	Marriott Hotel	Snowbird, 2nd Floor
Applied Mechanics Division Technical Committee Meeting on Mechanics of Soft Materials	TUE	Nov 12	1:00PM	2:00PM	Marriott Hotel	Snowbird, 2nd Floor
Applied Mechanics Koiter Lecture	TUE	Nov 12	5:30PM	6:30PM	Salt Palace Convention Center	Rooms 151 DE 1st Level
ASME Aerospace Division Reception	TUE	Nov 12	5:45PM	7:15PM	Marriott Hotel	Deer Valley, 1st Floor
ASME Aerospace Division Structures and Materials Technical Committee Meeting	TUE	Nov 12	7:30PM	8:30PM	Marriott Hotel	Salons GH, 1st Floor

Committee Meeting Program

Title	Day	Date	Start Time	End Time	Venue	Room Name
ASME Annual Awards Dinner: Celebrating Engineering Achievement	MON	Nov 11	6:00PM	9:30PM	Salt Palace Convention Center	Ballrooms EFGHI, 1st Level
ASME Business Meeting	SUN	Nov 10	8:00AM	8:30AM	Marriott Hotel	Salon E, 1st Floor
ASME Committee on Government Relations	SUN	Nov 10	9:00AM	1:00PM	Marriott Hotel	Salons IJ, 1st Floor
ASME Future ME Mini-Talks & Social Meetup	MON	Nov 11	3:00PM	5:00PM	Salt Palace Convention Center	Halls A & B, 1st Level
ASME Journal of Engineering and Science in Medical Diagnostics and Therapy Board of Editors Meeting	TUE	Nov 12	6:00PM	7:00PM	Marriott Hotel	Salon B, 1st Floor
ASME Nanoengineering for Energy and Sustainability (NEES) Technical Committee Meeting	Wed	Nov 13	9:00AM	10:00AM	Salt Palace Convention Center	Room 151 F, 1st Level
ASME's Philanthropic Impact <i>(By Invitation Only)</i>	SUN	Nov 10	7:30PM	10:00PM	Marriott Hotel	Salon E, 1st Floor
Audit Committee Meeting	MON	Nov 11	9:30AM	10:30AM	Marriott Hotel	Park City, 2nd Floor
Auxiliary Board Meeting	TUE	Nov 12	9:15AM	11:45AM	Marriott Hotel	Park City, 2nd Floor
Auxiliary Guest Luncheon	TUE	Nov 12	1:00PM	3:00PM	Marriott Hotel	Solitude, 1st Floor
Biomedical and Biotechnology Engineering Track Organizers Meeting	Wed	Nov 13	6:00PM	7:00PM	Marriott Hotel	Salon G, 1st Floor
Board of Governors Meeting	SUN	Nov 10	9:00AM	4:30PM	Marriott Hotel	Salon F, 1st Floor
BST Board Task Group on Advanced Manufacturing	SAT	Nov 9	12:00PM	3:30PM	Marriott Hotel	Solitude, 1st Floor
Committee of Past Presidents	MON	Nov 11	12:00PM	3:30PM	Marriott Hotel	Deer Valley III, 1st Floor
Committee on Engineering Education (CEE)	SUN	Nov 10	1:00PM	5:00PM	Marriott Hotel	Salons IJ, 1st Floor
Committee on Honors	TUE	Nov 12	9:30AM	1:30PM	Marriott Hotel	Salon C, 1st Floor
Composites and Heterogeneous Materials Technical Committee	MON	Nov 11	4:30PM	5:30PM	Marriott Hotel	Deer Valley I, 1st Floor
Connect Presentation & Career Fair	SAT	Nov 9	5:00PM	7:30PM	Marriott Hotel	Salons DE, 1st Floor
Council on Standards and Certification	MON	Nov 11	10:00AM	5:30PM	Marriott Hotel	Salon E, 1st Floor
Design of Engineering Materials Technical Committee	MON	Nov 11	12:00PM	1:00PM	Marriott Hotel	Deer Valley I, 1st Floor
Design, Materials and Manufacturing Segment Leadership Team	SUN	Nov 10	8:00AM	5:00PM	Marriott Hotel	Solitude, 1st Floor
Diversity & Inclusion Strategy Committee	SAT	Nov 9	12:00PM	4:00PM	Marriott Hotel	Park City, 2nd Floor
ECE Programming Committee (CAC Working Session) – <i>Closed Meeting</i>	SUN	Nov 10	1:00PM	5:00PM	Marriott Hotel	Salon A, 1st Floor
ECE Programming Committee Meeting	SUN	Nov 10	8:00AM	12:00PM	Marriott Hotel	Salon B, 1st Floor
ECLIPSE Intern Meeting	SUN	Nov 10	2:00PM	5:00PM	Marriott Hotel	Deer Valley I, 1st Floor
E-Fest Steering Committee Meeting <i>(Closed Meeting)</i>	SUN	Nov 10	8:00AM	12:00PM	Marriott Hotel	Salon C, 1st Floor

Committee Meeting Program

Title	Day	Date	Start Time	End Time	Venue	Room Name
Electronic Materials Technical Committee	MON	Nov 11	4:30PM	5:30PM	Marriott Hotel	Deer Valley II, 1st Floor
Engineering Sciences Segment (ESS) Leadership Team Meeting	SAT	Nov 9	8:00AM	5:00PM	Marriott Hotel	Deer Valley III, 1st Floor
Engineering Sciences Segment (ESS) Leadership Team Meeting	SUN	Nov 10	8:00AM	12:00PM	Marriott Hotel	Deer Valley III, 1st Floor
Fellows Review Committee	MON	Nov 11	10:30AM	11:45AM	Marriott Hotel	Salon C, 1st Floor
Fluids Engineering Division Towne Hall Assembly – open to all FED Volunteers	TUE	Nov 12	11:00AM	12:30PM	Salt Palace Convention Center	Room 151 DE, 1st Level
Fluids Engineering Division (FED) Executive Committee with TC Chairs/Vice Chairs (Closed Meeting)	SUN	Nov 10	3:30PM	5:15PM	Salt Palace Convention Center	Room 151 C, 1st Level
Fluids Engineering Division (FED) Executive Committee with TC Chairs/Vice Chairs (Closed Meeting)	THUR	Nov 14	11:00AM	12:00PM	Salt Palace Convention Center	Room 151 C, 1st Level
Fluids Engineering Division (FED) Advisory Board & Executive Committee (Closed Meeting)	TUE	Nov 12	12:30PM	2:00PM	Salt Palace Convention Center	Room 151 C, 1st Level
Fluids Engineering Division (FED) AE Meeting (Closed Meeting)	MON	Nov 11	4:00PM	5:30PM	Salt Palace Convention Center	Room 151 C, 1st Level
Fluids Engineering Division (FED) CFDTC Computational Fluid Dynamics Technical Committee	TUE	Nov 12	5:00PM	6:00PM	Salt Palace Convention Center	Room 151 C, 1st Level
Fluids Engineering Division (FED) Executive Committee (Closed Meeting)	SUN	Nov 10	11:30AM	3:15PM	Salt Palace Convention Center	Room 151 C, 1st Level
Fluids Engineering Division (FED) Executive Committee Set up for EC/TC Meeting (Closed Meeting)	THUR	Nov 14	10:30AM	11:00AM	Salt Palace Convention Center	Room 151 C, 1st Level
Fluids Engineering Division (FED) Executive Committee with ASME Staff (Closed Meeting)	TUE	Nov 12	9:45AM	11:00AM	Salt Palace Convention Center	Room 151 C, 1st Level
Fluids Engineering Division (FED) FASTC Fluids Application and Systems Technical Committee	TUE	Nov 12	6:00PM	7:00PM	Marriott Hotel	Snowbird, 2nd Floor
Fluids Engineering Division (FED) FMITC Fluid Measurement and Instrumentation Technical Committee	TUE	Nov 12	2:00PM	3:00PM	Salt Palace Convention Center	Room 151 C, 1st Level
Fluids Engineering Division (FED) FMTC Fluid Mechanics Technical Committee	TUE	Nov 12	3:00PM	4:00PM	Salt Palace Convention Center	Room 151 C, 1st Level
Fluids Engineering Division (FED) Graduate Student Scholarship Committee GSSC	TUE	Nov 12	8:00PM	9:00PM	Marriott Hotel	Snowbird, 2nd Floor
Fluids Engineering Division (FED) Honors and Awards Committee (Closed Meeting)	WED	Nov 13	5:30PM	6:30PM	Marriott Hotel	Salon J, 1st Floor
Fluids Engineering Division (FED) MFTC Multiphase Flow Technical Committee	TUE	Nov 12	7:00PM	8:00PM	Marriott Hotel	Snowbird, 2nd Floor
Fluids Engineering Division (FED) MNFDTC Micro Nano Fluid Dynamics Technical Committee	TUE	Nov 12	4:00PM	5:00PM	Salt Palace Convention Center	Room 151 C, 1st Level
Fluids Engineering Division (FED) Young Engineer Paper Committee Meeting	WED	Nov 13	10:00AM	11:00AM	Marriott Hotel	Salon J, 1st Floor
Fluids Engineering Division Reception	WED	Nov 13	6:30PM	8:30PM	Marriott Hotel	Salon E, 1st Floor
Foundation Board Meeting	MON	Nov 11	9:45AM	11:45AM	Marriott Hotel	Deer Valley II, 1st Floor

Committee Meeting Program

Title	Day	Date	Start Time	End Time	Venue	Room Name
Gantt Medal Committee Meeting	SUN	Nov 10	2:00PM	3:30PM	Marriott Hotel	Boardroom, 2nd Floor
GEC/MDE Committee Meeting	MON	Nov 11	9:45AM	5:00PM	Marriott Hotel	Salon B, 1st Floor
Heat Transfer Division Executive Committee Meeting (<i>Closed Meeting</i>)	SUN	Nov 10	12:00PM	3:15PM	Marriott Hotel	Salon C, 1st Floor
Heat Transfer Division Executive Committee Meeting (<i>OPEN</i>)	SUN	Nov 10	3:30PM	5:00PM	Marriott Hotel	Salon C, 1st Floor
Heat Transfer Division Honors & Awards Luncheon	TUE	Nov 12	11:45AM	1:00PM	Marriott Hotel	Deer Valley, 1st Floor
Heat Transfer Division Honors and Awards Committee (K3)	SUN	Nov 10	12:00PM	3:00PM	Salt Palace Convention Center	Rooms 151 AB, 1st Level
Heat Transfer Division Journal of Heat Transfer Editorial Board	MON	Nov 11	2:00PM	4:00PM	Marriott Hotel	Park City, 2nd Floor
Heat Transfer Division Journal of Thermal Science and Engineering Applications Editorial Board	TUE	Nov 12	2:00PM	4:00PM	Marriott Hotel	Brighton, 2nd Floor
History & Heritage Committee Meeting	SUN	Nov 10	9:00AM	4:30PM	Marriott Hotel	Park City, 2nd Floor
Human Powered Vehicle Challenge (HPVC) Committee	SAT	Nov 9	8:00AM	5:00PM	Marriott Hotel	Boardroom, 2nd Floor
IAM3D Committee Meeting	SUN	Nov 10	8:00AM	12:00PM	Marriott Hotel	Salon A, 1st Floor
IMECE First Time Attendee Orientation	SUN	Nov 10	2:30PM	3:30PM	Salt Palace Convention Center	Room 151 G, 1st Level
IMECE Steering Committee Meeting	SUN	Nov 10	4:00PM	5:00PM	Salt Palace Convention Center	Rooms 151 AB, 1st Level
IMECE Steering Committee Wrap-Up Meeting	WED	Nov 13	4:00PM	5:00PM	Salt Palace Convention Center	Rooms 151 AB, 1st Level
IMECE Volunteer and Student Recognition Reception	WED	Nov 13	5:30PM	7:00PM	Marriott Hotel	Salon F, 1st Floor
International Regions Meeting	SUN	Nov 10	4:00PM	5:30PM	Marriott Hotel	Salon B, 1st Floor
Joint AMD-MD Constitutive Equations Technical Committee	TUE	Nov 12	9:00AM	10:00AM	Marriott Hotel	Salon A, 1st Floor
Joint Board of Editors (BOE) / Technical Committee on Publications & Communications (TCPC)	SUN	Nov 10	12:00PM	4:30PM	Marriott Hotel	Salon D, 1st Floor
Journal Editor Workshop	SAT	Nov 9	5:00PM	7:00PM	Marriott Hotel	Park City, 2nd Floor
K-10 Heat Transfer Equipment Committee Meeting	TUE	Nov 12	2:00PM	4:00PM	Marriott Hotel	Salon C, 1st Floor
K-11 Fire and Combustion Committee Meeting	TUE	Nov 12	6:00PM	8:00PM	Marriott Hotel	Boardroom, 2nd Floor
K-13 Heat Transfer in Multiphase Flow Committee Meeting	MON	Nov 11	3:00PM	5:00PM	Marriott Hotel	Boardroom, 2nd Floor
K-14 Gas Turbine Heat Transfer Committee Meeting	WED	Nov 13	6:00PM	8:00PM	Marriott Hotel	Salon A, 1st Floor
K-15 Transport Phenomena in Manufacturing & Material Processing Committee Meeting	TUE	Nov 12	6:00PM	8:00PM	Marriott Hotel	Brighton, 2nd Floor
K-16 Heat Transfer in Electronic Equipment Committee Meeting	WED	Nov 13	6:00PM	8:00PM	Marriott Hotel	Boardroom, 2nd Floor
K-18 Heat Transfer under Extreme Conditions Committee Meeting	MON	Nov 11	3:00PM	5:00PM	Marriott Hotel	Solitude, 1st Floor

Committee Meeting Program

Title	Day	Date	Start Time	End Time	Venue	Room Name
K-19 Environmental Heat Transfer Committee Meeting	TUE	Nov 12	6:00PM	8:00PM	Marriott Hotel	Salon J, 1st Floor
K-20 Computational Heat Transfer Committee Meeting	TUE	Nov 12	6:00PM	8:00PM	Marriott Hotel	Salon I, 1st Floor
K-5 Coordination Committee Meeting	THUR	Nov 14	10:00AM	12:00PM	Salt Palace Convention Center	Room 151 F, 1st Level
K-6 Heat Transfer and Energy Systems Committee Meeting	WED	Nov 13	6:00PM	8:00PM	Marriott Hotel	Salon B, 1st Floor
K-7 Thermophysical Properties Committee Meeting	TUE	Nov 12	10:30AM	12:00PM	Marriott Hotel	Brighton, 2nd Floor
K-8 Theory and Fundamental Research Committee Meeting	TUE	Nov 12	6:00PM	8:00PM	Marriott Hotel	Park City, 2nd Floor
K-9 Nanoscale Thermal Transport Committee Meeting	TUE	Nov 12	6:00PM	8:00PM	Marriott Hotel	Salon C, 1st Floor
Management Division Executive Committee Meeting	SUN	Nov 10	8:30AM	1:00PM	Marriott Hotel	Boardroom, 2nd Floor
Materials Division Executive Committee Meeting	TUE	Nov 12	12:30PM	2:30PM	Salt Palace Convention Center	Rooms 151 AB, 1st Level
Materials Division General Meeting	TUE	Nov 12	11:00AM	12:30PM	Salt Palace Convention Center	Rooms 151 AB, 1st Level
Materials Division Reception	TUE	Nov 12	5:30PM	7:00PM	Salt Palace Convention Center	Room 151 G, 1st Level
Materials Processing Technical Committee	MON	Nov 11	4:30PM	5:30PM	Marriott Hotel	Deer Valley III, 1st Floor
ME/MET Department Heads Executive Committee Meeting	MON	Nov 11	4:00PM	5:30PM	Marriott Hotel	Salons GH, 1st Floor
ME/MET Department Heads Forum	MON	Nov 11	1:30PM	3:30PM	Marriott Hotel	Salon F, 1st Floor
ME/MET Department Heads Open Mic Reception	TUE	Nov 12	4:00PM	5:30PM	Marriott Hotel	Salons GH, 1st Floor
ME/MET Department Heads Professional Development Workshop	TUE	Nov 12	10:30AM	12:00PM	Marriott Hotel	Salon F, 1st Floor
MEMS Division Volunteer Reception and Committee Meeting (<i>Open</i>)	WED	Nov 13	7:00PM	9:00PM	Marriott Hotel	Salon H, 1st Floor
Multifunctional Materials Technical Committee Meeting	MON	Nov 11	5:00PM	6:00PM	Marriott Hotel	Salon A, 1st Floor
Nadai Award Lecture	TUE	Nov 12	4:30PM	5:15PM	Salt Palace Convention Center	Room 151 G, 1st Level
Nanomaterials for Biology and Medicine Technical Committee	MON	Nov 11	10:00AM	11:00AM	Marriott Hotel	Deer Valley I, 1st Floor
Nanomaterials for Energy Technical Committee	MON	Nov 11	9:00AM	10:00AM	Marriott Hotel	Deer Valley I, 1st Floor
Nanotechnology in Mechanical Engineering – Potential, Reality, Opportunity and Challenges (NANOMECH)	WED	Nov 13	2:30PM	5:30PM	Salt Palace Convention Center	Room 151 G, 1st Level
NDPD Executive Committee Meeting and Dinner with Predictive NDE Panelists	WED	Nov 13	6:00PM	9:00PM	Marriott Hotel	Salon I, 1st Floor
Noise Control and Acoustics Division (NCAD) Executive Committee Meeting	WED	Nov 13	12:30PM	1:45PM	Marriott Hotel	Salon A, 1st Floor

Committee Meeting Program

Title	Day	Date	Start Time	End Time	Venue	Room Name
Noise Control and Acoustics Division General Committee Meeting	THUR	Nov 14	11:30AM	1:00PM	Salt Palace Convention Center	Rooms 151 AB, 1st Level
Noise Control and Acoustics Division: Per Bruel Gold Medal Award & NCAD Reception	WED	Nov 13	6:00PM	7:30PM	Marriott Hotel	Solitude, 1st Floor
Noise Control and Acoustics Division: Rayleigh Lecture	WED	Nov 13	4:00PM	5:45PM	Salt Palace Convention Center	Rooms 151 DE, 1st Level
Old Guard Committee Meeting	SUN	Nov 10	8:30AM	5:00PM	Marriott Hotel	Deer Valley III, 1st Floor
Old Guard Oral Paper Competition	SAT	Nov 9	8:30AM	5:00PM	Marriott Hotel	Deer Valley I & II, 1st Floor
Old Guard Paper Competition Breakfast	SAT	Nov 9	7:30AM	8:30AM	Marriott Hotel	Deer Valley I & II, 1st Floor
Panel: Predictive NDE/SHM of Complex Materials and Structures	WED	Nov 13	2:00PM	4:00PM	Marriott Hotel	Deer Valley, 1st Level
Pension Plan Trustees – <i>(Closed Meeting)</i>	MON	Nov 11	10:30AM	12:00PM	Marriott Hotel	Salon A, 1st Floor
Philanthropy Committee Meeting	TUE	Nov 12	9:45AM	11:45AM	Marriott Hotel	Salon B, 1st Floor
Process Industries Division Meeting	MON	Nov 11	12:00PM	1:30PM	Marriott Hotel	Deer Valley II, 1st Floor
Public Affairs & Outreach Council Meeting	TUE	Nov 12	9:30AM	4:30PM	Marriott Hotel	Salon E, 1st Floor
PVP DLT/SOC Meeting	FRI	Nov 8	7:30AM	5:00PM	Marriott Hotel	Salon C, 1st Floor
PVP DLT/SOC Meeting	SAT	Nov 9	7:30AM	8:00PM	Marriott Hotel	Salon C, 1st Floor
Retirement Plan Committee – <i>(Closed Meeting)</i>	MON	Nov 11	2:00PM	3:30PM	Marriott Hotel	Salon A, 1st Floor
Robert Henry Thurston Awards Lecture	WED	Nov 13	11:00AM	12:00PM	Salt Palace Convention Center	Room 151 G, 1st Level
Safety Engineering Risk and Reliability Analysis Division (SER2AD) Business Meeting	WED	Nov 13	5:45PM	6:45PM	Marriott Hotel	Salon C, 1st Floor
Sector Management Committee	SAT	Nov 9	8:00AM	10:00AM	Marriott Hotel	Park City, 2nd Floor
Sia Nemat-Nasser Award Lecture	TUE	Nov 12	4:00PM	4:30PM	Salt Palace Convention Center	Room 151 G, 1st Level
Student and Early Career Development Council	SAT	Nov 9	10:00AM	5:00PM	Marriott Hotel	Salon J, 1st Floor
Student Design Competition (SDC) Committee Meeting	SUN	Nov 10	8:00AM	12:00PM	Marriott Hotel	Deer Valley I, 1st Floor
Student Leadership Training Conference	FRI	Nov 8	11:00AM	5:00PM	Marriott Hotel	Salons AB, 1st Floor
Student Leadership Training Conference	SAT	Nov 9	7:00AM	5:00PM	Marriott Hotel	Salons AB, 1st Floor
Student Programming Committee	SUN	Nov 10	1:00PM	5:00PM	Marriott Hotel	Deer Valley III, 1st Floor
Student Section Enterprise Committee	SAT	Nov 9	8:00AM	11:30AM	Marriott Hotel	Solitude, 1st Floor
Symposium for New and Prospective Faculty: “Tips for Faculty Job Search, Promotion and Tenure”	TUE	Nov 12	1:30PM	3:00PM	Marriott Hotel	Salon F, 1st Floor
TEC Council	MON	Nov 11	9:45AM	5:00PM	Marriott Hotel	Salons IJ, 1st Floor
Technical Committee on Publications & Communications (TCPC)	SUN	Nov 10	7:30AM	12:00PM	Marriott Hotel	Salon D, 1st Floor

Committee Meeting Program

Title	Day	Date	Start Time	End Time	Venue	Room Name
The Italian Way To Advanced Manufacturing Panel Discussion	WED	Nov 13	6:00PM	7:00PM	Marriott Hotel	Salon D, 1st Floor
Track 2 (Advanced Manufacturing Track) Awards Reception	WED	Nov 13	7:00PM	8:00PM	Marriott Hotel	Salon D, 1st Floor
Track 2 (Advanced Manufacturing Track) Organizers Meeting	WED	Nov 13	8:00PM	8:45PM	Marriott Hotel	Deer Valley I & II, 1st Floor
Volt Executive Committee	MON	Nov 11	12:30PM	4:30PM	Marriott Hotel	Salon C, 1st Floor
VOLT Leadership Workshop	SAT	Nov 9	4:30PM	6:30PM	Marriott Hotel	Solitude, 1st Floor
Women in Engineering Reception	TUE	Nov 12	5:30PM	7:00PM	Marriott Hotel	Salon D, 1st Floor



Exhibitor Program

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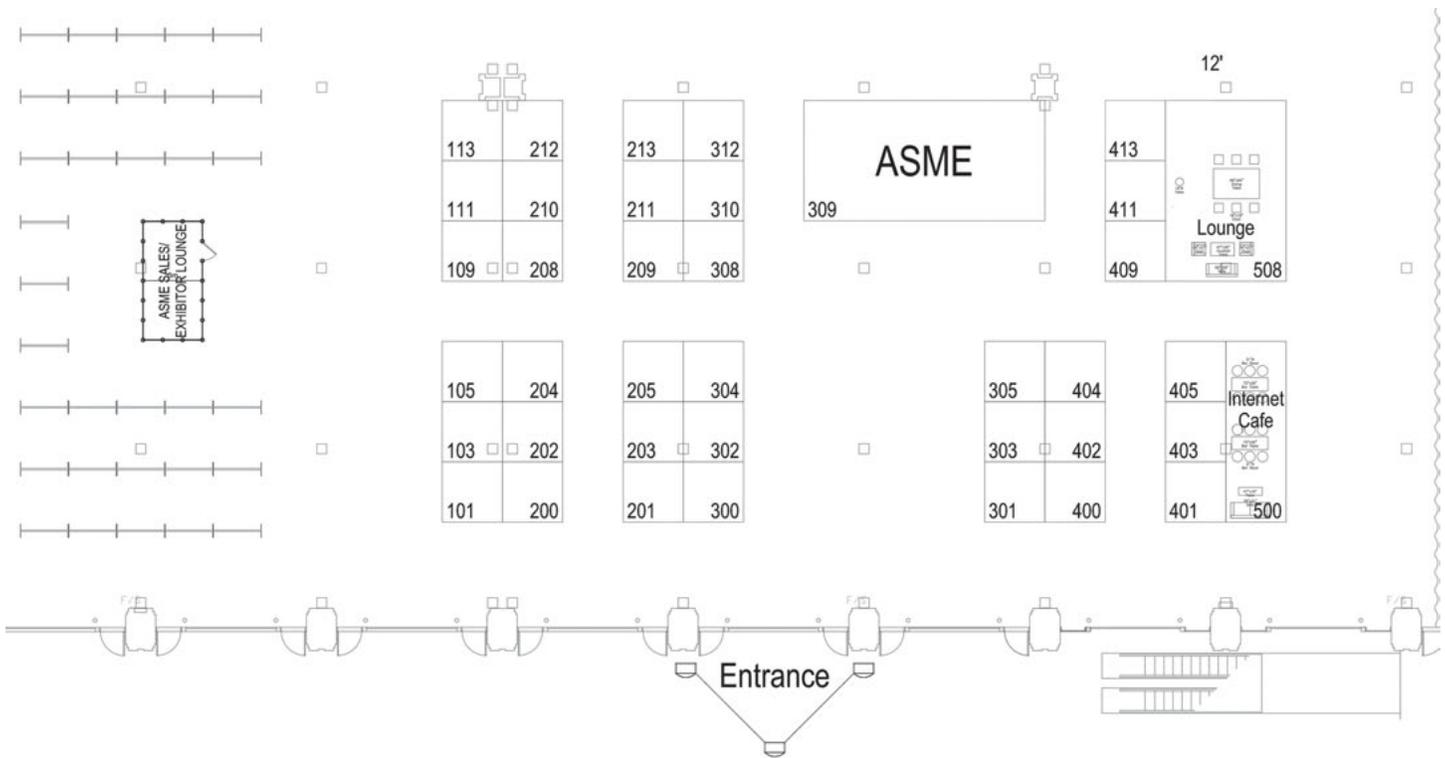
TRAVEL PORTLAND

PORTLAND

Exhibitor	Booth #
ASME	309
Cambridge University Press	201
In-Position Technologies	301
Italian Trade Agency	400
Lyncee Tec SA	212
Mercer	403
Morgan & Claypool Publishers	308
MSC Software- Cradle	208
North Carolina State University	404
NYU Tandon School of Engineering	300
Ohio University	209
PCB Piezotronics, Inc.	305

Exhibitor	Booth #
Proto Manufacturing Inc.	205
Rutgers, The State University of New Jersey	411
SAGE Publishing	303
Sandia National Laboratories	302
Spectra Quest, Inc.	200
Springer	304
University of Arizona	204
University of Maryland	413
University of Utah	211
Utah State University	409
Virginia Polytechnic Institute and State University	405
Wiley	401

Exhibit Floor Plan



Exhibitor Program



ASME Digital Collection (Booth 309)

asmedigitalcollection.asme.org

The ASME Digital Collection is ASME's authoritative, online reference for the mechanical engineering and related research communities. It provides unparalleled depth, breadth, and quality of peer-reviewed content with powerful search tools that retrieve content simultaneously from journals (1960 to present), conference proceedings (2000 to present, plus select proceedings back to 1955), and eBooks (1993 to present, plus select titles going back to 1944). A robust and customized taxonomy delivers highly accurate results and related content. Indexed in top A&I services.

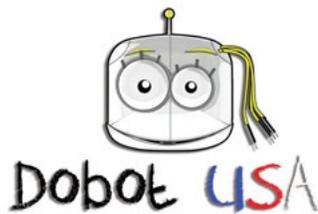


CAMBRIDGE UNIVERSITY PRESS

Cambridge University Press (Booth 201)

1 Liberty Plaza, Floor 20,
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cambridge.org

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In-Position Technologies (Booth 301)

iptech1.com

In-Position Technologies is a High Tech Industrial Automation company and a chief U.S. distributor for the Dobot Magician – an all-in-one educational robot that can 3D Print, draw, laser engrave and “pick and place.” We combine our knowledge of industry and education to provide an easy to use platform to teach about robotics and manufacturing in the classroom.



Italian Trade Agency (Booth 400)

ice.it/en

The ITA – Italian Trade Agency is the government organization that promotes the internationalization of Italian companies. At IMECE 2019, as part of its Innovation Days USA (ID) program, ITA will showcase Italy's leadership in advanced manufacturing solutions and technologies. Collaboration around innovation in engineering is at the core of ITA's outreach efforts in this sector.



Lyncée Tec (Booth 212)

lynceetec.com

Lyncée Tec provides an innovative 4D profilometry for 3D dynamic measurements on nano-micro samples. Based in Lausanne, Switzerland, its unique DHM® (digital holography microscope) technology leads to simultaneously high acquisition rate and interferometric resolution. This opens new quality control possibilities and novel research opportunities, enabling applications that were not possible before. Lyncée offers complete solutions, from sample handling to data analysis, in the field of material methodology, MEMS, semiconductor, micro-optics, smart polymer, and bio-cell imaging.



Mercer Co. (Booth 403)

mercerc.com

For over 30 years, ASME has proudly partnered with Mercer Consumer to help hundreds of ASME members insure their life, health, income and reputation; as well as home, vehicle and other property. Because Mercer Consumer is part of the world's leading provider of risk services and solutions, members enjoy the benefits of money-saving group rates, state-of-the-art technology and award-winning customer service available nowhere else. Mercer is located at booth 303.



Morgan & Claypool (Booth 308)
morganclaypool.com

Morgan & Claypool started the “short-book revolution” and we’ve been the top provider since. We are also the first to be “digital first,” offering unlimited access with library purchase. Other publishers laughed. Now they copy us. If you need critical updates in Mechanical Engineering, Physics, and other subjects but don’t want to be inundated with information you don’t need, we’re the best possible source. Short books, because everyone needs information, and everyone is pressed for time, always.



MSC Cradle (Booth 208)
cradle-cfd.com

MSC Software develops simulation software technology that enables engineers to validate and optimize their designs using virtual prototypes. Our CFD solutions are characterized by their user-friendly interfaces, high accuracy, and high efficiency.



North Carolina State University (Booth 404)
engr.ncsu.edu

The College of Engineering at North Carolina State University has 12 academic departments with 21 master’s and 13 PhD on campus programs. Working engineers, technicians and computer scientists can also continue their education by participating in one of the 16 online master degrees. The degrees are the same; the class locations are different. Learn more about these programs by visiting our websites at: www.engr.ncsu.edu



NYU Tandon School of Engineering (Booth 300)
engineering.nyu.edu

NYU graduate engineering programs exist in the fields of mechanical, civil, urban, industrial, electrical, computer, chemical, biomedical and financial engineering alongside programs in computer science, management of technology, cybersecurity, and integrated digital media. Our goal is to produce highly desirable graduates prepared for industry. This has led us to be one of the top ranked schools in the nation with regards to graduate employability, salary potential and return on investment.



RUSS COLLEGE OF ENGINEERING AND TECHNOLOGY
Engineering Management

Ohio University (Booth 209)
ohio.edu/engineering/ise

Ohio University's Russ College of Engineering and Technology offers a fully-online Master of Engineering Management degree as well as online graduate certificates for more accelerated and focused learning. Our curriculum covers concepts that are relevant in any technical leadership role, regardless of your engineering background. It combines graduate-level leadership and management courses with high-level engineering practices that can be immediately applied in the workplace and can prepare you for future career advancement.



PCB Piezotronics, Inc. (Booth 305)
pcb.com

PCB® Piezotronics, Inc. provides engineered sensors to measure sound, vibration, pressure, force, strain, load, & torque. ICP® sensor technology is used by development engineers and predictive maintenance professionals worldwide for test, measurement, monitoring, and control requirements in automotive, aerospace, industrial, R&D, military, educational, commercial, OEM applications, and more. PCB is committed to Total Customer Satisfaction with in-stock Platinum products, experienced global distribution network, & SensorLine™ 24-hour technical support. Visit www.pcb.com for more information.

Exhibitor Program



Proto (Booth 205)

protoxrd.com

PROTO is a leading manufacturer of portable and laboratory-based x-ray diffraction systems. Our product line includes residual stress and retained austenite measurement systems, Laue single-crystal orientation systems, x-ray tubes, custom XRD systems, and powder diffractometers. We are also pleased to offer measurement services through our ISO 17025 laboratories in the United States and Canada. Come visit our booth to see how we can help you optimize part performance and overcome engineering obstacles using x-ray diffraction.



Rutgers (Booth 411)

mae.rutgers.edu

Rutgers, The State University of New Jersey, is a top-tier public research university and the eighth-oldest university in the United States, established in 1766. Rutgers is a member of the prestigious American Association of Universities and of the Big Ten Academic Alliance. The Department of Mechanical and Aerospace Engineering offers two undergraduate degrees (Mechanical Engineering and Aerospace Engineering), as well as doctoral and master's degrees at the graduate level. Three new graduate certificates have been recently introduced in Robotics, Space and Advanced Manufacturing. For further information please visit mae.rutgers.edu



Sage (Booth 303)

us.sagepub.com

Sara Miller McCune founded SAGE Publishing in 1965 to support the dissemination of usable knowledge and educate a global community. SAGE publishes journals, books, and library products spanning a range of subject areas. SAGE remains majority-owned by our founder, who has ensured that the company will remain permanently independent.

Sandia National Laboratories

Sandia (Booth 302)

sandia.gov/

For over 60 years, Sandia has delivered essential science and technology to resolve the nation's most challenging security issues. A strong science, technology, and engineering foundation enables our mission working at the forefront of innovation, collaborative research with universities & companies, and discretionary research projects. We recruit the best and the brightest, equip them with world-class research tools & facilities, and provide opportunities to collaborate with experts from many disciplines.



SpectraQuest (Booth 200)

spectraquest.com

SpectraQuest is the leading developer and manufacturer of turn-key systems for research, education, and training in machine fault diagnosis, engineering laboratory devices, and wind energy. A turn-key system includes a machinery fault simulator, instrumentation, software, curriculum, and laboratory exercise books. Additionally, SpectraQuest offers material for enhancing workforce skills in industrial reliability and maintenance including an ISO certification program in vibration analysis along with teachers aid packages to certify industrial professionals.



Springer (Booth 304)

springer.com/gp/authors-editors

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THE UNIVERSITY OF ARIZONA
COLLEGE OF ENGINEERING

Aerospace & Mechanical Engineering

University of Arizona (Booth 204)

ame.engineering.arizona.edu/

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UNIVERSITY OF
MARYLAND

University of Maryland (Booth 413)

eng.umd.edu

The University of Maryland's A. James Clark School of Engineering serves as the catalyst for high-quality research, innovation, and learning, delivering on a promise that all graduates will leave ready to impact the Grand Challenges (energy, environment, security, and human health) of the 21st century. The Clark School is dedicated to leading and transforming the engineering discipline and profession, to accelerating entrepreneurship, and to transforming research and learning activities into new innovations that benefit millions.



Department of
MECHANICAL ENGINEERING
THE UNIVERSITY OF UTAH

University of Utah (Booth 211)

mech.utah.edu

Challenge. Opportunity. Choice. Excellence. The Future. The University of Utah Department of Mechanical Engineering produces world-class research and graduates engineering leaders at the Ph.D., MS, and BS levels that energize Utah and economies around the world. Research areas: Robotics, Controls, & Mechatronics; Solid Mechanics; Thermal-Fluids & Energy; Design, Ergonomics, Manufacturing, & Systems. In Salt Lake City—unparalleled access to national parks, outdoor activities, professional and college sports, and cultural events.

UtahStateUniversity®

MECHANICAL AND AEROSPACE ENGINEERING

Utah State University (Booth 409)

engineering.usu.edu

The Mechanical and Aerospace Engineering Department at Utah State University, which offers an undergraduate degree in Mechanical Engineering, and M.S. and PhD degrees in both Mechanical Engineering and Aerospace Engineering, currently enrolls 880 students. With 20 faculty members, active research areas include aeronautical and astronautical engineering, high temperature and nano materials, energy systems, composite materials, and fluid dynamics. Our nearly 175 annual graduates are highly sought after by both industry and graduate schools across the country.



COLLEGE OF ENGINEERING
MECHANICAL ENGINEERING
VIRGINIA TECH.

Virginia Tech (Booth 405)

me.vt.edu

With 66 full time faculty and 45 affiliate, adjunct and instructional faculty, graduate programs at Virginia Tech's Department of Mechanical Engineering have breadth and depth of research expertise across field disciplines. The department has five graduate thrust areas including bio, micro and nano systems; energy engineering and science; design, materials and manufacturing; robotics, autonomous and dynamical systems; and nuclear engineering and science. See www.me.vt.edu/graduate-students for more information.

WILEY

Wiley (Booth 401)

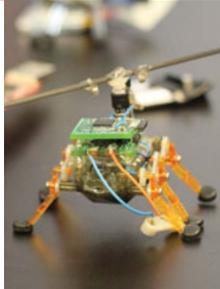
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MECHANICAL ENGINEERING AT MARYLAND



Additive manufacturing



Robotics (micro-to macro-sized)



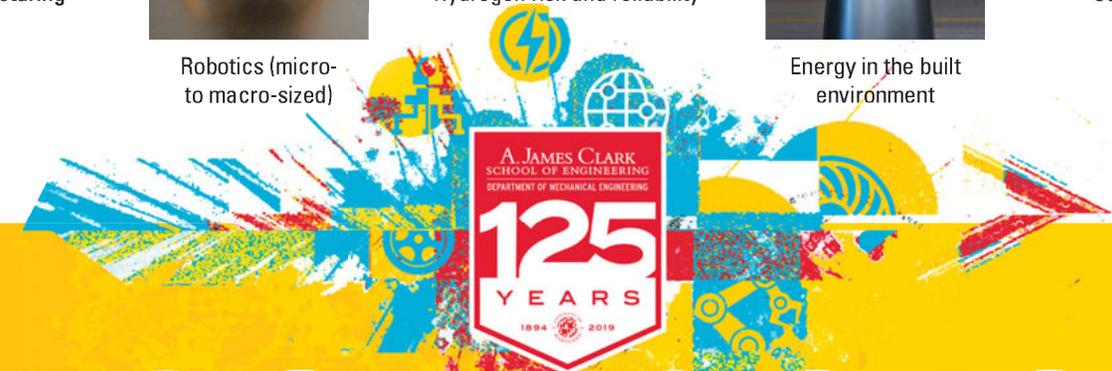
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