UC CINCINNATI

NAMRC 49 / MSEC 2021

NORTH AMERICAN MANUFACTURING RESEARCH CONFERENCE

MANUFACTURING SCIENCE AND ENGINEERING CONFERENCE

CONFERENCE PROGRAM

JUNE 22-25, 2021
Virtual Conference

NSF

University of CINCINNATI
COLLEGE OF ENGINEERING AND APPLIED SCIENCE

Table of Contents

Welcome Note from the University of Cincinnati Organizing Committee

As the organizers of NAMRC49 /MSEC2021, and on behalf of the Cincinnati, Ohio, manufacturing community and the College of Engineering and Applied Science at the University of Cincinnati, we warmly welcome you to the co-located conferences of SME NAMRC 49 and ASME MSEC 2021. It is our honor and pride to welcome you virtually to Cincinnati, well known for its manufacturing and machine tool industries. Cincinnati, also known as the "Queen City," is one of the three major business hubs in Ohio and serves as the US headquarters of several major manufacturing, consumer goods, and service industries, including Procter & Gamble, Kroger, Makino, Milacron, Ethicon Endo-Surgery, AK Steel, GE Aviation, and Fifth Third Bank. Due to the ongoing Covid-19 pandemic, the organizing committee decided to change the conference from in-person to virtual mode. In addition to the pre-recorded technical and keynote symposium sessions, the conference includes sessions on Women in Advanced Manufacturing, Blue Sky competition, Student Design competition, Doctoral symposiums, presentations by Federal Officers, NSF Directors, and Poster sessions. The technical sessions will have pre-recorded video presentations and will be available for viewing up to 90 days after the conference. Keynote presentations from various industry and federal agency leaders in advanced manufacturing are scheduled at the start of each day of the conference.

Our sincere appreciations go out to all of our conference sponsors, whose support is key to the success of the conference. We would like to thank our UC staff members, Ms. Katy Marston, Associate Director of Conference & Events Services, and Sarah M. Mullins, Web Communications Manager. We would also like to recognize graduate student Mr. Sourabh Deshpande, who has been working tirelessly to organize this online conference event. We are grateful to the NAMRl/SME Scientific Committee and the ASME Technical Program Committee for overseeing the technical paper submissions and editorial processes that have resulted in an outstanding technical program. We are excited to be hosting this conference and welcoming all of you. You will find the conference valuable in expanding your technical knowledge, as well as your network of contacts in the manufacturing research community.

University of CINCINNATI

Finally, we wish all of you an enjoyable time listening to the sessions and interacting virtually with the participants. We hope you will find inspiration and excitement in this first-ever online conference event in the long history of NAMRC /MSEC.

Sam Anand, PhD
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University of Cincinnati
Chair, Conference Organizing Committee
sam.anand@uc.edu

Jing Shi, PhD
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Murali Sundaram, PhD
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Welcome Note from ASME Manufacturing Engineering Division (MED)

On behalf of the ASME Manufacturing Engineering Division (MED) Executive Committee whose members include Dr. Moneer Helu from NIST, Prof. Frank Pfefferkorn from the University of Wisconsin-Madison, Assoc. Prof. Barbara S. Linke from the University of California Davis, Dr. Jarred Heigel from Third Wave Systems and myself from Clemson University, I would like to thank you for your interest, participation and support of the ASME International Manufacturing Science and Engineering Conference (MSEC), co-located with the North American Manufacturing Research Conference (NAMRC) of SME.

This year, due to the ongoing coronavirus (COVID-19) pandemic concerns, the co-located conferences of MSEC 2021 and NAMRC 49 will be held virtually in order to protect the health and wellness of our community. We look forward to a well-managed and prosperous interaction of attendees.

Manufacturing is a very important branch of the world's economy and is essential to the generation of wealth and building a national economy to enhance living standards for citizens. Manufacturing fosters innovation and thus directly impacts energy creation and utilization, environment health, economic stability, and societal sustainability. Therefore, it is vital to advance the science and technology of manufacturing and collaborate to overcome faster the challenges raised by the growing needs of the society.

The co-location of these conferences fosters increased collaboration and enables cross-pollination of new ideas that refresh the manufacturing research and development field. At the core of the collaboration is the joint annual conference that brings together ASME/MED and NAMRI/SME. Every three years, The Japan Society of Mechanical Engineering (JSME) also joins, enabling a truly grand event; due to the cancellation of the conference last year this partnership will again arise in 2023. On behalf of our organization, MED leadership would like to thank the NAMRI team led by Prof. Ihab Ragai for their enthusiastic and productive collaboration and contributions to the joint conference and field of manufacturing.

This conference has a unique position in the history of MED as we will be celebrating 100 years since the Division formation. Several commemorative activities are planned, including a special anniversary publication, a series of articles in ASME's Mechanical Engineering magazine and a special virtual reception at MSEC 2021. MED will continue to offer technical leadership and partnership opportunities to the manufacturing community, leveraging its flagship conference, MSEC, as a platform for manufacturing researchers and practitioners to exchange new ideas, foster innovations, and forge professional networks and collaborations. Our members are energized by the increase in visibility and role of Manufacturing in

society by the current trends associated with the fourth industrial revolution. Currently, we have nine technical committees: Additive Manufacturing, Manufacturing Processes, Manufacturing Equipment and Automation, Manufacturing Systems, Quality and Reliability, Life Cycle Engineering, Nano/Micro/Meso Manufacturing, Biomanufacturing, and Advanced Materials Manufacturing.

Transforming this year's efforts into a success despite the challenges raised by the virus pandemic, would not have been possible without the hard work of our Program Chairs, Assoc. Prof. Karl R. Haapala of Oregon State University and Prof. Yong Chen from the University of Southern California, and the contributions of our technical committee leadership and members. I would also like to acknowledge Prof. Sam Anand and his team from the University of Cincinnati, the hosts who secured the virtual platform and planned an excellent event despite the virtual nature.

Finally and most importantly, I would like to thank to all of you who contribute to the success of this conference through papers and poster submissions, and serve as reviewers, panelists, and symposium organizers each year. We thank you for this service and look forward to your continued active involvement with the division and future MSEC events.

Sincerely,

Laine Mears
Clemson University
Chair, ASME MED Executive Committee, 2020 – 2021

University of CINCINNATI

Welcome Note from the Chairs of NAMRI Scientific Committee

On behalf of the NAMRI Scientific Committee, we welcome you to the 49th North American Manufacturing Research Conference (NAMRC 49), sponsored by the North American Manufacturing Research Institution of SME (NAMRI/SME) and hosted by the University of Cincinnati. The event is taking place virtually from June 21 – 25, 2021. As a leading world-class society in the Manufacturing Engineering field, SME acts as an effective bridge between industries, government laboratories, and academic institutions. NAMRC symbolizes the continued collaboration between these esteemed organizations in research exchange and knowledge dissemination.

NAMRC 49 received over 130 technical paper submissions. Following the review process, 94 papers were accepted for publication in the Proceedings of NAMRI/SME and presentation at the conference in 18 technical sessions. The papers included in the conference address a wide range of basic and applied manufacturing research topics in six tracks: (1) Manufacturing Systems, (2) Manufacturing Processes, (3) Material Removal, (4) Additive Manufacturing, (5) Smart Manufacturing and Cyber-Physical Systems, and (6) Industrial Applications and Manufacturing Education. NAMRC 49 also includes a Student Research Presentations Competition. Every single paper submitted to the conferences was put through a rigorous peer review process. We are in debt to all reviewers for their critical assessment of such large number of submissions.

For the first time, the Scientific Committee is pleased to sponsor the Workshop on Manufacturing Engineering Education that will be held on June 21, 2021. The workshop aims to mobilize the manufacturing community to reach a new generation of undergraduate engineers in the classroom with a modern manufacturing curriculum. Additionally, the collocated NAMEC 49/ASME MSEC 2021 continues to feature the annual Manufacturing Blue Sky Competition, funded by the National Science Foundation (NSF) and SME. The winner of the Blue Sky Competition will receive the NAMRI/SME Dornfeld Manufacturing Vision Award, named in honor of the late Professor David Dornfeld, to recognize outstanding vision and leadership within the manufacturing community.

The conference program is the result of the outstanding efforts of many people. We would like to thank all the authors for their technical paper. We also express our gratitude to all the organizers for their dedicated management of the tracks as well as for guarding the quality of the papers to be presented, which has contributed a great deal to the success of the conference technical program. We would also like to thank the Host Organizing Committee, the Conference Coordinating Committee, the NAMRI/SME Scientific

Committee (as illustrated in Fig. 1), and the ASME MED Executive and Technical Committees. Our thanks also go to the SME and ASME staff for their outstanding job in presenting conference information on the Internet, managing the submitted technical papers, and ensuring high-quality publication of the conference proceedings for both NAMRC 49 and MSEC 2021. We would like to extend our gratitude to the Advanced Manufacturing Program within the Civil, Mechanical, and Manufacturing Innovation (CMMI) Division of NSF for sponsoring the Early Career Forum, the Blue Sky Competition, and for providing registration support for selected student participants from US universities.

We wish you a productive and enjoyable conference experience. We hope that the proceedings are beneficial and we sincerely wish that you have a long-lasting affiliation with NAMRC and MSEC. Finally, we would like to take this opportunity to invite you to NAMRC 50, hosted by Purdue University. We wish to see you there.

Sincerely,

Ihab Ragai, Ph.D., PE, FASME
Penn State University
NAMRI/SME Scientific Committee Chair

Robert Gao, Ph.D., FSME, FASME
Case Western Reserve University
NAMRI/SME Scientific Committee Chair-Elect

Welcome Note from the MSEC Technical Program Chairs

As Technical Program Chair and Co-Chair, we welcome you to this year's virtual ASME International Manufacturing Science and Engineering Conference (MSEC 2021), after an unprecedented year leading to the cancellation of MSEC 2020! This year's conference is sponsored by the Manufacturing Engineering Division of ASME, and held jointly with the 49th North American Research Conference (NAMRC 49), sponsored by the North American Research Institution of SME (NAMRI/SME). The conference also includes two joint symposia with the Japan Society of Mechanical Engineers (JSME).

While the conferences are held jointly, the paper submission, review, and acceptance processes were conducted separately for MSEC and NAMRC. Of the 186 technical papers received, MSEC's peer review process accepted 150 papers for publication in the MSEC 2021 proceedings. In addition, 49 technical posters were submitted, with 33 accepted for inclusion in the online paper site and for presentation at the conference. This year's conference welcomes 18 Ph.D. students and recent graduates to the new Doctoral Symposium, enabling these young engineers to present their doctoral research to the manufacturing community. Two industry practitioners will present their work in a presentation-only format. Seven leading experts were nominated and selected as Invited Symposium Speakers and will present their visions in long-form presentations. A special MED 100th anniversary session welcomes five authors to present recent work related to their state-of-the-art reviews presented at MSEC 2019 and published in the ASME Journal of Manufacturing Science and Engineering.

All talks for MSEC 2021 will be prerecorded and available for viewing for one month after the conference. Presenters will be available for live discussions for the final half hour of each of the 38 technical sessions. Twenty-six symposia have been organized under nine technical tracks:

- Additive Manufacturing (Chair: Dr. Jarred Heigel, Third Wave Systems)
- Advanced Materials Manufacturing (Chair: Prof. Srikanth Pilla, Clemson University
- Biomanufacturing (Chair: Prof. Roland Chen, Washington State University)
- Life Cycle Engineering (Chair: Prof. Nancy Diaz-Elsayed, University of South Florida)
- Manufacturing Equipment and Automation (Chair: Prof. Burak Sencer, Oregon State University)
- Manufacturing Processes (Prof. Ihab Ragai, Penn State University, The Behrend College)
- Manufacturing Systems (Chair: Dr. Michael Brundage, National Institute of Standards & Technology)

- Nano/Micro/Meso Manufacturing (Chair: Prof. Rajiv Malhotra, Rutgers, The State University of New Jersey)
- Quality and Reliability (Chair: Prof. Yong Wang, Binghamton University)

We would like to thank all the symposium organizers, technical committee and track chairs, authors, and reviewers for their dedication in support MSEC 2021, in spite of the accompanying personal, educational, and work hardships brought on by the global pandemic. We have witnessed the collegial desire for the important work toward the future of manufacturing to go on. This year's conference demonstrates innovations from the nano to macro scales, including advances in materials, additive, subtractive, and deformation processes; robotics and smart manufacturing; and quality, reliability, and sustainability, among numerous other topics.

Finally, we would like to thank everyone at ASME for their support over the past year. We especially wish to thank Lori Lee for her attention to detail and patience in answering every question we put her way in navigating the paper and poster submission and review process!

Dr. Karl R. Haapala, Associate Professor
Oregon State University
MSEC 2021 Technical Program Chair

Dr. Yong Chen, Professor
University of Southern California
MSEC 2021 Technical Program Co-Chair

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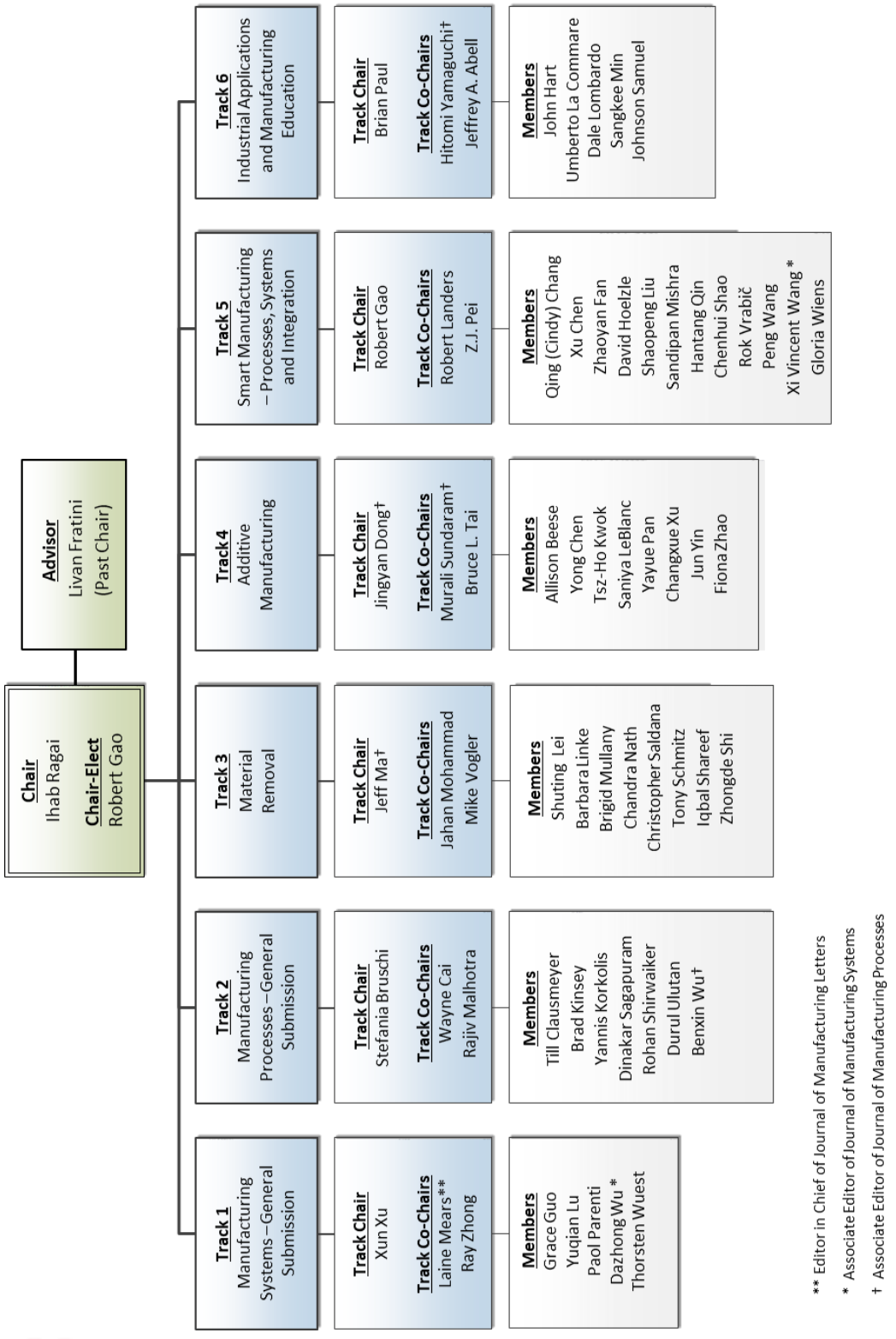

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Student Travel Award Recipients

Aarush Sood, *University of North Carolina at Charlotte*

Abdullah Al Mamun, *Mississippi State University*

Abhinav Bhardwaj, *Texas A&M University*

Aditya Nagaraj, *University of Wisconsin-Madison*

Aishwarya A Deshpande, *University of Wisconsin Madison*

Al Mazedur Rahman, *Texas A&M University*

Alec R Passarelli, *Rensselaer Polytechnic Institute*

Alejandro Najera-Acosta, *New Mexico State University*

Alex Brodsky, *Rensselaer Polytechnic Institute*

Alexander R Riensche, *University of Nebraska-Lincoln*

Amit Bajirao Deshpande, *Clemson University*

Ana Paula Clares, *Penn State University*

Andon Rosato, *University of Texas at Dallas*

Andrea Grisell, *University of Cincinnati*

Andrew S Eyring, *Brigham Young University*

Aniruddha Gaikwad, *University of Nebraska-Lincoln*

Ankit Varma, *Clemson University*

Areej A SH A Albahar, *Virginia Tech*

Michael Buckley, *University of Tennessee, Knoxville*

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Ming Li, *Texas A&M University*

Mingman Sun, *Kansas State University*

Mingxun Du, *Rensselaer Polytechnic Institute*

Mitchell R Woodside, *Missouri University of Science and Technology*

Mohammad Ali Ansari, *University of Wisconsin-Madison*

Mohammadamin Moghadasi, *Texas A&M University*

Muhammad Shuja Syed, *University of Cincinnati*

Muyue Han, *University of Illinois at Chicago*

Natalie Anne Reed, *University of Cincinnati*

Nathan Hertlein, *University of Cincinnati*

Nesar Ahmed Titu, *University of Tennessee, Knoxville*

Nilesh Ashok Kharat, *Clemson University International Center for Automotive Research*

Nishant Ojal, *University of North Carolina at Charlotte*

Obehi Georgina Dibua, *University of Texas at Austin*

Olalekan O Olowo, *University of Louisville*

Omey Mohan Manyar, *University of Southern California*

Arvind Shankar Raman, *Oregon State University*

Asmaa Harfoush, *Oregon State University*

Benjamin Stuhr, *Rochester Institute of Technology*

Benjamin Bevans, *University of Nebraska-Lincoln*

Bhaskar Botcha, *Texas A&M University*

Botao Zhang, *University of Cincinnati*

Brandon James Bethers, *San Diego State University*

Cartwright Nelson, *Keene State College*

Chang Liu, *Miami University*

Chao Liu, *New York State College of Ceramics*

Chao Sui, *University of Arkansas*

Chen Li, *University of Virginia*

Cheng Zhu, *University of Virginia*

Cheolhei Lee, *Virginia Tech*

Christopher W Indrarto, *Oregon State University*

Cuiyuan Lu, *University of Cincinnati*

Daniel Joseph Franke, *University of Wisconsin Madison*

Danming Wei, *University of Louisville*

David Omotayo Adeniji, *University of Kentucky*

Dylan Joralmon, *Arizona State University*

Eddie T Lee, *Oregon State University*

Ehsan Malekipour, *University of Michigan*

Elizabeth Marie Mamros, *University of New Hampshire*

Padmalatha Kakanuru, *Stevens Institute of Technology*

Partha Protim Mondal, *University of Illinois at Urbana Champaign*

Patrick Chernjavsky, *Worcester Polytechnic Institute*

Petro John, *University of Texas at Dallas*

Prahar Bhatt, *University of Southern California*

Pu Han, *University of Louisville*

Purvee Bhatia, *University of South Florida*

Qinqin Xiao, *University of Rochester*

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Rana Dabaja, *University of Michigan*

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Rui Dai, *Arizona State University*

Ryan Stebbins, *Penn State University*

Ryan Khawarizmi, *Michigan State University*

S M Abu Naser Shovon, *The University of Maine*

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Sahand Hajifar, *University at Buffalo*

Samantha Webster, *Northwestern University*

Santosh K Rauniyar, *University of Louisville*

Ethan Wescoat, *Clemson University*

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Gregory Corson, *University of Tennessee, Knoxville*

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Guanxiong Miao, *Texas A&M University*

Halil Tetik, *Kansas State University*

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James T Frandsen, *Brigham Young University*

Sara A Frunzi, *Worcester Polytechnic Institute*

Scott R Kerner, *Clemson University*

Sepehr Sadeh, *University of Texas at Dallas*

Shamali Laxman Nevase, *Clemson University International Center for Automotive Research*

Shenghan Guo, *Rutgers University*

ShohanuzzAMan Shohan, *North Carolina State University*

Shuheng Liao, *Northwestern University*

Shyam Sundar Balasubramanian, *Texas A&M University*

Siddhi G Mehta, *Texas A&M University*

Slesha Tuladhar, *Keene State College*

Sohan Nagaraj, *University of South Florida*

Sourabh Prashant Deshpande, *University of Cincinnati*

Srijana Shah, *University of Cincinnati*

Stanislau Niauzorau, Arizona State University

Suchana Akter Jahan, *Purdue University*

Sujithra Chandrasekaran, *University of North Carolina at Charlotte*

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Suman Bhandari, *Northwestern University*

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Yang Xu, *University of Southern California*

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Zhangyue Shi Shi, *Oklahoma State University*

Zhicheng Rong, *Miami Univeristy Oxford*

Zhicheng Xu, *University of Wisconsin Madison*

Zihao Luo, *Rensselaer Polytechnic Institute*

Zilin Jiang, *Northwestern University*

Zipeng Guo, *University at Buffalo*

Ziyad M. Smoqi, *University of Nebraska-Lincoln*

Conference Schedule

Day 1- Tuesday 06/22/2021		
Time*	**Event**	**Organizers**
10:15 AM to 10:20 AM	Welcome Note from the Organizing Committee- University of Cincinnati	Dr. Sam Anand
10:20 AM to 10:30 AM	Welcome Note from Dr. John W. Weidner, Dean of the University of Cincinnati College of Engineering and Applied Science	Dr. Sam Anand
10:30 AM to 10:55 AM	Welcome Note from David J. Adams, Chief Innovation Officer and Architect of the Cincinnati Innovation District	Dr. Sam Anand
10:55 AM to 11:25 AM	Keynote Session 1 (Live Event) by Mike Molnar, Director of the Advanced Manufacturing National Program Office & the Office of Advanced Manufacturing (OAM) at the National Institute of Standards & Technology (NIST)	Dr. Sam Anand
11:25 AM to 11:55 AM	Keynote Session 2 (Live Event) by Jutapat (Air) Boonvongsakorn, Global Transformational Engineering Senior Director at P&G	Dr. Sam Anand
12:00 PM to 1:30 PM	Technical Presentations	
	Women in Advanced Manufacturing Forum –Panel of Advanced Manufacturing Leaders & Virtual Networking	Dr. Li, Dr. McGovern, Ms. Reslan, Dr. Linke, Dr. Wiens
	Student Manufacturing Design Competition –Session I	Dr. Pfefferkorn
1:30 PM to 3:00 PM	Technical Presentations	
	Women in Advanced Manufacturing Forum –Panel of Advanced Manufacturing Leaders & Virtual Networking	Dr. Li, Dr. McGovern, Ms. Reslan, Dr. Linke, Dr. Wiens
	Student Manufacturing Design Competition –Session II	Dr. Pfefferkorn
3:10 PM to 4:40 PM	ASME Awards Ceremony	Dr. Pfefferkorn

Day 2- Wednesday 06/23/2021		
Time*	**Event**	**Organizers**
10:50 AM to 11:20 AM	Keynote Session by Sarah Kleinbaum, Technology Manager at United States Department of Energy (DOE) (Pre-recorded Event)	Dr. Sam Anand
11:25 AM to 11:55 AM	Keynote Session 4 (Live Event) by Kevin Eustace, Senior Vice President and General Manager, Engineering and Consulting Services, Siemens Digital Industry Software (Siemens Digital Industry)	Dr. Sam Anand
12:00 PM to 1:30 PM	Technical Presentations	
	Blue Sky Competition- I	Dr. Pfefferkorn
1:30 PM to 3:00 PM	Technical Presentations	
	Blue Sky Competition- II	Dr. Pfefferkorn
3:10 PM to 4:40 PM	NSF Early Career Forum	Dr. Linke, Dr. Z J Pei

Day 3- Thursday 06/24/2021		
Time*	**Event**	**Organizers**
10:50 AM to 11:20 AM	Keynote Session 5 (Pre-Recorded Event) by Dr.-Ing. Christian Brecher, Ordinary Professor for Machine Tools at the Laboratory for Machine Tools and Production Engineering (WZL) of the RWTH Aachen & Director of the Department for Production Machines at the Fraunhofer Institute for Production Technology IPT	Dr. Sam Anand
11:25 AM to 11:55 AM	Keynote Session 6 (Live Event) by Dr. Robert Ivester, Acting MEP Director and the Deputy Director of the Hollings Manufacturing Extension Partnership (MEP) Program at the National Institute of Standards & Technology (NIST)	Dr. Sam Anand

12:00 PM to 1:30 PM	Technical Presentations	
	Federal Agencies Perspective on Advanced Manufacturing	Dr. Pfefferkorn
1:30 PM to 3:00 PM	Technical Presentations	
	NSFs Advanced Manufacturing Program: Overview, Update and Q&A	Dr. Z J Pei
3:10 PM to 4:40 PM	SME Awards Ceremony	Suzy Marzano

Day 4- Friday 06/25/2021		
Time*	**Event**	**Organizers**
11:25 AM to 11:55 AM	Keynote Session 7 (Live Event) by Dr. Gen Satoh, Associate Director at the Raytheon Technologies Additive Manufacturing Process Capability Center	Dr. Sam Anand
12:00PM to 1:30 PM	Technical Presentations	
	Doctoral Symposium-I	Dr. Chen, Dr. Haapala
1:30 PM to 3:00 PM	Technical Presentations	
	Doctoral Symposium-II	Dr. Chen, Dr. Haapala
3:10 PM to 4:40 PM	Doctoral Symposium-III	Dr. Chen, Dr. Haapala
	Poster Session	Dr. Chen, Dr. Haapala

*All times indicated are as per Eastern Daylight Time (EDT)

Tuesday, June 22, 2021

Time*	Event	Organizers
10:15 AM to 10:20 AM	Welcome Note from the Organizing Committee- University of Cincinnati	Dr. Sam Anand
10:20 AM to 10:30 AM	Welcome Note from Dr. John W. Weidner, Dean of the University of Cincinnati College of Engineering and Applied Science	Dr. Sam Anand
10:35 AM to 10:55 AM	Welcome Note from David J. Adams, Chief Innovation Officer and Architect of the Cincinnati Innovation District	Dr. Sam Anand
10:55 AM to 11:25 AM	Keynote Session 1 (Live Event) by Mike Molnar, Director of the Advanced Manufacturing National Program Office & the Office of Advanced Manufacturing (OAM) at the National Institute of Standards & Technology (NIST)	Dr. Sam Anand
11:25 AM to 11:55 AM	Keynote Session 2 (Live Event) by Jutapat (Air) Boonvongsakorn, Global Transformational Engineering Senior Director at P&G	Dr. Sam Anand
12:00 PM to 1:00 PM	Pre-recorded Technical Presentations ▪ NAMRC Track 1- Manufacturing Systems Session 1 ▪ NAMRC Track 2- Manufacturing Processes Session 1 ▪ NAMRC Track 3- Material Removal Session 1 ▪ MSEC 01-01-01 Advances in Metal Additive Manufacturing Processes 1 ▪ MSEC 04-01-01 Smart Manufacturing for Resilient and Environmentally- Efficient Systems 1 ▪ MSEC 05-02-01 Innovations in the Design and Control of Manufacturing Machines and Equipment (ASME- JSME Joint Symposium) 1	

	▪ MSEC 06-01 Advances in Mechanics of Materials in Modern Manufacturing and Materials Processing Techniques ▪ MSEC 07-06-01 Industrial Internet, Cloud and Digital Twins in the Wake of COVID-19 (1)	
12:00 PM to 1:30 PM	Women in Advanced Manufacturing Forum– Panel of Advanced Manufacturing Leaders & Virtual Networking (Live Event)	Dr. Li, Dr. McGovern, Ms. Reslan, Dr. Linke, Dr. Wiens
12:00 PM to 1:30 PM	Student Manufacturing Design Competition –Session I (Live Event)	Dr. Pfefferkorn
1:00 PM to 1:30 PM	Live discussion for Technical Presentations	
1:30 PM to 2:30 PM	Pre-recorded Technical Presentations ▪ NAMRC Track 4- Additive Manufacturing Session 1 ▪ NAMRC Track 5- Smart Manufacturing and Cyber Physical Systems Session 1 ▪ NAMRC Track 6- Manufacturing Education Session 1 ▪ MSEC 01-01-02 Advances in Metal Additive Manufacturing Processes 2 ▪ MSEC 04-01-02 Smart Manufacturing for Resilient and Environmentally- Efficient Systems 2 ▪ MSEC 05-02-02 Innovations in the Design and Control of Manufacturing Machines and Equipment (ASME-JSME Joint Symposium) 2 ▪ MSEC 06-02 Tool Wear Mechanisms, Measurements, and Monitoring ▪ MSEC 07-06-02 Industrial Internet, Cloud and Digital Twins in the Wake of COVID-19 (2)	
1:30 PM to 3:00 PM	Women in Advanced Manufacturing Forum –Panel of Advanced Manufacturing Leaders & Virtual Networking (Live Event)	Dr. Li, Dr. McGovern, Ms. Reslan, Dr. Linke, Dr. Wiens

1:30 PM to 3:00 PM	Student Manufacturing Design Competition –Session II (Live Event)	Dr. Pfefferkorn
2:30 PM to 3:00 PM	Live discussion for Technical Presentations	
3:10 PM to 4:40 PM	ASME Awards Ceremony (Live Event)	Dr. Pfefferkorn

Welcome Note- University of Cincinnati

John Weidner
Dean of the University of Cincinnati College of Engineering and Applied Science

John W. Weidner is Dean of the College of Engineering and Applied Science at the *University of Cincinnati*. Prior to being appointed dean in August of 2019, he was the Chair of the Department of Chemical Engineering at the University of South Carolina (UofSC), Director of their Hydrogen and Fuel Cell Center, and a Distinguished Scientist at the Savannah River National Laboratory. He received his BS degree in chemical engineering from the *University of Wisconsin-Madison* in 1986 and his PhD in chemical engineering from NC State University in 1991. Professor Weidner has advised 24 PhD students, generated over $10 million in research funding, and published over 120 refereed journal articles in the field of electrochemical engineering, particularly in the synthesis and characterization of electrocatalysts and electrochemically active materials, and the mathematical modeling of advanced batteries, fuel cells, and hydrogen production processes. He has been a visiting scientist at NASA's Jet Propulsion Laboratory, the University of California-Berkeley, Los Alamos National Laboratory, and the Fraunhofer Institute for Solar Energy Systems. For his leadership role as director of the department's NSF-REU (Research Experience for Undergraduates) program and his mentoring of undergraduates in his lab, Professor Weidner was awarded the Golden Key Faculty Award by UofSC in 2006 for "Excellence in Integrating Undergraduate Teaching and Research". In 2008 and 2010, he received the Energy Research Award from the E.ON International Research Initiative and the Research Award from the Energy Technology Division of the Electrochemical Society (ECS), respectively, for his work on solar-hydrogen production. For his overall contributions to electrochemical research, Professor Weidner received the UofSC Educational Foundation Award for Research in Science, Mathematics and Engineering (2013), the Education Leadership Award at the Energy Inc. Summit in Charlotte, NC (2016), and the Breakthrough Leadership in Research Award from UofSC (2016). In 2019 he received the Carl Wagner Memorial Award from ECS and he was named a Fellow of the Graduate School at the *University of Cincinnati*. Dr. Weidner was inaugural editor of ECS Transactions and past Technical Editor for the Journal of the Electrochemical Society. He is a Fellow of ECS and the American Institute of Chemical Engineers (AIChE), and a Program Evaluator (PEV) for ABET.

Welcome Note- University of Cincinnati

David J. Adams

Chief Innovation Officer and Architect of the Cincinnati Innovation District

David J. Adams is the lead architect of the Cincinnati Innovation District, University of Cincinnati's Chief Innovation Officer and Chief Executive Officer of the 1819 Innovation Hub. Before joining UC, he was the Chief Administrative Officer and CEO of the Institute for Product Realization at the University of Louisville. As CAO, he oversaw the $1.2B financial and operational aspects of the university, implemented financial reporting and operational efficiencies, and developed the emerging innovation ecosystem. Prior to his work in academia, David was recruited by Governor Mitch Daniels to lead the operational improvement and merger of Indiana's $30B pension systems. During his tenure, David turned a problematic public pension system into a world class operation. He was also a founding member of the executive team that grew i2 Technologies from $4M to $1.1B in 7 years, becoming a NASDAQ 50 company in the process. David has held senior management positions in North and South America, and leading sales and consulting roles Europe, the Middle East, and Africa. He has a breadth of experience that is a great asset to UC and the region as a whole.

Keynote Speaker

Mike Molnar

Director of the Advanced Manufacturing National Program Office & the Office of Advanced Manufacturing (OAM) at the National Institute of Standards & Technology (NIST)

Mike Molnar is the founding director of the Advanced Manufacturing National Program Office, the interagency team responsible for the Manufacturing USA program. Mike also leads the NIST Office of Advanced Manufacturing and serves as co-chair of the National Science and Technology Council, Subcommittee on Advanced Manufacturing for the White House – the team responsible for the National Strategic Plan for Advanced Manufacturing. Prior to joining federal service in 2011 Mike had a successful industry career, including 25 years as a manufacturing leader with Cummins, a U.S. based global company that designs, manufactures, and distributes engines and power generation products.

Title: Manufacturing USA: Today and Tomorrow

Abstract:

The Manufacturing USA program was formally established in 2014 as a public-private partnership to accelerate advanced manufacturing research on transformational technologies important to industry. The institute model was designed to create an effective collaboration space for academia and industry on translational applied research, as well as how to best address workforce skills gaps in these emerging technologies. Now with 16 institutes, from additive manufacturing to sustainable manufacturing, the program has just achieved a new milestone: over 2,300 members from all 50 states have participated in over 1,600 projects. This keynote session will present on where Manufacturing USA is today, including impactful stories on how the institutes contributed to national needs from the COVID-19 pandemic. The program has been reauthorized by Congress with additional responsibilities and authorities, and future plans will be shared on how Manufacturing USA can increase U.S. leadership in global advanced manufacturing.

Keynote Speaker

Jutapat (Air) Boonvongsakorn

Global Transformational Engineering Senior Director at P & G

Transformation and Change Leader. More than 20 years of experiences in driving Breakthrough Transformation in Global Corporate Environment with Local Insight and Entrepreneurial Leadership. Has Lived and worked in USA, Singapore, Japan and Thailand. Global Track record in End to End Innovation, Engineering and Supply Chain Leadership. Led large-complex organization, Top 5 most complex and biggest one of Global P&G supply chains and factories, export to more than 30 countries. Certified Advanced Project Management (CMO) and Certified Advanced Innovation Management. Leading Business Platform Strategy, Portfolio Management, Holistic End to End Supply Chain Design, Re-platforming Programs, Technology Integration and Manufacturing Operation. Currently leading the transformation of Global Engineering. Passionate, Champion and Dedicate to transform organization to next S-Curve to deliver breakthrough business results in the fast-changing world.

Title: Modernize Engineering and Manufacturing with Models, Data Engineering and Data Science Integration

Abstract: In the VUCA world and the rapid changes of consumer behaviors, business requires agility and resiliency of supply chain in delivering speed of innovation and operation. Modernizing Engineering and Manufacturing Work Processes with the integrated hybrid-virtual strategies can step changes Quality, Speed, Cost and Productivity. The power of computing power today with the connectedness of principle models, data engineering and data science techniques enables the deeper understanding of product, process, material and equipment development like never before. Real time consumers inputs, 100% quality assurance, high speed data record for all process parameters and transformations have modernized the way we do Engineering and Engineering Work Process to create bigger, faster and more value innovation for business in the most effective and efficient approaches.

2nd Women in Advanced Manufacturing (WIAM) Virtual Forum 2021

Description

Following its inaugural event in 2019, the WIAM Forum 2021 will continue to showcase successful career paths, discuss next generation technologies, and address the diversity gap in the field of manufacturing engineering. This forum is organized by the ASME Manufacturing Engineering Division (MED) and sponsored by MED, the ASME Technical and Engineering Communities (TEC), and SME.

The WIAM 2021 virtual forum will feature (i) a panel discussion with panelists from government, academia, and industry, (ii) a networking event, (iii) a professional development workshop, and (iv) post-forum presentations by the SME society and ASME Volunteer Orientation and Leadership Training (VOLT) program. In the panel discussion, the panelists will showcase their successful career paths and discuss new technologies and opportunities for the diverse next generation in manufacturing engineering.

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The panel discussion will be followed by a networking event to promote interactions among the panelists and attendees. In the professional development workshop, participants will learn the difference between empowering leadership and controlling leadership. The post-forum presentation will feature introductions of the SME society and the ASME VOLT program.

We sincerely welcome all genders and diverse professionals to join us to together foster career growth and identify next steps for building diversity in manufacturing engineering!

Program

Session I: Panel of Advanced Manufacturing Leaders [12-1 pm ET]

Panel Topic: Career Pathways and Leadership Experiences in Advanced Manufacturing

Panelists: **Jennifer Fielding**, Government – Air Force Research Laboratory, Chief, Composites Branch

Jian Cao, Academia – Northwestern University, Associate VP for Research, Director, NIMSI, Cardiss Collins Professor

Delcie Durham, Academia – University of South Florida,

Professor Emerita

Chandra Brown, Manufacturing USA Institute – MxD, CEO

Sarah Krasley, Industry – Shimmy Technologies,

Founder and CEO

Session II: Virtual Networking [1-1:30 pm ET]

Session III: Professional Development Workshop [1:30-2:30 pm ET]

Moderator: **Crystal Morrison,** EverRise, Founder & CEO

Live Interactive Session: Leadership skills are absolutely necessary, even for scientists and engineers. In this session, participants will learn the difference between empowering leadership and controlling leadership. In addition, participants will receive guidance on how to clarify roles and responsibilities to advocate for themselves and/or empower their team. Tools gained in this session can be used immediately whether working in an office, lab or virtual environment.

Post-Forum Discussions [2:30-3 pm ET]

Discussion I: **SME Presentation**

Discussion II: **ASME's Volunteer Orientation and Leadership Training (VOLT) Presentation**

WIAM 2021 Organizing Committees

Annie Dian-Ru Li

Zap Surgical Systems – R&D Mechanical Engineer

Megan McGovern

General Motors Global R&D Center – Senior Researcher

Maya Reslan

NIST – Associate Researcher

University of CINCINNATI

Barbara S. Linke

University of California Davis – Associate Professor

Gloria Wiens,

University of Florida – Associate Professor

2021 ASME/SME Student Manufacturing Design Competition

Tuesday, June 22, 2021

12:00 PM – 3:00 PM Eastern Time

The purpose of the competition is to foster interest in manufacturing, provide the manufacturing engineering community with fresh new perspectives on design, and create a forum for students to share their new and innovative ideas. Original student designs that focus on manufacturing engineering and science are sought. Any design of a system, component, or process that can be used to promote the art, science, and practice of manufacturing engineering is acceptable.

2021 Finalists

Eastern Time	Title	Student Authors	University
12:00 - 12:20	Customized protective visor against COVID-19 enabled by 4D Printing	Qinglei Ji	KTH Royal Institute of Technology
12:20 - 12:40	Hybrid Manufacturing Work Cell for Fabrication of Large-Scale Metal Parts	Joshua Penney; Aaron Cornelius; Ethan Vals; Jake Dvorak; Michael Buckley; Leah Jacobs; Gregory Corson	University of Tennessee Knoxville
12:40 - 13:00	Analysis of a Closed-Loop Digital Twin	Andrew Eyring	Brigham Young University
13:00 - 13:20	4D Thermal Scanner for Additive Manufacturing Systems	Christopher Henson; Nathan Decker	University of Southern California
13:30 - 13:50	Development of a Handheld Biopsy Device for Needle Biopsy Procedures	Roy Araya; Zachary Tupper	University of Florida
13:50 - 14:10	Development of Manufacturing Automation for the Sorting and Assembly of Nasopharyngeal Swabs	Trent Sakakini; Josiah Go; Petro John; Thien Nguyen; Tobias Hynes; Jayaram Rajagopalan	University of Texas Dallas

14:10 - 14:30	Rotating Internal Mandrel Printhead Design for Material Extrusion Manufacturing of Artificial Muscles in Low Gravity Environments and Spaceflight	Kellen Mitchell; Lily Raymond	University of Nevada Reno
14:30 - 14:50	UR Cobot Digital Twins to Assist SMEs with Robot Integration	JT Frandsen	Brigham Young University

Judges:

- Ihab Ragai (Associate Professor, Penn State Behrend)
- Jarred Heigel (R&D Manager, Third Wave Systems, Inc.)
- Dale Lombardo (Special Process Technologies Leader, GE Aviation)

The First, Second, and Third Place awardees will be recognized at at the ASME Awards Ceremony on Tuesday, June 22, 2021 starting at 3:00 PM Eastern Time. The Student Manufacturing Design Competition will be announced towards the end of the ASME awards ceremony.

Competition Organizer:

- Professors Frank Pfefferkorn (frank.pfefferkorn@wisc.edu)

ASME Manufacturing Engineering Division

AWARDS

Tuesday, June 22, 2021

3:00 – 4:30 PM EDT

University of CINCINNATI

NAMRC 49/MSEC 2021 hosted by University of Cincinnati

June 22-25, 2021

https://ceas.uc.edu/events/namrc-msec-2021/info.html

Welcome
Laine Mears and Radu Pavel
Chair and Past Chair, MED Exec. Committee

Recognition of Collocated Conference Chair Prof. Sam Anand
Presented by *Radu Pavel*
Past Chair, MED Executive Committee

Recognition of 2021 MSEC Technical Program Chairs: Karl Haapala & Yong Chen
Presented by *Laine Mears*
Chair, MED Executive Committee

Best Paper Award
Presented by *Karl Haapala*

Recognition of Retiring Associate Editors Journal of Micro and Nano-Mfg.
Presented by *Nicholas Xuanlai Fang*
Editor, Journal of Micro- and Nano-Mfg.

Blackall Machine Tool and Gage Award
Presented by *Moneer Helu*
Vice-Chair, MED Executive Committee

William T. Ennor Mfg. Technology Award
Presented by *Moneer Helu*
Vice-Chair, MED Executive Committee

M. Eugene Merchant Mfg. Medal
Announced by *Moneer Helu*
Vice-Chair, MED Executive Committee

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MSEC Technical Program Chair

Best Organizer of Symposium & Session (BOSS) Award
Presented by *Karl Haapala*
MSEC Technical Program Chair

Recognition of Track and Symposium Organizers (E-Certificates)
Presented by *Karl Haapala*
MSEC Technical Program Chair

Recognition of Retiring Editor, Journal of Mfg. Science and Engineering
Presented by *Radu Pavel*
Past Chair, MED Executive Committee

Recognition of Retiring Associate Editors Journal of Mfg. Science and Engineering
Presented by *Y. Lawrence Yao*
Editor, Journal of Mfg. Sci. and Eng.

Milton C. Shaw Mfg. Research Medal
Presented by *Moneer Helu*
Vice-Chair, MED Executive Committee

Chao & Trigger Young Mfg. Engineer Award
Presented by *Moneer Helu*
Vice-Chair, MED Executive Committee

Kornel F. Ehmann Manufacturing Medal
Presented by *Moneer Helu*
Vice-Chair, MED Executive Committee

Recognition of New ASME Fellows
Presented by *Radu Pavel*
Past Chair, MED Executive Committee

MED Outstanding Service Award
Presented by *Laine Mears*
Chair, MED Executive Committee

Student Mfg. Design Competition Award
Presented by *Frank Pfefferkorn*
Program Chair, MED Executive Committee

MSEC Best Paper Award Finalists
(listed by first author's last name)

TRAJECTORY-DEPENDENT COMPENSATION SCHEME TO REDUCE MANIPULATOR EXECUTION ERRORS FOR MANUFACTURING APPLICATIONS
Prahar M. Bhatt, Rishi K. Malhan, Pradeep Rajendran, Aniruddha V. Shembekar, and Satyandra K. Gupta

HYBRID-LIGHT-SOURCE STEREOLITHOGRAPHY FOR FABRICATING MACRO-OBJECTS WITH MICRO-TEXTURES
Wenxuan Jia, Yuen-Shan Leung, Han Xu, and Yong Chen, Huachao Mao, and Chi Zhou

VIBRATION-ASSISTED INSERTION OF FLEXIBLE NEURAL MICROELECTRODES WITH BIO-DISSOLVABLE GUIDES FOR MEDICAL IMPLANTATION
Yi Wang, Yen Yu Ian Shih, Yuan-shin Lee

2020 Blackall Machine Tool and Gage Award

The Blackall Machine Tool and Gage Award is presented for the best current original paper or papers (not published elsewhere) which has/have been presented before ASME and/or published by ASME during the two calendar years immediately preceding the year of the award.

Chabum Lee
Texas A&M University

2021 William T. Ennor Manufacturing Technology Award The William T. Ennor Manufacturing Technology Award, established in 1990, is presented to an individual or team for developing or contributing significantly to an innovative manufacturing technology, the implementation of which has resulted in substantial economic and/or societal benefits.	**Albert Shih** University of Michigan
2021 M. Eugene Merchant Manufacturing Medal Established in 1986, the M. Eugene Merchant Mfg. Medal is awarded to an individual who has had significant influence and responsibility for improving the productivity and efficiency of the manufacturing operation(s).	**Scott Smith** Oak Ridge National Laboratory
2020 Milton C. Shaw Manufacturing Research Medal Established 2009, Milton Shaw Medal recognizes significant fundamental contributions to the science and technology of manufacturing processes.	**Jian Cao** Northwestern University
2021 Chao & Trigger Young Manufacturing Engineer Award This award recognizes a young manufacturing researcher with potential for significant contributions to the science and technology of manufacturing processes. Nominees must not have reached their 40th birthday before the nomination deadline.	**Chenhui Shao** University of Illinois Urbana-Champaign
Kornel F. Ehmann Manufacturing Medal This award recognizes the best current original ASME journal paper on micro- or nano-scale manufacturing processes and systems.	2020 Medal **Michael Cullinan, Obehi G. Dibua, Anil Yuksel, Nilabh K. Roy, Chee S. Foong** University of Texas and NXP Semiconductors
Kornel F. Ehmann Manufacturing Medal This award recognizes the best current original ASME journal paper on micro- or nano-scale manufacturing processes and systems.	2021 Medal **Yang Yang and Keyu Chen** The Chinese University of Hong Kong **Ping Guo** Northwestern University

ASME Fellows

Fellow is the highest elected grade of membership within ASME, the attainment of which recognizes exceptional engineering achievements and contributions to the engineering profession.

Salil Desai
North Carolina A&T State University

William Emblom
University of Louisiana-Lafayette

Xiaoqi Chen
Swinburne University of Technology

2021 MSEC Host Organizing Committee

Sam Anand, Chair
Jing Shi, Co-Chair
Sourabh Deshpande, Special Assistant

Murali Sundaram, Co-Chair
Katy Marston, Coordinator

Sponsors

Student Travel Award Sponsor

Key Conference Sponsors:

Early Career Forum Sponsor

WIAM Forum Sponsors

MED Centennial Celebration Sponsors

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Frank Pfefferkorn

Amit Bagchi

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Clemson University

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University of Wisconsin – Madison

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University of Louisville

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ASME
SETTING THE STANDARD

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Presentation Details for Tuesday, June 22, 2021

Tuesday, June 22	**NAMRC Track 1 Manufacturing Systems 1**	
12:00 PM – 1:30 PM	Session Chair: Xun Xu | Session Co-chair: Shiv Kapoor	
NAMRC Paper 10	Wei Li, Barrie R. Nault, Jingjing You and Briscoe Bilderback	Balancing Trade-offs in One-Stage Production with Processing Time Uncertainty
NAMRC Paper 71	Zhangyue Shi, Soumya Mandal, Sandip Harimkar and Chenang Liu	Surface Morphology Analysis Using Convolutional Autoencoder in Additive Manufacturing with Laser Engineered Net Shaping
NAMRC Paper 111	Santhana Pandiyan Muniraj and Xun Xu	An Implementation of OPC UA for Machine-to-Machine Communications in a Smart Factory
NAMRC Paper 104	Matthew Krugh and Laine Mears	Pervasive Environmental Sensing for Industry 4.0 as an Educational Tool
NAMRC Paper 99	Partha Protim Mondal, Placid Matthew Ferreira, Shiv Gopal Kapoor and Patrick N Bless	Monitoring and Diagnosis of Multistage Manufacturing Processes Using Hierarchical Bayesian Networks
Tuesday, June 22	**NAMRC Track 2 Manufacturing Processes 1**	
12:00 PM – 1:30 PM	Session Chair: Brad Kinsey | Session Co-chair: Brigid Mullany	
NAMRC Keynote	Brad Kinsey	Driving Manufacturing Process Innovations through Fundamental Science Phenomena
NAMRC Paper 119	Nakul Ghate and Amber Shrivastava	Power Spectral Analysis of Surface Microtopography Formed in CW Laser Surface Texturing
NAMRC Paper 90	Aarush Sood and Brigid Mullany	Advanced Surface Analysis to Identify Media Workpiece Contact Modes in a Vibratory Finishing Processes
Tuesday, June 22	**NAMRC Track 3 Material Removal 1**	
12:00 PM – 1:30 PM	Session Chair: Tony Schmitz | Session Co-chair: Muhammad Jahan	
NAMRC Paper 3	Al Mazedur Rahman, S M Abdur Rob and Anil K. Srivastava	Modeling and Optimization of Process Parameters in Face Milling of Ti6Al4V Alloy using Taguchi and Grey Relational Analysis
NAMRC Paper 15	Timothy No, Michael Gomez, Jaydeep Karandikar, Jarred Heigel, Ryan Copenhaver and Tony Schmitz	Propagation of Johnson-Cook Flow Stress Model Uncertainty to Milling Force Uncertainty using Finite Element Analysis and Time Domain Simulation

NAMRC Paper 32	Mark Gueli, Jianfeng Ma, Nicholas Cococcetta, David Pearl and Muhammad Jahan	Experimental Investigation into Tool Wear, Cutting Forces, and Resulting Surface Finish During Dry and Flood Coolant Slot Milling of Inconel 718
NAMRC Paper 43	Takenori Ono	Sharpening and Re-Shaping of the Diamond Tool Edge by the Ar Ion Beam Machine Tool
NAMRC Paper 106	Gustavo Fernandes, Guilherme Lopes, Lucas Barbosa, Paulo Martins and Álisson Machado	Wear Mechanism of Diamond-like Carbon Coated Tools in Tapping of AA6351 T6 Aluminium Alloy
Tuesday, June 22 12:00 PM – 1:30 PM	**MSEC 01-01-01 Advances in Additive Manufacturing Processes 1** Session Chair: Wenchao Zhou| Session Co-chair: Qiong Nian	
MSEC2021-60448	Sebastian Greco, Kevin Gutzeit, Hendrik Hotz, Marc Schmidt, Marco Zimmermann, Benjamin Kirsch and Jan C. Aurich	Influence of Machine Type and Powder Batch During Laser-Based Powder Bed Fusion (L-PBF) of AISI 316L
MSEC2021-61726	Jin Fu, Shuo Qu, Junhao Ding, Xu Song and Ming Wang Fu	Effect of Heat Treatment on Microstructure and Mechanical Property of 316L Stainless Steel by Micro Selective Laser Melting
MSEC2021-64108	Yash Parikh and Mathew Kuttolamadom	Selective Laser Melting of Stainless Steel 316L for Mechanical Property-Gradation
MSEC2021-63402	Dipesh Kumar Mishra and Pulak Mohan Pandey	Experimental Investigation into the Fabrication of Porous Biodegradable Fe Scaffold by Microwave Sintering of 3D Printed Green Body
MSEC2021-64111	Michael Liu and Mathew Kuttolamadom	Manufacturing of Co-Cr-Mo Alloy via Directed Energy Deposition
Tuesday, June 22 12:00 PM – 1:30 PM	**MSEC 04-01-01 Smart Manufacturing for Resilient and Environmentally- Efficient Systems 1** Session Chair: Nancy Diaz-Elsayed | Session Co-chair: KC Morris	
MSEC2021-72892	Björn Johansson	Tradeoff Analysis Using Digital Tools for Sustainable Manufacturing
MSEC2021-62227	Nancy Diaz-Elsayed, KC Morris and Julius Schoop	Towards a Digital Depot to Support Sustainable Manufacturing During Crisis Response
MSEC2021-62394	Arpita Chari, Johan Vogt Duberg, Emma Lindahl, Johan Stahre, Mélanie Despeisse, Erik Sundin, Björn Johansson and Magnus Wiktorsson	Swedish Manufacturing Practices Towards a Sustainability Transition in Industry 4.0: A Resilience Perspective

Tuesday, June 22 12:00 PM – 1:30 PM	**MSEC 05-02-01 Innovations in the Design and Control of Manufacturing Machines and Equipment (ASME-JSME Joint Symposium) 1** Session Chair: Martin Jun | Session Co-chair: Chandra Nath	
MSEC2021-72999	Yuefeng Luo	An Investigation into the Equipment Robustness of 3d Printing/L-PBF
MSEC2021-63900	Yi-Wei Chen, Rex Joseph, Alec Kanyuck, Shahwaz Khan, Rishi Malhan, Omey Manyar, Zachary Mcnulty, Bohan Wang, Jernej Barbic and Satyandra Gupta	A Digital Twin for Automated Layup of Prepreg Composite Sheets
MSEC2021-64036	Eunseob Kim, Huitaek Yun, Kyunghyun Kim, Suk-Won Cha and Martin Jun	Multiple Sound Sensors and Fusion in Modern CNN-Based Machine State Prediction
Tuesday, June 22 12:00 PM – 1:30 PM	**MSEC 06-01 Advances in Mechanics of Materials in Modern Manufacturing and Materials Processing Techniques** Session Chair: Dinakar Sagapuram | Session Co-chair: Koushik Viswanathan	
MSEC2021-59877	Elizabeth Mamros, Matthew Eaton, Jinjin Ha and Brad Kinsey	Numerical Analysis of Stainless Steel 316L Biaxial Cruciform Specimens Under Proportional Loading Paths
MSEC2021-63417	Fabian Stiebert, Heinrich Traphöner, Rickmer Meya and A. Erman Tekkaya	Characterization of Flow Curves for Ultra-Thin Steel Sheets with the In-Plane Torsion Test
MSEC2021-63614	Haseung Chung, Guangchao Song, Bibek Poudel, Patrick Kwon, Zachary Detweiler and Guangchun Quan	Development of Magnetic-Field Assisted Finishing (MAF) Process for Chromium-Alloyed Low Carbon Steel Sheet Metal
MSEC2021-63790	Wolfgang Lortz and Radu Pavel	Advanced Modeling of Drilling - Realistic Process Mechanics Leading to Helical Chip Formation
MSEC2021-64005	Mainak Pal, Vandit Pandya and Anupam Agrawal	Study of Formability Limit Based on Ductile Damage Criteria of Incremental Sheet Forming of Titanium Grade 2 Sheet
Tuesday, June 22 12:00 PM – 1:30 PM	**MSEC 07-06-01 Industrial Internet, Cloud and Digital Twins in the Wake of COVID-19 (1)** Session Chair: Xi (Vincent) Wang | Session Co-chair: Yujie Chen	
MSEC2021-72937	Thomas Kurfess	Democratizing Advanced Manufacturing – Ensuring Prosperity and Security
MSEC2021-64237	Jay Lee, Xiang Li, Qibo Yang, Xiaodong Jia and Keyi Sun	Collaborative Platform for Remote Manufacturing Systems Using Industrial Internet and Digital Twin in the Covid-19 Era

Tuesday, June 22 1:30 PM – 3:00 PM	**NAMRC Track 4 Additive Manufacturing 1** Session Chair: Tsz-Ho Kwok | Session Co-chair: Sam Anand	
NAMRC Paper 9	Michael Borish and Charles Wade	A GPU-based Approach for Path Planning Optimization via Travel Length Reduction
NAMRC Paper 23	Yunlong Tang, Guoying Dong, Yi Xiong and Qiusen Wang	Data- driven Design of Customized Porous Lattice Sole Fabricated by Additive Manufacturing
NAMRC Paper 26	Vysakh Venugopal, Nathan Hertlein and Sam Anand	Multi-Material Topology Optimization Using Variable Density Lattice Structures for Additive Manufacturing
NAMRC Paper 30	Halil Tetik, Keren Zhao, Nasrullah Shah and Dong Lin	3D Freeze- printed Cellulose-based Aerogels: Obtaining Truly 3D Shapes, and Functionalization with Cross-linking and Conductive Additives
NAMRC Paper 37	Nathan Decker and Qiang Huang	Optimizing the Expected Utility of Shape Distortion Compensation Strategies for Additive Manufacturing
Tuesday, June 22 1:30 PM – 3:00 PM	**NAMRC Track 5 Smart Manufacturing – Processes, Systems and Integration 1** Session Chair: Peng Wang | Session Co-chair: Carlos Escobar	
NAMRC Keynote	S Jack Hu	Industrial Internet of Things and smart, personalized manufacturing
NAMRC Paper 132	Carlos Escobar, Debejyo Chakraborty, Megan McGovern, Daniela Macias and Ruben Morales-Menedez	Quality 4.0 – Green Belt, Black Belt and Master Black Belt Curricula
NAMRC Paper 117	Bhaskar Botcha, Ashif Sikandar Iquebal and Satish Bukkapatnam	Efficient Manufacturing Processes and Performance Qualification via Active Learning: Application to a Cylindrical Plunge Grinding Platform
Tuesday, June 22 1:30 PM – 3:00 PM	**NAMRC Track 6 Industrial Applications and Manufacturing Education** Session Chair: Brian Paul | Session Co-chair: Albert Shih	
NAMRC Keynote Paper 133	Brian Paul, Laine Mears and Albert Shih	Teaching Manufacturing Processes from an Innovation Perspective
NAMRC Paper 84	Suryanarayanan Gunasekar, Scott Kerner, Matthew Krugh and Laine Mears	Wearable Shear Force-Sensing for Augmenting Manual Hose Connections in an Automotive Assembly
NAMRC Paper 81	John Hart, Dawn Wendell, John Liu, John Lewandowski, Miguel Funes and Albert Shih	Teaching Manufacturing Processes Using a Flipped Classroom Model

Tuesday, June 22 1:30 PM – 3:00 PM	**MSEC 01-01-02 Advances in Metal Additive Manufacturing Processes 2** Session Chair: Ho Yeung | Session Co-chair: Wenchao Zhou	
MSEC2021-63263	Basil Paudel, Garrett Marshal and Scott Thompson	Monitoring and Modeling of Ti-6AI-4V Thin Wall Temperature Distribution During Blown Powder Laser Directed Energy Deposition
MSEC2021-63632	Hanyu Zhu, Nanzhu Zhao, Sandeep Patil, Amit Bhasin and Wei Li	A Method to Predict Fatigue Life of Additively Manufactured Metallic Parts
MSEC2021-63841	Lauren Heinrich, Thomas Feldhausen, Kyle Saleeby, Christopher Saldana and Thomas Kurfess	Prediction of Thermal Conditions of DED with FEA Metal Additive Simulation
MSEC2021-63877	Bilal Taha, Sandeep Patil and Brian Dennis	Design and Manufacturing of Topology Optimized Heat Sinks Made of Copper Using 3D Printing
Tuesday, June 22 1:30 PM – 3:00 PM	**MSEC 04-01-02 Smart Manufacturing for Resilient and Environmentally Efficient Systems 2** Session Chair: Julius Schoop | Session Co-chair: Nancy Diaz-Elsayed	
MSEC2021-63460	David Adeniji and Julius Schoop	In-Situ Calibrated Digital Process Twin Models for Resource Efficient Manufacturing
MSEC2021-63822	Lei Di, Gaurav Manish Shah, Yiran Yang and Weiwei Cui	Greenhouse Gas Emission Analysis of Integrated Production-Inventory-Transportation Supply Chain Enabled by Additive Manufacturing
MSEC2021-63966	Hao-Yu Liao, Willie Cade and Sara Behdad	Forecasting Repair and Maintenance Services of Medical Devices Using Support Vector Machine
Tuesday, June 22 1:30 PM – 3:00 PM	**MSEC 05-02-02 Innovations in the Design and Control of Manufacturing Machines and Equipment (ASME-JSME Joint Symposium) 2** Session Chair: Chandra Nath | Session Co-chair: Martin Jun	
MSEC2021-60227	Weitao Li, Liping Wang and Guang Yu	Time Domain Study on the Construction Mechanism of Milling Stability Lobe Diagrams with Multiple Modes
MSEC2021-63302	Kotaro Mori, Iwao Yamaji, Daisuke Kono, Atsushi Matsubara, Takehiro Ishid, Yuki Kaitani, Eiji Higashi and Taisuke Urakami	Influence of Contact Positioning of Pivot Support on Machining Vibration
MSEC2021-63615	Christopher Martin, Alexandrina Unataroiu, Kemu Xu and S M Mahbobur Rahman	A Study of the Efficacy of Flame Electrical Resistance for Standoff Measurements During the Oxyfuel Cutting Process

MSEC2021-63617	Prahar Bhatt, Rishi Malhan, Pradeep Rajendran, Aniruddha Shembekar and Satyandra Gupta	Trajectory-Dependent Compensation Scheme to Reduce Manipulator Execution Errors for Manufacturing Applications
MSEC2021-63693	Yesiliang Qiu, Janet Dong and Caroline "Niki" Harrison Moretto	Platform Development of Tick Collection Robot
Tuesday, June 22 1:30 PM – 3:00 PM	**MSEC 06-02 Tool Wear Mechanisms, Measurements, and Monitoring** Session Chair: Rui Liu | Session Co-chair: Steven Liang	
MSEC2021-62021	Ben Stuhr and Rui Liu	A Flexible Similarity Based Algorithm for Tool Condition Monitoring
MSEC2021-63468	Zongwei Ren, Zhenglong Fang, Takuhiro Arakane, Toru Kizaki, Yannan Feng, Junshi Kugo, Tsukasa Nishikawa and Eiji Nabata, Naohiko Sugita	Predictions of Cutting Force and Tool Wear in Gear Power Skiving
MSEC2021-63510	Patrick Kwon, Ryan Khawarizmi, Dave Kim, Md Abdulla Sayem and Yinyin Han	The Effect of Carbon Fiber Types on Tool Wear During Edge Trimming of 0°, 45°, 90°, and 135°carbon Fiber Reinforced Plastic Laminates
MSEC2021-63573	Guisen Wang, Fuzhu Han and Liang Zhu	Evolution of White Layer and Residual Stress in Electrical Discharge Machining
MSEC2021-63576	Kuo Liu, Yongqing Wang, Mengmeng Niu, Honghui Wang, Mingrui Shen and Bo Qin	Tool Condition Monitoring Method Based on Generative Adversarial Network for Data Augmentation
Tuesday, June 22 1:30 PM – 3:00 PM	**MSEC 07-06-02 Industrial Internet, Cloud and Digital Twins in the Wake of COVID-19 (2)** Session Chair: Yujie Chen | Session Co-chair: Xi (Vincent) Wang	
MSEC2021-63647	Chuan Xiao, Chun Zhao, Yue Liu and Lin Zhang	A FPGA-Based Cloud-Edge Collaboration Platform in Cloud Manufacturing
MSEC2021-63700	Xiaobin Li and Chao Yin	A Cloud Solution for Service Oriented Workshop Management
MSEC2021-63857	Xiaobin Li and Chao Yin	An OSGi-Based Adaptation Access of Machine Tool in the Cloud Manufacturing Environment
MSEC2021-64438	Huiyue Huan and Xun Xu	Edge Computing Enhanced Digital Twins for Smart Manufacturing

Back to Conference Schedule

Wednesday, June 23, 2021

Time*	Event	Organizers
10:50 AM to 11:20 AM	Keynote Session 3 (Pre-Recorded Event) by Sarah Kleinbaum, Program Manager for Materials Technology in the Department of Energy's (DOE) Vehicle Technologies Office	Dr. Sam Anand
11:25 AM to 11:55 AM	Keynote Session 4 (Live Event) by Kevin Eustace, Senior Vice President and General Manager, Engineering and Consulting Services, Siemens Digital Industry Software (Siemens Digital Industry)	Dr. Sam Anand
12:00 PM to 1:00 PM	Pre-recorded Technical Presentations ▪ Student Competition ▪ NAMRC Track 1- Manufacturing Systems Session 2 ▪ NAMRC Track 2- Manufacturing Processes Session 2 ▪ MSEC 01-05 Smart Additive Manufacturing ▪ MSEC 05-02-03 Innovations in the Design and Control of Manufacturing Machines and Equipment (ASME-JSME Joint Symposium) 3 ▪ MSEC 06-03 Advances in Finishing Processes: Hard Machining, Grinding, and Abrasive Finishing ▪ MSEC 08-03-01 Advances in Micro- and Nano-scale Additive Manufacturing 1	
12:00 PM to 1:30 PM	Blue Sky Competition- I (Live Event)	Dr. Pfefferkorn
1:00 PM to 1:30 PM	Live discussion for Technical Presentations	
1:30 PM to 2:30 PM	Pre-recorded Technical Presentations ▪ Student Competition ▪ NAMRC Track 3- Material Removal Session 2 ▪ NAMRC Track 4- Additive Manufacturing Session 2	

	▪ NAMRC Track 5- Smart Manufacturing and Cyber Physical Systems Session 2 ▪ MSEC 01-02 Advances in Bioinspired Additive Manufacturing ▪ MSEC 06-04 Advances in Processing of Polymers and Polymer Composites ▪ MSEC 07-05 Robotic Manufacturing and Assembly in Smart Factories ▪ MSEC 08-03-02 Advances in Micro- and Nano-scale Additive Manufacturing 2	
1:30 PM to 3:00 PM	Blue Sky Competition- II (Live Event)	Dr. Pfefferkorn
2:30 PM to 3:00 PM	Live discussion for Technical Presentations	
3:10 PM to 4:40 PM	NSF Early Career Forum (Live Event)	Dr. Linke, Dr. Z J Pei

Keynote Speaker

Sarah Kleinbaum

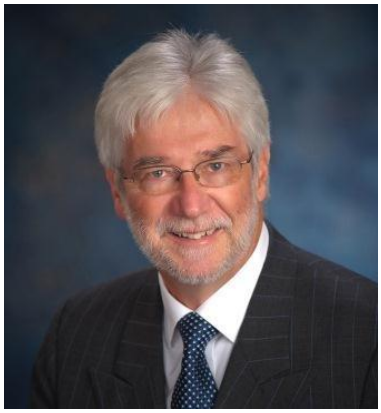
Program Manager for Materials Technology in the Department of Energy's (DOE) Vehicle Technologies Office

Sarah Kleinbaum is the Program Manager for Materials Technology in the Department of Energy's Vehicle Technologies Office. The Materials Technology program funds research on advanced materials and processing technologies to increase fuel economy and decrease greenhouse gas emissions of vehicles. The team assesses the materials related challenges facing the automotive industry to increase efficiency in vehicles and sponsors technical research projects including academia, national laboratory, and industry partners to address those challenges. Sarah also serves as co-chair of the USDRIVE Materials Tech Team which is a public-private partnership between Ford, GM, Stellantis, and US DOE. Prior to her work at the Department of Energy, Sarah managed the Materials Analysis and Approval Laboratory for North America at Whirlpool Corp. Sarah received both her Masters of Science and Bachelor's degree in Materials Engineering from Purdue University.

Title: Decarbonizing the Transportation Sector through Advanced Materials

Abstract: Reducing the weight of a vehicle by 10% results in a 6-8% improvement in fuel economy because it takes less energy to move a lighter object. Electric vehicles also benefit from light weighting because fewer batteries are needed to achieve a given range. Advanced high strength steel and aluminum are being used in increasing amounts by the automotive industry for this reason. Polymer composites and magnesium offer even greater weight savings but face significant challenges that limit implementation. Multi-functional materials also provide new opportunities for efficiency in both electric and conventional combustion vehicles. The Department of Energy funds research to advance materials technology and address the technical challenges that prevent the widespread use of lightweight, multi-functional materials to enable more fuel-efficient vehicles.

Keynote Speaker



Kevin Eustace

Senior Vice President and General Manager, Engineering and Consulting Services, Siemens Digital Industry Software (Siemens Digital Industry)

Kevin is responsible for driving engineering and consulting services worldwide that combines consulting expertise on PLM, Manufacturing and Digitalization processes and value definition together with the application of our software on customer projects and strategic initiatives.

Kevin has considerable experience in working with strategic deployments of Siemens DI Software Solutions world-wide. He has expertise and knowledge of a broad range of engineering, manufacturing and data management disciplines and continues to be involved in both technical and management review boards with Siemens DI Software customers across all industries.

Kevin holds a Bachelor's degree and Master of Science in Aeronautical Engineering from Imperial College, University of London. He also has an MBA from University of Cincinnati.

Title: Siemens Industry 4.0 – Digital Enterprise journey from Lean Digital Factory to Factory Digitalization

Abstract: As a leader in both Factory Automation and Industry Software, Siemens is in a unique position to bring these two often separate elements of IT and OT or Virtual and Physical together to enable a true Digital Enterprise and validate key elements and their impact on Plant Productivity.

This presentation will lay out Siemens internal journey starting in 2018 with the initial kickoff of the Lean Digital Factory (LDF) initiative. This Digitalization initiative focused on improving productivity across 30 plants based on defining and validating changes to current processes (e.g. Engineering/Manufacturing Communication, End to End Manufacturing) and introducing new ways of working and new processes/technology (e.g. IOT, Additive Manufacturing, AGV, Advanced Robots). How this initiative was planned and executed, the impact achieved and the lessons learned will be discussed.

After the success of LDF, a new Siemens wide Factory Digitalization (FD) initiative has been launched this year. This will be discussed in terms of leverage of the LDF work and the addition of new elements to take productivity improvement to the next level.

NSF Manufacturing Blue Sky Competition and SME David Dornfeld Manufacturing Vision Award

Wednesday, June 23, 2021

12:00 PM – 3:00 PM Eastern Time

https://www.sme.org/aboutsme/awards/blue-sky-competition/

The aim of this annual competition is to influence the future of manufacturing research and education in the United States through new, visionary ideas of the future. Such visionary ideas are often described as "radical," "outrageous," "transformational," "unconventional," "convergent," and "breakthrough." Presentations should pose grand challenges to be addressed by pursuing the manufacturing research vision, describing the intersections between disparate disciplines necessary to advance that vision. Topical areas should extend beyond the scope of a single investigator and show potential for transformative impact in areas of interest to federal agencies.

2021 Finalists

Eastern Time	Abstract Title	Abstract Authors
12:00 PM to 12:20 PM	Physics Aware Machine Learning Surrogates for Real-Time Digital Twin in Additive Manufacturing	Baskar Ganapathysubramanian; Soumik Sarkar; Aditya Balu; [Iowa State University]
12:20 PM to 12:40 PM	Manufacturing In-Vitro Living Neural Computing Chips for Efficient AI Learning and Computation	Binil Starly [North Carolina State University]
12:40 PM to 1:00 PM	There Is Only One Existential Threat. Let's Talk About It.	Carly Gayle [International Society for Ecology and Culture]; Carol Handwerker [Purdue University]; Frank Gayle [NIST]

1:00 PM to 1:20 PM	Product in a Patient: In Vivo Surgical Manufacturing	Michael McPhail; Juergen Neubauer; David Lott [Mayo Clinic]
1:30 PM to 1:50 PM	Convergent Systems of Systems Manufacturing (Convergent SoS Manufacturing)	Mihaela (Miki) Banu; Albert Shih; Alan I. Taub; Bogden I. Epureanu [University of Michigan]
1:50 PM to 2:10 PM	From Self-Aware to Self-Healing for "Perpetual" Manufacturing	Noel Greis [North Carolina State University]
2:10 PM to 2:30 PM	Self-sensing Smart-connected Products in Smart Manufacturing Systems	Thorsten Wuest [West Virginia University]; Juergen Lenz [INNEO Solutions]; Eric MacDonald [UT El Paso]; Ramy Harik [University of South Carolina]
2:30 PM to 2:50 PM	Lifelike metallic structures using Origami & Compliant Mechanism	Vanshika Singh [University of Tennessee Knoxville]; Suresh Babu [University of Tennessee, Knoxville; Oak Ridge National Laboratory]; Michael Kirka [Oak Ridge National Laboratory]

Selection Committee: https://www.sme.org/aboutsme/awards/blue-sky-competition/david-dornfeld-manufacturing-vision-award-selection-committee-members/

The winner of the 2021 SME David Dornfeld Manufacturing Vision Award will be announced at the SME Awards Ceremony on Thursday, June 24, 2021 at 3:00 PM Eastern Time.

Competition Organizers:

- Professors Frank Pfefferkorn (frank.pfefferkorn@wisc.edu)
- ZJ Pei (zjpei@tamu.edu)
- Tony Schmitz (tony.schmitz@utk.edu)

June 23, 2021 (Wednesday), 3.10 - 4.40 pm ET

Research Professions in Academia, Industry & National Laboratories: An Early Career Forum

Organized by: ASME/MED, and NAMRI/SME

Sponsored by: NSF (providing travel support to students)

Hosted by: The University of Cincinnati, College of Engineering and Applied Science, Ohio

Purpose: The goal of this forum is to provide current students at all levels of graduate and undergraduate programs as well as recent graduates with better information/knowledge of various research and technical positions in academia, industry, and national laboratories. The forum will further discuss how to be successful professionally in various settings.

Date/ Place: Wednesday, June 23, 2021, afternoon from 3.10 – 4:40 pm ET, online. The forum is held during the co-located manufacturing conferences: the NAMRI/SME 49th North American Manufacturing Research Conference (NAMRC49) and the ASME 2021 International Manufacturing Science and Engineering Conference (MSEC2021).

Agenda (Wednesday, June 23, 2021):

3:10 – 3:55 pm ET: Opening Remarks and Welcome Up to 5-minute spoken introduction by each panelist

3:55 – 4:40 pm ET: Breakout room discussions

Forum Format:

1.Each panelist will introduce themselves and share career advice during the panel session. Theyhave experience in conducting and leading research and engineering projects in academia,government labs, and industrial sectors.

2.Breakout room discussions will follow, where participants can discuss careers in academia,government, and industry. Panelists will discuss topics such as how to search for a job, careermanagement, funding for research, etc. Participants can move between breakout rooms.

3.Participants are encouraged to engage in conversations/ discussions related to their particular/personal interests.

Fee: Free for registered conference participants

Attendance: Open to all registered conference participants;

University of CINCINNATI

Mandatory for NSF Travel Grant student applicants

Early Career Forum Chairs:

Barbara S. Linke, Dr.-Ing. habil.
Associate Professor Department of Mechanical and Aerospace Engineering
University of California Davis, Davis, CA
Email: bslinke@ucdavis.edu

Zhijian (ZJ) Pei, PhD, FASME, FSME
Professor
Department of Industrial and Systems Engineering
Texas A&M University, College Station, TX
Email: zjpei@tamu.edu

The 9 panelists have experience working in academia, government/national labs, and industry. Many of the panelists have experience in more than one of these sectors.

Breakout room	Panelist	Academia	Government/ National Labs	Industry
Room 1	Hitomi Yamaguchi Greenslet (University of Florida)	**X**	**X**	**X**
Room 2	Jingjing Li (Pennsylvania State University)	**X**		**X**
Room 3	Dale Lombardo (GE Aviation)			**X**
Room 4	Brigid Mullany (University of North Carolina at Charlotte)	**X**	**X**	
Room 5	Subramanian Ramalingam (Saint-Gobain Research North America)			**X**
Room 6	Miguel Saez (GM)			**X**
Room 7	Alyssa Sullivan (MxD)		**X**	
Room 8	Scott Smith (Oak Ridge National Laboratory)	**X**	**X**	
Room 9	Sarah Wolff (Texas A&M University)	**X**	**X**	

Hitomi Yamaguchi, University of Florida

Hitomi Yamaguchi is currently an associate professor in the Department of Mechanical and Aerospace Engineering at the University of Florida. The path that led her to UF includes positions in industry, national laboratories, and academia both inside and outside her native Japan. When she was studying for her master's degree, she interned for three months at the Paul Scherrer Institut in Switzerland. This experience and a previous supervisor inspired her to explore academia. In 1996, she received her doctorate from Utsunomiya University, Japan, and started her professional career as research associate at the University of Tokyo. She soon realized that industrial experience was necessary in order to effectively teach Manufacturing Engineering, and she left the university in 1997 to work as a research engineer at Extrude Hone Corporation in Pennsylvania. After gaining some industrial experience, she returned to her alma mater where she became a research associate and later associate professor. In 2002-2003, she spent her sabbatical working as a researcher abroad at NASA Glenn Research Center in Ohio. She left Utsunomiya University in 2007 and moved to UF.

Her research interests have evolved throughout her career and now include ultra-precision finishing (such as magnetic field-assisted finishing), surface functionalization, and medical-device development. Her work has been published in over 90 refereed journal papers, and she has been granted 8 patents. She has received several awards, including Outstanding Young Engineer awards from JSME in 1995, SME in 2000, and JSAT in 2003. She served as the president of the North American Manufacturing Research Institute of SME for the 2018-2019 term. She is currently the vice chair of the Scientific Technical Committee for Abrasive Processes (STC-G) of CIRP (the International Academy for Production Engineering). In recognition of her contributions, she has been elected as a fellow of both ASME and SME. In addition to her research, she is passionate about working in the areas of Manufacturing Education and Workforce

Development. She is the faculty advisor of the UF chapter of Pi Tau Sigma. She hosts students (from K-12 to university) in her laboratory every summer and has hosted events where professionals can share their experiences in engineering education and career development.

Jingjing Li, Pennsylvania State University

Jingjing Li is an Associate Professor of Industrial and Manufacturing Engineering at the Pennsylvania State University, University Park, USA. She holds a PhD and MA from the University of Michigan, Ann Arbor, an MS from Tsinghua University and a BS from Beihang University, Beijing, China. She worked in General Motors R&D Center as an intern for one year. Her primary research interest focuses on materials processing and characterization, particularly on in-situ material characterization, mechanical behavior, failure analysis, and the effect of microstructure on macroscopic properties with applications in sheet metal forming, joining of dissimilar materials, additive manufacturing, and composite manufacturing. She is an Associate Editor of Journal of Manufacturing Science and Engineering, Manufacturing Letters, and Journal of Manufacturing Processes, and a recipient of the Chao and Trigger Young Manufacturing Engineer Award from the American Society of Mechanical Engineers, NSF CAREER Award, and several best paper awards

Dale Lombardo, General Electric Aviation

Dale Lombardo leads a diverse global team of manufacturing special process technologists for GE Aviation. The GEA Special Process Technology Center links materials to design performance and product safety through special processes including machining, joining, heat treatment, additive, chemistry, composites, and inspection. The SPTC team fulfills a specification, monitoring, and control function for manufacturing of GEA parts. In 1992, Dale graduated from Rensselaer Polytechnic Institute with MSME joined GE Research developing control

strategies for machining as a special process. In 1996, Dale worked for GE Aviation and expanded in-process machining monitoring and diagnostics and led the shot peening special process team. Dale joined GE Power in 2005 as part of an internal manufacturing technology startup organization and expanded into high speed machining and surface treatment and metrology. From 2013 to 2020, Dale led the GE Research Manufacturing Technology team as manager and principal engineer working across GE's products and external engagements in advancing manufacturing.

Brigid Mullany, University of North Carolina at Charlotte

Brigid Mullany received her Bachelor of Engineering Degree and Doctorate in Mechanical Engineering from University College Dublin in Ireland. Upon graduation she received a twoyear 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 now a Professor and the Associate Dean for Research in the College of Engineering. Her research areas include surface finishing, surface analysis and advanced manufacturing. She received the SME Kuo K Wang Outstanding Young Manufacturing Engineer Award in 2007, and the NSF CAREER award in 2008. She was a Program Director in the Advanced Manufacturing Cluster at the National Science Foundation from 2017-2019. She is a CIRP fellow, the Chair of the CIRP Scientific Technical Committee on Surfaces (STC-S), and the president elect for the North American Manufacturing Research Institute (NAMRI) of SME.

Subramanian Ramalingam, Saint-Gobain Research North America

Dr. Subramanian Ramalingam is a Senior Research Engineer with Saint-Gobain Research North America where he leads projects in the Bonded Abrasives Group on development of new grinding wheels and improvement of processes /testing techniques to better characterize the abrasive grinding performance. Subramanian received his Ph.D. in Materials Science from the Colorado School of Mines in 2013 and a B. S. in Metallurgical and Materials Engineering from National Institute of Technology, Trichy in India. Before joining Saint-Gobain, Subramanian was a Research Fellow at the Colorado School of Mines leading a research project and advising undergraduate students. During his time at Mines, Dr. Ramalingam's research focus has been on processing and characterization of glasses, ceramics and composites. His work on using food waste as raw materials for glass making received widespread media attention and is the basis for several ongoing research projects to find use for the waste as it presents a disposal problem despite having various waste management practices. Subramanian is an active member of the American Ceramic Society and he has authored numerous international journal publications and holds 2 patents with several in process. In his current role, Subramanian is using his strong technical and leadership skills to develop next generation grinding wheels with improved performance and also better understand the structure-property-performance relations to drive future product development efforts.

Miguel Saez, General Motors

Dr. Miguel Saez is currently a researcher for General Motors Research and Development, Manufacturing Systems Research Lab in Warren, Michigan. In his current role, he develops novel industrial robotics and automation solutions to advance the technology used for manufacturing electric vehicles. He holds a Bachelor's Degree in Mechanical Engineering from La Universidad del Zulia, Venezuela and both a Master's Degree in Automotive and Manufacturing and a Ph.D. in Mechanical Engineering

from the University of Michigan, USA. After obtaining his Bachelor's Degree, Miguel led multiple projects developing manufacturing and assembly systems for alternative fuel vehicle programs. During his graduate studies at the University of Michigan, Miguel developed new methods for modeling and control of manufacturing systems for multi-objective optimization of plant floor operations. After graduation, Miguel joined General Motors Research and Development in June 2018 as a researcher. In his current role, Miguel has been able to capitalize on his strong technical and leadership skills to develop new technology in the field of robotics. His work aims to enable coordinated movement of multi-arm systems using artificial vision and force sensing data fusion for robotic assembly operations.

Scott Smith, Oak Ridge National Laboratory

In 2019, Dr. Scott Smith joined Oak Ridge National Laboratory as Senior Distinguished R&D Staff Member in the Energy and Environmental Sciences Directorate. Prior to that he was Professor and Chair of Mechanical Engineering at the University of North Carolina at Charlotte, where he was a faculty member from 1995-2019. During 2012-13 he served as the Assistant Director for Technology at the US Advanced Manufacturing National Program Office in Washington DC. From 2019 – 2020 he served on the MForesight Leadership Council.

He received his PhD from the University of Florida in 1987, his MS from the University of Florida in 1985, and his BSME from Tennessee Technological University in 1983. He has been an engineering researcher and educator for more than 30 years at the University of Florida, and at the University of North Carolina at Charlotte. His teaching and research areas include high-speed machining, process optimization, and machine dynamics. He has taught numerous industrial short courses. He holds 11 patents. He has worked as a consultant on machining and machine tools for

Alcoa, Bell Helicopter, Boeing, Cooper Tire, General Motors, Georgia Pacific, Goodrich, Sikorsky, and many others.

Smith is one of 17 US Fellows of the International Academy for Production Engineering (CIRP), and he is a Fellow of both SME and ASME. Smith served as the Chair of the Manufacturing Engineering Division of ASME, and as President of the North American Manufacturing Research Institute of SME. He served as Chair of the SME International Awards and Recognition Committee, as member of the CIRP Council, as Chair of the CIRP Editorial Committee, and as Chair of the CIRP Machines Technical Committee. He was a founder of both of Manufacturing Laboratories, Inc., and BlueSwarf LLC. He is author of more than 100 technical papers, and he is co-author of the books Machining Dynamics: Frequency Response to Improved Productivity and Mechanical Vibrations: Modeling and Measurement. Smith has received numerous awards including the ASME William T. Ennor Award, the ASME Blackall Award, the NAMRI/SME S.M. Wu Research Implementation Award, the SME Education Award, the AMT Charles F. Carter Advancing Manufacturing Award, the American Helicopter Society Pinckney Award, an R&D 100 Award, and the NAMRI/SME Lifetime Service Award.

Alyssa Sullivan, MxD

Alyssa Sullivan is the Senior Director of External Relations at MxD, the nation's digital manufacturing institute and the National Center for Cybersecurity in Manufacturing as designated by the U.S. Department of Defense. MxD, which stands for "manufacturing times digital," helps manufacturers build every part better than the last using digital technologies.

Alyssa manages MxD's entire public-facing portfolio including media relations, digital presence, messaging, branding, and corporate events. Prior to joining MxD in 2014, Alyssa was the Chief of Staff to the head of energy efficiency programs at the U.S. Department of Energy where she completed

a Presidential Management Fellowship. She has also held roles at the International Energy Agency, the U.S. House of Representatives, and the U.S. Office of Management and Budget. Alyssa has a master's in American Government and a bachelor's in Government and Spanish from Georgetown University.

Sarah Wolff, Texas A&M University

Dr. Sarah Wolff is an assistant professor in the Industrial and Systems Engineering department at Texas A&M as of Fall 2019. She focuses on manufacturing processing, particularly monitoring additive manufacturing of metallic and composite materials with high-speed cameras and at the small scale. She completed her PhD in mechanical engineering at Northwestern University in 2018 with her thesis work on understanding the directed energy deposition additive manufacturing process. For the following year, she was an Enrico Fermi fellow at Argonne National Laboratory where she built a directed energy deposition system and used high energy X-rays at the Advanced Photon Source to monitor additive manufacturing processes in real time.

Presentation Schedule for Wednesday, June 23, 2021-

Wednesday, June 23 12:00 PM – 1:30 PM	**NAMRC Student Competition 1** Session Chair: Xi Vincent Wang | Session Co-chair: Tony Schmitz	
NAMRC Paper 80	Scott Kerner, Suryanarayanan Gunasekar, Rishabh Vedant, Matthew Krugh and Laine Mears	Parametrization of Manual Work in Automotive Assembly for Wearable Force Sensing
NAMRC Paper 4	Timothy No, Michael Gomez and Tony Schmitz	Contributions of Scanning Metrology Uncertainty to Milling Force Prediction
NAMRC Paper 16	Xiao Zhang, Weijun Shen, Vignesh Suresh, Jakob Hamilton, Li- Hsin Yeh, Xuepeng Jiang, Zhan Zhang, Qing Li, Beiwen Li, Iris V. Rivero and Hantang Qin	In-situ Monitoring of Direct Energy Deposition via Structured Light System and its Application in Remanufacturing Industry
NAMRC Paper 113	Md Moinuddin Shuvo and Guha Manogharan	Novel Riser Designs via 3D Sand Printing to Improve Casting Performance
NAMRC Paper 92	Abdullah Al Mamun, Chenang Liu, Chen Kan and Wenmeng Tian	Real-time Process Authentication for Additive Manufacturing Processes based on In-situ Video Analysis
Wednesday, June 23 12:00 PM – 1:30 PM	**NAMRC Track 1 Manufacturing Systems 2** Session Chair: Laine Mears | Session Co-chair: Matthew Krugh	
NAMRC Paper 103	Mohammed Shafae, Lee Wells and Jaime Camelio	Modeling in Process Machining Data Using Spatial Point Cloud vs. Time Series Data Structures
NAMRC Paper 124	Miguel Saez and Patrick Spicer	Fixtureless Assembly in the Automotive Industry: A Body Closure Case Study (Presentation Only)
NAMRC Paper 88	Behin Elahi	Manufacturing Plant Layout Improvement: Case Study of a High Temperature Heat Treatment Tooling Manufacturer in Northeast Indiana
NAMRC Paper 112	Farhang Momeni and Jun Ni	Quality Can Improve as Productivity Increases: Machining as Proof
NAMRC Paper 24	Waleed Ahmed, Hussien Hegab, Atef Mohany and Hossam Kishawy	Sustainability Assessment of Difficult-to-Cut Materials Using Rotary Tools: A Step Towards Sustainable Machining Environment
Wednesday, June 23 12:00 PM – 1:30 PM	**NAMRC Track 2 Manufacturing Processes 2** Session Chair: Rohan Shirwaiker | Session Co-chair: Sangkee Min	
NAMRC Paper 13	Abishek B. Kamaraj, Natalie Reed and Murali Sundaram	Effect of Ultra-High Pulse Frequency on the Resolution in the Electrochemical Deposition of Nickel

NAMRC Paper 101	Davide Campanella, Gianluca Buffa and Livan Fratini	A Two Steps Lagrangian-Eulerian Numerical Model for The Simulation of Explosive Welding of Three Dissimilar Materials Joints (Presentation Only)
NAMRC Paper 18	Andreas Hetzel, Marion Merklein and Michael Lechner	Influence of A Local Short-Term Heat Treatment on The Formability of Orbital Formed Functional Components
NAMRC Paper 130	Justin Morrow, Francis Deck, Aditya Nagaraj and Sangkee Min	Evaluating Sub-Surface Stress of Precision Machined Single-Crystal Sapphire with Raman Spectroscopy (Presentation Only)
NAMRC Paper 127	John Agapiou	Filling Friction Stir Welding In-Process Exit Holes in Copper Squirrel Cage Rotors for Electric Motors
Wednesday, June 23 12:00 PM – 1:30 PM	**MSEC 01-05 Smart Additive Manufacturing** Session Chair: Chinedum Okwudire | Session Co-chair: Prahalada Rao	
MSEC2021-68940	David Rosen	Smart Additive Manufacturing Process Chains for Part Production and Design
MSEC2021-63623	Juan Diego Toscan, Sahand Hajifar, Christian Oswaldo Segura, Luis Javier Segura and Hongyue Sun	Deformation Analysis of 3-D Printed Metacarpophalangeal and Interphalangeal Joints via Transfer Learning,
MSEC2021-63870	Keval Ramani, Ehsan Malekipour and Chinedum Okwudire	Toward Intelligent Online Scan Sequence Optimization for Uniform Temperature Distribution in LPBF Additive Manufacturing
Wednesday, June 23 12:00 PM – 1:30 PM	**MSEC 05-02-03 Innovations in the Design and Control of Manufacturing Machines and EquiPMent (ASME-JSME Joint Symposium) 3** Session Chair: Atsushi Matsubara | Session Co-chair: Naruhiro Irino	
MSEC2021-63199	Daisuke Kono and Tomoyuki Osumi	A Friction Fluctuation Model of Rolling Guideways
MSEC2021-63720	Shotaro Ogawa, Takuhiro Tsukada, Katsuki Koto and Yasuhiro Kakinuma	Enhancement of Force Control Performance of Macro-Micro System Based Polishing Robot with Gravity Compensation
MSEC2021-63809	Nobutoshi Ozaki, Shota Matsui, Toshiki Hirogaki, and Eiichi Aoyama	Cutting State Estimation via Chatter Mark on End Milled Surface and Analysis of Its Formation Mechanism Using Voxel Model Simulation
MSEC2021-63721	Katsuki Koto, Takuhiro Tsukada, Shotaro Ogawa and Yasuhiro Kakinuma	Performance Evaluation of Robot Polishing in Macro-Micro System Based Polishing Robo
MSEC2021-65062	Yoshitaka Morimoto, Akio Hayashi, Yoshiyuki Kaneko, Naohiko Suzuki, Akane Ishizuka and Narimasa Ueda	Study on Non-Axisymmetric 3-D Curved Surface Turning by Driven-Type Rotary Tool Synchronized with Spindle

Wednesday, June 23 12:00 PM – 1:30 PM	**MSEC 06-03 Advances in Finishing Processes: Hard Machining, Grinding, and Abrasive Finishing** Session Chair: Hitomi Yamaguchi Greenslet | Session Co-chair: Changsheng Guo	
MSEC2021-59981	Xin Li, Xueping Zhang and Rajiv Shivpuri	Microstructure Alteration in the High-Speed Machining of Titanium Alloy Involved with Tool Wear and Cryogenic Condition
MSEC2021-63535	Jin Zhang and Fuzhu Han	High-Speed EDM Milling Using Rotating Short Arcs Under Composite Field
MSEC2021-63712	Yun Huang, Shaochuan Li, Guijian Xiao, Benqiang Chen, Yi He, Wenxi Wang and Kun Zhou	Experimental Study on the Effect of Surface Integrity on Fatigue Performance of Aero-Engine Blade
MSEC2021-63805	Wolfgang Lortz and Radu Pavel	New Perspectives Regarding the Chip Formation Process of Ti-6Al-4V
Wednesday, June 23 12:00 PM – 1:30 PM	**MSEC 08-03-01 Advances in Micro- and Nano-scale Additive Manufacturing 1** Session Chair: Sourabh Saha | Session Co-chair: Brian Giera	
MSEC2021-72956	Jonathan Hopkins	Manufacturing Micro-Granular Crystals and Other Advanced Microstructures Using Optical Tweezers
MSEC2021-63929	Andriy Sherehiy, Andres Montenegro, Danming Wei and Dan Popa	Adhesive Deposition Process Characterization for Microstructure Assembly
MSEC2021-63942	Olalekan Olowo, Ruoshi Zhang, Zhong Yang, Brian Goulet and Dan Popa	Organic Piezoresistive Robotic Skin Sensor Fabrication, Integration and Characterization
Wednesday, June 23 1:30 PM – 3:00 PM	**NAMRC Student Competition 2** Session Chair: Dale Lombardo| Session Co-chair: Peng Wang	
NAMRC Paper 51	Karl Schuchard, Abhay Joijode, Vincent Willard, Bruce Anderson, Pierre Grondin, Behnam Pourdeyhimi and Rohan Shirwaiker	Fabrication of Drug-Loaded Ultrafine Polymer Fibers via Solution Blowing and their Drug Release Kinetics
NAMRC Paper 19	Aaron Cornelius, Jaydeep Karandikar, Michael Gomez and Tony Schmitz	A Bayesian Framework for Milling Stability Prediction and Reverse Parameter Identification
NAMRC Paper 38	Christopher Henson, Nathan Decker and Qiang Huang	A Digital Twin Strategy for Major Failure Detection in Fused Deposition Modeling Processes
NAMRC Paper 21	Matthew Russell, Evan King, Chadwick Parrish and Peng Wang	Stochastic Modeling for Tracking and Prediction of Gradual and Transient Battery Performance Degradation
NAMRC Paper 54	Nathan Hertlein, Philip Buskohl, Andrew Gillman, Kumar Vemaganti and Sam Anand	Generative Adversarial Network for Early-Stage Design Flexibility in Topology Optimization for Additive Manufacturing

Wednesday, June 23 1:30 PM – 3:00 PM	**NAMRC Track 3 Material Removal 2** Session Chair: N Arunachalam | Session Co-chair: Zhaoyan Fan	
NAMRC Paper 45	R Vignesh and N Arunachalam	Design and Development of Spiral Grooved Grinding Wheel and their Influence on the Performance of Vertical Surface Grinding Process
NAMRC Paper 60	Leonardo Rosa Ribeiro Da Silva, Felipe dos Anjos Rodrigues Campos, Wisley Falco Sales and Alisson Rocha Machado	Evaluation of the Tool Wear in the Turning Process of INCONEL 718 Using PCD Tools
NAMRC Paper 46	J Rajaguru and N Arunachalam	Effect of Ultrasonic Vibration on the Performance of the Deep Hole Drilling Process
NAMRC Paper 94	Eddie Taewan Lee, Zhaoyan Fan and Burak Sencer	Estimation of CBN Grinding Wheel Condition Using Image Sensor
NAMRC Paper 48	Deep Singh, N Arunachalam and D S Srinivasu	A Novel Iterative- Based Field Search Technique for Roundness Evaluation
Wednesday, June 23 1:30 PM – 3:00 PM	**NAMRC Track 4 Additive Manufacturing 2** Session Chair: Frank Pfefferkorn| Session Co-chair: Mathew Kuttolamadom	
NAMRC Paper 34	Stefan Ball, Milad Ghayoor, Somayeh Pasebani and Ali Tabei	Statistical Analysis of Porosity and Process Parameter Relationships in Metal Additive Manufacturing
NAMRC Paper 33	James Bevis, Shane Dunlavey and Rodrigo Martinez-Duarte	Development and Preliminary Validation of a Robocasting Platform for the Additive Manufacturing of a Composite Paste Towards the Fabrication of Complex Geometries of Porous Tungsten Carbide
NAMRC Paper 121	Michael Liu, Abhishek Kumar, Satish Bukkapatnam and Mathew Kuttolamadom	A Review of the Anomalies in Directed Energy Deposition (DED) Processes & Potential Solutions - Part Quality & Defects
NAMRC Paper 40	Kandice S. B. Ribeiro, Fábio E. Mariani, Henrique T. Idogava, Gustavo C. da Silva, Zilda C. Silveira, Milton S. F. de Lima and Reginaldo T. Coelho	Evaluation of Laser Polishing as Post-Processing of Inconel 625 Produced by Directed Energy Deposition
NAMRC Paper 125	Marcus Jackson, Aishwarya Deshpande, Aaron Kim and Frank Pfefferkorn	A Study of Particle Size Metrics Using Non-Spherical Feedstock for Metal Additive Manufacturing
Wednesday, June 23 1:30 PM – 3:00 PM	**NAMRC Track 5 Smart Manufacturing – Processes, Systems and Integration 2** Session Chair: Ahmed El-Ghannam | Session Co-chair: Hantang Qin	
NAMRC Paper 11	Ahmed El-Ghannam, Sujithra Chandrasekaran and Farjana Sultana	Mechanism of Epitaxial Growth of Silica Nanowires Reinforcing Agent on Porous Sic Scaffold
NAMRC Paper 12	Li Chen, Jing Huang and Qing Chang	Data-Enabled Real-Time Molding for Production Systems with Variable Cycle Time

NAMRC Paper 128	Russell Waddell and Taylor Fry	The Cheaply Connected Factory: A Brief Evaluation of Consumer Sensors and Hardware Deployed in Industrial Applications
NAMRC Paper 17	Weijun Shen, Xiao Zhang, Xuepeng Jiang, Li-Hsin Yeh, Zhan Zhang, Qing Li, Beiwen Li and Hantang Qin	Surface Extraction from Micro-Computed Tomography Data for Additive Manufacturing
NAMRC Paper 118	Yanglong Lu and Yan Wang	Machine Fault Diagnosis of Fused Filament Fabrication Process with Physics-Constrained Dictionary Learning
Wednesday, June 23 1:30 PM – 3:00 PM	**MSEC 01-02 Advances in Bioinspired Additive Manufacturing** Session Chair: Xiangjia (Cindy) Li | Session Co-chair: Yang Yang	
MSEC2021-60675	Binjamin Perelman and Vishal Sharma	Assessing the Mechanical Properties of 3d Printed Bio-Inspired Structures and Integrating the Structures into a Product
MSEC2021-60894	Brandon Bethers and Yang Yang	Computational Study of Reinforcement Mechanisms of Cuttlefish Bone Inspired Structure for 3d Printing
MSEC2021-61050	Dylan Joralmon, Evangeline Amonoo, Yizhen Zhu and Xiangjia Li	Magnetic Field Assisted 3d Printing of Limpet Teeth Inspired Polymer Matrix Composite With Compression Reinforcement
MSEC2021-63493	Zipeng Guo, Lu An, Sushil Lakshmanan, Jason Armstrong, Shenqiang Ren and Chi Zhou	Additive Manufacturing of Porous Ceramics With Foaming Agent
Wednesday, June 23 1:30 PM – 3:00 PM	**MSEC 06-04 Advances in Processing of Polymers and Polymer Composites** Session Chair: Felicia Stan | Session Co-chair: Anasuya Sahoo	
MSEC2021-62311	Carlos Javier Rodriguez Mondejar, Alvaro Rodriguez-Prieto and Ana Maria Camacho	Estimation of Maximum Flow Length for Cf-Peek Overmolded Grid Structures Using the Finite Element Method
MSEC2021-63499	Felicia Stan, Ionut-Laurentiu Sandu, Adriana-Madalina Turcanu, Nicoleta-Violeta Stanciu and Catalin Fetecau	The Influence of Carbon Nanotubes and Reprocessing on Morphology and Properties of High-Density Polyethylene/carbon Nanotube Composites
MSEC2021-63821	Fabrizio Quadrini, Daniele Santoro, Leandro Iorio and Loredana Santo	Conical Thermoplastic Composite Anisogrid Lattice Structure by Innovative Out-of-Autoclave Molding Process
MSEC2021-64002	Asma Ul Hosna Meem, Kyle Rudolph, Allyson Cox, Austin Andwan, Timothy Osborn and Robert Lowe	Impact of Process Parameters on the Tensile Properties of Dlp Additively Manufactured Elast-Blk 10 Uv-Curable Elastomer
MSEC2021-64039	Weiheng Xu, Dharneedar Ravichandran, Sayli Jambhulkar, Yuxiang Zhu and Kenan Song	Fabrication of Multilayered Polymer Composite Fibers for Enhanced Functionalities

Wednesday, June 23 1:30 PM – 3:00 PM	**MSEC 07-05 Robotic Manufacturing and Assembly in Smart Factories** Session Chair: Azadeh Haghighi | Session Co-chair: Bitao Yao	
MSEC2021-62468	Yunbo Zhang, Wenhao Yang and Qinqin Xiao	An Augmented-Reality Based Human-Robot Interface for Robotics Programming in the Complex Environment
MSEC2021-63670	Jared Flowers and Gloria Wiens	Collaborative Robot Risk of Passage Among Dynamic Obstacles
MSEC2021-63687	Danming Wei, Andriy Sherehiy, Alireza Tofangchi, Mohammad Hossein Saadatze, Dan Popa, Keng Hsu and Moath Alqatamin	Precision Evaluation of Nexus, a Custom Multi-Robot System for Microsystem Integration
MSEC2021-63787	Azadeh Haghighi, Abdullah Mohammed and Lihui Wang	Energy Efficient Multi-Robotic 3d Printing for Large-Scale Construction – Framework, Challenges, and a Systematic Approach
MSEC2021-64512	Yang Hu, Yalin Wang, Feng Xu, Bitao Yao, Wenjun Xu and Hao Feng	Two-Dimensional Image Based Product Connector Recognition for Robotic Disassembly in Remanufacturing
Wednesday, June 23 1:30 PM – 3:00 PM	**MSEC 08-03-02 Advances in Micro- and Nano-scale Additive Manufacturing 2** Session Chair: Brian Giera | Session Co-chair: Nilabh Roy	
MSEC2021-60255	Rushil Pingali and Sourabh Saha	Reaction-Diffusion Modeling of Photopolymerization During Femtosecond Projection Two-Photon Lithography
MSEC2021-63803	Dilan Ratnayake, Alexander Curry, Chuang Qu, John Usher and Kevin Walsh	Characterizing the Conductivity of Aerosol Jet Printed Silver Features on Glass
MSEC2021-63985	Obehi Dibua, Chee Foong and Michael Cullinan	Advances in Nanoparticle Sintering Simulation: Multiple Layer Sintering and Sintering Subject to a Heat Gradient
MSEC2021-64058	Byoungdo Lee, Weishen Chu and Wei Li	The Cooling Rate Effect on Graphene Synthesis in Low Pressure Chemical Vapor Deposition
MSEC2021-64048	Joshua Grose, Obehi Dibua, Dipankar Behera, Chee Foong and Michael Cullinan	Simulation and Characterization of Nanoparticle Thermal Conductivity for a Microscale Selective Laser Sintering System

Back to Conference Schedule

Thursday, June 24, 2021

Time*	Event	Organizer
10:50 AM to 11:20 AM	Keynote Session 5 (Pre-Recorded Event) by Dr.-Ing. Christian Brecher, Ordinary Professor for Machine Tools at the Laboratory for Machine Tools and Production Engineering (WZL) of the RWTH Aachen & Director of the Department for Production Machines at the Fraunhofer Institute for Production Technology IPT	Dr. Sam Anand
11:25 AM to 11:55 AM	Keynote Session 6 (Live Event) by Dr. Robert Ivester, Acting MEP Director and the Deputy Director of the Hollings Manufacturing Extension Partnership (MEP) Program at the National Institute of Standards & Technology (NIST)	Dr. Sam Anand
12:00 PM to 1:00 PM	Pre-recorded Technical Presentations ▪ NAMRC Track 4- Additive Manufacturing Session 3 ▪ NAMRC Track 5- Smart Manufacturing and Cyber Physical Systems Session 3 ▪ MSEC 01-03 Additive Manufacturing with Functional Polymers, Multi-material Structures and Composites ▪ MSEC 02-01 Advanced Materials Manufacturing ▪ MSEC 03-01-01 Advances in Biomanufacturing of Tissue-Engineered Scaffolds and Organs 1 ▪ MSEC 05-03-01 Advanced Machining and Metrology for Smart Manufacturing Technologies (ASME-JSME Joint Symposium) 1 ▪ MSEC 06-06-01 Advances in Lightweight and Dissimilar Materials Joining 1 ▪ MSEC 07-07-01 Changeable, Transformable Manufacturing & Distributed Green Supply Chains in Pandemic Recovery Efforts 1	

12:00 PM to 1:30 PM	Federal Agencies Perspective on Advanced Manufacturing (Live Event)	Dr. Pfefferkorn
1:00 PM to 1:30 PM	Live discussion for Technical Presentations	
1:30 PM to 2:30 PM	Pre-recorded Technical Presentations ▪ NAMRC Track 2- Manufacturing Processes Session 3 ▪ NAMRC Track 4- Additive Manufacturing Session 4 ▪ NAMRC Track 5- Smart Manufacturing and Cyber Physical Systems Session 4 ▪ MSEC 01-04-01 Computational Methods and Process Planning for Additive Manufacturing 1 ▪ MSEC 03-01-02 Advances in Biomanufacturing of Tissue-Engineered Scaffolds and Organs 2 ▪ MSEC 04-02 Advances in Sustainable Manufacturing Processes and Systems ▪ MSEC 06-08 Advances in Assisted and Augmented Manufacturing Processes ▪ MSEC 07-07-02 Changeable, Transformable Manufacturing & Distributed Green Supply Chains in Pandemic Recovery Efforts 2	
1:30 PM to 3:00 PM	NSF's Advanced Manufacturing Program: Overview, Update and Q&A (Live Event)	Dr. ZJ Pei
2:30 PM to 3:00 PM	Live discussion for Technical Presentations	
3:10 PM to 4:40 PM	SME Awards Ceremony (Live Event)	Suzy Marzano

Keynote Speaker

Dr.-Ing. Christian Brecher

Ordinary Professor for Machine Tools at the Laboratory for Machine Tools and Production Engineering (WZL) of the RWTH Aachen & Director of the Department for Production Machines at the Fraunhofer Institute for Production Technology IPT

Since January 1, 2004, Prof. Dr.-Ing. Christian Brecher is the Ordinary Professor for Machine Tools at the Laboratory for Machine Tools and Production Engineering (WZL) of the RWTH Aachen as well as the Director of the Department for Production Machines at the Fraunhofer Institute for Production Technology IPT. Further, he is CEO of the Cluster of Excellence "Integrative Production Technology for High-Wage Countries" that is funded by the German Research Foundation (DFG). Together with his colleague Prof. Hopmann he is also responsible for the Aachen Center for Integrative Lightweight Production (AZL) since 2012. After finishing his academic studies in mechanical engineering, he started his professional career first as a research assistant and later as a team leader in the department for machine investigation and evaluation at the WZL. From 1999 to April 2001, he was responsible for the department of machine tools in his capacity as a Senior Engineer. After a short spell as a consultant in the aviation industry, Professor Brecher was appointed in August 2001 as the Director for Development at the DS Technologie Werkzeugmaschinenbau GmbH, Mönchengladbach, where he was responsible for construction and development until December 2003. Prof. Brecher has received numerous honours and awards including the Springorum Commemorative Coin, the Borchers Medal of the RWTH Aachen, the Scholarship Award of the Association of German Tool Manufacturers (Verein Deutscher Werkzeugmaschinenfabriken VDW) and the Otto Kienzle Memorial Coin of the Scientific Society for Production Technology (Wissenschaftliche Gesellschaft für Produktionstechnik WGP). From 2015 to 2017he was for a period of three years chairman of the scientific group for machines of CIRP, the International Academy for Production Engineering. From 2015 to 2017 Professor Brecher became the acting Head of Institute at the Fraunhofer Institute for Production Technology IPT and in January 2018 he accepted the permanent position of Head of Institute.

Title: Turning data into value

Abstract: Reliable access to any kind of data, information and knowledge – at any time and any place – is considered to be one of the most important visions of the Internet of Production. However, what benefits do manufacturing companies draw from the diversity of the recorded data? Which analysis tools and algorithms offer accurate predictions and thus enable a continuous control of production? These and other questions will be presented in the talk with practical use cases from a metal cutting process on a machine tool. The Internet of Production describes the vision of the Cluster of Excellence, which is a unique long term and interdisciplinary research structure of Germany's Excellence Strategy.

Keynote Speaker

Dr. Robert Ivester

Acting MEP Director and the Deputy Director of the Hollings Manufacturing Extension Partnership (MEP) Program at the National Institute of Standards & Technology (NIST)

Dr. Robert W. Ivester serves as the Acting MEP Director and the Deputy Director of the Hollings Manufacturing Extension Partnership (MEP) Program at the National Institute of Standards and Technology. The MEP National NetworkTM focuses its expertise and knowledge as well as that of its partners (industry, educational institutions, state governments, NIST and other federal research laboratories and agencies) on providing U.S. manufacturers with information and tools they need to improve productivity, assure consistent quality, accelerate the transfer of manufacturing technology and infuse innovation into production processes and new products.

Dr. Ivester served at the Department of Energy for seven years, most recently as Director of the Federal Energy Management Program (FEMP) in the Office of Energy Efficiency and Renewable Energy. FEMP oversees the implementation of policy and actions that result in energy efficiency implementation, renewable energy adoption, and reduction in energy and water use in federal government operations. Dr. Ivester also served in the Advanced Manufacturing Office (AMO) for six years. During that time, AMO launched five Manufacturing USA Institutes, the Critical Materials Hub, and hundreds of small R&D and technical assistance projects across the Nation. He also worked at the National Institute of Standards and Technology for over 16 years, leading and performing research in advanced manufacturing.

He has been an instructor for the Johns Hopkins University Engineering for Professionals program for graduate-level studies in manufacturing engineering since 2001. He is a SME Fellow and a Fellow of the American Society of Mechanical Engineers. He received his doctorate in engineering and a Bachelor of Science in Mechanical Engineering and Master of Science in Manufacturing Engineering from the University of Massachusetts at Amherst.

Title: Manufacturing Extension Partnership: Strengthening U.S. Manufacturers and Empowering the U.S. Manufacturing Ecosystem

Abstract: The Hollings Manufacturing Extension Partnership (MEP) is based at the National Institute of Standards and Technology (NIST). The MEP program was created in 1988 by the Omnibus Trade and Competitiveness Act to improve the competitiveness of U.S.-based manufacturing by making manufacturing technologies, processes, and services more accessible to small and medium-sized manufacturers (SMMs) with MEP Centers in every state and Puerto Rico. These SMMs are critical to our nation's economy, as they constitute 62% of U.S. manufacturing gross domestic product (GDP), 67% of U.S. manufacturing wages and 73% of U.S. manufacturing jobs. These SMMs are also critical to the U.S. innovation ecosystem and helping to achieve the full impact of technology deployment in our nation. Join Rob Ivester, NIST MEP Deputy Director, to learn how MEP works to strengthen U.S. manufacturers by providing technology assistance, workforce, and supply chain services, and in doing so, is empowering the U.S. manufacturing ecosystem.

NSF's Advanced Manufacturing Program: Overview, Update and Q&A

Wednesday, June 24, 2021, 1:30 - 3:00 pm

Organizer: Zhijian (ZJ) Pei

In this special session, three NSF program directors from the NSF Advanced Manufacturing Cluster will update the audience what is new at NSF, especially regarding advanced manufacturing. They will also answer questions from the audience.

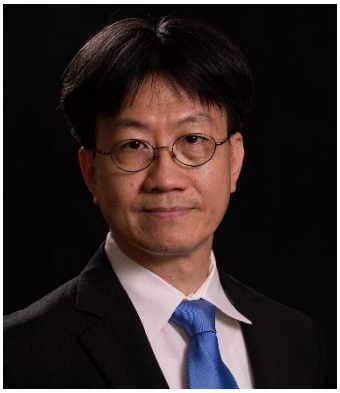
The panelists at this special session are:

- Kevin Chou, Program Director – Responsible for Advanced Manufacturing (AM).
- Khershed Cooper, Program Director – Responsible for Advanced Manufacturing (AM), Engineering Research Centers (ERCs), and Network for Computational Nanotechnology (NCN).
- Andy Wells, Program Director – Responsible for Advanced Manufacturing (AM).

Kevin Chou

Program Director

National Science Foundation (NSF)



Currently serving as a Program Director, Kevin Chou joined the NSF (as IPA) in April 2020 from University of Louisville (UofL), where he is the Edward R. Clark Chair of Advanced Manufacturing. Affiliated with Industrial Engineering Department, Dr. Chou also directed UofL's Additive Manufacturing Institute of Science and Technology (AMIST) from Jan. 2019 – Apr. 2020. He received his Ph.D. from Purdue University and post-doc training from National Institute of Standards and Technology. His research interest includes a broad range of manufacturing processes with recent focus on metal additive manufacturing. He is the recipient of 2016 SME RAPID Dick Aubin Distinguished Paper from SME's Rapid Technologies & Additive Manufacturing Community. Dr. Chou is a Fellow of American Society of Mechanical Engineers (ASME), for which he led the Technical Program of its International Manufacturing Science and Engineering Conference in 2011 and served as the Chair of its Manufacturing Engineering Division (MED) (Jan. 2018 – Jun. 2019). From Aug. 2014 – Aug. 2015, Dr. Chou was the Assistant Director for Technology in the Advanced Manufacturing National Program Office in the U.S. Department of Commerce, supporting the Manufacturing USA initiative.

Khershed P Cooper

Program Director

National Science Foundation (NSF)

Dr. Khershed P. Cooper is a Program Director (PD) for the Advanced Manufacturing (AM) program in the Civil, Mechanical and Manufacturing Innovation (CMMI) Division of the Engineering Directorate at National Science Foundation (NSF). He directs basic research activities in advanced manufacturing, and associated Manufacturing USA and NSF-DFG (Deutsche Forschungsgemeinschaft) collaborations. He is a disciplinary program officer for the Engineering Research Centers (ERC) and a co-PD for cross-cutting programs, such as, Critical Aspects of Sustainability (CAS), Emerging Frontiers in Research and Innovation (EFRI), Network for Computational Nanotechnology (NCN) and National Nanotechnology Coordinated Infrastructure (NNCI). He is an NSF representative for NSTC's Nano Science Engineering and Technology (NSET) Sub-committee, which frames the NNI Strategic Plan. He represents NSF for NextFlex (flexible electronics) and REMADE (circular economy) manufacturing innovation institutes. Prior to joining NSF, Dr. Cooper was a Program Officer for Manufacturing Science at the Office of Naval Research (ONR) and, concurrently, a Senior Research Metallurgist at the Naval Research Laboratory (NRL). His earlier appointments were to serve as a Supervisor of the Materials Research Group at Geo-Centers, Inc and a Scientist II at Olin Metals Research Laboratory. He received his MS and PhD from University of Wisconsin–Madison and his BTech from IIT—Bombay. He has presented at national and international conferences, meetings and workshops. He has over 200 invited talks, 70 contributed presentations, nearly 150 publications, edited one book and holds one patent. He has sponsored and participated in international studies in various emerging areas of advanced manufacturing. He is a Fellow of SME and ASM International and a recipient of ASM International's Burgess Memorial Award.

Andy Wells

Program Director

National Science Foundation (NSF)

Dr. Andy Wells has been a Program Director in the National Science Foundation's Advanced Manufacturing program since 2019, where he supports fundamental research to advance American manufacturing technologies. He is the co-leader of the Future Manufacturing solicitation, which supports research and education that will enable new, potentially transformative, manufacturing approaches to eliminate scientific, technological, educational, economic and social barriers that limit current manufacturing. He is an NSF representative to the National Science and Technology Council's (NSTC) Subcommittee on Advanced Manufacturing, and to the Manufacturing USA Interagency Working Group. Andy brings to the program over 25 years of experience developing and building precision equipment that enables manufacturers and researchers to visualize and transform materials at the micro- and nano-scale. Most recently, he was a technical program manager at Thermo Fisher Scientific and FEI Company, where he led development of scanning electron microscopes and ion-beam machining tools for semiconductor, materials science, and life science customers. Previously, he developed equipment for laser and mechanical micromachining at Electro Scientific Industries and was an adjunct professor at Portland State University. Andy received his PhD and MS degrees in mechanical engineering from Caltech, and his bachelor's degree from Dartmouth.

Presentation Details for Thursday, June 24, 2021-

Thursday, June 24 12:00 PM – 1:30 PM	**NAMRC Track 4 Additive Manufacturing Processes 3** Session Chair: Tarik Dickens | Session Co-chair: Wayne Hung	
NAMRC Paper 50	Vysakh Venugopal, Omkar Ghalsasi, Matthew McConaha, Alice Xu, Jonathan Forbes and Sam Anand	Image Processing-based Method for Automatic Design of Patient-Specific Cranial Implant for Additive Manufacturing
NAMRC Paper 56	Vinay Varghese and Soham Mujumdar	Micromilling-induced Surface Integrity of Porous Additive Manufactured Ti6Al4V Alloy
NAMRC Paper 131	Shyam-Sundar Balasubramanian, Chris Philpott, James Hyder, Mike Corliss, Bruce Tai and Wayne Hung	Novel Fatigue Tester for Additively Manufactured Metals
NAMRC Paper 68	Chaitanya Vundru, Ramesh Singh, Wenyi Yan and Shyamprasad Karagadde	Effect of Spreading of the Melt Pool on the Deposition Characteristics in Laser Directed Energy Deposition
NAMRC Paper 69	Helen Parker, Sean Psulkowski, Phong Tran and Tarik Dickens	In-Situ Defect Analysis of 3D Printing via Conductive Filament and Ohm's Law
Thursday, June 24 12:00 PM – 1:30 PM	**NAMRC Track 5 Smart Manufacturing: Processes, Systems and Integration 3** Session Chair: Matthew Krugh | Session Co-chair: Binil Starly	
NAMRC Paper 126	John Karigiannis, Shaopeng Liu, Stephane Harel, Xiao Bian, Peihong Zhu, Feng Xue, Steeves Bouchard, David Cantin, Maxime Beaudoin-Pouliot, Bernard Bewlay and Marie-Christine Caron	Multi-Robot System for Automated Fluorescent Penetrant Indication Inspection with Deep Neural Nets
NAMRC Paper 52	Mahmud Hasan, Kemafor Anyanwu and Binil Starly	Hybrid Blockchain Architecture for Cloud Manufacturing-as-a-service (CMaaS) Platforms with Improved Data Storage and Transaction Efficiency
NAMRC Paper 44	Jinwoo Song and Young Moon	A Layer Image Auditing System Secured by Blockchain
NAMRC Paper 55	Jonathan Rosales Vizuete, Sourabh Deshpande and Sam Anand	IIoT based Augmented Reality for Factory Data Collection and Visualization
NAMRC Paper 62	Ethan Wescoat, Matthew Krugh and Laine Mears	Random Forest Regression for Predicting an Anomalous Condition on a UR10 Cobot End-Effector from Purposeful Failure Data

Thursday, June 24 12:00 PM – 1:30 PM	**MSEC 01-03 Additive Manufacturing with Functional Polymers, Multi-material Structures and Composites** Session Chair: Bulent Arda Gozen | Session Co-chair: Kun (Kelvin) Fu	
MSEC2021-62317	Jordan Garcia, Robert Harper and Y. Charles Lu	Anisotropic Material Behaviors of 3D Printed Carbon-Fiber Polymer Composites with Open-Source Printers
MSEC2021-63208	Nor Aiman Sukindar, Azib Azhari Awang Dahan, Sharifah Imihezri Syed Shaharuddin and Farah Huda Abd Halim	Performance of Low-Cost 3D Printer in Medical Application
MSEC2021-63412	Roozbeh (Ross) Salary, Mohan Yu, Logan Lawrence, James Day and Pier Paolo Claudio	Pneumatic Microextrusion-Based Additive Biofabrication of Polycaprolactone Bone Scaffolds – Part II: Investigation of the Influence of Polymer Flow Parameters
MSEC2021-63635	Jing Zhao, Muyue Han and Lin Li	Impacts of Process Parameters on Shape Memory Properties of Stereolithography Manufactured Parts: An Experimental Analysis
MSEC2021-64133	Murali Sundaram, Zane Decker, Mason Makulinski and Suprita Vispute	Effects of Size-Reduction on the Failure Mechanism of 3D Printed PLA + Parts
Thursday, June 24 12:00 PM – 1:30 PM	**MSEC 02-01 Advanced Materials Manufacturing** Session Chair: Saeed Farahani | Session Co-chair: Mihaela Banu	
MSEC2021-58537	Aspen Glaspell, Jaejoong Ryu and Kyosung Choo	Thermo-Mechanical Simulation of Ti6Al4V-NiTi Dissimilar Laser Welding Process
MSEC2021-64052	Sahil Dhoka, Himansshu Abhi, Nicholas Hendrickson, William Emblom and Scott Wagner	Integrating Friction-Stir Back Extrusion to Powder Metallurgy
MSEC2021-64916	Mihaela Banu, Tae Hwa Lee, S. Jack Hu and Pei-Chung Wang	Investigation of the Dynamic Response of a Multispot System at Joining Using Ultrasonic Welding
Thursday, June 24 12:00 PM – 1:30 PM	**MSEC 03-01-01 Advances in Biomanufacturing of Tissue-Engineered Scaffolds and Organs 1** Session Chair: Yifei Jin | Session Co-chair: Jun Yin	
MSEC2021-71264 (Invited Symposium Speaker)	Michael McAlpine	3D Printing Bionic Devices
MSEC2021-63658	MD Ahasan Habib, Slesha Tuladhar and Cartwright Nelson	Rheological Analysis of Low-Viscous Hydrogels for 3D Bio-Printing Processes
MSEC2021-63996	Bashir Khoda and Md Ahasan Habib	A Rheological Study of Bio-Ink: Shear Stress and Cell Viability

Thursday, June 24 12:00 PM – 1:30 PM	**MSEC 05-03-01 Advanced Machining and Metrology for Smart Manufacturing Technologies (ASME-JSME Joint Symposium) 1** Session Chair: Takashi Matsumura | Session Co-chair: Norikazu Suzuki	
MSEC2021-60045	Tsutomu Uenohara, Reza Aulia Rahman, Yasuhiro Mizutani and Yasuhiro Takaya	Laser Micro Machining Using a Photonic Nanojet in Water Medium
MSEC2021-60409	Yizhao Guan, Hiromasa Kume, Shotaro Kadoya, Masaki Michihata and Satoru Takahashi	The FDTD Analysis of Near-Field Response for Microgroove Structure with Standing Wave Illumination for the Realization of Coherent Structured Illumination Microscopy
MSEC2021-60417	Yushen Liu, Shotaro Kadoya, Masaki Michihata and Satoru Takahashi	Numerical Study on Tip Shape of Near-Field Optical Fiber Probe for Detecting Electric Field Intensity of Whispering Gallery Mode Resonance
MSEC2021-64688	John Henry Navarro-Devia, Dzung Viet Dao, Yun Chen and Huaizhong Li	Analysis of Vibration Signals in Monitoring Titanium End Milling Process Using Triaxial Accelerometer
Thursday, June 24 12:00 PM – 1:30 PM	**MSEC 06-06-01 Advances in Lightweight and Dissimilar Materials Joining 1** Session Chair: Wayne Cai | Session Co-chair: Xun Liu	
MSEC2021-69636 (Invited Symposium Speaker)	Jingjing Li	Creation of Dissimilar Materials Structures
MSEC2021-61180	Tyler Grimm, Amit Deshpande and Laine Mears	Chipping Reduction Using Thermally-Assisted Friction Element Welding
MSEC2021-63650	Gowtham Parvathy, Tyler Grimm and Laine Mears	Conduction Heat Assisted Friction Element Welding
Thursday, June 24 1:30 PM – 3:00 PM	**NAMRC Track 2 Manufacturing Processes 3** Session Chair: Laine Mears | Session Co-chair: Arif Malik	
NAMRC Paper 27	Andreas Rohrmoser, Hinnerk Hagenah and Marion Merklein	Influence of the Forming Induced Hardening on the Wear Behavior of Aluminum Gears within a Metal-Plastic Material Pairing and Targeted Adaption
NAMRC Paper 28	Tyler Grimm, Gowtham Parvathy and Laine Mears	Friction Element Riveting: A Novel Aluminum to Aluminum Joining Process
NAMRC Paper 31	Tyler Grimm, Ankit Varma, Amit Deshpande, Laine Mears and Xin Zhao	Characterization of Aluminum Flow During Friction Element Welding
NAMRC Paper 39	Rachele Bertolini, Enrico Savio, Andrea Ghiotti and Stefania Bruschi	The Effect of Cryogenic Cooling and Drill Bit on the Hole Quality when Drilling Magnesium-based Fiber Metal Laminates

NAMRC Paper 20	Sumair Sunny, Glenn Gleason, Karuna Sitaula and Arif Malik	Predictive Modeling of Laser Shock Peening Induced Near-Surface Residual Stress in Alumina
Thursday, June 24 1:30 PM – 3:00 PM	**NAMRC Track 4 Additive Manufacturing 4** Session Chair: Yong Chen | Session Co-chair: Maxwell Praniewicz	
NAMRC Paper 91	Pu Han, Sihan Zhang, Alireza Tofangchi and Keng Hsu	Relaxation of Residual Stress in FFF Part with In-Process Laser Heating
NAMRC Paper 98	Yang Xu, Fangjie Qi, Xiangyun Gao, Yujie Shan, Yun Zhou and Yong Chen	Direct Droplet Writing – A Novel Droplet-punching Capillary-splitting 3D Printing Method for Highly Viscous Materials
NAMRC Paper 85	Chao Liu and Junjun Ding	Material Extrusion 3D Printing of Carbon Material Reinforced PDMS Matrix Composites and their Mechanical Properties
NAMRC Paper 109	Jie Sun	An Overview of Scaffolds for Retinal Pigment Epithelium Research
NAMRC Paper 59	Jaime Berez, Maxwell Praniewicz and Christopher Saldana	Assessing Laser Powder Bed Fusion System Geometric Errors through Artifact-Based Methods
Thursday, June 24 1:30 PM – 3:00 PM	**NAMRC Track 5 Smart Manufacturing – Processes, Systems and Integration 4** Session Chair: Weihong Guo | Session Co-chair: N Arunachalam	
NAMRC Paper 57	Dongdong Liu, Weidong Cheng, Jianjing Zhang, Robert Gao and Weigang Wen	Integrated Method of Generalized Demodulation and Artificial Neural Network for Robust Bearing Fault Recognition
NAMRC Paper 79	Nesar Ahmed Titu, Matthew Baucum, Timothy No, Mitchell Trotsky, Jaydeep Karandikar, Tony Schmitz and Anahita Khojandi	Estimating Johnson-Cook Material Parameters using Neural Networks
NAMRC Paper 25	Kandice S. B. Ribeiro, Henrique H. L. Núñez, Jason Jones, Peter Coates and Reginaldo Coelho	A Novel Melt Pool Mapping Technique Towards the Online Monitoring of Directed Energy Deposition Operations
NAMRC Paper 73	Matthew Behnke, Shenghan Guo and Weihong Guo	Comparison of Early Stopping Neural Network and Random Forest for In-Situ Quality Prediction in Laser Based Additive Manufacturing
NAMRC Paper 77	Rishikesan V, Bhagyesh Chaturvedi and Arunachalam N	Characterisation of drilling-induced damage in GFRP Honeycomb Sandwich Composites using Acoustic Emission

Thursday, June 24 1:30 PM – 3:00 PM	**MSEC 01-04-01 Computational Methods and Process Planning for Additive Manufacturing 1** Session Chair: Tsz-Ho Kwok | Session Co-chair: Yunbo 'Will' Zhang	
MSEC2021-63351	Ana Paula Clares and Guha Manogharan	Discrete-Element Simulation of Powder Spreading Process in Binder Jetting, and the Effects of Powder Size Distribution.
MSEC2021-63375	Liangkui Jiang, Pavithra Premaratne, Yanhua Huang, Zhan Zhang and Hantang Qin	Modeling and Experimental Validation of Droplet Generation in Electrohydrodynamic Inkjet Printing for Prediction of Printing Quality
MSEC2021-63719	Xiaoqing Tian, Yaling Li, Dingyifei Ma, Jiang Han and Lian Xia	Closed-Loop Control of Silicone Extrusion-Based Additive Manufacturing Based on Machine Vision
MSEC2021-63642	Zhicheng Rong, Chang Liu and Yingbin Hu	4D Printing of Complex Ceramic Structures via Controlling Zirconia Contents and Patterns
MSEC2021-63717	Wenxuan Jia, Yuen-Shan Leung, Huachao Mao, Han Xu, Chi Zhou and Yong Chen	Hybrid-Light-Source Stereolithography for Fabricating Macro-Objects with Micro-Textures
Thursday, June 24 1:30 PM – 3:00 PM	**MSEC 03-01-02 Advances in Biomanufacturing of Tissue-Engineered Scaffolds and Organs 2** Session Chair: Yifei Jin | Session Co-chair: Kyle Christensen	
MSEC2021-63242	Youping gong, Jinlai Qi, Rougang Z hou, Honghao Chen, Junling He, Zizhou Qiao, Zhikai Bi, Huipeng Chen, Furjan M. S. H. Al, Guojin Chen, Xiang Zhang and Huifeng Shao	Three-Dimensional Cell Culture with Alginate Hetero Gel Microspheres
MSEC2021-63411	Logan Lawrence, James Day, Pier Paolo Claudio and Roozbeh (Ross) Salary	Investigation of the Regenerative Potential of Human Bone Marrow Stem Cell-Seeded Polycaprolactone Bone Scaffolds, Fabricated Using Pneumatic Microextrusion Process
MSEC2021-63413	Roozbeh (Ross) Salary, Abigail Chaffins, Mohan Yu, James Day and Pier Paolo Claudio	Investigation of the Functional Properties of Additively-Fabricated Triply Periodic Minimal Surface-Based Bone Scaffolds for the Treatment of Osseous Fractures.
MSEC2021-63471	Cartwright Nelson, Slesha Tuladhar and MD Ahasan Habib	Designing an Interchangeable Multi-Material Nozzle System for 3D Bioprinting Process
MSEC2021-63654	Huifeng Shao, Zhuoluo Jing, Rougang Zhou, Zhiheng Nian, Haiqiang Liu, Youping Gong and Yong He	Manufacturing of Biodegradable Intramedullary Nail with High Strength

Thursday, June 24 1:30 PM – 3:00 PM	**MSEC 04-02 Advances in Sustainable Manufacturing Process and Systems** Session Chair: Daniel Cooper | Session Co-chair: William Bernstein	
MSEC2021-63507	Xiange Wang, Philip Kent Velbis and Barbara Linke	Framework for User-Friendly Modeling of Energy Use in Fused Deposition Modeling
MSEC2021-63645	Abigail Clarke-Sather, Asad Bashir Tyler Poggiogalle and Christopher Meehan	Material Properties of Discarded Textiles for Manufacturing Feedstocks
MSEC2021-63739	Reginald Elvis Peter Francis and Senthilkumaran Kumaraguru	Material Efficiency and Economics of Hybrid Additive Manufacturing
Thursday, June 24 1:30 PM – 3:00 PM	**MSEC 06-08 Advances in Assisted and Augmented Manufacturing Processes** Session Chair: Weilong Cong | Session Co-chair: Meng Zhang	
MSEC2021-60388	Yunze Li, Dongzhe Zhang and Weilong Cong	Ultrasonic Vibration Assisted-Laser Directed Energy Deposition of B4C-Ti Composite: Effects of Laser Power and Ultrasonic Vibration
MSEC2021-60520	Rui Dai, Beomjin Kwon and Qiong Nian	A Novel Packing Hollow Dodecahedron Model to Study the Mechanical and Thermal Properties of Stocastic Metallic Foams
MSEC2021-63281	Tom Zhang, Yubin Liu and Lawrence Yao	Effect of Laser Forming on the Energy Absorbing Behavior of Metal Foams
MSEC2021-63404	Tyler Grimm and Laine Mears	Electrically Assisted Wire Drawing Polarity Effects
Thursday, June 24 1:30 PM – 3:00 PM	**MSEC 07-07 Changeable, Transformable Manufacturing & Distributed Green Supply Chain in Pandemic Recovery Efforts** Session Chair: Ahmed Azab | Session Co-chair: Mohamed Gadalla	
MSEC2021-65490	Sardar Asif Khan	Single Minute Exchange of Die: A Case Study to Improve System Changeability
MSEC2021-60408	Saeideh Salimpour and Ahmed Azab	A Dynamic Programming Approach to Solve the Facility Layout Problem for Reconfigurable Manufacturing
MSEC2021-63766	Yunqing Li, Shivakumar Raman, Binil Starly and Paul Cohen	Design of Knowledge Graph in Manufacturing Services Discovery

[Back to Conference Schedule]

Friday, June 25, 2021

Time*	Event	Facilitator
11:25 AM to 11:55 AM	Keynote Session 7 (Live Event) by Dr. Gen Satoh, Associate Director at the Raytheon Technologies Additive Manufacturing Process Capability Center	Dr. Sam Anand
12:00 PM to 1:00 PM	Pre-recorded Technical Presentations ▪ NAMRC Track 2- Manufacturing Processes Session 4 ▪ NAMRC Track 4- Additive Manufacturing Session 5 ▪ MSEC 06-06-02 Advances in Lightweight and Dissimilar Materials Joining 2 ▪ MSEC 07-06-03 Industrial Internet, Cloud and Digital Twins in the Wake of COVID-19 (3) ▪ MSEC 08-02-01 Advances in Micro and Nano Manufacturing 1 ▪ MSEC 09-02 Data-Enabled Modeling, Detection, Optimization, and Prognostics for Quality and Reliability Improvement of Advanced Manufacturing Systems ▪ MSEC 12-01-01 MED 100-Year Issue of JSME State-of-the-Art Papers 1	
	Pre-recorded Doctoral Symposium-I Presentations (Process planning and modeling)	Dr. Chen, Dr. Haapala
1:00 PM to 1:30 PM	Live discussion for Technical Presentations and Doctoral Symposium-I	Dr. Chen, Dr. Haapala
1:30 PM to 2:30 PM	Pre-recorded Technical Presentations ▪ NAMRC Track 5- Smart Manufacturing and Cyber Physical Systems Session 5 ▪ MSEC 01-04-02 Computational Methods and Process Planning for Additive Manufacturing 2 ▪ MSEC 03-02 Advances in Manufacturing, Development, and Analysis of Biomedical Devices	

	▪ MSEC 05-03-02 Advanced Machining and Metrology for Smart Manufacturing Technologies (ASME-JSME Joint Symposium) 2 ▪ MSEC 06-06-03 Advances in Lightweight and Dissimilar Materials Joining 3 ▪ MSEC 07-02 Cyber-Physical Systems and Cybersecurity in Industry 4.0 ▪ MSEC 08-02-02 Advances in Micro and Nano Manufacturing 2 ▪ MSEC 12-01-02 MED 100-Year Issue of JSME State-of-the-Art Papers 2	
	Pre-recorded Doctoral Symposium-II Presentations (Processes and materials)	Dr. Chen, Dr. Haapala
2:30 PM to 3:00 PM	Live discussion for Technical Presentations and Doctoral Symposium-II	Dr. Chen, Dr. Haapala
3:10 PM to 4:10 PM	Pre-recorded Doctoral Symposium-III Presentations (Design, simulation and optimization)	Dr. Chen, Dr. Haapala
3:10 PM to 4:30 PM	Poster Session (Live Event)	Dr. Chen, Dr. Haapala
4:10 PM to 4:40 PM	Live discussion for Doctoral Symposium-III	Dr. Chen, Dr. Haapala

Keynote Speaker

Gen Satoh

Associate Director at the Raytheon Technologies Additive Manufacturing Process Capability Center

Gen Satoh is an Associate Director at the Raytheon Technologies Additive Manufacturing Process Capability Center and leads technology development activities in the areas of design, materials, and process simulation. Prior to joining Raytheon, Gen led the development of large-format wire-fed additive manufacturing at the Alcoa Technical Center targeting aerospace structural applications produced via near-net-shape deposition or the patented Ampliforge™ process. Gen received his M.S. and Ph.D. in Mechanical Engineering from Columbia University with a focus on laser materials processing and a B.S. in Engineering from Harvey Mudd College.

Title: Additive Manufacturing Capability and Tool Development

Additive manufacturing (AM) continues to impact the way we view the components and systems that drive aerospace and defense solutions across Raytheon Technologies. The capabilities offered by AM open opportunities for improvements in performance, cost, and lead time across the corporation. The development and deployment of additive manufacturing technologies across the product portfolio, however, requires a holistic understanding of the manufacturing process, including considerations from design to materials, deposition and in-situ monitoring, as well as post-processing and NDE. Addressing all of these interrelated areas when developing additive-enabled parts is critical to maximizing the business impact the technologies offer. This presentation will highlight approaches being employed within Raytheon Technologies to develop the capabilities and tools to address gaps in these areas as well as key aerospace and defense applications where AM is being adopted.

Doctoral Symposium

Welcome to the Doctoral Symposium of MSEC 2021!

The Doctoral Symposium will be an opportunity for doctoral students who will graduate soon (within a year) or a recently graduated doctoral student to showcase their doctoral dissertation research in various advanced manufacturing research areas. The symposium will also provide universities and industrial companies an opportunity to identify excellent candidates for job openings targeting Ph.D. graduates in advanced manufacturing.

In the first Doctoral Symposium of ASME Manufacturing Science and Engineering Conference, 16 students will present their work on Friday (June 25). They are assigned to three sessions, and each session will be 90 minutes. Each presentation will be 12 minutes with 3 minutes of Q&A.

The students' email addresses are given in this booklet. Please feel free to follow up with the students on their work before/after the Doctoral Symposium.

Organizers

Dr. Yong Chen, *University of Southern California, Los Angeles, CA, USA*

Dr. Karl Haapala, *Oregon State University, Corvallis, OR, USA*

Doctoral Symposium

13-01 Process Planning and Modeling (Friday, June 25 – 12 – 1:30 pm)

Karl	Schuchard	kgschuch@ncsu.edu	North Carolina State University
Rishi	Malhan	rmalhan@usc.edu	University of Southern California
Donghua	Zhao	dongdong5212a@163.com	Shanghai Jiao Tong University
Joseph	Kubalak	josephk7@vt.edu	Virginia Tech
Ankit	Agarwal	agarwal.3@iitj.ac.in	Indian Institute of Technology Jodhpur
Muhammad-Ali	Ablat	amaimaitiaili@ucmerced.edu	University of California Merced

13-02 Processes and Materials (Friday, June 25 – 1:30 – 3:00 pm)

Yizhou	Jiang	yizhouj@usc.edu	University of Southern California
Daniel	Franke	dfranke2@wisc.edu	University of Wisconsin- Madison
Padmalatha	Kakanuru	padmalathakakanuru@gmail.com	Stevens Institute of Technology
Yang	Xu	yxu195@usc.edu	University of Southern California
Hemant	Agiwal	agiwal@wisc.edu	University of Wisconsin- Madison

13-03 Design, Simulation, and Optimization (Friday, June 25 – 3:00 – 4:30 pm)

Nathan	Hertlein	hertlenj@mail.uc.edu	University of Cincinnati
Zhuo	Wang	zwg@umich.edu	University of Michigan-Dearborn
Vysakh	Venugopal	venugovh@mail.uc.edu	University of Cincinnati
Matthew	Krugh	mkrugh@gmail.com	Clemson University
Lun	Li	li2l6@mail.uc.edu	University of Cincinnati

Presentation Details for Friday, June 25, 2021-

Friday, June 25 12:00 PM – 1:30 PM	**NAMRC Track 2 Manufacturing Processes 4** Session Chair: N Arunachalam | Session Co-chair: Sarah J. Wolff	
NAMRC Paper 66	Przemysław Podulka	Application of Image Processing Methods for the Characterization of Selected Features and Wear Analysis in Surface Topography Measurements
NAMRC Paper 75	Hui Wang, Benjamin Gould, Niranjan Parab, Cang Zhao, Aaron Greco, Tao Sun and Sarah J. Wolff	High-Speed Synchrotron X-Ray Imaging of Directed Energy Deposition of Titanium: Effects of Processing Parameters on the Formation of Entrapped-Gas Pores
NAMRC Paper 120	T Aravind, S Boominathasellarajan and N Arunachalam	Fabrication of Micro-Channels on Polymethyl Methacrylate (PMMA) Plates by Thermal Softening Process Using Nichrome Wire: Tool Design and Surface Property Evaluation
NAMRC Paper 96	Ching-Tun Peng and Iqbal Shareef	Dry Machining Parameter Optimization for γ-TiAl With a Rhombic Insert
NAMRC Paper 108	Kelsey Lalka, Aaron Dunn, Hannah Skrbis, Noelle Langmack, Joseph Budzinski and Steven Schmid	Hydroforming of Ti-6Al-4V Acetabular Cups
Friday, June 25 12:00 PM – 1:30 PM	**NAMRC Track 4 Additive Manufacturing 5** Session Chair: Jing Shi | Session Co-chair: Sam Anand	
NAMRC Paper 70	Michael Ogunsanya, Joan Isichei, Santosh Kumar Parupelli, Salil Desai and Yi Cai	In-situ Droplet Monitoring of Inkjet 3D Printing Process using Image Analysis and Machine Learning Models
NAMRC Paper 72	Roman Savinov, Yachao Wang, Jin Wang and Jing Shi	Comparison of Microstructure and Properties of CoCrFeMnNi High-Entropy Alloy from Selective Laser Melting and Directed Energy Deposition Processes
NAMRC Paper 76	Edisson Andres Naula Duchi, Biali Fernando Lima Rodriguez, Luis Eduardo Garza Castañon and José Israel Martínez López	Manufacturing of Stereolithography Enabled Soft Tools for Point of Care Micromixing and Sensing Chambers for Underwater Vehicles
NAMRC Paper 100	Yujie Shan, Dongming Gan and Huachao Mao	Curved Layer Slicing based on Isothermal Surface
NAMRC Paper 89	Lun Li and Sam Anand	Hatch Pattern Optimization of Powder Bed Fusion Additive Manufacturing Process for Minimizing Part GD&T Errors

Friday, June 25 12:00 PM – 1:30 PM	**MSEC 06-06-02 Advances in Lightweight and Dissimilar Materials Joining 2** Session Chair: Yongbing Lee | Session Co-chair: Wayne Cai	
MSEC2021-60179	Fadi Al-Badour, Abdulrahman Al-Ghamdi, Akeem Adesina, Rami Suleiman and Nesar Merah	Friction Stir Diffusion Bonding of Magnesium Alloy ZK 60 to Steel
MSEC2021-61036	Jiangchao Wang, Bin Yi and Xiaoli Zhou	Influence of Clamping for Out-of-Plane Welding Distortion Mitigation During Thin Steel Plates Welding
MSEC2021-61250	Koen Faes, Jens Vermeersch and Rafael Gomes Nunes Silva	Joining of Metal-Plastic Composites with Advanced Welding Processes
MSEC2021-63321	Giovanni Chianese, Pasquale Franciosa, Jonas Nolte, Darek Ceglarek and Stanislao Patalano	Photodiode-Based In-Process Monitoring of Part-to-Part Gap and Weld Penetration Depth in Remote Laser Welding of Automotive Battery Tab Connectors
MSEC2021-64320	Daniel Franke, Shiva Rudraraju, Michael Zinn and Frank Pfefferkorn	Effect of Tool Eccentricity on the Development of Force Based Defect Detection During Friction Stir Welding of Aluminum Alloy 6061-T6
Friday, June 25 12:00 PM – 1:30 PM	**MSEC 07-06-03 Industrial Internet, Cloud and Digital Twins in the Wake of COVID-19 (3)** Session Chair: Yujie Chen | Session Co-chair: Xi (Vincent) Wang	
MSEC2021-61672	Dong Han, Wangming Li, Xinyu Li, Liang Gao and Yang Li	A Data-driven Proactive Scheduling Approach for Hybrid Flow Shop Scheduling Problem
MSEC2021-63407	David Stock, Aditi Mukhopadhyay, Rob Potter and Andy Henderson	Tool Wear Analysis of MTConnect Production Data
MSEC2021-63522	Yilin Fang and Kai Mei	Multi-Robotic Disassembly Line Balancing Using Deep Reinforment Learning
MSEC2021-64407	Yang Hu, Zitong Liu, Feng Xu, Jiayi Liu, Wenjun Xu and Hao Feng	Human Motion Position Prediction for Human-Robot Collaboration in Manufacturing Considering Human Joint Repair
MSEC2021-64642	Yang Hu, Yiwen Ding, Feng Xu, Jiayi Liu, Wenjun Xu and Hao Feng	Knowledge Recommendation System for Human-Robot Collaborative Disassembly Using Knowledge Graph
Friday, June 25 12:00 PM – 1:30 PM	**MSEC 08-02-01 Advances in Micro and Nano Manufacturing 1** Session Chair: Ping Guo | Session Co-chair: Bashir Khoda	
MSEC2021-59847	Chuang Qu, Bruce Alphenaar, Shamus Mcnamara and Kevin Walsh	Optimization of Ultra-High Aspect Ratio Nanostructures Fabricated Using Glancing Angle Deposition
MSEC2021-59982	Peiqiang Yang, Xueping Zhang, Zhenqiang Yao and Rajiv Shivpuri	Molecular Dynamics Modeling the Nano-Indentation of Titanium
MSEC2021-60390	Stanislau Niauzorau, Aliaksandr Sharstniou, Natalya Kublik,	Synthesis of Nanoporous Gold by Chemical Dealloying of Co-Sputtered

	Venkata Sampath and Bruno Azeredo	Gold-Silver Thin Films and Study of Its Variability
MSEC2021-60460	Madhu Vadali and Utsavkumar Mistry	Influence of Surface Geometry on Melt Pool Flows and Shape in Pulsed Laser Surface Melting
MSEC2021-63347	Michael Grzenda, Arielle Gamboa, James Mercado, Lin Lei, Jennifer Guzman, Lisa Klein, Andrei Jitianu and Jonathan Singer	Parametric Control of Melting Gel Morphology and Chemistry via Electrospray Deposition
Friday, June 25 12:00 PM – 1:30 PM	**MSEC 09-02 Data-Enabled Modeling, Detection, Optimization, and Prognostics for Quality and Reliability Improvement of Advanced Manufacturing Systems** Session Chair: Xiaowei Yue | Session Co-chair: Xiaolei Fang	
MSEC2021-58639	Shenglei Du, Jingmei Guo, Lin Yi, Chen Zhang and Shi Liu	Real-Time Reliability Assessment of Wind Turbine Components Using a Back-Propagation Neural Network and SCADA Data
MSEC2021-62056	Rajshekhar Singhania, Chinmay Sawkar and Manoj Tiwari	Optimal Sensor Deployment to Diagnose Large-Scale Manufacturing Systems Using a Convergence-Trajectory Controlled Ant Colony System Algorithm
MSEC2021-62348	Xiaolei Fang and Xin Li	Multistream Sensor Fusion-Based Prognostics Model for Systems Under Multiple Operational Conditions
MSEC2021-63465	Joseph Cohen and Jun Ni	A Semi-Supervised Multiclass Anomaly Detection Approach for Partially Labeled In-Process Measurement Data
MSEC2021-63661	Hao Wang, Yassine Qamsane, James Moyne and Kira Barton	Merging Subject Matter Expertise and Deep Convolutional Neural Network for State-Based Online Machine-Part Interaction Classification
Friday, June 25 12:00 PM – 1:30 PM	**MSEC 12-01-01 MED 100-Year Issue of JSME State-of-the-Art Papers 1** Session Chair: Laine Mears | Session Co-chair: Albert Shih	
MSEC2021-72735	Yuming Zhang	Advanced Welding Manufacturing - A Brief Analysis and Review of Challenges and Solutions
MSEC2021-73103	Jay Lee	Intelligent Maintenance Systems and Predictive Manufacturing
MSEC2021-73166	Yung C. Shin, Benxin Wu, Shuting Lei, Gary J. Cheng and Y. Lawrence Yao	Overview of Laser Applications in Manufacturing and Materials Processing in Recent Years

Friday, June 25 12:00 PM – 1:30 PM	**Doctoral Symposium- Session 1 Process planning and modeling** Session Chair: Yong Chen | Session Co-chair: Karl Haapala	
MSEC2021-68367	Donghua Zhao and Weizhong Guo	Research on Design Methodology and Key Technology of Rotary 3d Printer for Curved Layer Slicing
MSEC2021-68804	Ankit Agarwal	Modeling and Control of Geometric Tolerances in End Milling of Thin-Walled Component
MSEC2021-68865	Karl Schuchard	Computational and Experimental Characterization of 3d-Melt Blowing Process-Structure-Function Interrelationships for Tissue Engineering
MSEC2021-68992	Rishi Malhan	Manipulator Trajectory Planning Under Motion Constraints
MSEC2021-68998	Joseph Kubalak, Alfred Wicks and Christopher Williams	Topology and Toolpath Optimization via Layer-Less Multi-Axis Material Extrusion
MSEC2021-69071	Muhammad-Ali Ablat	Mechanics of Origami-Based Sheet Metal Bending
Friday, June 25 1:30 PM – 3:00 PM	**NAMRC Track 5 Smart Manufacturing - Processes, Systems and Integration 5** Session Chair: Zhaoyan Fan | Session Co-chair: Ali Tabei	
NAMRC Paper 78	Cheng Zhu, Tian Yu and Qing Chang	Applying Task-Oriented Safety Field Calibration in Human Robot Collaborative Systems
NAMRC Paper 61	Shohanuzzaman Shohan, Jordan Harm, Mahmud Hasan, Binil Starly and Rohan Shirwaiker	Non-Destructive Quality Monitoring of 3D Printed Tissue Scaffolds via Dielectric Impedance Spectroscopy and Supervised Machine Learning
NAMRC Paper 87	Niechen Chen	An Evolutionary Neural Network Approach to Machining Process Planning: A Proof of Concept
NAMRC Paper 53	Asmaa Harfoush, Karl Haapala and Ali Tabei	Application of Artificial Intelligence in Incremental Sheet Metal Forming: A Review
NAMRC Paper 97	Mitch Woodside, Joseph Fischer, Patrick Bazzoli, Douglas Bristow and Robert Landers	A Kinematic Error Controller for Real-Time Kinematic Error Correction of Industrial Robots
Friday, June 25 1:30 PM – 3:00 PM	**MSEC 01-04-02 Computational Methods and Process Planning for Additive Manufacturing 2** Session Chair: Chi Zhou | Session Co-chair: Tsz Ho Kwok	
MSEC2021-63540	Muyue Han, Jing Zhao and Lin Li	Emissions of Volatile Organic Compounds From 4D Printing and Associated Control Strategies Towards Workplace Safety
MSEC2021-63751	Shubhra Kamal Nandi, Rakesh Kumar, Anubhav Anubhav and Anupam Agrawal	Prediction of Melt-Pool Characteristics in SLM Process for Ti6Al4V Using a Semi-Analytical Model

MSEC2021-63823	Ryan Stebbins, Philip King and Guha Manogharan	A Computational Study on Novel Runner Extension Designs via 3D Sand-Printing to improve Casting Performance
MSEC2021-63965	Irfan Mustafa and Tsz Ho Kwok	Development of Intertwined Infills to Improve Multi-Material Interfacial Bond Strength
Friday, June 25 1:30 PM – 3:00 PM	**MSEC 03-02 Advances in Manufacturing, Development, and Analysis of Biomedical Devices** Session Chair: Yihao Zheng | Session Co-chair: Yancheng Wang	
MSEC2021-63406	Prasannavenkadesan Varatharajan and Pandithevan Ponnusamy	Prediction of Cutting Force in Bone Cutting Using Finite Element Analysis
MSEC2021-63715	Yong Lei, Yingda Hu and Murong Li	Friction Analysis in Needle Insertion into Soft Tissue
MSEC2021-63952	Yuan-Shin Lee, Yi Wang and Yen Yu Ian Shih	Vibration-Assisted Insertion of Flexible Cortical Neural Micro-Electrodes with Bio-Dissolvable Guides for Medical Implantation
MSEC2021-64056	Xinxiao Li, Patrick Chernjavsky, Katerina Angjeli, Sola Hoffman, Sara Frunzi and Yihao Zheng	Experimental Investigation of the Material Removal Rate in Grinding of Calcified Plaque by Rotational Atherectomy
Friday, June 25 1:30 PM – 3:00 PM	**MSEC 05-03-02 Advanced Machining and Metrology for Smart Manufacturing Technologies (ASME-JSME Joint Symposium) 2** Session Chair: Yasuhiro Takaya | Session Co-chair: Satoru Maruyama	
MSEC2021-60651	Norikazu Suzuki, Hiroki Hayashi, Eiji Shamoto, Naruhiro Irino and Yasuhiro Imabeppu	Time Domain Simulation of Dynamic Corner Milling Process Considering Chatter Vibration with Finite Amplitude
MSEC2021-63373	Mitsuru Hasegawa and Tatsuya Sugihara	Development of Cutting Tools with Micro-Textured Surface for High-Speed Machining of Ti-6Al-4V
MSEC2021-63704	Shoichi Tamura, Takashi Matsumura, Atsushi Ezura and Kazuo Mori	Anisotropic Cutting Force Characteristics in Milling of Maraging Steel Processed through Selective Laser Melting
MSEC2021-63727	Isamu Nishida and Keiichi Shirase	Automated Tool Path Generation for End-Milling Operation using CAD Model in STL Format
Friday, June 25 1:30 PM – 3:00 PM	**MSEC 06-06-03 Advances in Lightweight and Dissimilar Materials Joining 3** Session Chair: Xun Liu | Session Co-chair: Wayne Cai	
MSEC2021-60412	Jan-Tore Jakobsen, R. M Chandima Ratnayake, Arnfinn Neverdal and Sølve Sætre Sem	Investigating Optimal Parameter combination for Friction Stir Spot Welding on Al7075-T6: Engineering Robust Design Approach
MSEC2021-60759	Nannan Chen, Hongliang Wang, Jingjing Li, Vic Liu and James Schroth	Evolution of Interfacial Microstructure during Resistance Spot Welding of Cu and Al with Ni-P Coating
MSEC2021-61775	Shenghan Guo, Dali Wang, Jian Chen, Zhili Feng and Weihong Guo	Predicting Nugget Size of Resistance Spot Welds using Infrared Thermal videos with

		Image Segmentation and Convolutional Neural Network
Friday, June 25 1:30 PM – 3:00 PM	**MSEC 07-02 Cyber-Physical Systems and Cybersecurity in Industry 4.0** Session Chair: Rui Liu | Session Co-chair: Dazhong Wu	
MSEC2021-63892	Helen Guixiu Qiao and Guangkun Li	Auto-Calibration for Vision-Based 6-D sensing system to support Monitoring and Health Management for Industrial Robots
MSEC2021-63960	David Gamero, Andrew Dugenske, Thomas Kurfess, Christopher Saldana and Katherine Fu	SQL and NoSQL Databases for Cyber Physical Production Systems in Internet of Things for Manufacturing
MSEC2021-63990	Zhaojun Qin and Yuqian Lu	Multi-Agent-Based Self-Organising Manufacturing Network Towards Mass Personalisation
MSEC2021-63974	Junying Yao, Yongkui Liu, Tingyu Lin, Xubin Ping, He Xu, Wenxiao Wang, Yingying Xiao, Lin Zhang and Lihui Wang	Robotic Grasping Training Using Deep Reinforcement Learning with Policy Guidance Mechanism
MSEC2021-64065	Yongzhi Qu, Gregory Vogl and Zechao Wang	A Deep Neural Network Model for Learning Generalized Frequency Response Function Using Sensor Measurements
Friday, June 25 1:30 PM – 3:00 PM	**MSEC 08-02-02 Advances in Micro and Nano Manufacturing 2** Session Chair: Martin Jun | Session Co-chair: Chandra Nath	
MSEC2021-63864	Sri Sukanta Chowdhury, Zhong Yang, Patrick W. Clapacs and Dan O. Popa	Untethered Microrobots with Serpentine Actuators: The Role of Elastics Point Contact & Laser Beam Shape on Their Locomotion
MSEC2021-63887	Sushmita Challa, M. Shafquatul Islam, Danming Wei, Cindy Kathleen Harnett, Jasmin Beharic and Dan Popa	Functional Fiber Junctions for Circuit Routing in E-Textiles: Deterministic Alignment of MEMS Layout with Fabric Structure
MSEC2021-63902	Sayli Jambhulkar, Weiheng Xu, Yuxiang Zhu, Dharneedar Ravichandran and Kenan Song	Microscale 3D Printed Patterns for Nanoscale Particle Assembly
MSEC2021-63916	Andrea Grisell and Murali Sundaram	Creation of Functionally Graded Glass Channels by Electrochemical Discharge Machining Process: A Feasibility Study
MSEC2021-64079	Bashir Khoda, S M Naser Shovon and AMM Nazmul Ahsan	Solid Transfer of Large Particles by Dipping in a Heterogeneous Mixture
Friday, June 25 1:30 PM – 3:00 PM	**MSEC 12-01-02 MED 100-Year Issue of JSME State-of-the-Art Papers 2** Session Chair: Albert Shih | Session Co-chair: Laine Mears	
MSEC2021-68677	Jian Cao and Mihaela Banu	Opportunities and Challenges in Metal Forming for Lightweighting: Review and Future Work
MSEC2021-72613	Yusuf Altintas, Gabor Stepan,	Chatter Stability of Machining Operations

	Erhan Budak, Tony Schmitz and Zekai Murat Kilic	
MSEC2021-73443	I. Jawahir	Modeling and Optimization of Sustainable Machining Processes: Recent Advances and Outlook
Friday, June 25 1:30 PM – 3:00 PM	**Doctoral Symposium- Session 2 Processes and materials** Session Chair: Karl Haapala | Session Co-chair: Yong Chen	
MSEC2021-67567	Yizhou Jiang	Direct Ink Writing of Functional Fiber Composites
MSEC2021-68705	Padmalatha Kakanuru and Kishore Pochiraju	Additively Manufactured High-Performance Silicon Carbide Composite
MSEC2021-68869	Daniel Franke	Sub-Surface Void Formation and Detection During Friction Stir Welding of Aluminum Alloys
MSEC2021-68873	Yang Xu	Direct Droplet Writing – a Novel Droplet-Punching Capillary-Splitting 3D Printing Method for Highly Viscous Materials
MSEC2021-68999	Hemant Agiwal, Frank Pfefferkorn, Kumar Sridharan and Hwasung Yeom	Low Force Friction Surfacing for Crack Repair in 304l Austenitic Stainless Steels
Friday, June 25 3:10 PM – 4:40 PM	**Doctoral Symposium- Session 3 Design, simulation, and optimization** Session Chair: Yong Chen	
MSEC2021-68770	Zhuo Wang and Lei Chen	Machine Learning Boosted Modeling and Simulation of Additive Manufacturing: Process, Structure and Property
MSEC2021-68811	Nathan Hertlein	Optimal Design and Processing for Additive Manufacturing Using Machine Learning
MSEC2021-68991	Vysakh Venugopal	Numerical Optimization and Machine Learning Techniques for Part Design and Process Parameters for Additive Manufacturing
MSEC2021-69048	Lun Li	Fast Additive Manufacturing Simulation and Optimization
MSEC2021-69068	Matthew Krugh	Evaluation of Product Quality Through Technologically Augmented Workers in Industry 4.0 Assembly
Friday, June 25 3:10 PM – 4:40 PM	**Poster Session- Manufacturing Systems** Session Chair: Ahmed Azab | Session Co-chair: Chi Zhou	
MSEC2021-67770	Barbara S. Linke, Peter Groche, Zhijian Pei and Petra Wiederkehr	Promoting U. S. - Germany Collaborative Research in Advanced Manufacturing
MSEC2021-73030	Philipp Sembdner, Bernhard Bust, Lars Dornheim, Stefan Holtzhausen and Ralph Stelzer	Parametrically Adjustable Surgical Template Models to Support the Insertion of Individual Knee Joint Implants
MSEC2021-70118	Scott Kerner, Shamali Laxman Nevase, Matthew Krugh and Laine Mears	Wearable Force Sensing Glove for Manual Work in Automotive Assembly

MSEC2021-72796	Yinan Wang and Xiaowei Yue	NP-ODE: Neural Process Aided Ordinary Differential Equations for Uncertainty Quantification of Finite Element Analysis
MSEC2021-68691	David Merayo, Alvaro Rodriguez-Prieto and Ana Maria Camacho	Prediction of Material Properties by Using the Finite Element Method and Artificial Intelligence
MSEC2021-73167	Ethan Wescoat, Matthew Krugh a nd Laine Mears	Purposeful Failure Methodology: Generating Training Data for Predicting Equipment Failure
MSEC2021-69077	Purvee Bhatia and Nancy Diaz-Elsayed	A Framework to Aid Decision-Making for Investing in Smart Manufacturing Technologies
MSEC2021-68958	Chenang Liu and Zhangyue Shi	A Blockchain-Enabled Approach for Cyber-Physical Security in Advanced Manufacturing
MSEC2021-68971	Aniruddha Gaikwad, Brian Giera, Gabriel Guss, Jean-Baptiste Forien, Manyalibo Matthews and Prahalada Rao	Sensing and Physics-based Machine Learning for Quality Assurance in L-PBF
Friday, June 25 3:10 PM – 4:40 PM	**Poster Session- Additive Manufacturing - Metal** Session Chair: Yifei Jin	
MSEC2021-64845	Santosh Rauniyar and Kevin Chou	3D Transient Zone in Conduction and Keyhole Mode Melting in Laser Powder Bed Fusion Process
MSEC2021-68848	Kolbe Kirlin and James Garofalo	Design and Testing of Wire Arc Additive Manufacturing (WAAM) End Effector
MSEC2021-68965	Benjamin Bevans, Ziyad Smoqi, James Craig, Alan Abul-Haj, Brent Roeder, Bill Macy, Jeffery E. Shield and Prahalada Rao	Closed-Loop Control of Meltpool Temperature in Directed Energy Deposition
MSEC2021-69049	Reza Yavari, Ziyad Smoqi, Alex Rienschie, Ben Bevans, Humaun Kobir, Heimdall Mendoza, Hyeyun Song, Kevin Cole and Prahalada Rao	Part-Scale Thermal Simulation of Laser Powder Bed Fusion Using Graph Theory: Effect of Thermal History on Porosity, Microstructure Evolution, and Recoater Crash
MSEC2021-69073	Xiaoqing Wang, Yi Yao, Shanshan Zhang, Lin Li, Wenjun Cai, Natalia Esparragoza, Matthew Rosser, Dana Ingalsbe and Kaiwen Wang	Microstructure and Mechanical Properties of 18Ni-300 Maraging Steel Fabricated by Selective Laser Melting
MSEC2021-69078	Ziyad Smoqi, Benjamin Bevans, Harold (Scott) Halliday, Joshua Toddy, Jeffery Shield and Prahalada Rao	Directed Energy Deposition of Cobalt-Chromium Stellite Wear Coating
MSEC2021-67397	Rana Dabaja, Robert Buechler, Sun-Yung Bak, Gustavo	Intelligent Dental Implant Design

	Mendonca, Bogdan Ioan Popa and Mihaela Banu	
MSEC2021-62855	Fucheng Zhang and Robert Chang	Design and Fabrication of Heterogeneous Scaffolds using Melt Electrowriting
Friday, June 25 3:10 PM – 4:40 PM	**Poster Session- Additive Manufacturing-Polymer** Session Chair: Dong Lin	
MSEC2021-68643	India Dykes, Mahmoud Amr, Arda Gozen, Michelle Counts, Joshua Kernan, Alia Mallah, Juana Mendenhall, Nehal Abu-Lail and Bernard Vanwie	3D Printed Sa-Gel-Ga Scaffolds with Tunable Mechanical Properties
MSEC2021-68863	Karl Schuchard, Bruce Anderson, Behnam Pourdeyhimi and Rohan Shirwaiker	Characterization of 3d-Melt Blowing for Tissue Engineering Applications
MSEC2021-72866	Moataz Abdulhafez and Mostafa Bedewy	Direct Laser-Induced Nanocarbon Formation on Flexible Polymers: Tailoring Porous and Fibrous Morphologies
MSEC2021-73147	Chao Sui and Wenchao Zhou	Effects of Driving Signal on Piezo Inkjet Printing
MSEC2021-68771	Mingman Sun and Meng Zhang	Physics-Based Modeling for Two Photon Polymerization Additive Manufacturing
MSEC2021-68949	Liangkui Jiang, Pavithra Premaratne, Yanhua Huang, Zhan Zhang and Hantang Qin	Modeling of Droplet Generation in Electro Hydrodynamic Inkjet Printing
MSEC2021-68608	Ala Qattawi, Ala'aldin Alafaghani, Muhammad Ali Ablat Nuryar, Hossein Abedi and Jian-Qiao Sun	Data-Driven Modeling and Optimization of FDM Processing Parameters
MSEC2021-68726	Christopher Indrarto and Burak Sencer	Machine Tool Vibration Mitigation by Optimal Trajectory Pre-Filter Design
Friday, June 25 3:10 PM – 4:40 PM	**Poster Session - Machining** Session Chair: Zheng Yihao	
MSEC2021-68185	Ian Garretson, Qiuhao Guo and Barbara Linke	Simulations of a Stand for a Grinding Machine for Improved Energy Efficiency
MSEC2021-68798	Marija Glisic, Badrinath Veluri and Devarajan Ramanujan	Reusable Life Cycle Inventory Models for Centerless Grinding
MSEC2021-68852	Tyler Grimm and Laine Mears	Electrically Assisted Milling
MSEC2021-68968	Julianne Jonsson, Christopher Chighizola, Christopher D'elia, Michael Hill, Barbara Linke, Daniel Weber, Benjamin Kirsch and Jan Aurich	Wafer Experiments to Assess Machining Distortion in Aluminum
MSEC2021-71239	Nilesh Ashok Kharat, Tyler Grimm and Laine Mears	3D Stochastic Milling for Freeform Surfaces
MSEC2021-69521	Felicia Fashanu and Barbara Linke	Analysis of Force Controlled Grinding with a Multi-Grit Scratch Test on a Polishing Machine

MSEC2021-73165	Sohan Nagaraj and Nancy Diaz-Elsayed	Correlation Between the Tool Temperature and Workpiece Surface Characteristics in CNC Milling
MSEC2021-68966	Masafumi Endo, Burak Sencer	Machining Cycle-Time Prediction by Machine Learning of CNC Interpolator Dynamics
MSEC2021-68994	Nishant Ojal, Harish Cherukuri, Ryan Copenhaver, Tony Schmitz, Adam W. Jaycox and Kyle Devlugt	SPH Simulations of Modulated Tool Path Machining
Friday, June 25 3:10 PM – 4:40 PM	**Poster Session- Modeling & Welding** Session Chair: Karl Haapala	
MSEC2021-67424	Lydia Mika, Arthur Hilbig, Stefan Holtzhausen and Ralph Stelzer	Process Optimization for the Manufacturing of Individualized Ankle Foot Orthoses via Digitalization and AM
MSEC2021-69005	Ru Yang and Ping Guo	Deep-learning based Point-light Photometric Stereo for 3D Reconstruction of Metal Surface
MSEC2021-69021	Mohammad Ali Ansari, Frank Pfefferkorn and Shiva Rudraraju	Predictive Modeling of Defect Formation in Friction Stir Welding
MSEC2021-73041	Amit B. Deshpande, Tyler J. Grimm and Laine Mears	Abrasive Element Use in Friction Element Welding
MSEC2021-73042	Gowtham V. Parvathy, Tyler Grimm and Laine Mears	Heat Assisted Friction Element Welding
MSEC2021-73058	Golnaz Tomraei, Jaegeun Lee, Moataz Abdulhafez and Mostafa Bedewy	Decoupling Gas-Phase Decomposition, Catalyst Nanoparticle Formation, and Catalytic Growth in CVD of Carbon Nanotube Forests
MSEC2021-68963	Hossein Abedi, Keyvan Safaei Baghbaderani, Ala'aldin Alafaghani, Ala Qattawi, Moataz M. Attallah and Mohammad Elahinia	Neural Network Modeling of NiTiHf Transformation Temperatures
MSEC2021-68941	Ala Qattawi, Muhammad Ali Ablat and Jian-Qiao Sun	Investigating Fracture Failure in Origami-Based Sheet Metal Bending

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