NAMRC 51

NAMRI / SME North American Manufacturing Research Conference

MSEC 2023

ASME International Manufacturing Science & Engineering Conference

LEM&P 2023

JSME / International Conference on Leading Edge Manufacturing/Materials & Processing

June 12-16, 2023
Rutgers University-New Brunswick, New Jersey, USA

RUTGERS

TABLE OF CONTENTS

TABLE OF CONTENTS

CONFERENCE SCHEDULE

MONDAY, JUNE 12

Time	Location	Event
8:30-15:00	AB-2200	NAMRI Board Meeting
12:00-20:00	Brower Lobby	Registration
13:00-17:00	Brower Lobby	Exhibitor Booth Set Ups
	AB-2160	NSF Workshop on Machining Industry Cyberphysical Systems Roadmapping
15:00-17:00	AB-2200	ASME MED Executive Committee Meeting
15:00-17:00	Brower Dining Hall	NAMRC Awards Rehearsal
16:00-20:00	Brower Lobby	Poster Set Ups
18:00-20:00	Brower Dining Hall	Welcome Reception
18:30-20:00	Brower Room A&B	Women in Advanced Manufacturing (WIAM) Reception

TUESDAY, JUNE 13

Time	Location	Event
7:00-12:00 13:30-17:30	Academic Building (AB) East 2nd Floor Atrium	Registration
8:00-8:30	AB-2400	Welcome Address • Yuebin Guo, Weihong Grace Guo, *Conference Co-Chairs* • Denise Hien, *Rutgers-NB Vice Provost* • Robert "Bob" Willig, *Executive Director and CEO of the Society of Manufacturing Engineers (SME)* • Thomas Costabile, *Executive Director and CEO of the American Society of Mechanical Engineers (ASME)* • Masako Sudo, *Chair of Manufacturing and Machine Tool Division (MMT) of the Japan Society of Mechanical Engineers (JSME)* • Michael F. Molnar, *Director of the Advanced Manufacturing National Program Office*
8:30-9:10	AB-2400	Keynote: Thomas Bergs
9:10-9:30	AB East 2nd Floor Atrium	Morning Break
9:30-10:10	AB-2400	Keynote: John Dyck
10:15-10:35	AB East 2nd Floor Atrium	Morning Break
10:35-11:50	AB and MU	Technical Session 1
10:35-11:50	AB-2400	MED Student Design Competition 1
10:35-11:50	AB-2225	LEM&P Poster Session
10:35-11:25	AB-2160	NAMRC Track 5 Keynote: Thomas R. Kurfess
12:00-13:40	Brower Dining Hall	JSME Award Luncheon LEM&P Keynote: Fred Carter
12:00-18:00	Brower Lobby	Exhibitor Booths Open
13:50-15:05	AB and MU	Technical Session 2
13:50-15:05	AB-2400	MED Student Design Competition 2
13:50-15:05	AB-2225	Academic Plenary: Zi-Kui Liu Industry Plenary: Mathias Hakenberg

CONFERENCE SCHEDULE

15:05-15:25	AB East 2nd Floor Atrium	Afternoon Break
15:30-17:30	Brower Dining Hall	Poster Session with Networking Reception (food and beverage 4-7pm)
15:30-16:45	AB-2200	Journal of Manufacturing Science and Engineering Editorial Board Meeting
15:30-16:30	AB-2400	WIAM 1: Panel of Additive Manufacturing Leaders
16:30-17:30	AB-2400	WIAM 2: Professional Development Workshop
17:30-18:00	Brower Dining Hall	State of LEM&P Meeting
18:00-18:30	Brower Dining Hall	State of NAMRI Meeting
18:30-19:00	Brower Dining Hall	State of ASME MED Meeting

WEDNESDAY, JUNE 14

Time	Location	Event
7:30-12:00 13:30-17:30	Academic Building (AB) East 2nd Floor Atrium	Registration
7:30-9:00	AB-2200	SME Journals Meeting
8:00-8:40	AB-2400	Keynote: Michael F. Molnar
8:40-9:00	AB East 2nd Floor Atrium MU 1st Floor Hallway	Morning Break
9:00-10:15	AB and MU	Technical Session 3
9:00-10:15	AB-2400	Blue Sky Competition 1
9:00-9:50	MU-211	NAMRC Track 7 Keynote: Shaw C. Feng
9:00-10:15	AB-2160	NAMRC Student Research Competition 1
10:15-10:35	AB East 2nd Floor Atrium MU 1st Floor Hallway	Morning Break
10:35-11:50	AB and MU	Technical Session 4
10:35-11:50	AB-2400	Blue Sky Competition 2
10:35-11:50	AB-2160	NAMRC Student Research Competition 2
12:00-13:40	Brower Dining Hall	ASME MED Award Luncheon Luncheon Keynote: John Sutherland
12:00-18:00	Brower Lobby	Exhibitor Booths Open
13:50-15:05	AB and MU	Technical Session 5
13:50-15:05	AB-2400	NSF Advanced Manufacturing Program Update
13:50-14:40	MU-210	NAMRC Track 6 Keynote: Samuel Chiappone
13:50-15:05	AB-2160	NAMRC Student Research Competition 3
15:05-15:25	AB East 2nd Floor Atrium MU 1st Floor Hallway	Afternoon Break
15:25-16:40	AB and MU	Technical Session 6
15:25-16:40	AB-2400	Industry Plenary: Changsheng Guo Industry Plenary: Vinod Kumar
16:40-17:00	AB East 2nd Floor Atrium MU 1st Floor Hallway	Afternoon Break
17:00-18:15	AB and MU	Technical Session 7
15:00-17:00	Brower Dining Hall	NAMRC Awards Rehearsal
18:00-21:15	Brower Dining Hall	Early Career Forum (with pizza and beverage)

CONFERENCE SCHEDULE

THURSDAY, JUNE 15

Time	Location	Event
7:30-12:00 13:30-16:30	Academic Building (AB) East 2nd Floor Atrium	Registration
8:00-9:30	AB-2200	SME Focus Group Meeting
8:00-8:40	AB-2400	Keynote: Wei Chen
8:40-9:00	AB East 2nd Floor Atrium MU 1st Floor Hallway	Morning Break
9:00-10:15	AB and MU	Technical Session 8
9:00-10:15	AB-2400	Doctoral Symposium 1
9:00-10:15	AB-2225	Industry Plenary: Melissa Orme (Virtual) Academic Plenary: Michael Grieves
9:00-10:15	AB-4225	NSF Plenary (Virtual): Erwin Gianchandani
10:15-10:35	AB East 2nd Floor Atrium MU 1st Floor Hallway	Morning Break
10:35-11:50	AB and MU	Technical Session 9
10:35-11:50	AB-2400	Doctoral Symposium 2
10:35-11:50	AB-2225	Federal Agencies Perspective on Advanced Manufacturing
12:00-13:40	Brower Dining Hall	NAMRI/SME Award Luncheon Founder's Lecture: Scott Smith
12:00-18:00	Brower Lobby	Exhibitor Booths Open
13:50-15:05	AB and MU	Technical Session 10
15:05-15:25	AB East 2nd Floor Atrium MU 1st Floor Hallway	Afternoon Break
15:25-16:40	AB and MU	Technical Session 11
15:25-16:40	AB-2400	Workshop on Quality Publication in SME Journal of Manufacturing Systems
16:40-19:00		Shuttles for Lab Tours @ New Jersey Advanced Manufacturing Institute
19:00-21:00	Brower Dining Hall	Banquet Keynote: John Kennedy

FRIDAY, JUNE 16

Time	Location	Event
8:30-12:00	AB East 2nd Floor Atrium	Registration
09:00-10:15	AB and MU	Technical Session 12
10:15-10:35	AB East 2nd Floor Atrium MU 1st Floor Hallway	Morning Break
10:35-11:50	AB and MU	Technical Session 13
12:00-13:00	AB East 2nd Floor Atrium MU 1st Floor Hallway	Boxed Lunch

CONFERENCE RESOURCES

Registration: Registration will be located in the lobby of Brower Commons on Monday, and Academic Building East 2nd floor atrium on Tuesday-Friday.

Exhibitors: Exhibitor/Sponsor booths are located in the lobby of Brower Commons.

Coffee Breaks: Coffee, tea, water, and light snacks will be served in morning and afternoon breaks.

Name Badges: Please wear your badge at all times and especially to all conference events. Admission to events will be determined by your badge and all attendees must have a ticket for meals including guests. Your name badge is also useful information for other attendees.

Conference Program: We are committed to decreasing the environmental footprint and upholding green practices. For this reason, the printed Program will no longer be available at our premises. Please use our website or QR code to access the Program online and download a soft copy.

RUWireless Internet Access: Rutgers University provides free wireless access points throughout the campus. To connect, go to the list of available wireless networks on your device and select the **RUWireless** network. Once you have associated to RUWireless you will be automatically redirected to the RUWireless login web page. If you are not, open a browser and go to https://wifi.rutgers.edu. Click **I want guest Internet access**.

General Help: Look for the volunteers in red conference shirts for assistance.

New Brunswick Area Safety Tips: The Rutgers University Police Department reminds you to take reasonable safety precautions, including:

- Do not leave personal property such as laptop computers, wallets, cash, jewelry, or bicycles unattended and unsecured;
- Do not leave items of value visible in a parked car;
- Do not prop open exterior doors;
- Stay alert and attuned to people and circumstances around you;
- Report suspicious activity or persons to the police immediately.

CONFERENCE RESOURCES

Transportation:

- Complimentary shuttle service will be provided for the three East Brunswick area hotels: Hilton East Brunswick Hotel, Residence Inn by Marriott New Brunswick Tower Center Blvd., and Holiday Inn Express & Suites Tower Center New Brunswick. One bus will make continuous loops between HOLIDAY INN EXPRESS & SUITES and CONFERENCE VENUE at the specified periods in the schedule below, making stops at Hilton East Brunswick Hotel and Residence Inn by Marriott New Brunswick Tower Center Blvd.
- The New Brunswick City Bus Route 818 also serves the HOLIDAY INN and nearby hotels (Station 31478: Tower Center Blvd at Park & Ride Crosswalk#) to the CONFERENCE VENUE (Station 23450: George St at Albany St, then walk ~5 min). The bus runs approximately every one hour between about 7am to about 9pm. Google Map would be best to help identify the next bus. Bus schedule: https://content.njtransit.com/sites/default/files/bus_schedules/T0818.pdf Ticket instruction: https://msec-namrc2023.rutgers.edu/sites/default/files/2023-06/NAMRC-MSEC_LEM%26P_NJ%20Transit%20Guide.pdf
- Shuttle service is available for the lab tour on Thursday.
- Hyatt Regency New Brunswick and The Heldrich Hotel are within walking distance to the conference venue and shuttle service is not provided.

Monday, June 12	
Service to Brower Commons **From** Holiday Inn Express & Suites	Service to Holiday Inn Express & Suites **From** Brower Commons
5:00 pm – 9:00 pm First bus leaves Holiday Inn at 5:00 pm	5:00 pm – 9:00 pm
Tuesday, June 13	
Service to Academic Building **From** Holiday Inn Express & Suites	Service to Holiday Inn Express & Suites **From** Brower Commons
7:00 am – 9:00 am First bus leaves Holiday Inn at 7:00 am	6:00 pm – 8:00 pm First bus leaves Brower Commons at 6:00 pm
Wednesday, June 14	
Service to Academic Building **From** Holiday Inn Express & Suites	Service to Holiday Inn Express & Suites **From** Brower Commons
7:00 am – 9:00 am First bus leaves Holiday Inn at 7:00 am	7:30 pm – 9:30 pm First bus leaves Brower Commons at 7:30 pm
Thursday, June 15	
Service to Academic Building **From** Holiday Inn Express & Suites	Service to Holiday Inn Express & Suites **From** Brower Commons
7:00 am – 9:00 am First bus leaves Holiday Inn at 7:00 am	7:30 pm – 9:30 pm First bus leaves Brower Commons at 7:30 pm
Lab Tour Shuttle Service - Thursday, June 15	
Service to Weeks Hall **From** Academic Building	Service to Brower Commons **From** Weeks Hall
4:30 pm – 7:00 pm First bus leaves Academic Building at 4:30 pm	4:30 pm – 7:00 pm

CONFERENCE RESOURCES

Parking: Special Event Parking is provided to all conference attendees free of charge. Attendees are allowed to park in Lots 26, 30 & College Avenue Parking Deck after registering their vehicles online. Guests must use the below link to register for the event. Until this process is completed their vehicles are not registered and guests may receive a citation. Event Parking Registration: https://rudots.nupark.com/v2/portal/eventregister/54597d81-45e9-43dd-9f2f-7aa361652322#/events/registration/

The College Avenue Parking Deck is strongly recommended. It is accessible from George Street. Lots 26 and 30 are currently affected by the Solar Panel Construction Project, leaving only a small number of spots available.

A limited number of on-street metered spaces can be found on Rutgers campus.

Map

CONFERENCE RESOURCES

Academic Building (AB) Map

AB-2400: East Wing, front entrance on 2nd floor, rear entrance on 3rd floor
AB-2225: East Wing, front entrance on 2nd floor, rear entrance on 3rd floor
AB-2125: West Wing, front entrance on 2nd floor, rear entrance on 3rd floor
AB-2160: West Wing, front entrance on 2nd floor, rear entrance on 3rd floor
AB-4225: East Wing, 4th floor

WELCOME FROM RUTGERS UNIVERSITY

Welcome from the NAMRC 51 | MSEC 2023 | LEM&P 2023 Conference Hosts

We extend a warm and enthusiastic welcome to the NAMRC 51 | MSEC 2023 | LEM&P 2023 Conference at Rutgers! It is an honor to welcome you to attend this remarkable gathering of minds, dedicated to pushing the boundaries of manufacturing excellence.

Rutgers University stands at the forefront of education, research, and innovation in advanced manufacturing, and we take great pride in hosting this conference dedicated to advancing the realm of advanced manufacturing. Our commitment to excellence and our unwavering belief in the transformative power of technology drive us to push the boundaries of what is possible.

Now we stand at the precipice of Industry 4.0. Advanced manufacturing, propelled by groundbreaking technologies such as artificial intelligence/machine learning, robotics, additive manufacturing, and the Internet of Things, is transforming the manufacturing landscape. This conference catalyzes the exchange of ideas, best practices, and cutting-edge research that will shape the future of this industry.

We urge every one of you to actively participate, share your knowledge, and engage in meaningful discussions. Your expertise and insights are invaluable in driving the transformation of the manufacturing landscape. Through your collective efforts, we have the power to revolutionize the way we design, produce, and deliver goods, paving the way for a more prosperous and sustainable future.

In closing, we would like to express our deepest gratitude to all those who have played a pivotal role in making this conference a reality. The society leaders, organizers, sponsors, the entire organizing team, and countless individuals who have poured their time, energy, and expertise into shaping this event deserve our utmost appreciation. We are indebted to the NAMRI/SME Scientific Committee, the ASME Technical Committee, and the JSME Technical Committee for overseeing the technical paper submissions and editorial processes that have resulted in an outstanding technical program. Finally, we sincerely wish all of you a very enjoyable stay in New Brunswick and hope you will find inspiration and excitement in this stimulating manufacturing environment.

Co-Chairs

Dr. Yuebin Guo	Dr. Fernando Muzzio	Dr. Paul Takhistov	Dr. Grace Guo
Henry Rutgers Professor of Advanced Manufacturing	Distinguished Professor & Director, NSF ERC for Pharma Manufacturing	Professor, Food Manufacturing	Associate Professor, Industrial and Systems Engineering

WELCOME FROM CHAIRS OF NAMRC 51 SCIENTIFIC COMMITTEE & MSEC 2023 TECHNICAL PROGRAM & LEM&P 2023 TECHNICAL PROGRAM

On behalf of the Scientific and Technical Program Committees, we welcome you to the joint International Manufacturing Conference hosted by Rutgers University–New Brunswick, from June 12th to June 16th, 2023, in New Brunswick, New Jersey. The joint conference consists of the 51st North American Manufacturing Research Conference (NAMRC 51), sponsored by the North American Manufacturing Research Institution of SME (NAMRI/SME), the 2023 ASME International Manufacturing Science and Engineering Conference (MSEC 2023), sponsored by the Manufacturing Engineering Division (MED) of ASME, and the 2023 International Conference on Leading Edge Manufacturing/Materials & Processing (LEM&P 2023), sponsored by the Manufacturing and Machine Tool (MMT) Division of the Japan Society of Mechanical Engineers (JSME). As leading world-class societies in the Mechanical and Manufacturing Engineering fields, SME, ASME, and JSME act as global bridges between industries, government laboratories, and academic institutions. This joint conference symbolizes the continued collaboration between these esteemed organizations in research exchange and knowledge dissemination in the Manufacturing fields. Each of the co-located conferences include technical sessions covering the full range of manufacturing topics. 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 a very large number of submissions.

NAMRC 51 received 214 technical paper submissions. Following the review process, 158 papers were accepted for publication in the journal "Manufacturing Letters" as the Proceedings of NAMRI/SME and presentation at the conference in 52 technical sessions. In addition, 20 papers were recommended for fast-tracking to the SME Journal of Manufacturing Systems and Journal of Manufacturing Processes. The papers included in the conference address a wide range of basic and applied manufacturing research topics in 7 tracks: (1) Manufacturing Systems, (2) Manufacturing Processes, (3) Material Removal, (4) Additive Manufacturing, (5) Smart Manufacturing and Cyber-Physical Systems, (6) Manufacturing Education and Case Studies, and the new track (7) Sustainable Manufacturing. NAMRC 51 continues to feature the annual NSF Manufacturing Blue Sky Competition, funded by the National Science Foundation (NSF). The winner of the NSF Manufacturing Blue Sky Competition will receive the NAMRI/SME Dornfeld Manufacturing Vision Award, named in honor of the late Professor David Dornfeld. NAMRC 51 also includes a Student Research Presentations Competition.

MSEC 2023 received about 250 draft papers and 46 poster submissions. After a rigorous peer review process, 167 technical papers and 46 posters were accepted for presentation in 70 technical sessions. This year, MSEC has 22 symposia sessions in 8 technical tracks: (1) Additive Manufacturing, (2) Manufacturing Equipment and Systems, (3) Manufacturing Processes, (4) Materials Processing, (5) Bio and Sustainable Manufacturing, (6) Lifecycle Engineering, (7) Nano-micro-meso manufacturing, and (8) Manufacturing Automation. The conference also includes three student-centric events: Early Career Forum, Student Manufacturing Design Competition, and Doctoral Symposium. MSEC 2023 continues to feature the annual Women in Advanced Manufacturing Forum aiming to promote a diverse workforce in the broad field of manufacturing engineering. A session organized by NIST/NSF will present a forum for discussion on a recent report published related to Advanced Manufacturing in the context of Artificial Intelligence.

LEM&P 2023 received 77 abstracts and paper submissions. After receiving draft papers, 63 papers including 51 oral presentations in 18 technical sessions and 12 posters were accepted through a rigorous peer review process. This year, the conference has 18 symposia in 8 technical tracks: (1) Machine Tool Technologies, (2) Machining Processes, (3) Micro Manufacturing and Surface

WELCOME FROM CHAIRS OF NAMRC 51 SCIENTIFIC COMMITTEE & MSEC 2023 TECHNICAL PROGRAM & LEM&P 2023 TECHNICAL PROGRAM

Technology, (4) Metrology, Monitoring and Evaluation, (5) Additive Manufacturing, (6) Manufacturing Systems, (7) Materials, and (8) Material Processing. This is the second joint event between NAMRC, MSEC, and LEM&P. LEM&P participants have abundant expertise in advanced manufacturing and material processing technologies. The co-located conference highlights strong technical areas of coherence between SME, ASME and JSME, while simultaneously also being an expression of their distinct identities. This format will unquestionably cultivate a dynamic and stimulating environment to all the participants.

This conference program is the result of the outstanding efforts of many people - all volunteering their time. We would like to thank all the authors for their technical paper and poster submissions. We also express our gratitude to all the organizers for their dedicated management of the tracks, symposia, as well as for guarding the quality of the papers and posters 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, the ASME MED Executive and Technical Committees, and the JSME MMT/LEM&P Organizing Committee. 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 posters, and ensuring high-quality publication of the conference proceedings for NAMRC 51, MSEC 2023, and LEM&P 2023. We would like to extend our gratitude to all sponsors for providing financial support. Additionally, we would like to thank the Advanced Manufacturing Cluster within the Civil, Mechanical, and Manufacturing Innovation (CMMI) Division of NSF for sponsoring the NSF Manufacturing Blue Sky Competition, the Women in Advanced Manufacturing Forum and for providing registration and accommodation support for more than 60 selected students and early-career participants from across the United State.

We wish you a productive and enjoyable conference experience at Rutgers University in New Brunswick, New Jersey. We hope that the proceedings are beneficial and we sincerely wish that you have a long-lasting affiliation with the future of NAMRC, MSEC, and LEM&P.

Robert Gao	**Binil Starly**	**Takashi Matsumura**
Case Western Reserve University, USA	Arizona State University, USA	Tokyo Denki University, Japan
NAMRI/SME Scientific Committee Chair	MSEC 2023 Technical Program Chair	LEM&P 2023 Technical Program Chair
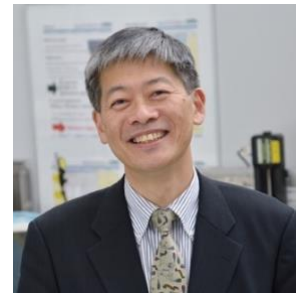
CONFERENCE SPONSORS

Travel Award Sponsor

ManufacturingUSA

NAMRI/SME SCIENTIFIC COMMITTEE

Chair
Robert Gao

Chair-Elect
Xun Xu

Advisor
Ihab Ragai
(Past Chair)

Track 1 Manufacturing Systems – General Submission	Track 2 Manufacturing Processes – General Submission	Track 3 Material Removal	Track 4 Additive Manufacturing	Track 5 Smart Manufacturing and Cyber-Physical Systems	Track 6 Manufacturing Education and Case Studies	Track 7 Sustainable Manufacturing
Track Chair Xun Xu	**Track Chair** Stefania Bruschi	**Track Chair** Jeff Ma†	**Track Chair** Jingyan Dong†	**Track Chair** Z.J. Pei	**Track Chair** Johnson Samuel	**Track Chair** Shaw C. Feng
Track Co-Chairs Laine Mears** Ray Zhong	**Track Co-Chairs** Wayne Cai Till Clausmeyer	**Track Co-Chairs** Jahan Mohammad Mike Vogler	**Track Co-Chairs** Murali Sundaram† Bruce L. Tai	**Track Co-Chairs** Robert Landers Qing (Cindy) Chang	**Track Co-Chair** Jeffrey A. Abell	**Track Co-Chairs** I.S. Jawahir Karl Haapala
Members Grace Guo Yuqian Lu Paol Parenti Dazhong Wu * Thorsten Wuest David Culler Pai Zheng	**Members** William Emblom Brad Kinsey Yannis Korkolis Dinakar Sagapuram Rohan Shirwaiker Scott Wagner Torgeir Welo Benxin Wu†	**Members** Shuting Lei Barbara Linke Brigid Mullany Chandra Nath Christopher Saldana Tony Schmitz Iqbal Shareef Zhongde Shi	**Members** Bruno Azeredo Fiona Zhao Jia Deng Jun Yin Changxue Xu Yong Chen Tsz-Ho Kwok Yayue Pan Yiwei Han	**Members** Xu Chen Zhaoyan Fan David Hoelzle Shaopeng Liu Hantang Qin Chenhui Shao Rok Vrabič Peng Wang Xi Vincent Wang * Gloria Wiens	**Members** John Hart Dale Lombardo Sangkee Min	**Members** Chris Yuan Sekhar Rakurty Fazleena Badurdeen Ryan Bradley Daniel Cooper Nancy Diaz-Elsayed Guiseppe Ingarao Hong-Chao Zhang Jeremy Rickly Devanathan Ramanujan

MSEC TRACK & SYMPOSIUM ORGANIZERS

Track 1: Additive Manufacturing (Yayue Pan)

Symposium 1-1: Advances in Qualification and Certification for Additive Manufacturing
Organizers: Zhaohui Geng, Jianzhi James Li, Dongchun Mary Qiao
Symposium 1-2: Smart Additive Manufacturing
Organizers: Chinedum Okwudire, Prahalada Rao, Azadeh Haghighi, Subhrajit Roychowdhury
Symposium 1-3: Advances in Metal Additive Manufacturing Processes
Organizers: Wenchao Zhou, Dong Lin, Ho Yeung
Symposium 1-4: Advances in Additive Manufacturing of Polymers and Composites
Organizers: Kenan Song, Kun (Kelvin) Fu, Erina Joyee, Jena McCollum
Symposium 1-5: In Situ Monitoring and Non-Destructive Testing of Additive Manufacturing Processes
Organizers: Sarah Wolff, Thomas Feldhausen, Gerardo Ortiz

Track 2: Advanced Materials Manufacturing (Mihaela Banu)

Symposium 2-1: Advances in Processing of Polymers and Polymer Composites
Organizers: Felicia Stan, Kenan Song, Fabrizio Quadrini
Symposium 2-2: Convergent Manufacturing Systems for Advanced Materials
Organizers: Saeed Farahani, Mihaela Banu, Hantang Qin

Track 3: BioManufacturing (Changxue Xu)

Symposium 3-1: Additive Manufacturing of Functional Devices and Bioinspired Materials and Structures
Organizers: Cindy (Xiangjia) Li, Yang Yang, Erina Joyee
Symposium 3-2: Advances in Design, Manufacturing, Analysis, and Development of Biomedical Devices
Organizers: Lei Chen, Yi Wang, Yang Liu
Symposium 3-3: Advances in Biomanufacturing of Tissue-Engineered Scaffolds and Organs
Organizers: Yifei Jin, Jun Yin, Zhengyi Zhang

Track 4: Life Cycle Engineering (Daniel Cooper)

Symposium 4-1: Advances in Sustainable Manufacturing for a Circular Economy
Organizers: Nehika Mathur, Buddhika Hapuwatte, Nancy Diaz-Elsayed

Track 5: Manufacturing Equipment and Automation (Chandra Nath)

Symposium 5-1: Innovations in Equipment Design, Control and Automation
Organizers: Chandra Nath, Lei Zhou, Martin Jun

Track 6: Manufacturing Processes (Jingjing Li)

Symposium 6-1: Advances in Clean Energy Manufacturing
Organizers: Lei Chen, Chris Yuan, Kevin Guo
Symposium 6-2: Advances in Nontraditional Machining Processes
Organizers: Murali Sundaram, Yuefeng Luo, Muhammad P. Jahan, Meng Zhang
Symposium 6-3: Advances in Lightweight and Dissimilar Materials Joining
Organizers: Yongbing Li, Xun Liu, Yunwu Ma
Symposium 6-4: Advances in Surface Engineering: Process, Metrology, and Property/Performance

MSEC TRACK & SYMPOSIUM ORGANIZERS

Organizers: Yiliang (Leon) Liao, Beiwen Li, ChaBum Lee
Symposium 6-5: Advances in Assisted and Augmented Manufacturing Processes
Organizers: Meng Zhang, Weilong Cong, Fuda Ning
Symposium 6-6: Physics-Informed Data-Driven (PIDD) models for Advanced Manufacturing Processes
Organizers: Ankit Agarwal, Kaushal A. Desai, Gregory W. Vogl, Yongzhi Qu
Symposium 6-7: Converging Manufacturing Techniques with Hybrid Manufacturing
Organizers: Thomas Feldhausen, Jason Jones, Christopher Saldana

Track 7: Manufacturing Systems (Hui Wang)

Symposium 7-1: Collaborative Robotic Manufacturing and Assembly
Organizers: Azadeh Haghighi, Yunbo "Will" Zhang, Rui Liu, Chinedum Okwudire, Vinh Nguyen
Symposium 7-2: Prognostics and Health Management (PHM) of Manufacturing Systems
Organizers: Chenhui Shao, Shenghan Guo, Yujie Chen
Symposium 7-3: Networked Manufacturing towards an Intelligent, Agile and Resilient Industry
Organizers: Yuqian Lu, Yujie Chen, Xi (Vincent) Wang
Symposium 7-4: Frontiers of Data Analytics- and Simulation-Enabled Digital Twins for Advanced Manufacturing Metaverse
Organizers: Shaw Feng, Gordon Shao, Albert Jones, Paul Witherell, Young-Jun Son

Track 8: Nano/Micro/Meso Manufacturing (Ping Guo)

Symposium 8-1: Advances in Micro and Nano Manufacturing
Organizers: Soham Mujumdar, Erina Joyee, Chandra Nath
Symposium 8-2: Advances in Micro- and Nano-scale Additive Manufacturing
Organizers: Sourabh Saha, Nilabh Roy, Bruno Azeredo
Symposium 8-3: Low-Dimensional Nanostructures and Porous Materials: Synthesis, Self-Organization, and Printing
Organizers: Mostafa Bedewy, Michael Cai Wang, Sei Jin Park

Track 9: Quality and Reliability (Dazhong Wu)

Symposium 9-1: Advances in Statistical Learning for Quality and Reliability in Smart Manufacturing
Organizers: Ashif Iquebal, Yinan Wang, Xiaowei Yue
Symposium 9-2: Bridging Academic Advances and Industrial Practices on Machine Learning for Quality and Reliability
Organizers: Peng (Edward) Wang, Xiaowei Yue, Hantang Qin, Shaopeng Liu

Posters & Doctoral Symposium (Chinedum Okwudire, Binil Starly)

Student Manufacturing Design Competition (Miki Banu, Jarred Heigel)

LEM&P TRACK & SYMPOSIUM ORGANIZERS

Program Chair: Takashi Matsumura, *Tokyo Denki University*

Secretary: Norikazu Suzuki, *Chuo University*

Organizing Committee

Takashi Matsumura, *Tokyo Denki University*
Norikazu Suzuki, *Chuo University*
Masako Sudo, *FANUC Co.*
Yasuhiro Takaya, *Osaka University*
Makoto Fujishima, *DMG MORI Co. Ltd.*
Atsushi Matsubara, *Kyoto University*
Keiichi Shirase, *Kobe University*
Hiroyuki Sasahara, *Tokyo University of Agriculture and Technology*
Rei Hino, *Nagoya University*
Toshitake Tateno, *Meiji University*
Seiichi Hata, *Nagoya University*

Track 1: Machine Tool Technologies

Symposium 1-1: Advanced Machine Tools
Organizers: Keiichi Shirase, Yoshitaka Morimoto
Symposium 1-2: Evaluation of Machine Tool Performance
Organizers: Yukitoshi Ihara, Soichi Ibaraki
Symposium 1-3: Mechatronics and Control Technologies
Organizers: Atsushi Matsubara, Tadahiko Shinshi, Ryuta Sato, Hayato Yoshioka

Track 2: Machining Processes

Symposium 2-1: Cutting Technologies
Organizers: Hiroyuki Sasahara, Hideharu Kato, Ryutaro Tanaka, Takashi Matsumura, Hirohisa Narita, Norikazu Suzuki, Jun'ichi Kaneko, Fumihiro Itoigawa, Katsuhiko Sakai, Masahiko Jin, Hiromi Isobe, Naohiko Sugita, Masato Okada, Shigehiko Sakamoto
Symposium 2-2: Grinding Technologies
Organizers: Kazuhito Ohashi, Takazo Yamada, Libo Zhou, Takayuki Kitajima, Hitoshi Ohmori, Weimin Lin, Nobuhito Yoshihara
Symposium 2-3: Finishing Technologies
Organizers: Toshiyuki Enomoto, Hitomi Yamaguchi, Yanhua Zou

Track 3: Micro Manufacturing and Surface Technology

Symposium 3-1: Nano/Micro Machining
Organizers: Masayoshi Mizutani, Keiji Ogawa, Mitsuyoshi Nomura, Noboru Takano, Koichi Okuda, Shinya Morita, Hirofumi Suzuki, Jiwang Yan, Chieko Kuji
Symposium 3-2: Micro-manufacturing for Science
Organizers: Arata Kanako, Mashiko Yoshino, Jun Taniguchi
Symposium 3-3: Surface Machining/Treatments and Tribology

LEM&P TRACK & SYMPOSIUM ORGANIZERS

Organizers: Noritsugu Umehara, Naoto Otake, Takanori Yazawa, Hatsuhiko Usami, Hiroki Akasaka, Masanori Hiratsuka

Track 4: Metrology, Monitoring, and Evaluation

Symposium 4-1: Nano/Micro Measurement and Intelligent Instruments
Organizers: Satoru Takahashi, Yasuhiro Takaya, Wei Gao, Kazuhide Kamiya, Terutake Hayashi, Yasuhiro Mizutani
Symposium 4-2: Monitoring of Machining Process
Organizers: Yasuhiro Kakinuma, Alan Hase
Symposium 4-3: Nondestructive Evaluations for Materials, Structures, and Processing
Organizers: Ikuo Ihara, Hironori Tohmyoh, Tatsuro Kosaka, Yoji Okabe

Track 5: Additive Manufacturing

Symposium 5-1: Rapid Prototyping Technologies
Organizers: Hiroyuki Narahara, Toshiki Niino
Symposium 5-2: Micro-structure of the Metal/Materials Fabricated by Additive Manufacturing
Organizers: Satoshi Kishimoto, Shinji Ogihara, Wataru Nakao

Track 6: Manufacturing Systems

Symposium 6-1: Digital Design and Digital Manufacturing (CAD / CAM)
Organizers: Koichi Morishige, Hideki Aoyama, Fumiki Tanaka, Koji Teramoto

Track 7: Materials

Symposium 7-1: Advanced Materials and Applications
Organizers: Hiroyuki Kawada, Masayuki Nakada, Kazuaki Nishiyabu, Satoshi Kobayashi, Atsushi Hosoi, Toshio Ogasawara, Wataru Nakao, Satoshi Kishimoto, Gen Sasaki, Hiroshi Asanuma

Track 8: Material Processing

Symposium 8-1: Advanced Casting and Semisolid Forming Techniques
Organizers: Toshio Haga, Hisaki Watari, Shinichi Nishida
Symposium 8-2: Advances in Molding Processing
Organizers: Nobuyuki Suzuki, Ryutaro Hino, Keigo Takasugi

TRAVEL AWARD RECIPIENTS

Student awardees

Hossein Abedi, *University of Toledo*
Lesly Aguilar, *Saint Louis University*
Muhammad Saad Amjad, *University of South Florida*
Nicholas Babich, *University of New Haven*
Monami Bhuyan, *University of Wisconsin-Madison*
Navaneeth Chandran, *University of Cincinnati*
Mengfei Chen, *Rutgers University*
Yan-Ting Chen, *Rochester Institute of Technology*
Patrick Chernjavsky, *Worcester Polytechnic Institute*
Jungho Choi, *Georgia Institute of Technology*
Scott Clark, *Keene State College*
Emmanuel Dasinor, *Arizona State University*
Lisa DeWitte, *Georgia Institute of Technology*
Israt Zarin Era, *West Virginia University*
Felicia Fashanu, *University of California Davis*
Shantanu Gopal Gaurkhede, *Binghamton University*
Ali Hosseinzadeh Ghobadlou, *University of Texas at San Antonio*
Suyog Ghungrad, *University of Illinois Chicago*
Manikanta Grandhi, *West Virginia University*
Muyue Han, *University of Illinois Chicago*
Abhishek Hanchate, *Texas A&M University*
Asmaa Harfoush, *Oregon State University*
Chuan He, *University of Michigan*
Natalya Kublik, *Arizona State University*
Hankang Lee, *The Pennsylvania State University*
Kyubokl Lee, *The Pennsylvania State University*
Rui Liang, *University of Wisconsin-Madison*

David Manford, *University of Arizona*
Max Matura, *Saint Louis University*
Manan Mehta, *University of Illinois Urbana-Champaign*
Philip Olubodun, *Missouri University of Science and Technology*
Hasnaa Ouidadi, *Arizona State University*
Shailesh Padalkar, *University of Cincinnati*
Conor Porter, *Northwestern University*
Romesh Prasad, *Syracuse University*
Imtiaz Qavi, *Texas Tech University*
Raihan Quader, *North Dakota State University*
Sally Shim, *Saint Louis University*
Ruitao Su, *University of Michigan*
Derick Suarez, *Northwestern University*
Akash Tiwari, *Texas A&M University*
Mahsa Valizadeh, *Texas A&M University*
Nicole Van Handel, *Arizona State University*
Emmanuel Yangue, *Oklahoma State University*
Nusrat Yasmin, *University of Mississippi*
Jihui Ye, *Texas A&M University*
Zehao Ye, *University of Texas at Arlington*
Ibrahim Yilmazlar, *Clemson University*
Valerie Zapata, *University of South Florida*
Nan Zhang, *Texas Tech University*
Yue Zhou, *Binghamton University*
Christian Zuniga, *University of Louisville*

Early-career awardees

Syed Zakiuddin Ahmed, *Bradley University*
Semih Akin, *Purdue University*
Maxwell Blais, *University of Maine*
Wenchao Du, *Argonne National Laboratory*

Jihoon Jeong, *Northwestern University*
Bo Shen, *New Jersey Institute of Technology*
Kaidong Song, *University of Florida*
Samantha Webster, *National Institute of Standards and Technology*

HOST ORGANIZING COMMITTEE

Organizing Committee of NAMRC 51 | MSEC 2023 | LEM&P 2023

Craig Arnold (Mechanical and Aerospace Engineering, Princeton)
Alberto Cuitiño (Mechanical and Aerospace Engineering, Rutgers)
Elsayed Elsayed (Industrial and Systems Engineering, Rutgers)
Xi Gu (Mechanical and Aerospace Engineering, Rutgers)
Weihong Grace Guo (Industrial & Systems Engineering, Rutgers) – Co-Chair
Yuebin Guo (Mechanical and Aerospace Engineering, Rutgers) – Co-Chair
Rajiv Malhotra (Mechanical and Aerospace Engineering, Rutgers)
Aaron Mazzeo (Mechanical and Aerospace Engineering, Rutgers)
Fernando Muzzio (Pharmaceutical Manufacturing, Rutgers) – Co-Chair
Lian Qi (Supply Chain Management, Rutgers)
Jerry Shan (Mechanical and Aerospace Engineering, Rutgers)
Ryan Sills (Materials Science and Engineering, Rutgers)
Jonathan Singer (Mechanical and Aerospace Engineering, Rutgers)
Paul Takhistov (Food Science, Rutgers) – Co-Chair
Zhimin Xi (Industrial and Systems Engineering, Rutgers)
Lawrence Yao (Mechanical Engineering, Columbia University)
Jingang Yi (Mechanical and Aerospace Engineering, Rutgers)
Ngwe Zin (Electrical and Computer Engineering, Rutgers)
Qingze Zou (Mechanical and Aerospace Engineering, Rutgers)

Volunteers

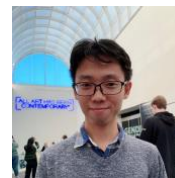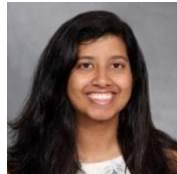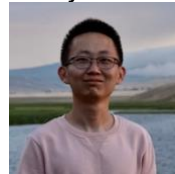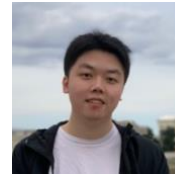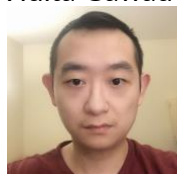| Jinwoo Bae | Baihui Chen | Mengfei Chen | Xunjie Chen | Zhetao Chen |
Shiqi Fang	Vidita Gawade	Yifei Guo	Feng Han	Liwen Hu
Panayiotis Kousoulas	Rong Lei	Bryan Llumiquinga	Yogin Patel	Johnathan Perino
Samar Saleh	Rahul Sharma	ElHussein Shata	Qianqian Zhao	
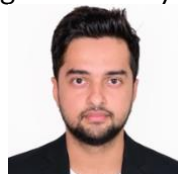
SESSION SUMMARY

Color Key: NAMRC MSEC LEM&P   Room: AB: Academic Building   MU: Murray Hall

Day/Date	Time / Session	Brower Commons	AB-2400	AB-2225	AB-2125	AB-2160	AB-4225	MU-111	MU-114	MU-204	MU-208	MU-210	MU-211	MU-212	MU-213
Monday 6/12/23	18:00-20:00	Welcome Reception													
	18:30-20:00	WIAM Reception													
Tuesday 6/13/23	08:00-08:30		Welcome												
	08:30-10:10		Keynote												
	10:35-11:50 Tech Session – 1		Student Mfg. Design Competition 1	LEM&P Poster Session	NIST/NSF Panel on National Adv. Mfg Strategy / MSEC-105805	Tr5: Smart Mfg & CPS 1 / Track 5 Keynote / NAMRC 54	3-1 Nano/Micro Machining / LEMP-041 / LEMP-066 / LEMP-035	NNM8-1: Micro and Nano 1 / MSEC-106561 / MSEC-102499 / MSEC-105165	ADM1-5: Monitor-ing and Testing 1 / MSEC-102317 / MSEC-104348 / MSEC-105098	Tr2: Mfg Processes 1 / NAMRC 1 / NAMRC 100 / NAMRC 181	Tr4: Add. Mfg 1 / NAMRC 66 / NAMRC 8 / NAMRC 10	Tr4: Add. Mfg 2 / NAMRC 147 / NAMRC 146 / NAMRC 149	Tr3: Mfg Removal 1 / NAMRC 180 / NAMRC 172 / NAMRC 177	LCE4-1: Mfg for Circular Economy 1 / MSEC-109288 / MSEC-101736	MP6-4: Surface Eng 1 / MSEC-103862 / MSEC-104380 / MSEC-104528
	12:00-13:40	Lunch													
	13:50-15:05 Tech Session – 2		Student Mfg. Design Competition 2	Plenary	ADM1-2: Smart Add. Mfg 1 / MSEC-101325 / MSEC-101622 / MSEC-103321	Tr4: Add. Mfg 3 / NAMRC 101 / NAMRC 22 / NAMRC 35	1-2 Machine Tool Performance / LEMP-006 / LEMP-017 / LEMP-020	NNM8-2: Micro and Nano 2 / MSEC-105092 / MSEC-106557 / MSEC-104955	AMM2-1: Processing Polym. & Compos. 1 / MSEC-104650 / MSEC-104816	Tr2: Mfg Processes 2 / NAMRC 37 / NAMRC 14 / NAMRC 23	Tr5: Smart Mfg & CPS 2 / NAMRC 105 / NAMRC 21 / NAMRC 28	Tr4: Add. Mfg 4 / NAMRC 155 / NAMRC 165 / NAMRC 82	Tr3: Mfg Removal 2 / NAMRC 207 / NAMRC 71 / NAMRC 98	MEA5-1: Equipment, Control, Automation 1 / MSEC-106259 / MSEC-100996 / MSEC-101118	MS7-1: Collaborative Robotic Mfg 1 / MSEC-104613 / MSEC-104622 / MSEC-105271
	15:30-17:30	Poster Session with Reception	Women in Adv. Mfg. (WIAM)												
Wednesday 6/14/23	08:00-08:40		Keynote												
	09:00-10:15 Tech Session – 3		NSF Mfg. Blue Sky 1		ADM1-1: Quality & Certification for AM 1 / MSEC-100937 / MSEC-105156 / MSEC-106095	Student Competition 1 / NAMRC 13 / NAMRC 91 / NAMRC 107	1-2 Machine Tool 1-3 Mechatronics / LEMP-045 / LEMP-004 / LEMP-046	NNM8-3: Micro and Nano 3 / MSEC-104979 / MSEC-104934 / MSEC-111394	AMM2-2: Mfg Sys for Adv. Materials 1 / MSEC-104366 / MSEC-104808 / MSEC-104904	Tr2: Mfg Processes 3 / NAMRC 73 / NAMRC 42 / NAMRC 45	Tr5: Smart Mfg & CPS 3 / NAMRC 33 / NAMRC 7 / NAMRC 9	Tr4: Add. Mfg 5 / NAMRC 170 / NAMRC 81 / NAMRC 176	Tr7: Sustainable Mfg 1 / Track 7 Keynote / NAMRC 2	LCE4-1: Mfg for Circular Economy 2 / MSEC-102037 / MSEC-104125 / MSEC-104361	MP6-4: Surface Eng 2 / MSEC-104620 / MSEC-105621
	10:35-11:50 Tech Session – 4		NSF Mfg. Blue Sky 2	5-1 Rapid Prototyping Tech. / LEMP-033 / LEMP-053 / LEMP-039	ADM1-2: Smart Add. Mfg 2 / MSEC-105507 / MSEC-103829 / MSEC-104525	Student Competition 2 / NAMRC 183 / NAMRC 178 / NAMRC 27	2-1 Cutting Tech. / LEMP-003 / LEMP-068	ADM1-3: Metal Add. Mfg 1 / MSEC-101307 / MSEC-104387 / MSEC-104463	BIOM3-1: Add. Mfg of Bioinspired Structures 1 / MSEC-104516 / MSEC-104962 / MSEC-105121	Tr2: Mfg Processes 4 / NAMRC 38 / NAMRC 46 / NAMRC 56	Tr5: Smart Mfg & CPS 4 / NAMRC 61 / NAMRC 47 / NAMRC 49	Tr4: Add. Mfg 6 / NAMRC 188 / NAMRC 191 / NAMRC 194	Tr7: Sustainable Mfg 2 / NAMRC 88 / NAMRC 215 / NAMRC 197	MP6-2: Non-Traditional Mfg 1 / MSEC-106838 / MSEC-101133 / MSEC-101998	MP6-4: Surface Eng 3 / MSEC-105071 / MSEC-104899
	12:00-13:40	Lunch													
	13:50-15:05 Tech Session – 5		Panel: NSF	5-1 & 5-2 AM Materials & 7-1 / LEMP-067 / LEMP-024 / LEMP-002	ADM1-2: Smart Add. Mfg 3 / MSEC-105015 / MSEC-105134 / MSEC-105274	Student Competition 3 / NAMRC 90 / NAMRC 202 / NAMRC 175	2-1 Cutting Tech. / LEMP-027 / LEMP-031 / LEMP-034	ADM1-3: Metal Add. Mfg 2 / MSEC-104496 / MSEC-104610 / MSEC-104941	BIOM3-2: Mfg of Biomedical Devices 1 / MSEC-101752 / MSEC-106520 / MSEC-102339	Tr2: Mfg Processes 5 / NAMRC 65 / NAMRC 72 / NAMRC 74	Tr5: Smart Mfg & CPS 5 / NAMRC 121 / NAMRC 59 / NAMRC 89	Tr6: Education & Case Studies 1 / Track 6 Keynote / NAMRC 58	Tr7: Sustainable Mfg 3 / NAMRC 106 / NAMRC 70 / NAMRC 12	MP6-2: Non-Traditional Mfg 2 / MSEC-104875 / MSEC-105143 / MSEC-110190	MS7-2: Prognostics & Health Mgmt 1 / MSEC-105230 / MSEC-104906 / MSEC-104452
	15:25-16:40 Tech Session – 6		Plenary	7-1 Adv. Materials / LEMP-032 / LEMP-038 / LEMP-063	MP6-7: Hybrid Mfg 1 / MSEC-104922 / MSEC-104902 / MSEC-105170	Tr4: Add. Mfg 7 / NAMRC 139 / NAMRC 39 / NAMRC 44	2-1 Cutting Tech. / LEMP-044 / LEMP-049 / LEMP-058	BIOM3-3: Biomfg of Tissue and Organs 1 / MSEC-100819 / MSEC-104233 / MSEC-104978	BIOM3-2: Mfg of Biomedical Devices 2 / MSEC-103285 / MSEC-103318 / MSEC-104300	Tr2: Mfg Processes 6 / NAMRC 77 / NAMRC 79 / NAMRC 84	Tr5: Smart Mfg & CPS 6 / NAMRC 20 / NAMRC 31 / NAMRC 111	Tr6: Education & Case Studies 2 / NAMRC 122 / NAMRC 80 / NAMRC 129	Tr7: Sustainable Mfg 4 / NAMRC 140 / NAMRC 154 / NAMRC 16	MP6-1: Clean Energy Mfg 1 / MSEC-101247 / MSEC-105595 / MSEC-105472	MS7-3: Networked Mfg 1 / MSEC-106670 / MSEC-104323 / MSEC-104868
	17:00-18:15 Tech Session – 7			8-1 Casting and Forming Tech. / LEMP-001 / LEMP-009 / LEMP-015	MP6-7: Hybrid Mfg 2 / MSEC-104144 / MSEC-104372 / MSEC-110460	Tr4: Add. Mfg 8 / NAMRC 201 / NAMRC 57 / NAMRC 48	2-2 Grinding 2-3 Finishing / LEMP-030 / LEMP-061 / LEMP-062	BIOM3-3: Biomfg of Tissue and Organs 2 / MSEC-104235 / MSEC-104996 / MSEC-105561	BIOM3-2: Mfg of Biomedical Devices 3 / MSEC-104321 / MSEC-104324 / MSEC-104454	Tr2: Mfg Processes 7 / NAMRC 94 / NAMRC 86 / NAMRC 51	Tr5: Smart Mfg & CPS 7 / NAMRC 40 / NAMRC 50 / NAMRC 92	Tr6: Education & Case Studies 3 / NAMRC 130 / NAMRC 184 / NAMRC 185	Tr1: Mfg Sys 1 / NAMRC 30 / NAMRC 24 / NAMRC 18	LCE4-1: Mfg for Circular Economy 3 / MSEC-104449 / MSEC-104792 / MSEC-104968	MS7-3: Networked Mfg 2 / MSEC-105046 / MSEC-105605
	18:00-21:15	Early Career Forum													
Thursday 6/15/23	08:00-08:40		Keynote												
	09:00-10:15 Tech Session – 8		Doctoral Symposium 1	Plenary	MP6-6: Physics-Informed Data-Driven Mfg 1 / MSEC-105175 / MSEC-104529 / MSEC-104565	Tr4: Add. Mfg 9 / NAMRC 68 / NAMRC 67 / NAMRC 78	NSF Plenary (Virtual)	ADM1-3: Metal Add. Mfg 3 / MSEC-105104 / MSEC-105182 / MSEC-105190	BIOM3-1: Add. Mfg of Bioinspired Structures 2 / MSEC-105248 / MSEC-105866 / MSEC-100737	Tr2: Mfg Processes 8 / NAMRC 117 / NAMRC 124 / NAMRC 103	Tr5: Smart Mfg & CPS 8 / NAMRC 102 / NAMRC 99 / NAMRC 115	Tr4: Add. Mfg 10 / NAMRC 206 / NAMRC 195 / NAMRC 208	Tr1: Mfg Sys 2 / NAMRC 17 / NAMRC 32 / NAMRC 60	MEA5-1: Equipment, Control, Automation 2 / MSEC-104869 / MSEC-105528 / MSEC-105270	MS7-4: Digital Twins for Mfg 1 / MSEC-101127 / MSEC-101130 / MSEC-105613
	10:35-11:50 Tech Session – 9		Doctoral Symposium 2	Panel: Federal Agencies	MP6-5: Assisted and Augmented Mfg 1 / MSEC-104689 / MSEC-104931 / MSEC-105504	Tr4: Add. Mfg 11 / NAMRC 162 / NAMRC 169 / NAMRC 83	4-1 Measurement and Instruments / LEMP-008 / LEMP-016 / LEMP-019	QR9-1: Quality and Reliability 1 / MSEC-100969 / MSEC-101060 / MSEC-101213	BIOM3-2: Mfg of Biomedical Devices 4 / MSEC-105162 / MSEC-105870 / MANU#22-1539	Tr2: Mfg Processes 9 / NAMRC 173 / NAMRC 133 / NAMRC 132	Tr5: Smart Mfg & CPS 9 / NAMRC 108 / NAMRC 109 / NAMRC 116	Tr4: Add. Mfg 12 / NAMRC 221 / NAMRC 220 / NAMRC 213	Tr1: Mfg Sys 3 / NAMRC 125 / NAMRC 75 / NAMRC 119	MEA5-1: Equipment, Control, Automation 3 / MSEC-105311 / MSEC-101825 / MSEC-104752	MP6-8: Mfg Processes 1 / MSEC-111117 / MSEC-111133 / MSEC-110630
	12:00-13:40	Lunch													
	13:50-15:05 Tech Session – 10			6-1 Digital Design and Mfg / LEMP-021 / LEMP-025 / LEMP-040	MP6-5: Assisted and Augmented Mfg 2 / MSEC-105521 / MSEC-106174 / MSEC-105645	Tr4: Add. Mfg 13 / NAMRC 87 / NAMRC 93 / NAMRC 96	4-1 Measurement and Instruments / LEMP-022 / LEMP-036 / LEMP-047	QR9-1: Quality and Reliability 2 / MSEC-104888 / MSEC-105080 / MSEC-106171	ADM1-2: Smart Add. Mfg 4 / MSEC-100739 / MSEC-104775 / MSEC-104786	Tr2: Mfg Processes 10 / NAMRC 182 / NAMRC 186 / NAMRC 11	Tr5: Smart Mfg & CPS 10 / NAMRC 123 / NAMRC 118 / NAMRC 137	Tr5: Smart Mfg & CPS 11 / NAMRC 211 / NAMRC 212 / NAMRC 128	Tr1: Mfg Sys 4 / NAMRC 205 / NAMRC 160 / NAMRC 204	ADM1-4: Add. Mfg of Polym. and Compos. 1 / MSEC-101823 / MSEC-102275 / MSEC-105526	MP6-3: Lightweight Materials Joining 1 / MSEC-104457 / MSEC-104706 / MSEC-105586
	15:25-16:40 Tech Session – 11		Workshop on Quality Publication in J. Mfg Sys	6-1 Digital Design and Digital Mfg / LEMP-054 / LEMP-059	MP6-6: Physics-Informed Data-Driven Mfg 2 / MSEC-101504 / MSEC-102616 / MSEC-105178	Tr4: Add. Mfg 14 / NAMRC 97 / NAMRC 110 / NAMRC 112	4-1 Measurement 4-2 Monitoring / LEMP-055 / LEMP-056 / LEMP-018	QR8-2: Quality and Reliability 3 / MSEC-101281 / MSEC-102011 / MSEC-102678	ADM1-3: Metal Add. Mfg 4 / MSEC-105627 / MSEC-105582 / MSEC-104929	Tr2: Mfg Processes 11 / NAMRC 219 / NAMRC 218 / NAMRC 127	Tr5: Smart Mfg & CPS 12 / NAMRC 164 / NAMRC 153 / NAMRC 138	Tr5: Smart Mfg & CPS 13 / NAMRC 200 / NAMRC 199 / NAMRC 203		ADM1-4: Add. Mfg of Polym. and Compos. 2 / MSEC-103018 / MSEC-104858 / MSEC-105478	MP6-3: Lightweight Materials Joining 2 / MSEC-104127 / MSEC-105603
	16:40-19:00						Shuttles for Lab Tour								
	19:00-21:00	Banquet													
Friday 6/16/23	09:00-10:15 Tech Session – 12					Tr4: Add. Mfg 15 / NAMRC 114 / NAMRC 120 / NAMRC 113	4-2 & 4-3 / LEMP-026 / LEMP-028 / LEMP-012	QR9-2: Quality and Reliability 4 / MSEC-117661 / MSEC-105105 / MSEC-105565	MP6-8 & QR9-3 / MANU#22-1369 / MSEC-106628	Tr3: Mfg Removal 3 / NAMRC 135 / NAMRC 148 / NAMRC 143	Tr5: Smart Mfg & CPS 14 / NAMRC 171 / NAMRC 167 / NAMRC 174	Tr5: Smart Mfg & CPS 15 / NAMRC 210 / NAMRC 216 / NAMRC 214	Tr1: Mfg Sys 5 / NAMRC 41 / NAMRC 25 / NAMRC 19	ADM1-4 & BIOM3-2 / MSEC-104984 / MSEC-106511	MP6-4: Surface Eng 4 / MSEC-104618 / MSEC-104554 / MSEC-105876
	10:35-11:50 Tech Session – 13					Tr4: Add. Mfg 16 / NAMRC 126 / NAMRC 136 / NAMRC 223	4-3 Nondestructive Evaluation / LEMP-060 / LEMP-064			Tr3: Mfg Removal 4 / NAMRC 166 / NAMRC 152 / NAMRC 163	Tr5: Smart Mfg & CPS 16 / NAMRC 189 / NAMRC 193 / NAMRC 198	Tr5: Smart Mfg & CPS 17 / NAMRC 222 / NAMRC 63 / NAMRC 168			
	12:00-13:00						Boxed Lunch								

MONDAY JUNE 12, 2023

Time	Location	Event
8:30-15:00	AB-2200	NAMRI Board Meeting
12:00-20:00	Brower Lobby	Registration
13:00-17:00	Brower Lobby	Exhibitor Booth Set Ups
	AB-2160	NSF Workshop on Machining Industry Cyberphysical Systems Roadmapping
15:00-17:00	AB-2200	ASME MED Executive Committee Meeting
15:00-17:00	Brower Dining Hall	NAMRC Awards Rehearsal
16:00-20:00	Brower Lobby	Poster Set Ups
18:00-20:00	Brower Dining Hall	Welcome Reception
18:30-20:00	Brower Room A&B	Women in Advanced Manufacturing (WIAM) Forum Welcome Reception

4th Women in Advanced Manufacturing (WIAM) Forum 2023

The WIAM Forum 2023 will continue to showcase successful career paths, discuss next generation technologies, and promote diversity, equity, and inclusion in the field of advanced manufacturing. This forum is organized by the ASME Manufacturing Engineering Division (MED). Funding for this event is provided by the NSF Advanced Manufacturing program, MED, and the ASME Technical and Engineering Communities (TEC) Sector, and is co-sponsored by SME.

Registration fee of $5 is required. All genders are welcome!

TUESDAY JUNE 13, 2023

Time	Location	Event
7:00-12:00 13:30-17:30	Academic Building (AB) East 2nd Floor Atrium	Registration
8:00-8:30	AB-2400	Welcome Address • Yuebin Guo, Weihong Grace Guo, *Conference Co-Chairs* • Denise Hien, *Rutgers-NB Vice Provost* • Robert "Bob" Willig, *Executive Director and CEO of the Society of Manufacturing Engineers (SME)* • Thomas Costabile, *Executive Director and CEO of the American Society of Mechanical Engineers (ASME)* • Masako Sudo, *Chair of Manufacturing and Machine Tool Division (MMT) of the Japan Society of Mechanical Engineers (JSME)* • Michael F. Molnar, *Director of the Advanced Manufacturing National Program Office*
8:30-9:10	AB-2400	Keynote: Thomas Bergs
9:10-9:30	AB East 2nd Floor Atrium	Morning Break
9:30-10:10	AB-2400	Keynote: John Dyck
10:15-10:35	AB East 2nd Floor Atrium	Morning Break
10:35-11:50	AB and MU	Technical Session 1
10:35-11:50	AB-2400	MED Student Design Competition 1
10:35-11:50	AB-2225	LEM&P Poster Session
10:35-11:25	AB-2160	NAMRC Track 5 Keynote: Thomas R. Kurfess
12:00-13:40	Brower Dining Hall	JSME Award Luncheon LEM&P Keynote: Fred Carter
12:00-18:00	Brower Lobby	Exhibitor Booths Open
13:50-15:05	AB and MU	Technical Session 2
13:50-15:05	AB-2400	MED Student Design Competition 2
13:50-15:05	AB-2225	Academic Plenary: Zi-Kui Liu Industry Plenary: Mathias Hakenberg
15:05-15:25	AB East 2nd Floor Atrium	Afternoon Break
15:30-17:30	Brower Dining Hall	Poster Session with Networking Reception (food and beverage 4-7pm)
15:30-16:45	AB-2200	Journal of Manufacturing Science and Engineering Editorial Board Meeting
15:30-16:30	AB-2400	WIAM 1: Panel of Additive Manufacturing Leaders
16:30-17:30	AB-2400	WIAM 2: Professional Development Workshop
17:30-18:00	Brower Dining Hall	State of LEM&P Meeting
18:00-18:30	Brower Dining Hall	State of NAMRI Meeting
18:30-19:00	Brower Dining Hall	State of ASME MED Meeting

KEYNOTE SPEECH

TUESDAY JUNE 13, 2023

From Digitization to Sustainability - Challenges and Opportunities for Future Manufacturing

Thomas Bergs

Univ. Prof. Dr.-Ing. MBA

Head of Chair, Member of Board of Directors

RWTH Aachen University

Tuesday, June 13th | 8:30-9:10 | Location: AB-2400

Abstract

In recent years, hardly any other development had such an impact on production engineering as digitization. As such, the utilization of data as well as the consistent and comprehensive connectivity within growing IIoT environments play a key role for various innovations in manufacturing. In addition to digitization, the second trend topic rises the question, how we can ensure "sustainability" in our industrial value chains by radical minimizing energy - and resource consumption. Both topics, digitization and sustainability will therefore have a huge impact on the future transformation of manufacturing. Here, the digital twin (DT) will be the central vehicle, aggregating, structuring, and utilizing the available data and information for holistic optimization over the entire life-cycle, from design, manufacturing, usage and recovery of real products.

This presentation will introduce the concept of digital twins within a typical manufacturing environment and deepens the understanding of the interaction between data- and model-driven approaches based on specific and representative use cases. These aspects are then put into the context of "sustainability" and it will be presented how digital twins within the production and manufacturing domain can be used as a basis for life cycle assessments as well as for the transformation from a linear to a sustainable circular economy.

Bio

Thomas Bergs is Professor at the Chair of Manufacturing Technology at the Laboratory for Machine Tools and Production Engineering WZL of the RWTH Aachen University and as Director of the Process Technology Division at the Fraunhofer Institute for Production Technology IPT. He is also a member of the Board of Directors of both production engineering institutes.

KEYNOTE SPEECH

TUESDAY JUNE 13, 2023

The Urgent Need to Accelerate the Adoption of Smart Manufacturing in the US

John Dyck

Chief Executive Officer

CESMII - Clean Energy Smart Manufacturing Innovation Institute

Tuesday, June 13th | 9:30-10:10 | Location: AB-2400

Abstract

As we transition from one manufacturing era to another, it's clear that legacy behaviors, business models and technology architectures must make way for new ones. The mission of The Smart Manufacturing Institute to enhance U.S. manufacturing productivity through a collaborative ecosystem of partners, an interoperable technology standard and continuous improvement in workforce development and education will help break down those barriers.

Bio

John Dyck is the Chief Executive Officer of CESMII - Clean Energy Smart Manufacturing Innovation Institute. CESMII is a Manufacturing USA Institute chartered with transforming the U.S. manufacturing market and increasing global competitiveness through the democratization of Smart Manufacturing technologies, knowledge, and business practices. John brings a highly pragmatic perspective to CESMII, and a crisp focus on outcomes that will benefit the Nation's energy and economic security by sharing existing resources and co-investing to accelerate development and commercial deployment of innovative technologies. He was recognized by the Society of Manufacturing Engineering (SME) in 2020 as one of '30 Leaders Transforming Manufacturing in the USA'. Prior to joining CESMII, John held senior leadership positions in large corporations like GE and Rockwell Automation, and was effective in raising VC funding and building a successful software startup called Activplant.

LUNCHEON KEYNOTE SPEECH

TUESDAY JUNE 13, 2023

JSME Award Luncheon and LEM&P Keynote:

On The Path Towards a More Efficient Single Laser SLM Machine Using In-Situ and Ex-Situ X-Ray Imaging

Fred M. Carter III

Head of Research & Development

DMG MORI Additive Solutions Inc.

Tuesday, June 13th | 12:00-13:40 | Brower Dining Hall

Abstract

Many manufacturers of Selective Laser Melting (SLM) machines are turning towards multi-laser systems as a method to improve productivity and reduce overall Cost Per Part (CPP). While there is merit to this approach there are also some drawbacks including increased optical complexity, calibration burden, alignment issues, and unbalanced toolpath strategies. As additive manufacturing has gone from prototyping and a growing manufacturing method to an impactful process used in many critical industries such as medical and aerospace, the developments that help improve CPP are of increasing focus.

There are many limitations to the achievable productivity of a single laser SLM system, including laser beam diameter, laser power, layer thickness, laser beam profile, and laser speed. This work describes a new approach leveraging a programmable laser technology enabling a hybrid toolpath workflow that uses different laser profiles within a single optical processing head. In-situ X-ray imaging work has been performed to understand the impact of non-Guassian energy profiles on melt pool dynamics, spatter generation, and coaxial monitoring signature. Part scale X-ray Computed Tomography has been performed to rapidly evaluate the processing domain for this new paradigm. The results show significant changes in melt pool dynamics, enlarged processing domain, and improved processing time while maintaining near identical surface finish, density, and accuracy.

Bio

Fred M. Carter III is the Head of Research and Development at DMG MORI Additive Solutions Inc. leading a multi-disciplinary team of development engineers focused on delivering the next generation of Additive Manufacturing machine tools. During his professional and academic tenure, he has worked on a range of metal additive manufacturing technologies, developments, and applications in terms of fluid process modeling, monitoring, process control, mechanical and material characterization. He has made many contributions to the field of advanced additive manufacturing with many creative works published in academic journals. He recently received the outstanding paper award for works submitted to NAMRC 2022.

Concurrent Engineering of Materials, Manufacturing, and Design in Terms of Materials Genome
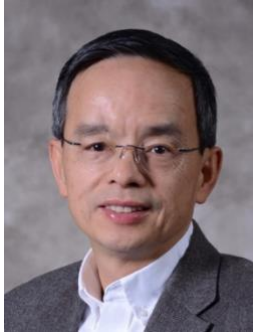
Zi-Kui Liu

Dorothy Pate Enright Professor of Materials Science and Engineering

The Pennsylvania State University

Tuesday, June 13th | 13:50-14:25 | Location: AB-2225

Abstract

Design is a process to determine optimal combinations of ingredients and processing parameters for desired performances of a product. The ingredients for materials design are their chemical compositions, and processing parameters are temperature, pressure/stress, and electric/magnetic fields with the outcomes being the phases and their morphologies, i.e., microstructures, which dictate the performances of materials. In the history of human civilization, those optimal combinations were obtained through extended periods of trial-and-error experimentations such as the tin content in bronze and blacksmith procedures. Human knowledge has been accumulated through apprenticeships, books, journals, and the latest digitization as the core of the 4th industry revolution. The digitization of knowledge on phases and their properties in last century can be broadly categorized as bottom up from quantum mechanics in terms of the density functional theory and top down from phenomenological CALPHAD modeling in terms of free energy of individual phases. In this presentation, author's experiences and perspectives on these two approaches and their integrations in terms of zentropy theory and the theory of cross phenomena through integrating quantum, statistical, and irreversible thermodynamics will be discussed (https://doi.org/10.1080/21663831.2022.2054668).

Bio

Dr. Zi-Kui Liu is the Dorothy Pate Enright Professor in the department of Materials Science and Engineering at The Pennsylvania State University. He obtained his BS from Central South University (China), MS from University of Science and Technology Beijing (China), PhD from Royal Institute of Technology (KTH, Sweden). He was a research associate at University of Wisconsin-Madison and a senior research scientist at Questek Innovation, LLC. He has been at the Pennsylvania State University since 1999, coined the term "Materials Genome®" in 2002, and served as the 100th President of ASM International in 2020. Dr. Liu is Fellow of ASM International and TMS. His current research activities are centered on (1) DFT-based first-principles calculations and deep neural network machine learning for prediction and modeling of materials properties through integration of quantum, statistical, and irreversible thermodynamics, and (2) their applications for designing and tailoring materials chemistry, processing, and performances. He published over 600 papers in peer-reviewed journals and was the lead author of a textbook titled "Computational Thermodynamics of Materials" published by Cambridge University Press.

INDUSTRY PLENARY

TUESDAY JUNE 13, 2023

The Future of Automation in Smart Manufacturing

Mathias Hakenberg

Senior Key Expert, Siemens Technology

Tuesday, June 13th | 14:30-15:05 | Location: AB-2225

Abstract

Automation has been a key enabler of productivity increases in manufacturing since the beginning of the industrial revolution. For high volume production Automation is very efficient, but we still struggle to exploit its full benefits for smaller lot sizes. The availability of computing power on the shop floor offers new possibilities to increase the level of autonomy in automation and extend its applicability towards new tasks. The first part of this keynote will highlight advances in automation, that become feasible through image processing, statistical analysis, and optimization. Developing these technologies into tools for the real world requires thoroughness and vigor. Therefore, the second part of this keynote is dedicated to bridging the gap between research and industrial practice. The latter of these is characterized by inconsistent or missing data and a heterogeneity of systems.

Bio

Dr. Mathias Hakenberg is a Senior Key Expert at Siemens Technology in Princeton. He is the lead developer for the Receding Horizon Planner technology for production planning and fleet management. Before joining Siemens in 2017 he was the chief engineer for 'Industrial automation and control' at the Institute of Automatic Control at RWTH Aachen University, Germany. He got his Ph.D. at the faculty of mechanical engineering at RWTH Aachen University in 2013.

WIAM FORUM

4th Women in Advanced Manufacturing (WIAM) Forum

Tuesday, June 13th | 15:30-17:30 | Location: AB-2400

The WIAM Forum 2023 will continue to showcase successful career paths, discuss next generation technologies, and promote diversity, equity, and inclusion in the field of advanced manufacturing. This forum is organized by the ASME Manufacturing Engineering Division (MED). Funding for this event is provided by the NSF Advanced Manufacturing program, MED, and the ASME Technical and Engineering Communities (TEC) Sector, and is co-sponsored by SME.

Registration fee of $5 is required. All genders are welcome!

Program Details

Session I (3:30-4:30 PM): Panel of Additive Manufacturing Leaders

Panel Topic: Advances in Additive Manufacturing
Panelists:
- Adeola Olubamiji, STEMHub Foundation – Founder, Desktop Metal – Manager
- Nanci Hardwick, MELD Manufacturing Corporation – CEO
- Melissa Orme, Boeing Additive Manufacturing – Vice President (Virtual Presentation)

Session II (4:30-5:30 PM): Professional Development Workshop

Workshop Topic: Diversifying and Retaining the Advanced Manufacturing Workforce
Moderator: Kimberly Cook-Chennault, Rutgers University – Associate Professor
Agenda:
- Opening Presentation on DEI moments [5 mins]
  - Clare Bruff, ASME Volunteer Leadership Development and Diversity – Senior Manager
- Panel Presentation and Q&A [40 mins]
  - Adeola Olubamiji, STEMHub Foundation – Founder, Desktop Metal – Manager
  - Megan Magee, GE Research – Talent Acquisition Director
  - Salam Elhalabi, Nanofabrication Facility – Cleanroom Technician
- Brainstorming Session [10 mins]
- Closing Remarks [5 mins]
  - Clare Bruff, ASME Volunteer Leadership Development and Diversity – Senior Manager

WIAM FORUM

ASME MED WIAM 2023 Panel of Additive Manufacturing Leaders

Adeola Olubamiji, STEMHub Foundation – Founder, Desktop Metal – Manager

Dr. Adeola Olubamiji is a Portfolio Professional - she holds a PhD in Biomedical Engineering, she is an Additive Manufacturing Leader, Founder of STEMHub Foundation, Canada and Founder of D-Tech Centrix Inc. She has 10+ years of experience in Additive Manufacturing technologies spanning across Metal Binder Jetting, Laser Powder Bed Fusion (LPBF), Selective Laser Sintering (SLS) and Bioprinting. She previously held roles such as Director of Solutions Engineering at Desktop Metal Inc, where she championed industrialization of metal additive manufacturing processes and Advanced Manufacturing Technical Advisor at Cummins Inc, where she was praised for being instrumental in the development of additive manufacturing technology roadmap, also improving Cummins' laser printed 316L stainless steel.

Through her consulting company D-Tech Centrix Inc (with branches in the US, Canada and Nigeria), she has impacted over 10000 professionals on their journey to the top of their careers at their desired locations. In addition, she champions relocation opportunities through study abroad programs for Africans who wish to relocate abroad and thrive in their desired locations.

She founded STEMHub Foundation, Canada in 2017. STEMHub foundation is a Canadian Charity Organization that provides free hands-on experiments and unique learning programs that engage black youths in Science, Technology, Engineering, and Mathematics (STEM), mentorship programs to visible minority professionals, and provide free industry 4.0 to professionals with intention to pivot into the technology space in Canada. STEMHub Foundation has impacted close to 8,000 youths and professionals since its inception in Canada and continues to be a go-to organization for youths and professionals seeking to understand how to leverage digital transformation for their career advancements.

Her academic contributions have yielded several scholarly publications, scientific conference presentations, and a TEDx talk. Some of the awards she has won include 2022 Women of the Year by DMZ Canada, 2022 Accomplished Black Canadian, 2020 STEP (Science technology Engineering and Production) Award by the American Manufacturing Institute, 2020 Canada's Top 100 Most Powerful Women, RBC Top 25 Canadian Immigrant 2020, 2019 Influential Women in Manufacturing Award by Putman Media, 2019 L'Oréal Paris Women of Worth Canada Honoree, 2019 Canada's Top 100 Black Women to Watch, and so many others.

Nanci Hardwick, MELD Manufacturing Corporation and Aeroprobe Corporation – CEO

Nanci Hardwick is CEO of MELD Manufacturing Corporation and Aeroprobe Corporation. MELD® has changed the scale of metal additive manufacturing with its solid-state printing process. Nanci has led MELD® from a concept to commercialization with several awards, including R&D100's most disruptive new technology worldwide and the Edison award. The company holds over two dozen patents and manufactures industrial MELD printers capable of printing aluminum, magnesium, copper, titanium, steel, and more. Aeroprobe provides the aerospace industry with air data systems designed to improve safety and performance of unmanned aerial vehicles. Aeroprobe also designs, manufacturers, and calibrates multi-hole probes used by researchers around the world for design validation.

Nanci was founding member and board chair of the AUVSI Ridge and Valley Chapter; board chair for Roanoke Blacksburg Technology Council (RBTC), board chair for United Way; board vice-chair for OnwardNRV;

founding board member of Roanoke Blacksburg Innovation Network (RBIN), Virginia Tech CRC Community Impact Program, and United Way's United in Caring Fund; board member of New River Community College Foundation and Lyric Theatre; board of directors for Virginia Manufacturers Association; volunteer adult literacy tutor for Literacy Volunteers of America (LVA). She has received awards and been recognized by the Governor of Virginia for leadership in community and business.

Melissa Orme, Boeing Additive Manufacturing – Vice President (Virtual Presentation)

Melissa is a renowned pioneer, innovator and leader in the developing field of Additive Manufacturing, where her seminal work in additive manufacturing spans three decades and has resulted in 15 US patents. Melissa has a rich and diverse professional background, having begun her career in academia where she rose to the rank of Full Professor of Mechanical and Aerospace Engineering at the University of California Irvine. There, she established globally recognized research laboratories in the field that is now termed 'Additive Manufacturing,' where she developed methods for controlled electrostatically charged and deflected molten metal droplet deposition for precision manufacturing, direct writing of electronic components, and precise powder production. Subsequently, she transitioned from academia to high tech startups where she served as the Chief Technology Officer of Morf3D, a company that is focused on producing and delivering flight qualified additively manufactured hardware to the aerospace industry. From Morf3D she was recruited by Boeing to lead Additive Manufacturing across all business units.

In the capacity of Vice President of Additive Manufacturing at The Boeing Company, Melissa leads a highly innovative team that drives advanced engineering solutions to complex design problems for commercial airplanes such as the 787 Dreamliner; space and launch vehicles such as Artemis SLS rocket; satellites such as the O3b constellation; vertical lift programs such as the Chinook helicopter; fighter airplanes such as the F/A-15 and F/A-18; and autonomous vehicles such as the MQ-25 refueling drone. Insertions of Additive Manufacturing into these and other flight vehicles has been demonstrated to enhance quality and performance while simultaneously saving millions of dollars. Additionally, Melissa oversees Boeing research, both internal and external, focused on Additive Manufacturing including the development of new processes; materials; manufacturing digital transformation for industry 4.0; the creation of the digital thread; machine learning and data analytics.

Melissa has been a leader in additive manufacturing since the early days when she was an outlier in her academic department, advocating for adoption of manufacturing processes of the future. Today she leads a team of highly creative engineers, some of whom have never designed for traditional manufacturing, and have adopted and regularly implement additive manufacturing as a standard manufacturing technology in order to solve complex engineering problems on Boeing products, reducing cost and improving performance.

ASME MED WIAM 2023 Workshop Moderator

Kimberly Cook-Chennault, Rutgers University – Associate Professor

Kimberly Cook-Chennault is an Associate Professor within the Mechanical and Engineering Department, with graduate faculty roles in the Biomedical Engineering Department and Department of Educational Psychology at Rutgers University. Dr. Cook-Chennault applies qualitative, quantitative, mixed- and multimodal methods to explore and improve outcomes for students (high school and undergraduate) and K-12 teachers (high school) in science, technology, engineering, and mathematics (STEM).

She leverages her expertise in power management design and mechanical engineering to guide other young researchers in both investigation of material processing techniques for smart composite materials and engineering education. In particular, her work converges on multiple technologies and disciplines to advance the understanding of the circuits and pathways of cognitive function, attention, focus, and emotion – linked to project based and experiential learning. She applies these research techniques to projects that explore how students are motivated to engage with and associate value to engineering educational games; and elucidate what aspects of curriculum, environment, and instruction that foster enhanced cognitive learning and outcomes for students who participate in virtual and in-person educational engineering laboratories. In this way, she triangulates engineering technology and biophysiological markers with Cognitive and Constructivism Learning Theories to advance human technology interaction and engagement. As a result of her efforts, she has received awards for her innovative approaches to engineering education, mentorship, community engagement activities, and scholarships.

ASME MED WIAM 2023 Workshop Panelists

Clare Bruff, ASME Volunteer Leadership Development and Diversity – Senior Manager

Clare Bruff is Senior Manager, Volunteer Leadership Development and Diversity at ASME, in which role she works with volunteers to offer training, orientation, succession planning, and professional development for the organization's volunteer leadership and emerging leaders, and is the lead staff person for ASME's Diversity, Equity, and Inclusion Strategy Committee. She has been with ASME since 2013. Prior to joining ASME, she was Director, Field Support at the American Lung Association, where she worked with Lung Association chapters throughout the country on organizational performance management. She also staffed the Lung Association's national Diversity Committee and provided leadership on nationwide diversity initiatives. She has been a member of the New York Association for Volunteer Administration since 2004 and served on its Board from 2006-2017, as President from 2014-2016. Clare is a graduate of Rutgers University with a degree in Africana Studies and English and she holds a Master's of Public Administration from Baruch College.

Adeola Olubamiji, STEMHub Foundation – Founder, Desktop Metal – Manager

Dr. Adeola Olubamiji is a Portfolio Professional - she holds a PhD in Biomedical Engineering, she is an Additive Manufacturing Leader, Founder of STEMHub Foundation, Canada and Founder of D-Tech Centrix Inc. She has 10+ years of experience in Additive Manufacturing technologies spanning across Metal Binder Jetting, Laser Powder Bed Fusion (LPBF), Selective Laser Sintering (SLS) and Bioprinting. She previously held roles such as Director of Solutions Engineering at Desktop Metal Inc, where she championed industrialization of metal additive manufacturing processes and Advanced Manufacturing Technical Advisor at Cummins Inc, where she was praised for being instrumental in the development of additive manufacturing technology roadmap, also improving Cummins' laser printed 316L stainless steel.

Through her consulting company D-Tech Centrix Inc (with branches in the US, Canada and Nigeria), she has impacted over 10000 professionals on their journey to the top of their careers at their desired locations. In addition, she champions relocation opportunities through study abroad programs for Africans who wish to relocate abroad and thrive in their desired locations.

She founded STEMHub Foundation, Canada in 2017. STEMHub foundation is a Canadian Charity Organization that provides free hands-on experiments and unique learning programs that engage black youths in Science, Technology, Engineering, and Mathematics (STEM), mentorship programs to visible minority professionals, and provide free industry 4.0 to professionals with intention to pivot into the technology space in Canada. STEMHub Foundation has impacted close to 8,000 youths and professionals since its inception in Canada and continues to be a go-to organization for youths and professionals seeking to understand how to leverage digital transformation for their career advancements.

Her academic contributions have yielded several scholarly publications, scientific conference presentations, and a TEDx talk. Some of the awards she has won include 2022 Women of the Year by DMZ Canada, 2022 Accomplished Black Canadian, 2020 STEP (Science technology Engineering and Production) Award by the American Manufacturing Institute, 2020 Canada's Top 100 Most Powerful Women, RBC Top 25 Canadian Immigrant 2020, 2019 Influential Women in Manufacturing Award by Putman Media, 2019 L'Oréal Paris Women of Worth Canada Honoree, 2019 Canada's Top 100 Black Women to Watch, and so many others.

Megan Magee, GE Research – Talent Acquisition Director

Megan Magee is the Talent Acquisition Director for the GE Research Center, headquartered in Niskayuna, NY. Megan leads recruiting, hiring, onboarding and strategic diversity, equity & inclusion outreach and engagement for an interdisciplinary organization of scientists and engineers (with over 600 PhD's). GE Research's cross-discipline expertise and diverse technology portfolio are accelerating the energy transition, advancing precision healthcare, and enabling safer, sustainable air travel. Our scientists and engineers boast an unmatched breadth of expertise and experience, turning cutting-edge research into impactful realities across industry. Prior to GE, Megan held various recruitment roles in the Automotive industry, the Department of Defense industry and then joined GE (Yoh) in 2009 to start up the Advanced Manufacturing and Software Technology Center in Michigan. Megan moved to New York to take the role as the Operations Leader supporting GE Research in 2012, until becoming the Talent Acquisition Director in 2013. Megan holds a Bachelor's Degree in Communications from Saint Mary's College, Notre Dame IN.; she resides in Michigan with her husband Ray and two daughters Melody and Ireland.

Salam Elhalabi, Nanofabrication Facility – Cleanroom Technician

Ms. Salam Elhalabi is a recent 2nd bachelor's graduate from CCNY for Mechanical Engineering, with Biomedical Engineering as my first degree. She is also a recent hire at the Nanofabrication Facility as a cleanroom technician, and she hopes to bring to the team and community a set of skills from my unique background. With recent interests in mechatronics and micro/Nano-fabrication, she is eager to learn and help the team to the best of my ability in their endeavors. She has worked in various roles and industries such as makerspaces, automotive, agriculture, and manufacturing for commercial buildings. In those areas, she has worked on R&D (research and development) projects that were for startups, company, and in academia settings. While working for the CCNY Makerspace, she was involved with CiPASS' (the City College Initiative to Promote Academic Success in STEM) Apprenticeship Program. The program is designed to give students STEM projects to develop their technical skills - especially in manufacturing, learn engineering design principles, build up their resume and project portfolio, and soft skills. CiPASS had the first finale event this spring semester, and the students presented their projects with enthusiasm and knowledge that they had not started with. Whenever Salam is not in the lab, she likes to work on custom pieces or engravings with laser and vinyl cutters, and play trumpet in community bands.

WIAM FORUM

ASME MED WIAM 2023 Organizing Committee

Chair: Nancy Diaz-Elsayed, University of South Florida
Co-Lead: Sarah Wolff, Ohio State University
Vice Chair: Maya Reslan, NIST
Treasurer: Megan McGovern, General Motors Global R&D Center
Secretary: Ala Qattawi, University of Toledo
Liaison Coordinator: Dian-Ru Annie Li, National Taiwan University
ASME Coordinator: Barbara Zlatnik, ASME

Nancy Diaz-Elsayed, University of South Florida – Assistant Professor, WIAM 2023 Lead Organizer

Dr. Nancy Diaz-Elsayed joined the Department of Mechanical Engineering at USF as an Assistant Professor in 2020 where she leads the Smart and Sustainable Systems Laboratory. Under her leadership, the S3 Lab evaluates the sustainability of engineered systems to inform strategies that can lower environmental and economic impacts, while improving technological performance using data-driven methodologies. Her research interests include system and process modeling, technology development for smart and sustainable systems, and the role of industrial symbiosis in the design and growth of urban environments. She holds a M.S. and Ph.D. in Mechanical Engineering from UC Berkeley and a B.S. in Mechanical Engineering from MIT. For her professional achievements to date and support of the future generation of engineers, she has received several accolades including the 2022 SME Sandra L. Bouckley Outstanding Young Manufacturing Engineer Award from the Society of Manufacturing Engineers, a 2022 Luminary Award from Great Minds in STEM, and a 2021 William R. Jones Outstanding Mentor Award from the Florida Education Fund.

She has collaborated with partners across the Tampa Bay, Florida, and the U.S. in support of offering local manufacturing workforce training and accelerating technology development for advanced manufacturing solutions. In addition to her technical and professional achievements, Dr. Diaz-Elsayed has supported USF's Sloan University Center of Exemplary Mentoring (UCEM) by leading the documentation of best practices for the recruitment and mentoring of Hispanic and African American students in STEM doctoral programs. She led the inaugural Girls Rise Up program at USF in 2022 in collaboration with STEM from Dance out of New York City, which invited middle school and high school students to our USF campus from across Hillsborough County to learn engineering skills through a dance-infused curriculum.

Sarah Wolff, Ohio State University – Assistant Professor

Dr. Sarah Wolff is an assistant professor in the mechanical and aerospace department at The Ohio State University. She was awarded the 2022 SME Outstanding Young Manufacturing Engineer Award. Her previous roles include an assistant professorship in the industrial and systems engineering department at Texas A&M University and an Enrico Fermi Fellow at Argonne National Laboratory. She graduated from Northwestern University in 2018 with a PhD in mechanical engineering. Dr. Wolff's expertise is in metal additive manufacturing and laser processing, particularly in the areas of situ monitoring, high-speed X-ray imaging, image processing, and microstructural characterization.

WIAM FORUM

Maya Reslan, NIST – Associate Researcher

Maya Reslan is an Associate Researcher at the National Institute of Standards and Technology in Gaithersburg, Maryland. Her research focuses on Lean manufacturing, maintenance workflows, advanced manufacturing, industry 4.0, and change management. She graduated from the Lebanese American University with a Bachelor in Mechanical Engineering in December of 2015, and then moved to Germany to pursue her Masters in Management and Engineering in production systems at RWTH Aachen.

Maya is a certified Six Sigma Green belt and has experience in many manufacturing environments, including automotive, metal, furniture, pumps, aerospace, and others. Most of her work in industry varied between lean six sigma, continuous process improvements, supply chain management, risk mitigation, project management, inventory management, and others. She has held positions ranging from Business Development to Production Engineer to Research. She is also passionate about psychology and anthropology and has been integrating her engineering research in topics like work motivation, job attitudes, teams, enhancing performance and efficiency, and organizational development; mainly how employees can adapt to digitization and technology and transition into smart factories.

Maya is an active member in ASME since 2012 and is currently serving the Career Engagement Center (CEC) and Student Leadership Training Conference (SLTC). She joined ASME during her second year of undergrad and has remained involved since. She is also an active volunteer in different societies and NGOs targeting humanitarian issues like the refugee crisis, poverty, and emergency relief. Furthermore, Maya's hobbies vary between Martial Arts, swimming, painting, volunteering, traveling, and experiencing new cultures.

Megan McGovern, General Motors Global R&D – Senior Researcher

Dr. Megan McGovern is a Senior Researcher in the Manufacturing Systems Research Lab at General Motors Global Research & Development. She joined General Motors in 2016, where she leads research projects to develop inline and post manufacturing inspection systems crucial for first-time quality, especially in low-volume applications where launches are quick and highly customized. In 2019, she was the lead inventor in developing a technique to enable inline inspection of welded joints during pre-production battery pack assembly. Dr. McGovern received her Bachelor's, Master's, and Doctorate degrees in Systems and Entrepreneurial Engineering from the University of Illinois Urbana-Champaign. Her research interests include inline and post manufacturing inspection solutions, nondestructive evaluation of materials, components and structures, digital signal and image processing, process monitoring, and prognosis of materials and components. She is proficient in several nondestructive techniques, including ultrasound, thermography, X-Ray CT, and laser ultrasound. Dr. McGovern is the chair of the Detroit Section of the American Society for Nondestructive Testing (ASNT). She is active in various professional societies and is a licensed Professional Engineer (Michigan). She has 6 patents and 27 peer-reviewed journal articles, one of which received the Outstanding Paper Published in Materials Evaluation. She recently received the 2022 ASNT Research Innovation award and the 2022 SME Outstanding Young Manufacturing Engineer Award.

Ala Qattawi, University of Toledo - Assistant Professor

Dr. Ala Qattawi is an assistant professor at the Department of Mechanical, Industrial, and Manufacturing Engineering at the University of Toledo. She is the director and the principal investigator at the Integrated Design and

Manufacturing (IDM) Laboratory at the University of Toledo, where her research group interests include advanced manufacturing: additive manufacturing and sheet metal forming, design for manufacturing, sustainable manufacturing, and Origami-inspired metal structures as well as applications to vehicles body-in-white design. Her work as an educator also includes engineering education research with an emphasis on understanding students' engagement and academic success in hyflex classrooms.

Ala attended and received a Ph.D. in Automotive Engineering from Clemson University and worked as a post-doctorate fellow at the International Center for Automotive Research, South Carolina before joining University of Toledo. Dr. Qattawi received the Hellman Faculty Award in 2016, the SME Young Manufacturing Engineer Award in 2018, and the SAE Ralph Teetor Education Award in 2021.

Dian-Ru Annie Li, National Taiwan University – Assistant Professor

Dr. Dian-Ru (Annie) Li is currently an Assistant Professor in the Department of Mechanical Engineering at National Taiwan University. Dr. Li received her Bachelor's and Master's degrees from the Department of Mechanical Engineering at National Taiwan University. She then obtained her Doctorate degree from the Department of Mechanical Engineering at University of Michigan – Ann Arbor in 2019, and continued as a Postdoctoral Researcher for a year. Dr. Li was also a senior R&D mechanical engineer at Zap Surgical Systems, Inc. during 2020-2022. Dr. Li's research interests lie in the field of design and manufacturing with the focused areas on biomedical engineering and advanced & smart manufacturing. She has a deep understanding of tool-workpiece interaction mechanics and mechanical structural analysis. She is also experienced with the processes of medical product design and development including initial concept prototyping, manufacturability evaluation, performance testing and patentability/commercialization assessment. Beyond this, Dr. Li's recent research themes extend to advanced and smart manufacturing, focusing on integrating advanced computer science technologies into manufacturing processes to improve the product quality and achieve process sustainability.

Dr. Li was selected as one of thirty of the top junior academic women in Mechanical Engineering and invited to a Rising Star in Mechanical Engineering workshop hosted by Massachusetts Institute of Technology in 2018. She also led a project team developing an innovative nasal airway device and won the First Prize of Michigan Business Challenge in 2020. Dr. Li has 11 peer-reviewed journal articles, 11 conference proceedings (one of them received Paper Presentation Award at World Congress on Micro and Nano Manufacturing 2017 International Conference), and 4 patent applications (with 1 USA patent awarded).

Barbara Zlatnik, CAE, ASME – Senior Manager, Technical & Engineering Communities (TEC) Operations

Barbara Zlatnik is a Senior Manager at ASME supporting a number of the Society's technical divisions and technology groups. Barbara supports the division and technology group members and their leadership. Barbara has worked for several professional membership associations in various membership, volunteer management and customer service positions. She earned her Certified Association Executive credential in 2010.

POSTER SESSION

TUESDAY JUNE 13, 2023

Joint MSEC-LEM&P Poster Session

Tuesday, June 13th | 15:30-17:30 | Location: Brower Commons

Food and beverage will be served between 4-7pm.

Posters will be on display till Thursday.

MSEC2023-102025	Siying Liu, Wenbo Wang, and Xiangfan Chen	Rapid Three-Dimensional Printing of High-Resolution Piezoelectric Structures Using Micro-Clip
MSEC2023-104466	Lena Konzelman, Alexandra Marnot, and Blair Brettmann	Dual Cure for Highly Loaded Systems Printed via DIW at Low Temperatures
MSEC2023-109808	Hoonmin Park, Hwijin Park, Yuseop Sim, Huitaek Yun, Cheolwoo Park, Martin Byung-Guk Jun, and Hak Yi	Human Involved Cyber Physical System Using Virtual Reality Interface
MSEC2023-109834	Gyubok Choi, Donguk Kim, Seunghan Yang, Martin Byung Guk Jun, and Younghun Jeong	A Study on Robot Chamfering Process Through Orientation Adjustment of End Effector for Avoiding Singularity Points
MSEC2023-110020	Minchul Shin, Jihwan Han, Hak Yi, Younghun Jeong, Martin Byung Guk Jun, and Gyuman Kim	Micromachining of Glass Microfluidic Chips for Droplet Generation
MSEC2023-110075	Kim Donguk, Jeong Younghun, and Kim Jeonhwa	Nanofiber Structures with Controllable Mechanical Properties
MSEC2023-110600	Dongchan Kim, Yunjae Hwang, Yun Seok Kang, and Hyung Wook Park	Observation of Secondary Machining Processes for Carbon Fiber Reinforced Plastics in Robotic Machining
MSEC2023-111600	Dae Nyoung Kim, Suk Bum Kwon, Aditya Nagaraj, and Sangkee Min	Investigation on Anisotropic Material Behavior of Single Crystal Yttria-Stabilized Zirconia
MSEC2023-111681	Sohan Nagaraj, Nancy Diaz-Elsayed, and Donald Mccleeary	An Investigation of Data-Driven Tool Condition Monitoring (TCM) for Drilling of Synthetic Bone
MSEC2023-112291	Nicholas Hendrickson, Inderpreet Juneja, and Vinh Nguyen	Test Artifacts for Qualification of Hybrid Systems
MSEC2023-112311	Angelo Hawa, Ali Bahrami, and Kira Barton	Identifying a Gap in CFD Simulations of Complex E-Jet Printing Modalities
MSEC2023-112567	Nismath Valiyakath Vadakkan Habeeb, Behzad Fotovvati, Trong-Nhan Le, and Kevin Chou	In-Situ Detection and Ex-Situ Characterization of Porosity in Laser Powder Bed Fusion (LPBF)
MSEC2023-112811	Muhammad Saad Amjad and Nancy Diaz-Elsayed	Conceptual Model for a Net Zero Factory – a Job Scheduling Perspective

POSTER SESSION

MSEC2023-112817	Manish Raj Aryal, Sourabh Deshpande, Vysakh Venugopal, and Sam Anand	Immersive Visualization of Design and Simulation of Complex Organic Geometries
MSEC2023-112835	Jingjie Wu and Lei Zhou	Sequential Structure and Control Co-Design of Lightweight Precision Stages with Active Control of Flexible Modes
MSEC2023-112866	Boris Oskolkov	Securing Manufacturing Data by Integration of Blockchain and Online Ml
MSEC2023-113044	Jiunnjyh Wang and Qun-Zhi Lin	Identification of Operational Stiffness and Process Damping in Milling
MSEC2023-113088	Felicia Stan, Ionut-Laurentiu Sandu, and Fetecau Catalin	Effect of Processing Parameters on Adhesion Strength and Electrical Conductivity of CNT/ TPU-ABS Laminate Parts by Overmolding Process
MSEC2023-113139	Boyang Xu, Nicole Van Handel, and Shenghan Guo	3d Image Segmentation for Internal Defect Identification in LPBF
MSEC2023-113321	Ragavanantham Shanmugam, Mahendra Gaikwad, Pradeep Gaikwad, and Seth Dennison	Investigation on Mechanical Properties of Ceramic Waste Reinforced Polymer Matrix Composites
MSEC2023-113482	Aditya Chivate and Chi Zhou	0-Dus: Low Latency Sensing Modality for Anomaly Detection in Inkjet Printing
MSEC2023-113514	Vignesh Selvaraj, Monami Bhuyan, and Sangkee Min	Intelligent and Robust Monitoring of Human-Centric Assembly Operations in Manufacturing Industries Using Representation Learning
MSEC2023-113563	Sarower Tareq, Bibek Poudel, Hoa Nguyen, Alexandra Defilippis, Haseung Chung, and Patrick Kwon	Heat Treatment for SLM Printed Nitinol Shape Memory Alloy for Biomedical Applications
MSEC2023-113617	Botao Zhang, Lun Li, and Sam Anand	Support Optimization and Nurbs Geometry Compensation for Reducing GD&T Errors in Am
MSEC2023-113670	Aditya Nagaraj, Suk Bum Kwon, Dae Nyoung Kim, Dalei Xi, Yiyang Du, Woo Kyun Kim, and Sangkee Min	Study on Residual Stress Anisotropy in Machined Yttria-Stabilized Zirconia Through Nanoindentation
MSEC2023-113846	Mohsan Uddin Ahmad, Zhiyuan Qu, Patrick Kwon, and Haseung Chung	Heat Exchanger (HX) for Sco2 Power Generation by Additive Manufacturing
MSEC2023-113906	Byeong Kwon Kang, Yong Jae Jeon, Seok-Kwan Hong, Jiho Lee, and Sang Won Lee	Optimization of Non-Conformal Temperature Control Blow Molding Process Based on Gradient Class Activation Map (Grad-Cam)
MSEC2023-113964	Suk Bum Kwon and Sangkee Min	Cutting Force Characteristics During UPM of Single-Crystal Sapphire

POSTER SESSION

MSEC2023-113974	Yue Zhou and Fuda Ning	Directed Energy Deposition of Ss 316l/sic Composites Using Coincident and Coaxial Wire-Powder Feeding
MSEC2023-113985	Mengfei Chen, Rajiv Malhotra, and Weihong (Grace) Guo	Transfer Learning for Predictive Quality in Laser-Induced Plasma Micro-Machining
MSEC2023-114070	Zipeng Guo, Licheng Liang, Jason Armstrong, Shenqiang Ren, and Chi Zhou	Multi-Stage Advanced Manufacturing of Multi-Scale Porous Structures
MSEC2023-114088	Dayue Jiang and Fuda Ning	Bi-Metal Structures Fabricated by Extrusion-Based Sintering-Assisted Additive Manufacturing
MSEC2023-114154	Purvee Bhatia and Nancy Diaz-Elsayed	A Rapid & Cost-Effective Technique for Quality Assessment of 3d Printed Parts
MSEC2023-114164	Emmanuel Yangue	A Comparison Study for Generative Models in Augmenting Additive Manufacturing Layer-Wise Images.
MSEC2023-114179	Rong Lei	Physics-Guided Long Short-Term Memory Networks for Emission Prediction in Laser Powder Bed Fusion
MSEC2023-114210	Hyewon Shin, Bon Sang Koo, Junsoo Ahn, Du Ju Lee, Jiho Lee, and Sang Won Lee	Optimization of Composite Material-Based Injection Molding Process Based on Transfer Learning and Genetic Algorithms
MSEC2023-114291	Md Mahmudul Hassan	High-Speed X-Ray Study of Process Dynamics of Laser Polishing
MSEC2023-114305	Swarit Anand Singh, Naveen Kansara, and K A Desai	Design of Indigenous Hardware for Vision-Based Surface Inspection of Axisymmetric Components
MSEC2023-114728	Hossein Abedi, Reza Javanbakht, Mohammad Reza Nematollahi, Kevan Safaei, Anwar Algamal, Mohammad Elahinia, and Ala Qattawi	Modeling NiTi Melt Pool Dimension for a Single Laser Track Additive Manufacturing
MSEC2023-114777	Majed Ali, Abdalmageed Almotari, Juan Negron Castro, Ala'Aldin Alafaghani, Anwar Algamal, and Ala Qattawi	The Effect of Heat Treatment and Building Direction on 15-5ph Steel
MSEC2023-116948	Soohyun Nam, Hyein Kim, Jaehyun Lee, and Kyung-Hee Park	Proposal of Methodology for Selecting Optimal Cutting Parameters to Maximize Machining Efficiency
MSEC2023-117291	Abdalmageed Almotari, Majed Ali, Lakshmi Ramineni, Anwar Algamal, and Ala Qattawi	Residual Stresses Mapping in Laser Additive Manufacturing of in 718

POSTER SESSION

MSEC2023-117313	Hyein Kim, Soohyun Nam, Kyung-Hee Park, and Jeongin Koo	A Feature Engineering and Feature Selection Method Using FFT Analysis to Improve Cutting Force Estimation Performance
LEMP2023-005	Xinhuan Li, Jianguo Zhang, Yufan Fu, Yongjing Yu, Shaojin Shen, and Jianfeng Xu	In-situ ultrasonic-laser hybrid assisted cutting of single crystal silicon
LEMP2023-007	Shinya Moriyama, Yazawa Takanori, Tatsuki Otsubo, and Koichiro Harada	Study on initial wear of fixed diamond wire tools -Effect of addition of abrasives on wear of nickel plating-
LEMP2023-011	Takumi Nozaki, Akari Tawa, Yoshitaka Morimoto, Akio Hayashi, and Hidetaka Yamaoka	Adaptive control for feed rate of kinematics type machine tool based on spindle torque
LEMP2023-013	Kazuma Kurotani, Isamu Nishida, and Keiichi Shirase	Automatic classification of blood cells for bone marrow diagnosis with automatic imaging processing
LEMP2023-014	Ryo Takamori, Isamu Nishida, and Keiichi Shirase	Automated process planning system to machine organic shapes by combining turning and milling
LEMP2023-029	Takumi Nomura, Isamu Nishida, and Keiichi Shirase	Automated NC program generation for swarf machining using 5-axis machining center
LEMP2023-037	Takuto Wakasa, Kazuki Fujiwara, and Jun Taniguchi	Fabrication of a rose-petal surface using release coated UV curable resin via the Ultraviolet Nanoimprint Lithography
LEMP2023-043	Kazuki Arai, Ryohei Hokari, Kazuma Kurihara, and Jun Taniguchi	Fabrication of a high-aspect-ratio electroformed mold through thermal nanoimprinting process
LEMP2023-048	Tadaaki Naruki, Kenichi Suzuki, Hideharu Kato, Shigehiko Sakamoto, Masahiro Seto, Jin Katayama, and Takayuki Oka	Effect of different feed rates on chip evacuation in drilling of lead-free brass with a small diameter drill
LEMP2023-050	Mirai Sakaida, Hirofumi Suzuki, Tatsuya Furuki, Katsuhiro Miura, and Tatsuya Fukuda	Precision cutting of CVD-SiC by PCD milling tool - Effect of CVD-SiC grain size on surface roughness-
LEMP2023-052	Akira Goto, Hirofumi Suzuki, Tatsuya Furuki, Katsuhiro Miura, Akinori Yui, Tsunehiro Nakagawa, Toshikiyo Makino, Junichi Uehara, and Toshiyuki Moriizumi	Fabrication of micro array mold with ultrasonic vibration-assisted indentation
LEMP2023-065	Takanori Yamazaki and Daichi Hirabayashi	A design method of acceleration profiles for NC machine tools

NAMRC TRACK 5 KEYNOTE

TUESDAY JUNE 13, 2023

Advanced Manufacturing – Enabling Innovation at the Speed of Thought

Thomas R. Kurfess, Ph.D., P.E.

Chief Manufacturing Office Georgia Institute of Technology
Executive Director Georgia Tech Manufacturing Institute
HUSCO/Ramirez Distinguished Chair in Fluid Power and
Motion Control and Professor
George W. Woodruff School of Mechanical Engineering
Georgia Institute of Technology, USA

Tuesday, June 13th | 10:35-11:25 | Location: AB-2160

Abstract

It has been said that having a good idea is not nearly as important to success as having a good business plan. There is some truth to this statement. However, regardless of the idea or business plan, if one cannot rapidly scale a product to mass production in a cost-effective manner, the ability to make an impact on society or to launch a successful product is substantially jeopardized at best. This talk presents some of the technical concepts and business models that will enable new technologies and capabilities in the manufacturing sector to be rapidly deployed throughout the industrial base. The insight will be presented into next-generation resilient hyper-connected production operations and business models that favor local and point-of-assembly manufacturing. Such operations will leverage readily available tools such as ChatGPT to advance manufacturing capabilities in a global manner. The talk will conclude with a discussion of how rapidly advancing technological innovations such as AR/VR and AI/ML will be propagated throughout the manufacturing enterprise via flexible cloud/fog operations, ensuring a state-of-the-art manufacturing economy. This will provide opportunities for businesses of all sizes and democratize advanced manufacturing technologies. Such capabilities will enable the rapid scaling of new concepts and products into manufacturing operations, enabling industry to innovate at the speed of thought.

Bio Thomas R. Kurfess is the Chief Manufacturing Officer of the Georgia Institute of Technology and the Executive Director of the Georgia Tech Manufacturing Institute. He is also the HUSCO/Ramirez Distinguished Chair in Fluid Power and Motion Control and Professor of Mechanical Engineering at Georgia Tech. During 2019-2021 he served as the Chief Manufacturing Officer, and the Founding Director for the Manufacturing Science Division at Oak Ridge National Laboratory. During 2012-2013 served as the Assistant Director for Advanced Manufacturing at the Office of Science and Technology Policy in the Executive Office of the President of the United States of America, where he was responsible for coordinating Federal advanced manufacturing R&D. He was President of SME in 2018, and currently serves on the Board of Governors of the ASME. His research focuses on the design and development of advanced manufacturing systems targeting secure digital manufacturing, additive and subtractive processes, and large-scale production enterprises. He is an elected member of the National Academy of Engineering and is a Fellow of ASME, AAAS, and SME.

NAMRC TECHNICAL SESSIONS

TUESDAY JUNE 13, 2023

10:35-11:50 AB-2160	**NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 1** *Session Chair: Cindy Chang	Session Co-Chair: Zhaoyan Fan*	
Track 5 Keynote	Thomas R. Kurfess	Advanced Manufacturing – Enabling Innovation at the Speed of Thought
Paper 54	Ana Wooley, Daniel F. Silva, and Julia Bitencourt	When is a Simulation a Digital Twin? A Systematic Literature Review
10:35-11:50 MU-204	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 1** *Session Chair: Till Clausmeyer	Session Co-Chair: Kundan K. Singh*	
Paper 1	Marlon Hahn, Jan Bechler, and A. Erman Tekkaya	Modeling and validation of forming by vaporizing foil actuators
Paper 100	Daniel Beyfuss, Evgueni Bordatchev, Sven Linden, O. Remus Tutunea-Fatan, and Edgar Willenborg	Preliminary thermographic and statistical analysis of surface topography non-uniformities produced by laser remelting on metallic surfaces
Paper 181	Gururaja S and Kundan K. Singh	Influence of Microphone Tilt Angle on Instability Identification in Micromilling of Ti6Al4V
10:35-11:50 MU-208	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 1** *Session Chair: Yong Chen	Session Co-Chair: Samantha Webster*	
Paper 66	Samantha Webster, Jihoon Jeong, Shuheng Liao, and Jian Cao	Machine-Agnostic Energy Density Model for Laser, Powder-blown Directed Energy Deposition
Paper 8	Md Shakil Arman, Ben Xu, Andrew Tsin, and Jianzhi Li	Laser-Induced Forward Transfer (LIFT) based Bioprinting of the Collagen I with Retina Photoreceptor Cells
Paper 10	Chukwuzubelu Ufodike, Gaius Nzebuka, and Al Mazedur Rahman	Combine Effect of Feeding Rate and Numerical Modeling Parameter on the Extrusion Pressure in Material Extrusion Additive Manufacturing
10:35-11:50 MU-210	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 2** *Session Chair: Murali Sundaram	Session Co-Chair: Ramesh Singh*	
Paper 147	Israt Era, Mojtaba Farahani, Thorsten Wuest, and Zhichao Liu	Machine Learning in Directed Energy Deposition (DED) Additive Manufacturing: A State-of-the-art Review
Paper 146	Gourhari Ghosh, Shobhit Agrawal, Anil Saigal, and Ramesh Singh	Effect of process parameters on the porosity in laser-directed energy deposition of Al_2O_3 reinforced Inconel-based composite coating
Paper 149	Rajendra Hodgir, Ramesh K. Singh, and Soham Mujumdar	Experimental Investigation of Laser Remelting in Directed Energy Deposition (DED) of CPM-9V

NAMRC TECHNICAL SESSIONS
TUESDAY JUNE 13, 2023

10:35-11:50 MU-211	**NAMRC - TRACK 3 MANUFACTURING REMOVAL - Session 1** *Session Chair: Muhammad Jahan	Session Co-Chair: Sathyan Subbiah*	
Paper 180	Yashdeep Yashdeep and Sathyan Subbiah	Micro-Grit Blasting to Enhance Adhesion of Diamond Coating on Ti6Al4V
Paper 172	Foxian Fan, Sagar Jalui, and Guha Manogharan	Mass Finishing of Additively Manufactured Ti6Al4V Parts: An Investigation of Surface Finish Dependency on Build Orientation and Processing Conditions
Paper 177	Muhammad Abdun Nafi, Mahmud Anjir Karim, Shashi Lalvani, Paul James, Andrew Sommers, and Muhammad Jahan	Investigating wettability and corrosion resistance of the titanium alloy surface engineered by the WEDM process

13:50-15:05 AB-2160	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 3** *Session Chair: Murali Sundaram	Session Co-Chair: Martin Jun*	
Paper 101	Semih Akin, Young Won Kim, Shujia Xu, Chandra Nath, Wenzhuo Wu, and Martin Jun	Cold spray direct writing of flexible electrodes for enhanced performance triboelectric nanogenerators
Paper 22	Chetana Madhukar Suryawanshi, Samrat Sagar, Ravi Bhallamudi, and Sushil Mishra	Effective Design and Mechanical Response of Gyroid Lattice Scaffold for Orthopedic Implants
Paper 35	Damira Dairabayeva, Asma Perveen, and Didier Talamona	Influence of Fused Filament Fabrication parameters on the flexural strength of Nylon

13:50-15:05 MU-204	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 2** *Session Chair: Hongtao Ding	Session Co-Chair: Shiqi Fang*	
Paper 37	Shivaprasad Cherukupally, Subrahmanyam Adabala, and Venkata Reddy Nallagundla	Effect of electric path in electric pulse aided V-bending of Ti-6Al4V: An experimental and numerical study
Paper 14	Avik Samanta, Wuji Huang, Kyungjun Lee, Chanaka Kumara, Xin He, Jun Qu, and Hongtao Ding	Effect of Surface Wetting on Tribological Behavior for Laser Textured Steel using Ionic Liquid-based Lubricants
Paper 23	Zhibin Han, Yifeng Xiong, Yuncong Feng, Wanrui Zhang, and Weizhao Zhang	Manufacturing Woven Carbon Fabric Electrodes with High Areal Capacity via High-Pressure Spray of Active Lithium-Ion Particles

NAMRC TECHNICAL SESSIONS

TUESDAY JUNE 13, 2023

13:50-15:05 MU-208	**NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 2** *Session Chair: Zhaoyan Fan	Session Co-Chair: Ethan Wescoat*	
Paper 105	Ethan Wescoat, Mihir Bangale, Vinita Gangaram Jansari, and Laine Mears	Physics Verification and Validation for Transferring Data Between Bearings
Paper 21	Leah Jacobs, Jake Dvorak, Aaron Cornelius, Ross Zameroski, Timothy No, and Tony Schmitz	Structured light scanning artifact-based performance study
Paper 28	Haodong Chen, Niloofar Zendehdel, Ming C. Leu, and Zhaozheng Yin	Real-time Human-Computer Interaction Using Eye Gazes
13:50-15:05 MU-210	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 4** *Session Chair: Yiwei Han	Session Co-Chair: Nismath V H*	
Paper 155	Trong-Nhan Le, Santosh Rauniyar, Nismath V H, and Kevin Chou	An Investigation into the Effects of Contouring Process Parameters on the Up-skin Surface Characteristics in Laser Powder-Bed Fusion Process
Paper 165	Qingrui Jiang, Abhishesh Bajracharya, Yongjian Qiu, and Yiwei Han	Direct Writing of Microheater for Studying Plant Thermal Biology
Paper 82	Wenchao Du, Ming Li, Zhijian Pei, and Chao Ma	Roller-compaction-assisted Binder Jetting with Different Granulated Zirconia Powders
13:50-15:05 MU-211	**NAMRC - TRACK 3 MANUFACTURING REMOVAL - Session 2** *Session Chair: Barbara Linke	Session Co-Chair: Yang Guo*	
Paper 207	Aaqib Ali, Jianxin Zhao, Patrick Kwon, Burak Sencer, and Yang Guo	Modulated Orthogonal Cutting System Realized by Piezo Stack Actuation and Linear Guide Coupling
Paper 71	Jeffrey Ma, Nithin Rangasamy, Chandra Sekhar Rakurty, and Roan Kirwin	An experimental and finite element study to understand the effects of the number of teeth in cut: Bandsaw application.
Paper 98	Vishal Kharka, Soham Mujumdar, and Shashank Shukla	Tool Wear and Hole Quality Evaluation in Helical Milling of SS 304 with Minimum Quantity Lubrication (MQL)

MSEC SPECIAL SESSIONS

TUESDAY JUNE 13, 2023

10:35-11:55 AB-2400	**ASME Student Manufacturing Design Competition - 1** *Session Chair: Miki Banu*	
10:35-10:40	**Introduction & Welcome**	
10:40-11:05	Jack Pluta, Jake Holwerda, Dante Cardinali, and Connar Christensen *(Faculty Advisor: Vinh Nguyen) Michigan Technological University*	Improved Camshaft Delivery Process
11:05-11:30	Andrea Pastor Villarreal, Jesus Martinez, Haydn Haby, Kennedy Donovan, Jared Tolentino, and Mustafa Hamid *(Faculty Advisor: Robert Hart) The University of Texas at Dallas*	Truck Tire Install Lifting Device
11:30-11:55	Jeremy Cleeman and Adeline Ripberger *(Faculty Advisor: Rajiv Malhotra) Rutgers University*	High Throughput Multiplexed Fused Filament Fabrication

13:50-15:05 AB-2400	**ASME Student Manufacturing Design Competition - 2** *Session Chair: Miki Banu*	
13:50-14:15	Ryley Murakami, Austin Tran, Simon Demaggio, Lucas Nguyen, Phillip Branca, and Kishan Patel *(Faculty Advisor: Robert Hart) The University of Texas at Dallas*	Weldment Fixture for Manufacturing of Radome Panels
14:15-14:40	Ben Forbes, Dash Slamowitz, Elaine Liu, Kayla Blas, Lukas Wolf, Margaret Gao, and Sam Griswold *(Faculty Advisors: Michael Beltran, Jian Cao, and Kornel Ehmann) Northwestern University*	Desktop Robotic English Wheel System
14:40-15:05	Niklas Weber, Marvin Hagen Feuerhelm, and Yannis Erb *(Faculty Advisor: Dr.-Ing. Daniel Stehle) Baden-Wuerttemberg Cooperative State University Loerrach*	A New Approach to SLM Metal 3D Printing by using Powder Coating for Layer Deposition

MSEC TECHNICAL SESSIONS
TUESDAY JUNE 13, 2023

10:35-11:50 AB-2125	**NIST/NSF Panel on National Strategic Plan for Advanced Manufacturing** *Session Chair: Said Jahanmir*	
MSEC2023-105805	Panelists: Said Jahanmir, Michael Molnar, Rob Ivester, Greg Henschel, and Craig Scott	

10:35-11:50 MU-111	**NNM8-1: Micro and Nano Manufacturing - 1** *Session Chair: Chuang Qu*	
MSEC2023-106561	Emmanuel Dasinor, Aliaksandr Sharstniou, Yifu Ding, and Bruno Azeredo	Understanding Mechanical Behavior of Porous Polymeric Stamps During Large-Area Metal-Assisted Chemical Imprinting of Silicon
MSEC2023-102499	Shiqi Fang, Alexander Frank, Mareike Schäfer, and Dirk Bähre	Implementation of a Picosecond Laser for Micromachining the Cathode of PECM and a Case Study
MSEC2023-105165	Chuang Qu, Shamus Mcnamara, and Kevin Walsh	Fabrication of Superhydrophobic Surfaces Using Glancing Angle Deposition

10:35-11:50 MU-114	**ADM1-5: In Situ Monitoring and Non-Destructive Testing of AM - 1** *Session Chair: Sarah Wolff*	
MSEC2023-102317	Jihoon Jeong, Samantha Webster, Rujing Zha, Jon-Erik Mogonye, Kornel Ehmann, and Jian Cao	Effects of Laser-Powder Alignment on Clad Dimension and Melt Pool Temperature in Directed Energy Deposition
MSEC2023-104348	Hui Yang, Joni Reijonen, and Alejandro Revuelta	Multi-Resolution Quality Inspection of Layerwise Builds for Additive Manufacturing
MSEC2023-105098	Mahsa Valizadeh, Samuel Clark, Kamel Fezzaa, and Sarah Wolff	Real-Time Detection and Prediction of Pores and Their Lifespan in Laser Melting Using Transfer Learning

10:35-11:50 MU-212	**LCE4-1: Sustainable Manufacturing for Circular Economy - 1** *Session Chair: Nehika Mathur*	
MSEC2023-109288	Ryan Bradley	Invited Talk: Towards Data-Driven Sustainable Design and Manufacturing for a Circular Economy
MSEC2023-101736	Sandhya Sethuraman, Julien Walzberg, Tapajyoti Ghosh, Taylor Uekert, and Alberta Carpenter	Combining Agent Based Modeling and System Dynamics to Investigate the Circularity of Plastics

MSEC TECHNICAL SESSIONS
TUESDAY JUNE 13, 2023

10:35-11:50 MU-213	MP6-4: Advances in Surface Engineering - 1 Session Chair: Chabum Lee	
MSEC2023-103862	Zhikun Wang, Kuan Lu, and Chabum Lee	A Fringe Pattern Analysis Technique for Photomask Line-Edge-Roughness Characterization
MSEC2023-104380	Badrinath Balasubramaniam and Beiwen Li	Single Shot 3D Shape Measurement of Non-Volatile Data Storage Devices
MSEC2023-104528	M Merajul Haque, Li-Hsin Yeh, Xing Zhang, Beiwen Li, and Yiliang Liao	Surface Morphology of Api 5l X65 Pipeline Steel Processed by Ultrasonic Impact Peening
13:50-15:05 AB-2125	**ADM1-2: Smart Additive Manufacturing - 1** *Session Chair: Kira Barton*	
MSEC2023-101325	Hossein Abedi, Mohammadjavad Abdollahzadeh, Abdalmageed Almotari, Majed Ali, Shiva Mohajerani, Mohammad Elahinia, and Ala Qattawi	Additively Manufactured Nitihf Shape Memory Alloy Transformation Temperature Evaluation by Radial Basis Function and Perceptron Neural Networks
MSEC2023-101622	Benjamin Bevans, André Ramalho, Ziyad Smoqi, Aniruddha Gaikwad, Telmo G. Santos, Prahalad Rao, and J.P. Oliveira	Flaw Detection in Wire Arc Additive Manufacturing Using In-Situ Acoustic Sensing and Graph Signal Analysis
MSEC2023-103321	Angelo Hawa, Ali Bahrami, and Kira Barton	The Effect of Voltage on the Initiation of Natural Pulsation in Electrohydrodynamic Jet Printing
13:50-15:05 MU-111	**NNM8-2: Micro and Nano Manufacturing - 2** *Session Chair: Soham Mujumdar*	
MSEC2023-105092	Natalya Kublik, Stanislau Niauzorau, and Bruno Azeredo	Feedstock Analysis of Low-Reflectance Hybrid Copper Mixes in Laser Powder Bed Fusion
MSEC2023-106557	Joshua Grose, Ramakrishna Annaluru, C.S. Foong, and Michael Cullinan	Regression-Based Model for Rapid Prediction of Thermal Evolution in a Microscale Selective Laser Sintering System
MSEC2023-104955	Jungho Choi and Sourabh Saha	Low-Cost Nanoscale Metal Printing Beyond the Diffraction Limit via Off-Focus Light Projection

MSEC TECHNICAL SESSIONS

TUESDAY JUNE 13, 2023

13:50-15:05 MU-114	**AMM2-1: Processing of Polymers and Composites - 1** *Session Chair: Felicia Stan*	
MSEC2023-104650	Felicia Stan, Ionut-Laurentiu Sandu, and Catalin Fetecau	Investigation on the Printability of Recycled Thermoplastic Polyurethane/ Carbon Nanotube Nanocomposites
MSEC2023-104816	Raihan Quader, David Grewell, and Lokesh Narayanan	Effect of Ultrasonic Vibration on Physical and Tensile Properties of Fused Deposition Modeled Polylactic Acid Specimens

13:50-15:05 MU-212	**MEA5-1: Equipment, Control and Automation - 1** *Session Chair: Xiaoning Jin*	
MSEC2023-106259	Zifeng Wang and Xiaoning Jin	Spatial-Terminal Iterative Learning Control for Registration Error Elimination in Roll-to-Roll Printing
MSEC2023-100996	Liam Rudd, Matthew Campbell, and Ghazi Alonayni	Multi-Axis 3d Printer Design Challenges for In-Situ Additive Manufacturing
MSEC2023-101118	Seonghyo Ahn, Juan Chavarria, Haoxuan Mu, Yifeng Liao, Jamie Warner, and Lei Zhou	Semi-Automated Soft Robotic Stamp Transfer Tool for Van Der Waals Heterostructure Device Assembly

13:50-15:05 MU-213	**MS7-1: Collaborative Robotic Manufacturing - 1** *Session Chair: Azadeh Haghighi*	
MSEC2023-104613	Daniel Weber, Wenchao Zhou, and Zhenghui Sha	Job Placement for Cooperative Three Dimensional Printing
MSEC2023-104622	Yashwanth Maddipatla, Jiaqiong Li, Yi Zheng, and Beiwen Li	Tracking and Visualization of Benchtop Assembly Components Using a RGBD Camera
MSEC2023-105271	Neel Dhanaraj, Niraj Ganesh, Rohit Gurav, Minseok Jeon, Omey Manyar, Santosh Narayan, Jaehyun Park, Zhao Yu, and Satyandra Gupta	A Human Robot Collaboration Framework for Assembly Tasks in High Mix Manufacturing Applications

LEM&P TECHNICAL SESSIONS

TUESDAY JUNE 13, 2023

10:35-11:50 AB-2225	LEM&P: Poster Short Presentations *Session Chair: Norikazu Suzuki*	
LEMP2023-011	Takumi Nozaki, Akari Tawa, Yoshitaka Morimoto, Akio Hayashi, and Hidetaka Yamaoka	Adaptive control for feed rate of kinematics type machine tool based on spindle torque
LEMP2023-065	Takanori Yamazaki and Daichi Hirabayashi	A design method of acceleration profiles for NC machine tools
LEMP2023-005	Xinhuan Li, Jianguo Zhang, Yufan Fu, Yongjing Yu, Shaojin Shen, and Jianfeng Xu	In-situ ultrasonic-laser hybrid assisted cutting of single crystal silicon
LEMP2023-048	Tadaaki Naruki, Kenichi Suzuki, Hideharu Kato, Shigehiko Sakamoto, Masahiro Seto, Jin Katayama, and Takayuki Oka	Effect of different feed rates on chip evacuation in drilling of lead-free brass with a small diameter drill
LEMP2023-007	Shinya Moriyama, Yazawa Takanori, Tatsuki Otsubo, and Koichiro Harada	Study on initial wear of fixed diamond wire tools -Effect of addition of abrasives on wear of nickel plating-
LEMP2023-050	Mirai Sakaida, Hirofumi Suzuki, Tatsuya Furuki, Katsuhiro Miura, and Tatsuya Fukuda	Precision cutting of CVD-SiC by PCD milling tool - Effect of CVD-SiC grain size on surface roughness-
LEMP2023-037	Takuto Wakasa, Kazuki Fujiwara, and Jun Taniguchi	Fabrication of a rose-petal surface using release coated UV curable resin via the Ultraviolet Nanoimprint Lithography
LEMP2023-043	Kazuki Arai, Ryohei Hokari, Kazuma Kurihara, and Jun Taniguchi	Fabrication of a high-aspect-ratio electroformed mold through thermal nanoimprinting process
LEMP2023-013	Kazuma Kurotani, Isamu Nishida, and Keiichi Shirase	Automatic classification of blood cells for bone marrow diagnosis with automatic imaging processing
LEMP2023-014	Ryo Takamori, Isamu Nishida, and Keiichi Shirase	Automated process planning system to machine organic shapes by combining turning and milling
LEMP2023-029	Takumi Nomura, Isamu Nishida, and Keiichi Shirase	Automated NC program generation for swarf machining using 5-axis machining center

| LEMP2023-052 | Akira Goto, Hirofumi Suzuki, Tatsuya Furuki, Katsuhiro Miura, Akinori Yui, Tsunehiro Nakagawa, Toshikiyo Makino, Junichi Uehara, and Toshiyuki Moriizumi | Fabrication of micro array mold with ultrasonic vibration-assisted indentation |

10:35-11:50 AB-4225	**LEM&P: Track 3-1 Nano/Micro Machining** *Session Chair: Masayoshi Mizutani*	
LEMP2023-041	Shunsaku Kawasaki, Norio Yamashita, Shinya Morita, and Hideo Yokota	Observations of chip producing behavior in ultraprecision diamond cutting of Ni-based Alloy718 utilizing ultrasonic elliptical vibration
LEMP2023-066	Taisei Kato, Ryo Morisaki, Takahiro Yamazaki, Chiemi Oka, Junpei Sakurai, and Seiichi Hata	Prototype of parallel plate type fast atom beam source and its improvement of irradiation characteristics
LEMP2023-035	Noritsugu Umehara, Tomoki Kitamura, Takayuki Tokoroyama, and Motoyuki Murashima	Effect of hard carbonaceous coatings on friction and wear properties for aluminum alloy slide bearings

13:50-15:05 AB-4225	**LEM&P: Track 1-2 Evaluation of Machine Tool Performance** *Session Chair: Yukitoshi Ihara*	
LEMP2023-006	Ryuta Sato, Zongze Li, and Shigehiko Sakamoto	Tool path design of cube-machining test to minimize influence of Z-axis reversal error motion
LEMP2023-017	Ryoji Kondo and Kazuhito Ohashi	Estimation of thermal deformation on machining center in linear feed axis operation and evaluation of cooling method for guiding using FEM
LEMP2023-020	Yuta Teshima, Shun Tanaka, Toru Kizaki, Kenichi Tomita, Shinji Tsujimura, and Naohiko Sugita	Robust estimation of thermal displacement using an array of temperature sensors and a reduced order model

WEDNESDAY JUNE 14, 2023

Time	Location	Event
7:30-12:00 13:30-17:30	Academic Building (AB) East 2nd Floor Atrium	Registration
7:30-9:00	AB-2200	SME Journals Meeting
8:00-8:40	AB-2400	Keynote: Michael F. Molnar
8:40-9:00	AB East 2nd Floor Atrium MU 1st Floor Hallway	Morning Break
9:00-10:15	AB and MU	Technical Session 3
9:00-10:15	AB-2400	Blue Sky Competition 1
9:00-9:50	MU-211	NAMRC Track 7 Keynote: Shaw C. Feng
9:00-10:15	AB-2160	NAMRC Student Research Competition 1
10:15-10:35	AB East 2nd Floor Atrium MU 1st Floor Hallway	Morning Break
10:35-11:50	AB and MU	Technical Session 4
10:35-11:50	AB-2400	Blue Sky Competition 2
10:35-11:50	AB-2160	NAMRC Student Research Competition 2
12:00-13:40	Brower Dining Hall	ASME MED Award Luncheon Luncheon Keynote: John Sutherland
12:00-18:00	Brower Lobby	Exhibitor Booths Open
13:50-15:05	AB and MU	Technical Session 5
13:50-15:05	AB-2400	NSF Advanced Manufacturing Program Update
13:50-14:40	MU-210	NAMRC Track 6 Keynote: Samuel Chiappone
13:50-15:05	AB-2160	NAMRC Student Research Competition 3
15:05-15:25	AB East 2nd Floor Atrium MU 1st Floor Hallway	Afternoon Break
15:25-16:40	AB and MU	Technical Session 6
15:25-16:40	AB-2400	Industry Plenary: Changsheng Guo Industry Plenary: Vinod Kumar
16:40-17:00	AB East 2nd Floor Atrium MU 1st Floor Hallway	Afternoon Break
17:00-18:15	AB and MU	Technical Session 7
15:00-17:00	Brower Dining Hall	NAMRC Awards Rehearsal
18:00-21:15	Brower Dining Hall	Early Career Forum (with pizza and beverage)

KEYNOTE SPEECH

WEDNESDAY JUNE 14, 2023

Expanding U.S. Advanced Manufacturing Opportunities

Michael F. Molnar, PE SES

Director, Advanced Manufacturing National Program Office

National Institute of Standards and Technology - United States Department of Commerce

Wednesday, June 14th | 8:00-8:40 | Location: AB-2400

Abstract

Manufacturing is receiving federal attention at a level not seen for decades. As global economies recover from COVID-induced supply chain disruptions, policymakers are focusing on ensuring reliable access to materials, domestic manufacturing capacity, and skilled workers. Advanced manufacturing plays a critical role in these efforts and the Manufacturing USA® program, in conjunction with the Manufacturing Extension Partnership program, is helping to lead the way. Across a range of sectors – biomanufacturing, microelectronics, digital controls and automation, clean energy manufacturing, and advanced materials – Manufacturing USA institutes are bringing together researchers from industry, universities, and national labs to create and transition innovative technologies into scalable, cost-effective, and high-performing production capabilities while preparing the technology-ready workforce needed to win in the global arena. During this presentation, updates will be shared about significant new program initiatives, including new Manufacturing USA institutes, the National Science Foundation's Innovation Engine program, the Department of Commerce Technology Hubs, and implementation of the $50 billion Commerce-led CHIPS program.

Bio

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 – 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 leading manufacturing and technology development at Cummins, a U.S. based global company that designs, manufactures, and distributes engines and power generation products. Midcareer he served as the first Manufacturing Policy Fellow in the White House Office of Science and Technology Policy. He earned a Bachelor's in Mechanical Engineering and Master's in Manufacturing Systems Engineering from the University of Wisconsin, and an Executive MBA from the University of Notre Dame. He is a licensed Professional Engineer, a member of the Senior Executive Service, and was elected a Fellow of SME and a Fellow and Honorary Member of ASME.

BLUE SKY COMPETITION
WEDNESDAY JUNE 14, 2023

NSF Manufacturing Blue Sky Competition

Session 1: 9:00-10:15 | Session 2: 10:35-11:50 | Location: AB-2400

Organizers: Moneer Helu, Tony Schmitz, and Brigid Mullany

This is the seventh annual NSF Manufacturing Blue Sky Competition and SME David Dornfeld Manufacturing Vision Award, with funding from the National Science Foundation. It aims to identify areas for emphasis in manufacturing research and education, and to catalyze support for a vision of the future of US manufacturing. The selection committee is responsible for choosing 6 finalists to make presentations at these sessions, and selecting the recipient of the SME David Dornfeld Manufacturing Vision Award from these presentations.

The following 6 finalists will make presentations:

- **3D Printing of Shape-Conformable and Structural Batteries**
  Alexis Maurel, Ana C. Martinez, Eric MacDonald, The University of Texas at El Paso

- **Beyond The Blueprint: Conversational AI As A Game-Changer In Manufacturing**
  Aditya Balu, Anushrut Jignasu, Adarsh Krishnamurthy, and Baskar Ganapathysubramanian, Iowa State University

- **The Intelligent Machine Tool**
  Radu Pavel, TechSolve, Inc.
  Steven R. Schmid, University of North Carolina at Charlotte

- **Mechanobiological Manufacturing of Functional Products**
  Yong Huang, University of Florida
  Zhijian (ZJ) Pei, Texas A&M University
  Steven Y. Liang, Georgia Institute of Technology

- **Digital Twin for Bioprinting Process Monitoring and Control**
  Bo Shen, New Jersey Institute of Technology
  Yanglong Lu, Hong Kong University of Science and Technology

- **Cognitive Manufacturing Machines**
  Binil Starly, Arizona State University

The selection committee members are:

- **Adele Ratcliff**, Director, Industrial Base Analysis & Sustainment (IBAS) Program, Department of Defense (DoD)
- **Dale Lombardo**, Special Process Technologies Leader, General Electric Aviation
- **Jaydeep Karandikar**, Senior R&D Staff Member in the Intelligent Machine Tool Research group, Oak Ridge National Laboratory
- **John Vickers**, Principal Technologist, Space Technology Mission Directorate, National Aeronautics and Space Administration (NASA)
- **Noel Greis**, Research Professor, University of North Carolina at Charlotte
- **Rich Seugling**, Manufacturing Engineering Section Leader, Lawrence Livermore National Laboratory
- **Brian Rohm**, Principal Engineer CTH, General Electric Aviation

LUNCHEON KEYNOTE SPEECH

WEDNESDAY JUNE 14, 2023

ASME MED Award Luncheon Keynote:

Sustainable Manufacturing: Origins and Future Directions

John W. Sutherland, Ph.D.

Professor and Fehsenfeld Family Head

Environmental and Ecological Engineering, Purdue University

Wednesday, June 14th | 12:00-13:40 | Brower Dining Hall

Abstract

Over the last 60 years, driven by an increasing population and improved affluence that has been enabled by advances in manufacturing, there has been a dramatic global growth in resource consumption and concomitant waste production. This has, in turn, motivated increasing attention to the environment and sustainability that is now impacting all aspects of society. This presentation will describe the origins of the environmental movement and the emergence of "sustainable manufacturing," which is focused on reducing the environmental impact of manufacturing processes and systems, and the design of products that result in minimum environmental impact across the life cycle. Some personal reflections on my own journey will be provided. Thoughts on future research directions will be offered, including actions that the ASME community should pursue to ensure a sustainable future. Since this presentation is associated with the awards luncheon, the speaker will share his connections with some of the namesakes for these awards.

Bio

Dr. John W. Sutherland is Professor and Fehsenfeld Family Head of Environmental and Ecological Engineering (EEE) at Purdue University. He has led the development of the department into one of the largest environmental engineering programs in the U.S. He is one of the world's leading authorities on the application of sustainability principles to industrial issues. He has published more than 400 papers in various journals and conference proceedings and is co-author of the textbook: *Statistical Quality Design and Control: Contemporary Concepts and Methods*. His recognitions include an SME Outstanding Young Manufacturing Engineer Award, Presidential Early Career Award for Scientists and Engineers, SAE Teetor Educational Award, SME Education Award, SAE John Connor Environmental Award, ASME Ennor Manufacturing Technology Medal, SME Gold Medal, and Frederick George Pohland Medal from AEESP/AAEES. He is a Fellow of SME, ASME, CIRP, and AAAS. He was elected to the National Academy of Engineering (NAE) in 2023. Sutherland received his B.S., M.S., and Ph.D. degrees from the University of Illinois at Urbana-Champaign.

NSF UPDATES

What's New at NSF - Update from NSF Program Directors

Wednesday, June 14th | 13:50-15:05 | Location: AB-2400

In this special session, four 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:

- **Linkan Bian**, Program Director - Responsible for Advanced Manufacturing
- **Bruce Kramer**, Senior Advisor – Responsible for Advanced Manufacturing (AM), Cyber-Physical Systems (CPS), Future Manufacturing (FM), and Leading Engineering for America's Prosperity, Health, and Infrastructure (LEAP HI)
- **Janis Terpenny**, Program Director - Responsible for Manufacturing Systems Integration (MSI)
- **Andy Wells**, Program Director - Responsible for Advanced Manufacturing (AM) and Future Manufacturing (FM)

LINKAN BIAN is a program director in the Advanced Manufacturing (AM) cluster of Civil, Mechanical and Manufacturing Innovation division of National Science Foundation (NSF). At his home institute Mississippi State University, Dr. Bian is the Thomas B. & Terri L. Nusz Endowed Professor in Industrial and Systems Engineering Department. Dr. Bian received his Ph.D. in Industrial and Systems Engineering from Georgia Institute of Technology, and B.S. in Applied Mathematics from Beijing University. The major themes of Dr. Bian's research focus on understanding the process-structure-property relationships of additive manufacturing, as well as the investigation of how AI/ML can transform the modeling and experimental approaches. His research has received federal funding from NSF, NIH, DoD, DoE, and industrial companies. Dr. Bian received the Outstanding Young Investigator Award from Institute of Industrial and Systems Engineering (IISE) and serves as Associate Editor for multiple ASME and IISE journals.

BRUCE KRAMER is a graduate of MIT (S.B., S.M., Ph.D) and has served on the faculties of Mechanical Engineering of MIT and George Washington University. He is currently the Senior Advisor in the Division of Civil, Mechanical and Manufacturing Innovation of the National Science Foundation, coordinating NSF's participation in the National Advanced Manufacturing Program. Dr. Kramer previously directed NSF's Divisions of Design, Manufacture and Industrial Innovation and Engineering Education and Centers. He holds three U.S. patents, and is a Fellow of the Society of Manufacturing Engineers and an International Fellow of the School of Engineering of the University of Tokyo. He has received the F.W. Taylor Medal of CIRP, the ASME Blackall Award, and the R.F. Bunshah Medal of the ICMC for his contributions to

manufacturing research and the Distinguished Service Award, the highest honorary award granted by the NSF.

JANIS TERPENNY is Program Director for the Manufacturing Systems Integration (MSI) program at NSF. She is also Professor of Systems Engineering & Operations Research and Mechanical Engineering at George Mason University. Her research focuses on smart integrated systems for design and manufacturing and on design education. She is area editor for two journals, Chair of the ASME Intelligent Manufacturing Technology Group (IMTG), and Senior Vice President for Academics on the IISE Board of Trustees. Previously, she served as Professor of Industrial & Systems Engineering (ISE) and Dean of Engineering at the University of Tennessee, Department Head of Industrial & Manufacturing Engineering at Penn State, Department Chair of Industrial & Manufacturing Systems Engineering at Iowa State, Technology Thrust Lead for the Digital Manufacturing and Design Innovation Institute (DMDII, now MxD), Director of the NSF Center for e-Design, Program Director at NSF in the Division of Undergraduate Education, and Professor at Virginia Tech and the University of Massachusetts. She completed her BS in Applied Mathematics from VCU and MS and PhD in ISE from Virginia Tech. She worked in industry for General Electric, including a 2-year rotational management program in information systems. She is fellow of ASME and IISE, and member of AAAS, Alpha Pi Mu, ASEE, INORMS, SME, and Tau Beta Pi.

ANDY WELLS is a Program Director in the National Science Foundation's Advanced Manufacturing program, and also co-leads the Future Manufacturing solicitation. 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. He has 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. Previously, 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. Prior to that, he developed equipment for laser and mechanical micromachining at Electro Scientific Industries and was an adjunct professor at Portland State University. He received his PhD and MS degrees in mechanical engineering from Caltech, and his bachelor's degree from Dartmouth.

WEDNESDAY JUNE 14, 2023

DFM With Knowledge Embedded in Manufacturing Data

Changsheng Guo

Associate Director, Raytheon Technologies Research Center

Wednesday, June 14th | 15:25-16:00 | Location: AB-2400

Abstract

Implementing Design for Manufacturing (DFM) is challenging for parts such as jet engine compressor rotors and turbine components, where advanced designs with more complex geometry, advanced materials, and tighter tolerance requirements impose greater manufacturing challenges. The growing adoption of industry 4.0 and availability of detailed manufacturing data are creating a real opportunity for transforming the product development and implementing co-designing with manufacturing. There is also an urgent need to establish and adopt industry standard to facilitate efficient manufacturing data exchanges. This presentation will outline the industry needs, the challenges, and the potential use cases for manufacturing data. The discussion will focus on how the industry can use digital thread to capture and link all production data to part designs, how to automatically extract manufacturing knowledges and manufacturing capabilities at part feature level and use the extracted knowledge to develop products with good producibility.

Bio

Dr. Changsheng Guo is an Associate Director of Advanced Manufacturing at the Raytheon Technologies Research Center in East Hartford, Connecticut, USA, leading projects on developing manufacturing models and software tools. Dr. Guo's recent work has been focused on digital thread and co-design with manufacturing. He has more than 80 published papers, co-authored one book, and 50 patents. Changsheng received his Ph.D. in mechanical engineering and MBA from University of Massachusetts, a MS from Northeastern University in China. He is a Fellow of the International Academy for Production Engineering (CIRP) and a Fellow of SME. Changsheng received numerous awards such as the prestigious F.W. Taylor Medal of CIRP and the ASME Blackall Award.

WEDNESDAY JUNE 14, 2023

Future of Flight Manufacturing at GE Aerospace

Vinod Kumar

Chief Engineer – Manufacturing, Supply Chain

GE Aerospace

Wednesday, June 14th | 16:05-16:40 | Location: AB-2400

Abstract

Aerospace manufacturing, like many other industry sectors, continues to face multitude of challenges and disruptions in its supply chain. Yet, to meet customer demands and maintain resiliency, there is constant need to deploy solutions that increase productivity, capture efficiencies, and cut costs. At GE Aerospace, we address these challenges by building solutions on a strong foundation of Lean, Technology and Digital with a strong emphasis on innovation. Lean with a continuous improvement mindset significantly boosts both throughput and productivity, maximizes utilization while maintaining superior product quality. Technology that seamlessly integrates novel manufacturing processes, digital inspection, and sensor-enabled automation enables optimal production of complex geometries. Digital transformation through model-based manufacturing, digital thread, process optimization, and advanced data analytics unlocks hidden value as well as rapidly advances production capability. With commitment to revolutionary propulsion capabilities and decarbonization breakthroughs in our next generation of engines, GE Aerospace continues to invent the future of flight that is enabled by technological advancements in manufacturing and production.

Bio

Dr. Vinod Kumar is the Chief Engineer Manufacturing for GE Aerospace Supply Chain leading initiatives to accelerate the global supply chain for GE Aerospace by providing advanced manufacturing, technology, and automation solutions for factories worldwide. Vinod leads a central team of experts and engineers who are responsible for multigenerational strategies on new product manufacturing, production readiness, manufacturing technology maturation, and technical talent development. His organization is responsible for engaging in industry standards and ensure regulatory compliance as key contributor to industry and government agencies and committees. Prior to this role, Vinod has held multiple leadership roles in GE Global Research leading organizations on Manufacturing, Materials, and Inspection. Vinod holds a doctorate in mechanical engineering from the University of Michigan, Ann Arbor. He has authored 15 publications and has 5 patents. Vinod is a certified Six Sigma Black Belt.

EARLY CAREER FORUM

WEDNESDAY JUNE 14, 2023

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

Wednesday, June 14th | 18:00-21:15 | Location: Brower Dining Hall

Organized by: ASME/MED and NAMRI/SME

Sponsored by: The U.S. National Science Foundation (providing travel support to students)

Hosted by: Rutgers University, New Brunswick, New Jersey

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 information about various research and technical positions in academia, industry, and national laboratories. Panelists will present and overview of their careers and discuss how to be successful professionally in various settings in a roundtable format.

Agenda

> 6:00 – 6:10 pm: Sign up and welcome
> 6:10 – 6:15 pm: Opening remarks
> 6:15 – 7:20 pm: 5-minute spoken introductions by each panelist
> 7:20 – 9:15 pm: Roundtable discussions and wrap-up
> (Pizza and beverages will be served between 7-9 pm)

Forum Format

1. Panelists will introduce themselves and discuss their career paths. Panelists have experience in conducting/leading research and engineering projects in academia, government labs, and industry.
2. During the roundtable discussions, forum participants can discuss careers in academia, government, and industry. Panelists will discuss how to search for a job, career management, and funding, among other topics. Participants will be able to visit with a number of panelists.
3. During and after the forum, participants are encouraged to engage in conversations/ discussions related to their particular professional and personal interests.

All registered conference participants are welcome to attend the forum with no additional fee.

Attendance of the Early Career Forum is <u>mandatory for NSF Travel Grant student applicants</u>.

2023 Early Career Forum Chair: Dr. Yong Chen, Professor, Department of Aerospace and Mechanical Engineering, Epstein Department of Industrial and Systems Engineering, University of Southern California, Los Angeles, California 90089. Email: yongchen@usc.edu.
Web: https://viterbi-web.usc.edu/~yongchen/

EARLY CAREER FORUM
WEDNESDAY JUNE 14, 2023

The 13 panelists have experience working in academia, government/national labs, and industry. Several of the panelists have experience in more than one of these sectors, as indicated below.

Panelist	Academia	Government/ National Labs	Industry
Dr. Bruno Azeredo (Arizona State University)	X		
Dr. Thomas Feldhausen (Oak Ridge National Laboratory)		X	X
Dr. Mathias Hakenberg (Siemens)			X
Dr. Yong Lin Kong (University of Utah)	X		
Dr. Vinod Kumar (GE Aerospace)			X
Dr. Cindy (Xiangjia) Li (Arizona State University)	X		
Dr. Shaopeng Liu (GE Research)			X
Dr. Rajiv Malhotra (Rutgers University)	X		
Dr. Chinedum ("Chi") Okwudire (Univ. of Michigan & Ulendo Technologies)	X		X
Dr. Nilabh K Roy (Canon Nanotechnologies)	X		X
Dr. Sourabh Saha (Georgia Institute of Technology)	X	X	X
Dr. Sarah Wolff (Ohio State University)	X	X	
Dr. Ho Yeung (National Inst. of Standard and Technology)	X	X	

Panelist Biographies

Dr. Bruno Azeredo, Arizona State University

Dr. Bruno Azeredo is the Ira A. Fulton Development Associate Professor in the School of Manufacturing Systems and Networks at Arizona State University and currently serves as its Assistant Director. He is a member of the graduate faculty in Manufacturing, Mechanical, and Materials Engineering. Prior to ASU, Dr. Azeredo earned his B.S. in engineering mechanics in 2010, M.S. in theoretical and applied mechanics in 2013, and Ph.D. in mechanical engineering in 2016, all from the University of Illinois at Urbana-Champaign. His research focuses on scalable nanomaterial synthesis and its size-dependent properties with an eye at exploiting them in the production of multi-scale and multi-material structures. For his contributions, he is recipient of awards such as the 2018 Bisgrove Scholars Award from

the Science Foundation Arizona, the 2020 National Science Foundation CAREER award, and the 2022 SME Sandra L. Bouckley Outstanding Young Manufacturing Engineer Award.

Dr. Thomas Feldhausen, Oak Ridge National Laboratory

Dr. Thomas Feldhausen is a research staff member and technical lead for hybrid manufacturing with the Manufacturing Automation and Controls Group at Oak Ridge National Laboratory. His research at ORNL's Manufacturing Demonstration Facility utilizes hybrid manufacturing, a combination of additive and subtractive (machining) manufacturing, to provide industrial solutions for component repair, tooling and tooling repair, advanced energy systems, aerospace, and automotive applications. Before working at ORNL, Thomas worked at Honeywell Federal Manufacturing in Kansas City where he focused on multi-axis additive techniques for direct ink-write technologies. Feldhausen received his B.S. and M.S. degrees in Mechanical Engineering from Kansas State University, and his Ph.D. in Mechanical Engineering from the Georgia Institute of Technology. He has received several awards including a National Nuclear Security Administration Defense Program Award of Excellence, as well as being named 30-under-30 and Outstanding Young Manufacturing Engineer Award from the Society of Manufacturing Engineers.

Dr. Mathias Hakenberg, Siemens

Dr. Hakenberg is Senior Key Expert for Demand Driven Production Planning at the Siemens Technology Research Center in Princeton. He is the lead developer of the Receding Horizon Planner technology for production planning and autonomous fleet management. He received his M.S. (2007) and his Ph.D. (2013) from the faculty of mechanical engineering at RWTH Aachen University in Germany. Before joining Siemens in 2017 he was chief engineer of the Institute of Automatic control of RWTH Aachen University. He is leading a MxD project on online manufacturing scheduling with partners both from industry and academia. His research interests include autonomous production systems and process control.
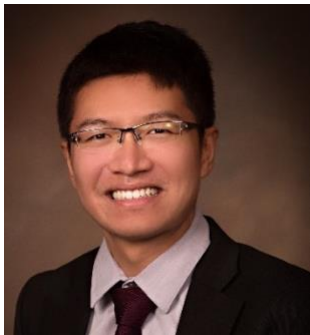
Dr. Yong Lin Kong, University of Utah

Dr. Yong Lin Kong is an Assistant Professor at the Department of Mechanical Engineering at the University of Utah. He received his Ph.D. from Princeton University in 2016 and was a postdoctoral associate at MIT. Yong Lin's research focuses on the additive manufacturing of nanomaterial-based functional devices and biomedical devices. He has been awarded patents in "3D printed active electronic materials and devices", "3D printed multi-functional hybrid devices and structures", and invented "gastric resident electronics." He is a recipient of the Office of Naval Research Young Investigator Program (ONR YIP) Award, NIH Trailblazer Award, DOD CDMRP Discovery Award, 3M Non-Tenured Faculty Award, SME Outstanding Young Manufacturing Engineer Award, SPIE Rising Researcher Award, ORAU Ralph E. Powe Junior Faculty Enhancement Award, TMS Young Leaders Professional Development Award, and MIT Technology Review Innovators Under 35 Asia Award.

EARLY CAREER FORUM

WEDNESDAY JUNE 14, 2023

Dr. Vinod Kumar, GE Aerospace

Dr. Vinod Kumar is the Chief Engineer Manufacturing for GE Aerospace Supply Chain leading initiatives to accelerate the global supply chain for GE Aerospace by providing advanced manufacturing, technology, and automation solutions for factories worldwide. Vinod leads a central team of experts and engineers who are responsible for multigenerational strategies on new product manufacturing, production readiness, manufacturing technology maturation, and technical talent development. His organization is responsible for engaging in industry standards and ensure regulatory compliance as key contributor to industry and government agencies and committees. Prior to this role, Vinod has held multiple leadership roles in GE Global Research leading organizations on Manufacturing, Materials, and Inspection. Vinod holds a doctorate in mechanical engineering from the University of Michigan, Ann Arbor. He has authored 15 publications and has 5 patents. Vinod is a certified Six Sigma Black Belt.

Dr. Cindy (Xiangjia) Li, Arizona State University

Dr. Li is an assistant professor in the Department of Mechanical and Aerospace Engineering at the School for Engineering of Matter, Transport, and Energy at Arizona State University. She obtained her Ph.D. in Industrial Engineering from the University of Southern California. Dr. Li's research is focused on developing novel additive manufacturing processes to overcome current design and manufacturing challenges with bio-inspired hierarchical structures and materials. Her research interests are in photopolymerization-based additive manufacturing with bioinspired design methodologies and programmable functional materials for applications in biomedical engineering, interfacial technology, soft actuators, and energy harvesting. Dr. Li has chaired symposiums and sessions for ASME MSEC conferences and ASME ISFA, and she is an associate editor of bio-design and manufacturing. She has received several awards, including the ASME MSEC2022 Best Paper Award and the 2023 SME Outstanding Young Manufacturing Engineer Award. Her research outcomes have been featured in various media outlets, and she holds four U.S. patents for the novelty and innovation of her manufacturing process developments.

Dr. Shaopeng Liu, GE Research

Dr. Shaopeng Liu is the Technology Manager, Autonomous Systems at GE Aerospace Research in Niskayuna, NY. He first joined GE Research as a summer intern in 2012, and has spent the next 10 years developing technologies across GE's industrial portfolio focusing on complex system design, robotics, software & analytics, and artificial intelligence (AI). In his current role, he and his team work on robotics and autonomy related technology research and development for GE and its government customers, including various applications in field service, manufacturing, and defense domains. Shaopeng has over 30 technical articles published in refereed journals and conferences, and over 30 patents and applications. He is a winner of the Society of Asian Scientists and Engineers (SASE) National Professional Achievement Award in 2022. Outside of GE, he has been part of the Scientific Committee of the North American Manufacturing Research Institution of SME since 2016, and has also served on technical program committees of numerous research conferences. Shaopeng received his Ph.D. in mechanical engineering from the University of Connecticut in 2012, and his master's and bachelor's degrees both in mechanical engineering from Tsinghua University, Beijing, China in 2007 and 2004 respectively.

EARLY CAREER FORUM

WEDNESDAY JUNE 14, 2023

Dr. Rajiv Malhotra, Rutgers University

Dr. Rajiv Malhotra got his PhD in Mechanical Engineering from Northwestern University and joined Rutgers University in 2017, where he is currently an associate professor in the department of Mechanical and Aerospace Engineering. His research focusses on science-driven and AI-accelerated innovation and control of novel manufacturing processes across diverse length scales and application sectors, for which he has received both federal and industrial funding. He is an associate editor for the *Manufacturing Letters* and *Journal of Manufacturing Processes* journals, has been a guest-editor for ASME and SME journals, was chair of the Micro-Nanomanufacturing track in the ASME Manufacturing Science and Engineering Conference, and was a scientific committee member in the North American Manufacturing Research Conference. His research and service efforts were recognized by the SME Young Manufacturing Engineer Award and the SME Associate Editor of the Year Award.

Dr. Chinedum ("Chi") Okwudire, University of Michigan, Founder and CTO, Ulendo Technologies, Inc.

Dr. Chinedum (Chi) Okwudire is an associate professor of Mechanical Engineering and Miller Faculty Scholar at the University of Michigan. Prior to joining Michigan, he was the mechatronic systems optimization team leader at DMG Mori USA, Davis, CA. His research is focused on exploiting knowledge at the intersection of machine design, control, and computing to boost the performance of manufacturing automation systems at low cost. Chi has received a number of awards including the CAREER Award from the National Science Foundation; the Young Investigator Award from the International Symposium on Flexible Automation; the Outstanding Young Manufacturing Engineer Award from the Society of Manufacturing Engineers; the Ralph Teetor Educational Award from SAE International; and the Russell Severance Springer Visiting Professorship from UC Berkeley. He was recently selected by SME as one of the 25 leaders transforming manufacturing. He has co-authored a number of best-paper-award-winning papers in the areas of manufacturing automation, control and mechatronics. He is also the Founder and CTO of Ulendo Technologies, Inc., a start-up company focused on developing automation software for 3D printing and other manufacturing processes.

Dr. Nilabh K Roy, Canon Nanotechnologies

Dr. Nilabh K Roy is a Staff Research Engineer in the technology group at Canon Nanotechnologies. He is currently working on designing & developing novel high precision force, motion, and metrology systems for advanced semiconductor equipments for applications ranging from lithography to advanced packaging. His research interests include design and development of microscale precision systems, modeling, controls, optics, laser–metal nanoparticle interactions and optimization to overcome challenges in micro-nanoscale manufacturing systems. Dr. Roy received his Ph.D. in Mechanical Engineering from University of Texas at Austin in 2018 where he worked on developing a novel microscale selective laser sintering system and his B.Tech degree from Indian Institute of Technology, Delhi in 2014. He has authored over 25 peer reviewed articles in journals and conferences and has filed over 10 patents in lithography and additive manufacturing areas.

EARLY CAREER FORUM

WEDNESDAY JUNE 14, 2023

Dr. Sourabh Saha, Georgia Institute of Technology

Dr. Saha is an assistant professor in the G. W. Woodruff School of Mechanical Engineering at the Georgia Institute of Technology. He received his PhD in Mechanical Engineering from the Massachusetts Institute of Technology and his Masters and Bachelors in Mechanical Engineering from the Indian Institute of Technology Kanpur. Prior to joining Georgia Tech, he was a research engineer at the Lawrence Livermore National Laboratory. His research focuses on overcoming the scientific and technological barriers that prevent scaling up advanced manufacturing processes, especially for the generation of complex micro and nanoscale 3D structures. He has received 11 US patents and has published more than 40 peer-reviewed journal and conference articles. He is a licensed Professional Engineer in the States of Georgia, California, and Massachusetts. He has been awarded the NSF CAREER award, the SME Outstanding Young Manufacturing Engineer award, the Federal Laboratory Consortium Far West Regional Outstanding Technology Development award, and the Best Organizer of Symposium & Sessions award at ASME MSEC 2022.

Dr. Sarah Wolff, Ohio State University

Dr. Sarah Wolff is an assistant professor in the mechanical and aerospace department at The Ohio State University. She was awarded the 2022 SME Outstanding Young Manufacturing Engineer Award. Her previous roles include an assistant professorship in the industrial and systems engineering department at Texas A&M University and an Enrico Fermi Fellow at Argonne National Laboratory. She graduated from Northwestern University in 2018 with a PhD in mechanical engineering. Dr. Wolff's expertise is in metal additive manufacturing and laser processing, particularly in the areas of situ monitoring, high-speed X-ray imaging, image processing, and microstructural characterization.
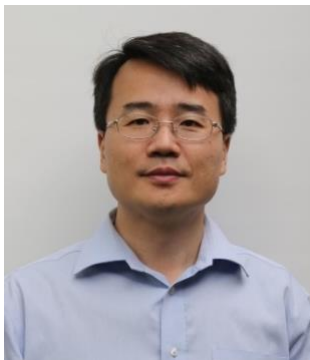
Dr. Ho Yeung, National Institute of Standard and Technology

Dr. Ho Yeung is an electronics engineer at the National Institute of Standards and Technology (NIST). He leads the additive manufacturing process control project at NIST and has been a significant contributor to the Department of Commerce's Gold Medal Award-winning Additive Manufacturing Metrology Testbed (AMMT). Ho Yeung began his career as an entrepreneur after obtaining his Bachelor's and Master's degrees in Electrical Engineering from Purdue University. As a co-founder and director of Viekey Company Limited, he helped develop technology for the telecommunication sector. With over a decade of experience working for information technology companies like Hewlett Packard and Sun Microsystems, Ho Yeung honed his skills in the industry before pursuing his Ph.D. in Industrial Engineering. He earned his Ph.D. from Purdue University, where his research focused on machining processes and large plastic deformation. Utilizing his expertise in electrical engineering, Ho Yeung modified and instrumented conventional machines to enhance machining quality. These insights into machine tool control have enabled him to excel in his current role at NIST, where he leads the development of next-generation additive manufacturing controls. In addition to his work at NIST, Ho Yeung also imparts his knowledge as an instructor in the Mechanical Engineering Department at the University of Maryland, where he teaches manufacturing processes.

Sustainable Manufacturing: Today and Tomorrow

Shaw C. Feng

Systems Integration Division, Engineering Laboratory
National Institute of Standards and Technology (NIST)

Wednesday, June 14th | 9:00-9:50 | Location: MU-211

Abstract

With combined pressures of raw material price increases, global climate change concerns, public emphasized social responsibilities, and quick advancement in using artificial intelligence techniques, the number of manufacturing companies looking to operate sustainably is rapidly increasing. Sustainable manufacturing has become a common practice to save energy and materials and reduce emissions. Reuse, recycle, and remanufacturing are quickly becoming a sustainability goal in manufacturing industry. Likewise, the means for measuring sustainability in processes and products is gaining more public attention. Many standards for sustainable manufacturing have been developed in ASTM and ISO. Sustainability metrics can provide crucial guidance for decision-making in managing the product development process within a company or a supply chain. Recently, machine Learning and artificial intelligence are used as new methods to make manufacturing more sustainable by learning from the best sustainable manufacturing practices. This talk will review the current state of sustainable manufacturing and present a currently being developed measurement infrastructure that is designed to enable manufacturing companies to measure sustainability in multiple dimensions, such as environmental stewardship, social well-being, economic growth, and performance management while providing an open platform for information sharing and smooth communications. Techniques of machine learning to improve sustainability will also be introduced for advancing sustainability manufacturing beyond Industry 4.0.

Bio Shaw C. Feng is working on sustainable manufacturing indicators and disassembly for reuse, recycle, and remanufacturing in the Systems Integration Division in the Engineering Laboratory at NIST. Shaw Feng has been leading research and development efforts in metrology of mechanical parts, process planning, design for eco-friendly manufacturing, disassembly, and sustainability performance metrics.

His research work is focused on manufacturing metrology, specifically in the following fields: advanced manufacturing (AM), dimensional metrology and quality, manufacturing process performance measurement, and tolerances for three-dimensional (3D) models. Shaw Feng's standardization work includes AM data registration, inspection planning rules as part of the Quality Information Framework standard, key performance indicators for sustainable manufacturing, and 3D tolerances in Product Data Exchange standard. Shaw has received awards from both ASTM E60 Sustainability and Digital Metrology Standardization Consortium for his outstanding leadership and significant contributions. Shaw also received three U.S. Department of Commerce Bronze Medals. Shaw has numerous publications in additive manufacturing, quality information framework, sustainable manufacturing, process planning, and product lifecycle engineering. Recently, Shaw received the SME 2021 Eli Whitney Productivity Award for the impact made on cost savings in manufacturing industries.

NAMRC TRACK 6 KEYNOTE

WEDNESDAY JUNE 14, 2023

Lessons from Rensselaer's 'Teaching Factory': A Two-decade Journey in Manufacturing Education

Samuel Chiappone

Director of Manufacturing Innovation

Rensselaer Polytechnic Institute

Wednesday, June 14th | 13:50-14:40 | Location: MU-210

Abstract

Rensselaer's Manufacturing Innovation Learning Laboratory (MILL) has a two-decade-long history in successfully deploying the 'Teaching factory' model for manufacturing education. The MILL's flagship course involves a two-semester long, hands-on experience for the students where they are required to (1) Design a product that uses all of MILL's diverse manufacturing capabilities; (2) Establish both manufacturing and assembly pathways for their product; (3) Design and manufacture appropriate fixtures and tooling; (4) Realize the production-run for 300-400 units of their product and (5) Document their work in a technical data package. This keynote talk will highlight the cornerstones of this teaching factory model that includes the continuous design of appropriate curriculum, manufacturing infrastructure investment decisions, and engagement of industry stakeholders. The talk will also showcase lessons from leveraging CESMII's capabilities to provide a more 21st-century-relevant manufacturing education. Finally, the talk will discuss the MILL's efforts in engaging with STEM outreach through community colleges, middle/high schools, and minority outreach programs in the upstate New York ecosystem. These engagements are critical to maintaining a thriving local ecosystem that promotes the cause of manufacturing education.

Bio

Samuel Chiappone is the Director of Manufacturing Innovation for the School of Engineering (SOE) at RPI. As the director, Sam works with administration and faculty to provide the strategic vision that guides the direction of the manufacturing classes and facilities within SOE. Sam ensures manufacturing programs align with the SOE vision, Accreditation Board for Engineering and Technology requirements, and current industry practices. He is an instructor or part of a teaching team for various manufacturing classes at the graduate and undergraduate levels. Sam is the past chairperson of the Society of Manufacturing Engineers CH20 and currently serves as an advisor for Rensselaer's Student Chapter of SME, S141. Sam is also a past University Representative on the Haas Technical Education Council.

NAMRC TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

09:00-10:15 AB-2160	**NAMRC - Student Competition - Session 1** *Session Chair: Tony Schmitz	Session Co-Chair: Pai Zheng*	
Paper 13	Baanu Payandehjoo and Tsz Ho Kwok	Embedding Ionic Hydrogel in 3D Printed Human-Centric Devices for Mechanical Sensing
Paper 91	Dayue Jiang and Fuda Ning	Bi-metal structures fabricated by extrusion-based sintering-assisted additive manufacturing
Paper 107	Shih-Hsuan Chien, Burak Sencer, and Robert Ward	Accurate prediction of machining cycle times and feedrates with deep Neural Networks using BiLSTM

09:00-10:15 MU-204	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 3** *Session Chair: George Tan	Session Co-Chair: Jong Eun Ryu*	
Paper 73	Kevin Zhou, Hongliang Wang, Thomas Perry, and Daniel Thompson	Understanding The Factors Critical To The TIG Welding Of Cu Components In Bar Wound Electric Motors
Paper 42	Myers Harbinson, Michael Pudlo, Sipan Liu, Taimur Chaudhry, Yuxuan Liu, Chenxi Sui, Yong Zhu, Po-Chun Hsu, and Jong Eun Ryu	Template-free scalable roll-to-roll fabrication of textured transparent film for passive radiation cooling of photovoltaics
Paper 45	Imtiaz Qavi, Dilshan Sooriyaarachichi, and George Tan	The Effect of Surface Micropatterns on the Flow in a Lab-on-a-Chip with Nanowires

09:00-10:15 MU-208	**NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 3** *Session Chair: Young Moon	Session Co-Chair: Yi Cai*	
Paper 33	Tao Li, Zhongyuan Liao, and Yi Cai	Physical Modeling for Digital Twin of Continuous Damping Control Damper
Paper 7	Carlos Espinoza-Zelaya and Young Moon	Framework for enhancing the operational resilience of cyber-manufacturing systems against cyber-attacks
Paper 9	Romesh Prasad, Seyed Mehr, and Young Moon	Recovery systems architecture for cyber-manufacturing systems against cyber-manufacturing attacks

NAMRC TECHNICAL SESSIONS

WEDNESDAY JUNE 14, 2023

09:00-10:15 MU-210	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 5** *Session Chair: Frank Pfefferkorn	Session Co-Chair: Bruno Azeredo*	
Paper 170	Aishwarya Deshpande, Hemant Agiwal, Christian Baumann, Stephan Krall, Friedrich Bleicher, and Frank Pfefferkorn	Metal cutting Chips into a Consolidated Deposition with Friction Surfacing
Paper 81	Vysakh Venugopal and Sam Anand	Structural and Thermal Generative Design using Reinforcement Learning-Based Search Strategy for Additive Manufacturing
Paper 176	Jiahui Ye, Robert N. Saunders, and Alaa Elwany	Surrogate-based Model Chains for Establishing Process-Structure-Property Linkages with Quantified Uncertainties in Metal Additive Manufacturing

09:00-10:15 MU-211	**NAMRC - TRACK 7 SUSTAINABLE MANUFACTURING - Session 1** *Session Chair: Fu Zhao	Session Co-Chair: Shaw Feng*	
Track 7 Keynote	Shaw C. Feng and I.S. Jawahir	Sustainable Manufacturing: Today and Tomorrow
Paper 2	Tim Simon and Fu Zhao	Chemical Characterization of Particulates and Volatile Organic Compounds Emitted during Fused Deposition Modeling

10:35-11:50 AB-2160	**NAMRC - Student Competition - Session 2** *Session Chair: Ihab Ragai	Session Co-Chair: Peng Wang*	
Paper 183	Kewei Li, Shreyas Limaye, and Xin Zhao	Generation of Periodic Nanobumps Through a Double-Scan Method with Femtosecond Lasers
Paper 178	Rong Lei, Samar Saleh, Weihong Guo, Fred Roberts, and Elsayed Elsayed	Simulation modeling of the counterfeit threat and countermeasures in ICT manufacturing supply chains
Paper 27	Yiran Yang, Shuchisnigdha Deb, Miao He, and Md Humaun Kobir	The Use of Virtual Reality in Manufacturing Education: State-of-the-Art and Future Directions

NAMRC TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

10:35-11:50 MU-204	NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 4	
	*Session Chair: Stefania Bruschi	Session Co-Chair: George Tan*	
Paper 38	Yi-Mo Ho, Cheng-Hsun Lee, Jeng-Rong Ho, Chih-Kuang Lin, Pi-Cheng Tung, and Yuan-Shin Lee	Assessment of glass-to-glass welding by USP lasers with machine learning approaches
Paper 46	Nan Zhang, Imtiaz Qavi, Sampa Halder, and George Tan	Biomimetic Hydrogel Scaffolds Embedded with Porous Microtubes as Capillary Vessels
Paper 56	Yan Chen, Yue Zhou, El Mehdi Abbara, Mohammed Alhendi, Mark Poliks, Fuda Ning, and Yingge Zhou	Bioprinting of Poly(ethylene oxide) or Electrospun Polystyrene Microtube Embedded Sodium Alginate and Carboxymethyl Cellulose Hydrogel

10:35-11:50 MU-208	NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 4	
	*Session Chair: Philipp Gönnheimer	Session Co-Chair: Young Moon*	
Paper 61	Abhishek Hanchate, Satish Bukkapatnam, Kye Hwan Lee, Anil Srivastava, and Soundar Kumara	Explainable AI (XAI)-driven vibration sensing scheme for surface quality monitoring in a smart surface grinding process
Paper 47	Philipp Gönnheimer, Robin Ströbel, Roman Dörflinger, Marcel Mattes, and Jürgen Fleischer	Interoperable System for Automated Extraction and Identification of Machine Control Data in Brownfield Production
Paper 49	Max Kirkpatrick, Drew Sander, Fadi El Kalach, and Ramy Harik	Motion Capture Based Calibration for Industrial Robots

10:35-11:50 MU-210	NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 6	
	*Session Chair: Bruno Azeredo	Session Co-Chair: Chenang Liu*	
Paper 188	Emmanuel Yangue, Zehao Ye, Chen Kan, and Chenang Liu	Integrated Deep Learning-based Online Layer-wise Surface Prediction of Additive Manufacturing
Paper 191	Sandy Karam, Nikhil Shirdade, Benjamin Madden, Justin Rheinstadter, Ephraim Church, Melissa Brindise, and Guha Manogharan	Additive manufacturing of patient-specific high-fidelity and thickness-controlled cerebral aneurysm geometries
Paper 194	Shantanu Gopal Gaurkhede, Yiwei Han, and Jia Deng	Electric field-assisted fused deposition modeling process for robust additive manufacturing in unconventional orientations

NAMRC TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

10:35-11:50 MU-211	**NAMRC - TRACK 7 SUSTAINABLE MANUFACTURING - Session 2** *Session Chair: Shaw Feng	Session Co-Chair: Giuseppe Ingarao*	
Paper 88	Giuseppe Ingarao, Massimiliano Amato, Abdul Latif, Angela Daniela La Rosa, Rosa Di Lorenzo, and Livan Fratini	Life Cycle Assessment of aluminum alloys chips recycling through Single and Multi-Step Friction Stir Consolidation processes
Paper 215	Syed Ahmed, Dileep Parvathaneni, and Iqbal Shareef	Reorganization of inventory to improve kitting efficiency and maximize space utilization
Paper 197	David Manford, Hannah Budinoff, Benjamin Callaghan, and Yeji Jeon	Towards a general model to predict energy consumption for fused filament fabrication

13:50-15:05 AB-2160	**NAMRC - Student Competition - Session 3** *Session Chair: Peng Wang	Session Co-Chair: Tsz Ho Kwok*	
Paper 90	Clayton Cooper, Jianjing Zhang, Yuebin Guo, and Robert Gao	Surface roughness prediction through GAN-synthesized power signal as a process signature
Paper 202	Akash Tiwari, Yuandong Wang, Kyle Saleeby, Narasimha Reddy, and Satish Bukkapatnam	Learning Digital Emulators for Closed Architecture Machine Tool Controllers
Paper 175	Md Monir Hossain and Gregory Purdy	Integration of industry 4.0 into Lean production system: A systematic literature review

13:50-15:05 MU-204	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 5** *Session Chair: Till Clausmeyer	Session Co-Chair: Hongtao Ding*	
Paper 65	Avik Samanta, Wuji Huang, and Hongtao Ding	Nanosecond Laser Textured Superhydrophobic/Superhydrophilic Patterned Surface for Efficient Fog Harvesting
Paper 72	Stefania Bruschi, Enrico Simonetto, Mirko Pigato, Andrea Ghiotti, and Rachele Bertolini	Analysis of the AISI 316 Stainless Steel Sheet Response to Sub-zero Deformation Temperatures
Paper 74	Ping Ren and Jingyan Dong	Direct printing of conductive polymer PEDOT:PSS for foldable transient electronics

NAMRC TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

13:50-15:05 MU-208	**NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 5** *Session Chair: Kaushal A. Desai	Session Co-Chair: Chenhui Shao*	
Paper 121	Manan Mehta, Siyuan Chen, Haichuan Tang, and Chenhui Shao	A Federated Learning Approach to Mixed Fault Diagnosis in Rotating Machinery
Paper 59	Anthony Sexton and Matthew Doolan	Effect of electrode misalignment on the quality of resistance spot welds
Paper 89	Vikanksh Nath, Chiranjoy Chattopadhyay, and Kaushal A. Desai	Development of an Image-based Fast Defect Recognition and Localization Network (FDRLNet) for Steel Surfaces
13:50-15:05 MU-210	**NAMRC - TRACK 6 MANUFACTURING EDUCATION AND CASE STUDIES - Session 1** *Session Chair: Johnson Samuel	Session Co-Chair: Sangkee Min*	
Track 6 Keynote	Samuel Chiappone	Lessons From Rensselaer's 'Teaching Factory': A Two-decade Journey in Manufacturing Education
Paper 58	Ronak Shah and Hazim El-Mounayri	Integrated Model-based Systems Engineering (iMBSE) driven Digital Manufacturing Curriculum for Industry 4.0
13:50-15:05 MU-211	**NAMRC - TRACK 7 SUSTAINABLE MANUFACTURING - Session 3** *Session Chair: Karl Haapala	Session Co-Chair: Andrea Matta*	
Paper 106	Anna Billey and Thorsten Wuest	Energy Digital Twins in Smart Manufacturing Systems: A Literature Review
Paper 70	Alberto Loffredo, Nicla Frigerio, and Andrea Matta	Energy Efficiency Improvement of Industrial Parts Washers Using State Control
Paper 12	Sara Ordonselli, Tsz Ho Kwok, and Qingkai Meng	Removing Carbon-Black Pigments from Acrylonitrile-Butadiene-Styrene (ABS) using Collector Solvents
15:25-16:40 AB-2160	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 7** *Session Chair: Bruce L. Tai	Session Co-Chair: Yiran Yang*	
Paper 139	Dominik Kozjek, Conor Porter, Fred Carter, Jon-Erik Mogonye, and Jian Cao	Data-driven prediction of geometry- and toolpath sequence-dependent intra-layer process conditions variations in laser powder bed fusion
Paper 39	Md Humaun Kobir, Xin Liu, and Yiran Yang	Additive Manufacturing of Body-Centered Cubic Metamaterials with Novel I-Shaped Beam Lattice Towards Enhanced Mechanical Properties
Paper 44	Wei Li, Benquan Li, and Runyu Zhang	Exploratory Study of Directed Energy Deposition Conducted at Low Temperature -20°C

NAMRC TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

15:25-16:40 MU-204	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 6** *Session Chair: Till Clausmeyer | Session Co-Chair: Jingjing Li*	
Paper 77	Kyubok Lee, Teresa Rinker, Masoud Pour, Wayne Cai, Wenkang Huang, Wenda Tan, Jennifer Bracey, and Jingjing Li	A Study on Cracks and IMCs in Laser Welding of Al and Cu
Paper 79	Rudreshkumar Makwana, Bharat Modi, and Kaushik Patel	In-process grain refinement on AA5052-H32 sheet metal in single-stage single point square hole flanging
Paper 84	Muhammad Syed Shuja and Murali Sundaram	Ultrasonic Nanocrystal Surface Modification (UNSM) of Surface Properties and Residual Stress In 300M Steels

15:25-16:40 MU-208	**NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 6** *Session Chair: Peng Wang | Session Co-Chair: Martin Jun*	
Paper 20	Syeda Marzia, Alejandro Vital-Soto, and Ahmed Azab	Automated Process Planning and Dynamic Scheduling for Smart Manufacturing: A Systematic Literature Review
Paper 31	Xingyu Fu, Dheeraj Peddireddy, Fengfeng Zhou, Yuting Xi, Vaneet Aggarwal, Xingyu Li, and Martin Jun	BREP Compatible Feature Recognition for Manufacturing CAD Models
Paper 111	Pavel Koprov, Binil Starly, and Xiaolei Fang	Systems and Methods for Authenticating Manufacturing Machines Through an Unobservable Fingerprinting System

15:25-16:40 MU-210	**NAMRC - TRACK 6 MANUFACTURING EDUCATION AND CASE STUDIES - Session 2** *Session Chair: Johnson Samuel | Session Co-Chair: Sathyan Subbiah*	
Paper 122	Nisha Raghunath, Karl Haapala, and Christopher Sanchez	Examining industry expectations for content knowledge in mechatronics across career and professional certificate programs
Paper 80	Sathyan Subbiah	A shape-based introduction of manufacturing processes to undergraduate students
Paper 129	Joshua Grodotzki, Benedikt Tobias Müller, and A. Erman Tekkaya	Enhancing Manufacturing Education based on controller-free Augmented Reality Learning

NAMRC TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

15:25-16:40 MU-211	NAMRC - TRACK 7 SUSTAINABLE MANUFACTURING - Session 4 *Session Chair: Sekhar Rakurty	Session Co-Chair: Fazleena Badurdeen*	
Paper 140	Alessandro Selvaggio and A. Erman Tekkaya	Identification of Factors Influencing the Quality of Extruded Profiles Using Aluminum Recyclate-Based Billets
Paper 154	Malte Hansjosten and Jürgen Fleischer	Towards autonomous adaptive disassembly of permanent-magnet synchronous motors with industrial robots
Paper 16	Wei Li and Barrie R Nault	The robustness of scheduling for trade-off balancing in one-stage production

17:00-18:15 AB-2160	NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 8 *Session Chair: Bruce L. Tai	Session Co-Chair: Manikanta Grandhi*	
Paper 201	Manikanta Grandhi, Vy Nguyen, Zhichao Liu, Cesar-Octavio Romo-De-La-Cruz, and Xueyan Song	Copper-Nickel Functionally Gradient Material Fabricated via Directed Energy Deposition
Paper 57	Ibraheem Redhwi, Ho-Won Noh, Sonal Padalkar, Tian Lan, and Pranav Shrotriya	Mechanical Alloying and High-Repetition-Pulsed-Laser based Manufacturing Method for Nanostructured Hydroxyapatite Films on Cobalt-Chromium Substrates
Paper 48	Anushrut Jignasu, Jeremy D. Rurup, Ethan B. Secor, and Adarsh Krishnamurthy	Conformal Aerosol Jet Printing Using a 3-Axis Printer

17:00-18:15 MU-204	NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 7 *Session Chair: Wei Li	Session Co-Chair: Shiqi Fang*	
Paper 94	Manuel Reck and Marion Merklein	Comparison of forming processes for micro textured cups
Paper 86	Stephan Rosenthal, Niklas Bechler, Marlon Hahn, and Erman Tekkaya	Large sandwich sheets enabled by joining rolled sheets and additively manufactured core structures for forming
Paper 51	Dong Yoon Lee and Joo-Sung Yoon	Unified CNC interface platform for smart applications of machine tools

NAMRC TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

17:00-18:15 MU-208	**NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 7** *Session Chair: Gregory Purdy	Session Co-Chair: Ruqiang Yan*	
Paper 40	Christian Kubik, Dirk Alexander Molitor, Marvin Rojahn, and Peter Groche	Deep Learning-based Domain Adaptation for a generalized detection of wear phenomena during blanking
Paper 50	Michail Katsigiannis, Minas Pantelidakis, Konstantinos Mykoniatis, and Gregory Purdy	Current monitoring for a fused filament fabrication additive manufacturing process using an Internet of Things system
Paper 92	Xi Chen, Xinxian Chen, Hui Wang, Siliang Lu, and Ruqiang Yan	Federated Learning with Network Pruning and Rebirth for Remaining Useful Life Prediction of Engineering Systems

17:00-18:15 MU-210	**NAMRC - TRACK 6 MANUFACTURING EDUCATION AND CASE STUDIES - Session 3** *Session Chair: Dale Lombardo	Session Co-Chair: Rui Liu*	
Paper 130	Pratik C Sorathiya, Swarit Anand Singh, and K A Desai	Mobile-Based Augmented Reality (AR) Module for Guided Operations of CNC Surface Roughness Machine
Paper 184	Kyle Konrad, Mitchell Sommer, and Iqbal Shareef	Crate consolidation and standardization
Paper 185	Yan-Ting Chen, Krzysztof Jarosz, and Rui Liu	An Investigation on Performance of Human Visual and Tactile Perception in Machined Surface Inspection

17:00-18:15 MU-211	**NAMRC - TRACK 1 MANUFACTURING SYSTEMS - Session 1** *Session Chair: Pai Zheng	Session Co-Chair: Ibrahim Yilmazlar*	
Paper 30	Ibrahim Yilmazlar and Mary Kurz	Adaptive Local Search Algorithm for Solving Car Sequencing Problem
Paper 24	Zhiyuan Chen and Tiemin Li	Precise geometry and pose measurement of in-hand objects with simple features using a multi-camera system
Paper 18	Md Sadman Sakib, Hany Osman, Ahmed Azab, and Fazle Baki	Product-platform design and multi-period, multi-platform lot-sizing for hybrid manufacturing considering stochastic demand and processing time

MSEC TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

09:00-10:15 AB-2125	**ADM1-1: Quality & Certification for Additive Manufacturing - 1** *Session Chair: Zhaohui Geng*	
MSEC2023-100937	Kenan Song, Dharneedar Ravichandran, Sayli Jambhulkar, and Weiheng Xu	3D Printing-Enabled Layer Hierarchies
MSEC2023-105156	Sean Rescsanski, Aref Yadollahi, Mojtaba Khanzadeh, and Farhad Imani	Anomaly Detection of Laser-Based Metal Additive Manufacturing Using Neural-Variational Auto-Encoder
MSEC2023-106095	Yinong Chen, Anupam Ajit Deshpande, Erina Baynojir Joyee, and Yayue Pan	Machine Learning-Based Modeling of Electric-Field-Assisted Direct Ink Writing (EDIW) Process

09:00-10:15 MU-111	**NNM8-3: Micro and Nano Manufacturing - 3** *Session Chair: Sourabh Saha*	
MSEC2023-104979	Golnaz Tomaraei, Jaegeun Lee, Seung Min Kim, Moataz Abdulhafez, and Mostafa Bedewy	Suppression of Catalyst Diffusion Into Alumina Support in Dynamic Chemical Vapor Deposition of Carbon Nanotubes
MSEC2023-104934	Rushil Pingali and Sourabh Saha	Printability Prediction in Projection Two-Photon Lithography via Machine Learning Based Surrogate Modeling of Photopolymerization
MSEC2023-111394	Bruce Tai and Jay Raval	Mist Flow in Through-Tool Minimum Quantity Lubrication Drilling: Two-Phase Flow Simulation and Experimental Observation

09:00-10:15 MU-114	**AMM2-2: Manufacturing Systems for Advanced Materials - 1** *Session Chair: Saeed Farahani*	
MSEC2023-104366	Kazi Safowan Shahed and Guha Manogharan	Powder-Binder Interaction in Binder Jetting Process: A Simulation Study on Bimodal Powders
MSEC2023-104808	Ryan O'Quinn, Sai Aditya Pradeep, Srikanth Pilla, and Saeed Farahani	Additive Insert Molding (AIM) – a Practical Paradigm for Mass Customization of Multi-Material/functional Parts
MSEC2023-104904	Amit Makarand Deshpande, Gautami Girish Keskar, Sai Aditya Pradeep, Saeed Farahani, and Srikanth Pilla	Composites 4.0: Enabling the Modernization of Legacy Manufacturing Assets in South Carolina

MSEC TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

09:00-10:15 MU-212	**LCE4-1: Sustainable Manufacturing for Circular Economy - 2** *Session Chair: Buddhika Hapuwatte*	
MSEC2023-102037	Christian Enyoghasi and Fazleena Badurdeen	Sustainable Product Design Decision-Making Through Integrated Risk Likelihood and Impact Analyses
MSEC2023-104125	Buddhika Hapuwatte, Nehika Mathur, and Kc Morris	Emissions Avoidance Quantification and Allocation Framework for Secondary Materials Marketplaces Supporting the Circular Economy
MSEC2023-104361	Paulo Henrique Teixeira França Alves, Abigail R. Clarke-Sather, Sam Carlson, and Angela Martini	Theoretical Method for Optimizing Mechanically Recycled Fiber Output from a Textile Shredder

09:00-10:15 MU-213	**MP6-4: Advances in Surface Engineering - 2** *Session Chair: Jianfeng Ma*	
MSEC2023-104620	Peiqiang Yang, Xueping Zhang, Zhenqiang Yao, and Rajiv Shivpuri	Evolution of Grain Refinement and Phase Transformation Based on Stress-Strain Induced Incremental Model in Machining of Titanium Alloy
MSEC2023-105621	Ebrahim Seidi, Scott Miller, Lu Huang, and Thomas Stoughton	Mathematical Analysis of the Tensile Behavior of Dp 980 Steel Using Digital Image Correlation (DIC)

10:35-11:50 AB-2125	**ADM1-2: Smart Additive Manufacturing - 2** *Session Chair: Chinedum Okwudire*	
MSEC2023-105507	Chuan He and Chinedum Okwudire	A Versatile Point Cloud Registration Method for Quantifying Geometric Deviation in Additive Manufacturing
MSEC2023-103829	Alexander Riensche, Benjamin Bevans, Ziyad Smoqi, Reza Yavari, Ajay Krishnan, Josie Gilligan, Nicholas Piercy, Kevin Cole, and Prahalada Rao	Physics-Based Feedforward Control of Thermal History in Laser Powder Bed Fusion Additive Manufacturing
MSEC2023-104525	Austen Thien, Zaky Hussein, and Christopher Saldana	In-Situ Detection and Prediction of Waam Cross Feature Geometry

MSEC TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

10:35-11:50 MU-111	**ADM1-3: Metal Additive Manufacturing - 1** *Session Chair: Elham Mirkoohi*	
MSEC2023-101307	Seyedmehrab Hosseini, Ehsan Vaghefi, and Elham Mirkoohi	Fatigue Study of Ti-6al-4v Fabricated by Laser Powder Bed Fusion: Role of Defect Structure and Residual Stress
MSEC2023-104387	Hasnaa Ouidadi, Boyang Xu, and Shenghan Guo	Defect Segmentation from X-Ray Computed Tomography of Laser Powder Bed Fusion Parts: A Comparative Study Among Machine Learning, Deep Learning, and Statistical Image Thresholding Methods
MSEC2023-104463	Ehsan Vaghefi and Elham Mirkoohi	Artificial Intelligence-Based Design of Process Parameters in Laser Powder Bed Fusion of Ti-6Al-4V for Desired Solidification Structure

10:35-11:50 MU-114	**BIOM3-1: Additive Manufacturing of Bioinspired Functional Structures - 1** *Session Chair: Xiangjia Li*	
MSEC2023-104516	M. M. Towfiqur Rahman and Erina Baynojir Joyee	3D Printed Bioinspired Hierarchical Surface Structure with Tunable Wettability
MSEC2023-104962	Tengteng Tang, Dylan Joralmon, Tochukwu Anyigbo, and Xiangjia Li	Contactless 3d Printing of Artificial Cells in Air for Biomedical Applications
MSEC2023-105121	Qingqing He, Han Tang, Yushun Zeng, and Yang Yang	3D Printing of Filefish Inspired Microscale Multifunctional Structure

10:35-11:50 MU-212	**MP6-2: Non-Traditional Machining - 1** *Session Chair: Murali Sundaram*	
MSEC2023-106838	Suprita Vispute, Murali Sundaram, Jung Ho Yang, Nagaraja Iyyer, Nam D Phan, and Madan Kittur	Effects of Electrolyte Bath Composition on the Surface Properties and Nickel Content of Zinc-Nickel Electroplating
MSEC2023-101133	Yushun Zhang and Fuzhu Han	Experimental Investigation of the Surface Topography in Terms of Process Parameters During Picosecond Laser Machining of Polycrystalline Diamond
MSEC2023-101998	Sally Shim, Lesly Aguilar, Jianfeng Ma, and Muhammad Jahan	Computational Modeling of Nanosecond Laser Ablation of Ti-6al-4v

MSEC TECHNICAL SESSIONS

WEDNESDAY JUNE 14, 2023

10:35-11:50 MU-213	**MP6-4: Advances in Surface Engineering - 3** *Session Chair: Scott Miller*	
MSEC2023-105071	Max Matura, Lesly Aguilar, Jianfeng Ma, and Muhammad Jahan	A Numerical Investigation on Nanosecond Laser Shock Peening of Ti-6al-4v
MSEC2023-104899	Putong Kang, Shengke Huang, Brandon Beckle, Edwin Saavedra Cifuentes, Leyun Feng, Kyoo-Chul Park, Kornel Ehmann, and Jian Cao	Toolmarks-Driven Surface Texture for Coating Attachment with Drag Reduction and Anti-Biofouling Performance

13:50-15:05 AB-2125	**ADM1-2: Smart Additive Manufacturing - 3** *Session Chair: Azadeh Haghighi*	
MSEC2023-105015	Benjamin Standfield and Zhenyu (James) Kong	A 3D Convolutional Neural Networks Based Model for High-Resolution Prediction and Compensation of Geometrical Errors of Additive Manufactured Parts
MSEC2023-105134	Christian Zuniga-Navarrete, Chi Zhou, Hongyue Sun, and Luis Javier Segura	Model Calibration in Inkjet Printing Process
MSEC2023-105274	Yang Yang, Ying Cai, Yeo Jung Yoon, Hangbo Zhao, and Satyandra Gupta	Sensor-Based Planning and Control for Conformal Deposition on a Deformable Surface Using an Articulated Industrial Robot

13:50-15:05 MU-111	**ADM1-3: Metal Additive Manufacturing - 2** *Session Chair: Xiangfan Chen*	
MSEC2023-104496	Mohanish Andurkar, Valentina O'Donnell, Tahmina Keya, Bart Prorok, John Gahl, and Scott M. Thompson	Thermal and Fast Neutron Irradiation Effects on Additively Manufactured and Wrought Inconel 625
MSEC2023-104610	Luyang Liu, Natalya Kublik, Bruno Azeredo, and Xiangfan Chen	Rapid 3D Printing of Nanoporous Copper Powders via Micro-Clip
MSEC2023-104941	Alexandra Vest, Ruixiong Hu, and Antoinette Maniatty	Modeling of Laser Powder Bed Fusion of Inconel-718 Towards Relating Processing to Properties

MSEC TECHNICAL SESSIONS

WEDNESDAY JUNE 14, 2023

13:50-15:05 MU-114	**BIOM3-2: Manufacturing of Biomedical Devices - 1** *Session Chair: Yi Wang*	
MSEC2023-101752	Barbara Linke, Felicia Fashanu, Kholoud Bashayan, Riddhi Thavi, and Anjali Roeth	Sustainable 3D Printing of Organ Replica for Endoscopy Training and Medical Research
MSEC2023-106520	Chengyao Xu, Yancheng Wang, Jiawei Liu, Shuo Han, and Deqing Mei	Fiber-Reinforced Polymer Composites Fabrication Through Acoustic-Assisted 3d Printing Process
MSEC2023-102339	Yingda Hu, Shilun Du, and Yong Lei	Experimental Analysis on Tissue Fracture in Needle Insertion Process

13:50-15:05 MU-212	**MP6-2: Non-Traditional Machining - 2** *Session Chair: Muhammed Jahan*	
MSEC2023-104875	Geethapriyan T, Kailaash Pandiyan C, and I A Palani	Impact of Process Parameters on Laser Beam Machining of Ceramic Material
MSEC2023-105143	Mahmud Anjir Karim, Muhammad Abdun Nafi, and Muhammad Jahan	Investigating Electrode Design Methodologies for Improving Productivity in Silicon Using Die Sinking EDM
MSEC2023-110190	Yousef Abdelgaber, Cole Klemstine, and Roozbeh (Ross) Salary	A Novel, Image-Based Method for Characterization of the Porosity of Additively Manufactured Bone Scaffolds with Complex Microstructures

13:50-15:05 MU-213	**MS7-2: Prognostics & Health Management - 1** *Session Chair: Shenghan Guo*	
MSEC2023-105230	Deogratias Kibira and Guixiu (Helen) Qiao	Degradation Modeling of a Robot Arm to Support Prognostics and Health Management
MSEC2023-104906	Zhiqiao Dong, Qianmeng Chen, Kuan-Chieh Lu, and Chenhui Shao	A Fast and Cost-Effective Imaging System for Fine-Scale Tool Condition Monitoring in Ultrasonic Welding
MSEC2023-104452	Lingxiang Yun, Jingwen Wang, Minkun Xiao, and Lin Li	Comparison of Reinforcement Learning Methods for Production Control in Discrete Manufacturing Systems

MSEC TECHNICAL SESSIONS

WEDNESDAY JUNE 14, 2023

15:25-16:40 AB-2125	**MP6-7: Hybrid Manufacturing - 1** *Session Chair: Bruce Tai*	
MSEC2023-104922	Jesse Goodwin and Christopher Saldana	Vision-Enabled Robot-Mill Collaboration for Hybrid Manufacturing
MSEC2023-104902	Aman Nigam and Bruce Tai	Proof of Concept for Rapid Polymer Printing Using a Hybrid Fused Filament Fabrication Process
MSEC2023-105170	Danny Hoang, Nasir Mannan, Ruby Elkharboutly, Ruimin Chen, and Farhad Imani	Edge Cognitive Data Fusion: From In-Situ Sensing to Quality Characterization in Hybrid Manufacturing Process
15:25-16:40 MU-111	**BIOM3-3: Biomanufacturing of Tissue Scaffolds and Organs - 1** *Session Chair: Yifei Jin*	
MSEC2023-100819	Ethan O'Malley and Roozbeh (Ross) Salary	3D-Fabrication of Hydroxyapatite-Polysaccharide Composite Scaffolds for Bone Tissue Engineering
MSEC2023-104233	Slesha Tuladhar, Scott Clark, and Md Habib	Controlling Rheological Properties of Hybrid Hydrogel Using Short Fiber for Extrusion-Based 3d Bioprinting Process
MSEC2023-104978	Jiachen Liu and Changxue Xu	Improving Uniformity of Cell Distribution Within Inkjet-Based Bioprinted Microspheres
15:25-16:40 MU-114	**BIOM3-2: Manufacturing of Biomedical Devices - 2** *Session Chair: Lei Chen*	
MSEC2023-103285	Dongyang Yi, Yao Yao, Yi Wang, and Lei Chen	Manufacturing Processes of Microelectrode Arrays for Neural Electrophysiological Recordings: A State-of-the-Art Review
MSEC2023-103318	Suheng Zhang, Yao Yao, and Yi Wang	Pedot:pss Modified Laser Scribed Graphene for Flexible and Wearable Bioelectronics
MSEC2023-104300	Yang Liu and Dian-Ru Li	Review of Interventional Robotic Systems
15:25-16:40 MU-212	**MP6-1: Clean Energy Manufacturing - 1** *Session Chair: Lei Chen*	
MSEC2023-101247	Eyob Messele Sefene, Chao-Chang A. Chen, and Steve Hsueh-Ming Wang	Sustainable Analysis of Energy Consumption and Surface Quality of Monocrystalline Silicon in Diamond Wire Sawing
MSEC2023-105595	Yaohong Xiao, Jinrong Su, and Lei Chen	Improving Cathode Stripping Efficiency of Spent Li-Ion Batteries for Directly Recycling Based on Acoustic Vibration Technology
MSEC2023-105472	Soyeon Park	3D Printing for Structured Electrodes of Lithium-Ion Batteries

MSEC TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

15:25-16:40 MU-213	**MS7-3: Networked Manufacturing - 1** *Session Chair: Yuqian Lu*	
MSEC2023-106670	Jonathan Sim, Kavan Shah, Miguel Saez, Jeffrey Abell, Yanli Zhou, John Faris, Dawn Tilbury, and Kira Barton	Full Stack Virtual Commissioning: Requirements Framework to Bridge Gaps in Current Virtual Commissioning Process
MSEC2023-104323	Jianfei Tan, Hao Yang, Chun Zhao, and Lin Zhang	FPGA-Based Edge Computing Framework: Modeling of Computation Task Scheduling
MSEC2023-104868	Kuan-Chieh Lu, Yuquan Meng, Zhiqiao Dong, and Chenhui Shao	Online Cost-Effective Classification of Mixed Tool and Material Conditions in Ultrasonic Metal Welding: Towards Integrated Monitoring and Control

17:00-18:15 AB-2125	**MP6-7: Hybrid Manufacturing - 2** *Session Chair: Thomas Feldhausen*	
MSEC2023-104144	Alan Burl, Joseph Fletcher, and Christopher Saldana	Prediction of Substrate Distortion in Hybrid Additive Manufacture of Sacrificial Support Structures
MSEC2023-104372	Lauren Heinrich, Rangasayee Kannan, Alan Burl, Peeyush Nandwana, Kenton Fillingim, Thomas Feldhausen, Thomas Kurfess, and Christopher Saldaña	Effect of Blown Powder Directed Energy Deposition Angle on Overspray Contamination
MSEC2023-110460	Frank Pfefferkorn	Numerical Investigation into the Influence of Alloy Type and Thermo-Mechanics on Void Formation in Friction Stir Welding of Aluminium Alloys

17:00-18:15 MU-111	**BIOM3-3: Biomanufacturing of Tissue Scaffolds and Organs - 2** *Session Chair: Robert Chang*	
MSEC2023-104235	Connor Quigley, Slesha Tuladhar, Samrat Adhikari, and Md Ahasan Habib	Systemic Control of 3d Bioprinting Process Parameters to Achieve Defined Scaffold Porosity
MSEC2023-104996	Ralf Zgeib, Xiaofeng Wang, Ahmadreza Zaeri, Fucheng Zhang, Kai Cao, and Robert Chang	Development of an Open-Source Low-Cost Quad-Extrusion 3d Bioprinter
MSEC2023-105561	Lily Raymond, Weijian Hua, Naima Valentin, Ryan Coulter, and Yifei Jin	Coaxial Nozzle-Assisted Embedded 3d Printing of Multi-Layered Channels Within a Yield-Stress Matrix Bath

MSEC TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

17:00-18:15 MU-114	**BIOM3-2: Manufacturing of Biomedical Devices - 3** *Session Chair: Md Ahasan Habib*	
MSEC2023-104321	Jack Mankowsky, Connor Quigley, Scott Clark, and Md Ahasan Habib	An Investigation on 3d Bio-Printed Scaffold Shape Fidelity Incubated in a Custom-Made Perfusion Bioreactor
MSEC2023-104324	Scott Clark, Connor Quigley, Jack Mankowsky, and Md Ahasan Habib	Fluid Flow Analysis for Suitable 3d Bio-Printed Scaffold Architectures to Incubate in a Perfusion Bioreactor: A Simulation Approach
MSEC2023-104454	Connor Quigley, Warren Hurd, Scott Clark, Rokeya Sarah, and Md Ahasan Habib	Inhouse Nozzle System Design and Fabrication for Multi-Material Deposition for Extrusion Based 3D Bioprinting Process: Next Step

17:00-18:15 MU-212	**LCE4-1: Sustainable Manufacturing for Circular Economy - 3** *Session Chair: Nancy Diaz-Elsayed*	
MSEC2023-104449	Muyue Han, Jing Zhao, and Lin Li	Energy Consumption and Carbon Emissions of Additive Manufacturing of Smart Materials: A Supply Chain Perspective
MSEC2023-104792	Hao-Yu Liao, Yuhao Chen, Boyi Hu, Xiao Liang, and Sara Behdad	Forecasting the Range of Possible Human Hand Movement in Consumer Electronics Disassembly Using Machine Learning
MSEC2023-104968	Hariteja Nandimandalam, Christine Costello, and Gamini Mendis	A Monte-Carlo Method for Evaluating the Economic Performance of Plastics Recycling Systems

17:00-18:15 MU-213	**MS7-3: Networked Manufacturing - 2** *Session Chair: Chenhui Shao*	
MSEC2023-105046	Michele Maasberg, Brendan Birch, Daniel Janes, Kirsten Stor, Kyungmin Ham, and Leslie G. Butler	Cyber-Physical Trust Anchors in Additive Manufacturing: Secure, Low-Cost, and Educational
MSEC2023-105605	Agajan Torayev, Zi Wang, Giovanna Martínez-Arellano, Jack C. Chaplin, David Sanderson, and Svetan Ratchev	Multi-Criteria Decision-Making for Optimal Manufacturing Configuration Selection Using a Combined Object-Oriented and Mathematical Data Model

LEM&P TECHNICAL SESSIONS

WEDNESDAY JUNE 14, 2023

09:00-10:15 AB-4225	**LEM&P: Track 1-2 Evaluation of Machine Tool Performance** **LEM&P: Track 1-3 Mechatronics and Control Technologies** *Session Chair: Soichi Ibaraki*	
LEMP2023-045	Yuto Inoue and Yukitoshi Ihara	8-Shaped motion test on five-axis machining centers
LEMP2023-004	Tianhao Cui and Soichi Ibaraki	Identification of rotary axis angular positioning deviations of a six-axis robot by R-Test
LEMP2023-046	Shingo Tajima, Yuta Kojima, and Hayato Yoshioka	Displacement compensation of machining robot based on trajectory control for high accuracy

10:35-11:50 AB-2225	**LEM&P: Track 5-1 Rapid Prototyping Technologies** *Session Chair: Atsushi Ezura*	
LEMP2023-033	Chao Wang, Toru Kizaki, Zongwei Ren, and Naohiko Sugita	Fabrication of an intelligent cutting tool for in-situ temperature monitoring using fused deposition modelling technology
LEMP2023-053	Yohei Kunimatsu, Hiroyuki Narahara, Hiroshi Koresawa, and Hiroyuki Taguchi	Correlation of mechanical properties between 3D printer prototypes and injection molded parts for snap-fit functional design
LEMP2023-039	Masahiro Kawabata, Tomoaki Sasaki, Katsunori Wada, Shuhei Kanemaru, Yuji Nomura, and Hiroyuki Sasahara	Deposition stability against arc length variation of a rotary TIG torch for WAAM

10:35-11:50 AB-4225	**LEM&P: Track 2-1 Cutting Technologies** *Session Chair: Takashi Matsumura*	
LEMP2023-003	Ilia Radchenko, Wataru Takahashi, Hidebumi Takahashi, and Hiroyuki Sasahara	Internal coolant circulation-based cooling schemes to reduce the cutting edge temperature and heat spreading when turning SUS304 stainless steel
LEMP2023-068	Yukio Takahashi, Genki Murata, Hiroto Teratani, and Norikazu Suzuki	Influence of vibration conditions on tool life in low frequency vibration cutting of difficult- to-cut materials

LEM&P TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

13:50-15:05 **AB-2225**	**LEM&P: Track 5-1 Rapid Prototyping Technologies** **LEM&P: Track 5-2 Micro-structure of Materials Fabricated by AM** **LEM&P: Track 7-1 Advanced Materials and Applications** *Session Chair: Hiroyuki Narahara*

LEMP2023-067	Atsushi Ezura, Satoshi Abe, Tatsuaki Furumoto, Toshihiko Sasaki, and Jiro Sakamoto	Laser scan strategy for isotropic residual stress distribution and reduction of warpage in metal-based powder bed fusion with laser
LEMP2023-024	Naoki Takano, Masayoshi Mizutani, Keiichi Shirasu, Hajime Yoshinaga, Tsuyoshi Oguri, Kenichi Ogawa, Tomonaga Okabe, and Shigeru Obayashi	Application of metal additive manufacturing to multi-material adhesion with CFRP through porosity control
LEMP2023-002	Yuki Goto, Rina Soraoka, Atsushi Hosoi, Nilson Kunioshi, and Hiroyuki Kawada	Evaluation of the effect of silane coupling treatment on the bond strength of aluminum alloy and CF/PEEK laminates

13:50-15:05 **AB-4225**	**LEM&P: Track 2-1 Cutting Technologies** *Session Chair: Shoichi Tamura*

LEMP2023-027	Yo Kamada and Hiroyuki Sasahara	Analytical prediction of regenerative chatter vibration orthogonal to cutting feed direction in low frequency vibration cutting
LEMP2023-031	Kazuki Kaneko, Jun Shimizu, and Keiichi Shirase	Prediction of machining error induced by workpiece elastic deformation in end milling
LEMP2023-034	Naofumi Tsuji, Akira Sakurada, Kota Takashima, Keisuke Hara, Hirofumi Kawamura, Kazuto Miyazaki, and Hiromi Isobe	Improvement of engagement behavior utilizing ultrasonic vibration-assisted drilling

15:25-16:40 **AB-2225**	**LEM&P: Track 7-1 Advanced Materials and Applications** *Session Chair: Hisaki Watari*

LEMP2023-032	Kento Mizutani, Mai Kikuchi, Takuji Komukai, Maki Onizuka, Atsushi Hosoi, and Hiroyuki Kawada	Effect of CNTs deposited onto carbon fibers by new coating method on the mechanical properties of CNT/CF composites
LEMP2023-038	Yoshimasa Kuzuno, Shota Endo, Yugo Ikuta, Akira Kunimoto, Atsushi Hosoi, and Hiroyuki Kawada	Investigation of densification treatment method for strengthening dry-spun CNT yarns
LEMP2023-063	Gen Sasaki, Chisato Indo, Sinji Watanabe, and Kenjiro Sugio	Microstructure control of functionally graded aluminum alloy composites with alumina short fiber and particles by gravity sedimentation method

LEM&P TECHNICAL SESSIONS
WEDNESDAY JUNE 14, 2023

15:25-16:40 AB-4225	**LEM&P: Track 2-1 Cutting Technologies** *Session Chair: Hiroyuki Sasahara*	
LEMP2023-044	Kota Takashima, Naofumi Tsuji, Daisuke Kono, Akira Sakurada, Kenji Yanagisawa, Hirofumi Kawamura, Keisuke Hara, and Hiromi Isobe	Improved tribological properties with the surface texture generated by ultrasonic vibration cutting
LEMP2023-049	Kazuya Sawada, Tatsuya Sugihara, and Toshiyuki Enomoto	The effect of adsorption molecules added to cutting fluids on the chip formation process
LEMP2023-058	Shoichi Tamura and Takashi Matsumura	Cutting process in non-step drilling of deep hole with tool wear progress

17:00-18:15 AB-2225	**LEM&P: Track 8-1 Advanced Casting and Semisolid Forming Techniques** *Session Chair: Gen Sasaki*	
LEMP2023-001	Yoshio Haga, Hisaki Watari, and Shinichi Nishida	Improvement of mechanical property of cast Al-Mg alloy using hot forging
LEMP2023-009	Naoki Ishikawa, Hotaka Tozuka, Hisaki Watari, and Toshio Haga	Effects of different speed cold rolling on static recrystallization of twin-roll cast Mg-Al-Zn- Sn alloys
LEMP2023-015	Hayato Ueno, Shun Yasuhara, Shuji Okubo, Yusei Otake, Shinichi Nishida, and Toshio Haga	Vertical twin roll strip casting of aluminum alloy A7075 under low roll speed and high rolling force

17:00-18:15 AB-4225	**LEM&P: Track 2-2 Grinding Technologies** **LEM&P: Track 2-3 Finishing Technologies** *Session Chair: Tatsuya Sugihara*	
LEMP2023-030	Hiroyuki Kodama, Yuya Takami, Kota Yoshida, and Kazuhito Ohashi	Study on self-excited chatter vibrations increased by transition of natural vibration modes in cylindrical plunge grinding process
LEMP2023-061	Yohei Hashimoto, Tomoya Sasaki, Ryuki Shibasaki, Tatsuaki Furumoto, Tomohiro Koyano, and Mitsugu Yamaguchi	Investigation of slurry supply to boundary between workpieces and upper platen in double-sided lapping
LEMP2023-062	Ryuki Shibasaki, Yohei, Hashimoto, Tomoya Sasaki, Tatsuaki Furumoto, Tomohiro Koyano, and Mitsugu Yamaguchi	Investigation of platen torque variation near endpoint in double-sided lapping

THURSDAY JUNE 15, 2023

Time	Location	Event
7:30-12:00 13:30-16:30	Academic Building (AB) East 2nd Floor Atrium	Registration
8:00-9:30	AB-2200	SME Focus Group Meeting
8:00-8:40	AB-2400	Keynote: Wei Chen
8:40-9:00	AB East 2nd Floor Atrium MU 1st Floor Hallway	Morning Break
9:00-10:15	AB and MU	Technical Session 8
9:00-10:15	AB-2400	Doctoral Symposium 1
9:00-10:15	AB-2225	Industry Plenary: Melissa Orme (Virtual) Academic Plenary: Michael Grieves
9:00-10:15	AB-4225	NSF Plenary (Virtual): Erwin Gianchandani
10:15-10:35	AB East 2nd Floor Atrium MU 1st Floor Hallway	Morning Break
10:35-11:50	AB and MU	Technical Session 9
10:35-11:50	AB-2400	Doctoral Symposium 2
10:35-11:50	AB-2225	Federal Agencies Perspective on Advanced Manufacturing
12:00-13:40	Brower Dining Hall	NAMRI/SME Award Luncheon Founder's Lecture: Scott Smith
12:00-18:00	Brower Lobby	Exhibitor Booths Open
13:50-15:05	AB and MU	Technical Session 10
15:05-15:25	AB East 2nd Floor Atrium MU 1st Floor Hallway	Afternoon Break
15:25-16:40	AB and MU	Technical Session 11
15:25-16:40	AB-2400	Workshop on Quality Publication in SME Journal of Manufacturing Systems
16:40-19:00		Shuttles for Lab Tours @ New Jersey Advanced Manufacturing Institute
19:00-21:00	Brower Dining Hall	Banquet Keynote: John Kennedy

KEYNOTE SPEECH

THURSDAY JUNE 15, 2023

A Digital Twin Framework for Materials-Aware Manufacturing Process Design

Wei Chen, Ph.D.

Wilson-Cook Professor in Engineering Design

Chair, Department of Mechanical Engineering

Northwestern University, Evanston, IL

Thursday, June 15th | 8:00-8:40 | Location: AB-2400

Abstract

Concurrent materials, geometry and manufacturing process optimization involves many computational challenges such as high-dimensionality associated with location dependency, material heterogeneity, multi-modal information, and nonlinear material behaviors such as large deformations and plasticity. The recent growth of using physics-based machine learning creates opportunities for incorporating data-driven methodologies with physical models into design. Furthermore, digital twin is an emerging technology in the era of Industry 4.0 that holds promises for real time optimization of manufacturing processes and quality control. We will present in this talk a digital twin framework that integrates materials modeling, part-scale manufacturing simulation and mechanics analysis, as well as state-of-the-art data science techniques to achieve off-line surrogate modeling and model uncertainty quantification and on-line predictive model control. To support materials-aware product and process design, techniques of microstructure characterization and reconstruction, machine learning of materials laws, differentiable simulation-based optimization, and deep-learning based computer vision metrology will be introduced.

Bio

Dr. Wei Chen is the Wilson-Cook Professor in Engineering Design and Chair of Department of Mechanical Engineering at Northwestern University. Directing the Integrated DEsign Automation Laboratory (IDEAL- http://ideal.mech.northwestern.edu/), her current research involves the use of statistical inference, machine learning, and uncertainty quantification techniques for design of emerging materials systems including microstructural materials, metamaterials and programmable materials. She serves as the Design Thrust lead for the newly funded NSF Engineering Research Center (ERC) on Hybrid Autonomous Manufacturing, Moving from Evolution to Revolution (HAMMER), where she works on digital twin systems for concurrent materials and manufacturing process design. Dr. Chen is an elected member of the National Academy of Engineering (NAE) and currently serves as the President of the International Society of Structural and Multidisciplinary Design (ISSMO). She served as Editor-in-chief of the ASME Journal of Mechanical Design and the Chair of the ASME Design Engineering Division (DED). Dr. Chen is the recipient of the 2022 Engineering Science Medal from the Society of Engineering Science (SES), ASME Pi Tau Sigma Charles Russ Richards Memorial Award (2021), ASME Design Automation Award (2015), Intelligent Optimal Design Prize (2005), ASME Pi Tau Sigma Gold Medal achievement award (1998), and the NSF Faculty Career Award (1996). She received her Ph.D. from the Georgia Institute of Technology in 1995.

INDUSTRY PLENARY

THURSDAY JUNE 15, 2023

Additive Manufacturing in Industry 4.0: Disrupting the Aerospace and Defense Industry

Melissa Orme, PhD.

Vice President, Boeing Additive Manufacturing

Boeing Engineering, Test & Technology

Thursday, June 15th | 9:00-9:35 | Location: AB-2225

Abstract   Additive Manufacturing is an emerging technology that has the potential to significantly disrupt the Aerospace and Defense industry by creating innovative design solutions to difficult engineering problems that increase a vehicles performance, lower cost, reduce schedule, and enhance sustainability trades. Because Additive Manufacturing is a digital process, the end-to-end value stream can be more readily integrated into the digital thread, where extracted data from each process in the value stream is archived in a cloud-based repository that is easily accessible for engineering analytics such as the creation of data driven models and machine learning algorithms to drive quality and scale. This talk will provide case studies illustrating positive trades in performance, cost, quality, schedule, sustainability, and digital integration, and will discuss opportunities and challenges on the path forward.

Bio   Melissa is a renowned pioneer, innovator and leader in the developing field of Additive Manufacturing, where her seminal work in additive manufacturing spans three decades and has resulted in 15 US patents. Melissa has a rich and diverse professional background, having begun her career in academia where she rose to the rank of Full Professor of Mechanical and Aerospace Engineering at the University of California Irvine. There, she established globally recognized research laboratories in the field that is now termed 'Additive Manufacturing,' where she developed methods for controlled electrostatically charged and deflected molten metal droplet deposition for precision manufacturing, direct writing of electronic components, and precise powder production.   Subsequently, she transitioned from academia to high tech startups where she served as the Chief Technology Officer of Morf3D, a company that is focused on producing and delivering flight qualified additively manufactured hardware to the aerospace industry. From Morf3D she was recruited by Boeing to lead Additive Manufacturing across all business units.

In the capacity of Vice President of Additive Manufacturing at The Boeing Company, Melissa leads a highly innovative team that drives advanced engineering solutions to complex design problems for commercial airplanes such as the 787 Dreamliner; space and launch vehicles such as Artemis SLS rocket; satellites such as the O3b constellation; vertical lift programs such as the Chinook helicopter; fighter airplanes such as the F/A-15 and F/A-18; and autonomous vehicles such as the MQ-25 refueling drone. Insertions of Additive Manufacturing into these and other flight vehicles has been demonstrated to enhance quality and performance while simultaneously saving millions of dollars. Additionally, Melissa oversees Boeing research, both internal and external, focused on Additive Manufacturing including the development of new processes; materials; manufacturing digital transformation for industry 4.0; the creation of the digital thread; machine learning and data analytics.

Melissa has been a leader in additive manufacturing since the early days when she was an outlier in her academic department, advocating for adoption of manufacturing processes of the future. Today she leads a team of highly creative engineers, some of whom have never designed for traditional manufacturing, and have adopted and regularly implement additive manufacturing as a standard manufacturing technology to solve complex engineering problems on Boeing products, reducing cost and improving performance.

THURSDAY JUNE 15, 2023

Intelligent Digital Twins: Driving 21st Century Manufacturing Transformation

Michael Grieves

Executive Director, Digital Twin Institute

University of Central Florida

Thursday, June 15th | 9:40-10:15 | Location: AB-2225

Abstract

Digital Twins have been integrally connected to manufacturing from their inception. Manufacturing is the product phase where there are two major and distinct uses of digital twins: the use of digital twins of manufacturing equipment and processes for the efficient and effective production of products and the creation and testing of the as-built digital twins instances that will stay connected to their physical counterparts for the rest of the physical product's life. Dr. Grieves will discuss the transformation of manufacturing enabled by digital twins and the possibilities that artificial intelligence will provide for intelligent digital twins.

Bio

Dr. Michael Grieves is an internationally renowned expert on digital twins, a concept he originated, and Product lifecycle Management (PLM) a discipline he wrote the seminal book for. Dr. Grieves has over five decades of executive, board, and technical experience in both global and entrepreneurial technology and manufacturing companies. He has consulted and done research at some of the global organizations (NASA, Boeing, GM, Unilever) and has served as a senior executive and board member at both Fortune 1000 companies and entrepreneurial organizations. Academically, he has had appointments and has done research and/or taught at the University of Michigan, Purdue University, and University of Iowa. Dr. Grieves has a BS Computer Engineering from Michigan State, and MBA from Oakland University, and his doctorate from Case Western Reserve University.

NSF New Directorate for Technology, Innovation and Partnerships (TIP)

Erwin Gianchandani

Assistant Director, Technology, Innovation and Partnerships (TIP)

National Science Foundation

Thursday, June 15th | 9:00-10:15 | Location: AB-4225

Virtual Presentation

Abstract

The new NSF Directorate for Technology, Innovation and Partnerships, TIP, advances use-inspired and translational research in all fields of science and engineering, giving rise to new industries and engaging all Americans — regardless of background or location — in the pursuit of new, high-wage jobs in science, technology, engineering and math (STEM). TIP harnesses the nation's vast and diverse talent pool to advance critical and emerging technologies, address pressing societal and economic challenges, and accelerate the translation of research results from lab to market and society. TIP improves U.S. competitiveness, growing the U.S. economy and training a diverse workforce for future, high-wage jobs.

An overview of TIP's mission, programs, proposal review, and challenges will be given in this talk.

Bio

Dr. Erwin Gianchandani is the U.S. National Science Foundation's assistant director for Technology, Innovation and Partnerships (TIP), leading the newly established TIP Directorate. Prior to becoming the assistant director for TIP, he served as the senior advisor for Translation, Innovation and Partnerships, where he helped develop plans for the new TIP directorate in collaboration with colleagues at NSF, other government agencies, industry, and academia. During the previous six years, Gianchandani was the NSF deputy assistant director for Computer and Information Science and Engineering (CISE), twice serving as acting assistant director. Before joining NSF in 2012, Gianchandani was the inaugural director of the Computing Community Consortium, providing leadership to the computing research community in identifying and pursuing bold, high-impact research directions such as health information technology and sustainable computing. Gianchandani holds a Ph.D. in biomedical engineering from the University of Virginia. In 2021, Gianchandani received the Distinguished Presidential Rank Award, awarded to members of the Federal Government's Senior Executive Service for sustained extraordinary accomplishment.

FEDERAL AGENCIES

Federal Agencies' Perspectives on Advanced Manufacturing

Thursday, June 15th | 10:35-11:50 | Location: AB-2225

In this special session, representatives from several federal agencies will share their perspectives on matters related to Advanced Manufacturing. They will also answer questions from the audience.

The panelists at this special session are:

- **NSF: Bruce Kramer**, Senior Advisor
- **DOC: Rob Ivester**, CHIPS for America
- **DOC/MfgUSA: Mike Molnar**, Director, Advanced Manufacturing National Program Office (AMNPO)
- **DOE: Sudarsan Rachuri**, Technology Manager, Federal Program Officer for CESMII and CYMANII

Bruce Kramer, Ph.D, is currently the Senior Advisor in the Division of Civil, Mechanical and Manufacturing Innovation of the National Science Foundation, coordinating NSF's participation in the National Advanced Manufacturing Program. Dr. Kramer previously directed NSF's Divisions of Design, Manufacture and Industrial Innovation and Engineering Education and Centers. He holds three U.S. patents, and is a Fellow of the Society of Manufacturing Engineers and an International Fellow of the School of Engineering of the University of Tokyo. He has received the F.W. Taylor Medal of CIRP, the ASME Blackall Award, and the R.F. Bunshah Medal of the ICMC for his contributions to manufacturing research and the Distinguished Service Award, the highest honorary award granted by the NSF.

Robert W. Ivester, Ph.D., currently serves as the senior advisor for semiconductor engagement at the National Institute of Standards and Technology. Previously, Ivester served as the Deputy Director of the Hollings Manufacturing Extension Partnership Program. The MEP National Network 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. Ivester served at the Department of Energy for seven years, most recently as director of the Federal Energy Management Program 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. He also served in the Advanced Manufacturing Office 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. Ivester also worked at NIST 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. Ivester is a fellow of SME and the American Society of Mechanical Engineers. He received his doctorate in engineering, master's degree in manufacturing engineering and a bachelor's degree in mechanical engineering from the University of Massachusetts at Amherst.

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 – 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 leading manufacturing and technology development at Cummins, a U.S. based global company that designs, manufactures, and distributes engines and power generation products. Midcareer he served as the first Manufacturing Policy Fellow in the White House Office of Science and Technology Policy. He earned a Bachelor's in Mechanical Engineering and Master's in Manufacturing Systems Engineering from the University of Wisconsin, and an Executive MBA from the University of Notre Dame. He is a licensed Professional Engineer, a member of the Senior Executive Service, and was elected a Fellow of SME and a Fellow and Honorary Member of ASME.

Sudarsan Rachuri, Ph.D., is a Technology Manager in the Advanced Manufacturing Office, EERE, and DOE. He is the Federal Program Manager for CESMII. and CYMANII. Prior to joining DOE, he was the program manager at the National Institute of Standards and Technology (NIST) and also a research professor at George Washington University and worked in the CAD/CAE/PLM software industry. Dr. Rachuri is serving as Editor-in-Chief of ASTM International's journal, Smart and Sustainable Manufacturing Systems (www.astm.org/ssms). Rachuri is also a founding member and served as the vice-chair of the ASTM subcommittee on sustainable manufacturing (E60.13). He also serves on ASTM International's Smart Manufacturing Advisory Committee. Rachuri is the founding member and the Chair of the standards committee on ASME V&V 50 Verification and Validation of Computational Modeling for Advanced Manufacturing. Dr. Rachuri is a Fellow of ASME and AAAS.   Dr. Rachuri received the 2016 ASTM International President's Leadership Award. Dr. Rachuri won first prize in the 2017 World Standards Day (WSD) Paper Competition, awarded by The Society for Standards Professionals. Dr. Sudarsan Rachuri was honored with the Excellence in Research Award by the American Society of Mechanical Engineers (ASME) Computers and Information in Engineering (CIE) Division. Rachuri is leading the effort in developing a national plan for smart manufacturing with National Academies.

LUNCHEON KEYNOTE SPEECH
THURSDAY JUNE 15, 2023

NAMRI/SME Founder's Lecture:
How Did We Get Here, and What Are We Going to Do?

Scott Smith

Section Head for Precision Manufacturing and Machining

Oak Ridge National Laboratory

Thursday, June 15th | 12:00-13:40 | Brower Dining Hall

Abstract

Manufacturing and manufacturing innovation are important, and they always have been. Manufacturing is the fundamental mechanism of wealth creation. Manufacturing innovation even improves the productivity of other wealth creation mechanisms like farming and mining by creating the necessary tools for those sectors. A distinguishing characteristic of being human has been our ability to manufacture things that people need and want. Manufacturing is crucial to the economy, to our health and welfare, and to national security. Innovation in manufacturing has brought into existence a world where today even relatively poor people can afford things that would have been unthinkable luxuries, even for the richest people hundreds of years ago. Manufacturing innovation is deflationary – it increases the buying power of existing wealth. The positive impact of manufacturing innovation on our quality of life is undeniable.

The US has been a traditional manufacturing powerhouse, but is that still true? The extent of our dependency was clearly shown in during the recent pandemic and supply chain shortages. Why then, did the US let manufacturing go? How did we get in a position where we are not self-sufficient, but dependent? More importantly, what are we going to do about it?

Bio

Scott Smith is the Section Head for Precision Manufacturing and Machining at Oak Ridge National Laboratory. Prior to joining ORNL in 2019, Smith was Professor and Chair of Mechanical Engineering at the University of North Carolina at Charlotte. During 2012-13 he served as the Assistant Director for Technology at the US Advanced Manufacturing National Program Office in Washington DC. His research areas include high-speed machining, process optimization, and machine dynamics. He has taught numerous industrial short courses.

Smith is a Fellow of the International Academy for Production Engineering (CIRP), and he is a Fellow of both ASME and SME. 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 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*. He holds 14 patents.

Smith has received numerous awards including the ASME/SME M. Eugene Merchant Manufacturing Medal, the ASME William T. Ennor Manufacturing Technology Award, the ASME Blackall Machine Tool and Gage 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, a Federal Laboratory Consortium Technology Transfer Impact Award, two R&D 100 Awards, the University of Florida MAE Outstanding Alumnus Award, and the NAMRI/SME Lifetime Service Award.

NAMRC WORKSHOP

THURSDAY JUNE 15, 2023

Workshop on Quality Publication in SME Journal of Manufacturing Systems

Thursday, June 15th | 15:25-16:40 | Location: AB-2400

SME Journal of Manufacturing Systems has emerged as one of the top journals in manufacturing. In order to sustain and improve the journal's influence in manufacturing research community and industry, continuous submission of quality manuscripts from authors and rigorous peer review are crucial. This workshop aims to discuss with audience important publishing ethics and tips for quality manuscript preparation. Potential authors and reviewers are welcome to participate in and contribute to the workshop discussions. The workshop will be led by Timo Bazuin and Lihui Wang.

- **Timo Bazuin** (Publisher, Industrial and Manufacturing Engineering, Elsevier) will present and lead the discussions on publishing ethics.
- **Lihui Wang** (Editor-in-Chief, SME Journal of Manufacturing Systems) will present and lead the discussions on paper writing tips.
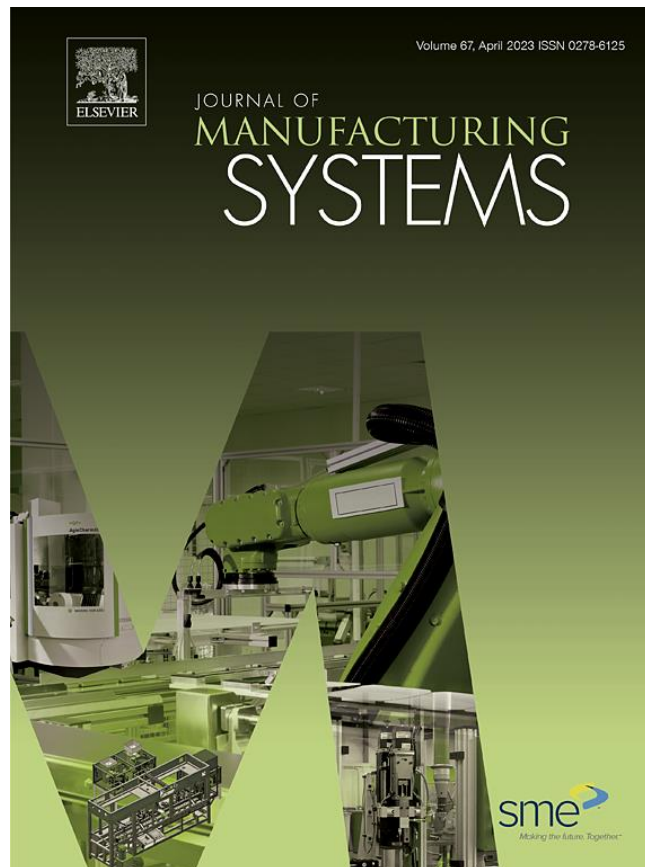
RUTGERS LAB TOUR

THURSDAY JUNE 15, 2023

New Jersey Advanced Manufacturing Institute (NJAMI)

NJAMI serves as a Rutgers nexus point of the public-private AI manufacturing innovation ecosystem. Three core objectives of this Fraunhofer-style AI Manufacturing Institute are to support fundamental research, engage the manufacturing industry, and foster education and workforce development at the intersection of AI and advanced manufacturing. The state-of-the-art machine tools, metrology equipment, and materials testing facilities in the 3,000 ft2 NJAMI offer excellent opportunities to meet our core objectives. Our interdisciplinary and synergistic team (20+ faculty) has four research thrusts including advanced manufacturing processes, Robotics, 5G sensing network, AI/machine learning, and advanced control. More than 30 applied research projects have been supported by the local and national aerospace, healthcare, tooling, automotive, energy, and materials industries since 2019.

Microfabrication Cleanroom

The core functions of the Rutgers Microfabrication Core Facility include: (1) Supporting research activities of Rutgers School of Engineering; (2) Educating students and postdocs with skills and capabilities that can be readily applied in high-tech semiconductor industries and research institutes; (3) Promoting research collaborations between research centers and industrial organizations; (4) Bringing in Research Incomes through Grants, User Access Fee and Trainings; and (5) Leading the applications of federal- and state-funded competitive fundings.

NSF ERC Center for Structured Organic Particulate Systems (C-SOPS)

Founded in 2006, the NSF ERC Center for Structured Organic Particulate Systems (C-SOPS) brings together a cross-disciplinary team of researchers from major universities to work closely with industry leaders and regulatory authorities to improve the way pharmaceuticals, foods and agriculture products are manufactured. C-SOPS focuses on advancing the scientific foundation for the optimal design of SOPS with advanced functionality while developing the methodologies for their active control and manufacturing. Headquartered at Rutgers University, C-SOPS partners include the New Jersey Institute of Technology, Purdue University, the University of Puerto Rico at Mayaguez, and more than 40 industrial consortium member companies.

Shuttle Service for Lab Tour: One bus will run continuous loops during 4:30 pm -7:00 pm from Academic Building to Weeks Hall where the labs are located, and then from Weeks Hall to Brower Commons where the banquet will take place.

BANQUET KEYNOTE SPEECH

THURSDAY JUNE 15, 2023

The Creation, Development & Implementation of a National Supply Chain Tool

John W. Kennedy, Ph.D.

Chief Executive Officer - Emeritus

New Jersey Manufacturing Extension Program (NJMEP), Inc.

Thursday, June 15th | 19:00-21:00 | Brower Dining Hall

Abstract

This talk will provide insight into the development status of a National Supply Chain tool being driven forward by the NIST-MEP National Network to ensure the nation has a deeper understanding of domestic manufacturing capabilities and ensure the United States can quickly act in time of disaster. The COVID crisis shined a light on the need for visibility and transparency regarding the nation's manufacturing capabilities. Federal and State governments need to understand what is, or what is not, in the domestic supply chain. Not only will this tool be able to help pull the nation out of a crisis, but it will provide a way for the federal government to source more products and services from United States manufacturers and distributors. Find out what progress is being made, expect timelines, and intended outcomes while emphasizing the harsh realities of the nation's current supply chain shortcomings.

Bio

John Kennedy is the CEO of the New Jersey Manufacturing Extension Program (NJMEP). John is first and foremost a 'Jersey Boy', as he has always been proud of his home State and what it actually brings to our country...including significant Manufacturing, Engineering, Science, and R&D capabilities. As an Engineer and NJ Business Owner, John was focused on (both) Engineering & Manufacturing and enjoyed success through working with many incredible individuals. From Coleman Equipment to Sandvik to Barnett Industries to The Multitech Group...all part of my Manufacturing evolution through the Material Handling, Power Plants, and DoD workloads. When John came to NJMEP in 2012, he found a place where he could support a critical Industry that means all the difference to our independence as a Country, while keeping New Jersey at the forefront of technology. NJMEP is his ultimate 'fit' as a professional. John is a proud Eagle Scout and National Distinguished Eagle. NJ Manufacturing...it is our time again!

NAMRC TECHNICAL SESSIONS

THURSDAY JUNE 15, 2023

09:00-10:15 AB-2160	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 9** *Session Chair: Yiwei Han	Session Co-Chair: Tony Schmitz*	
Paper 68	Joshua Kincaid, Ross Zameroski, Elijah Charles, Timothy No, John Bohling, Brett Compton, and Tony Schmitz	Hybrid manufacturing by additive friction stir deposition, metrology, CNC machining, and microstructure analysis
Paper 67	Benjamin Nelson, Wuji Huang, and Hongtao Ding	An Analysis of Surface Texture and Wetting Behavior for Metal Alloys Produced by Laser-Powder Bed Fusion
Paper 78	Yue Zhou and Fuda Ning	Directed Energy Deposition of SS 316L/SiC Composites Using Coincident and Coaxial Wire-Powder Feeding

09:00-10:15 MU-204	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 8** *Session Chair: Stefania Bruschi	Session Co-Chair: Ramesh Kumar Singh*	
Paper 117	Yunze Li, Muhammad Garbie, Yingbin Hu, and Weilong Cong	The Effects of Scratching Speed in Ultrasonic Vibration-Assisted Single Diamond Scratching Process
Paper 124	Priyabrata Sahoo, Nilanjan Banerjee, and Ramesh Kumar Singh	Modeling and Analysis of Chip Segmentation in Micro-cutting of Zr-Based Bulk Metallic Glass (BMG)
Paper 103	John Agapiou	Development of Manufacturing Technology for a Hybrid Induction Rotor

09:00-10:15 MU-208	**NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 8** *Session Chair: Pai Zheng	Session Co-Chair: Chenhui Shao*	
Paper 102	Liqiao Xia, Pai Zheng, Kin Lok Keung, Chenyu Xiao, and Tao Jing	From Fault Tree to Fault Graph: Bayesian Network Embedding-Based Fault Isolation for Complex Equipment
Paper 99	Yanglong Lu and Yan Wang	Active Physics-Constrained Dictionary Learning to Diagnose Nozzle Conditions in Fused Filament Fabrication Process
Paper 115	Tyler Toner, Miguel Saez, Kira Barton, and Dawn M. Tilbury	Opportunities and Challenges in Applying Reinforcement Learning to Robotic Manipulation: an Industrial Case Study

NAMRC TECHNICAL SESSIONS
THURSDAY JUNE 15, 2023

09:00-10:15 MU-210	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 10** *Session Chair: Albert Shih	Session Co-Chair: Omar Faruk Emon*	
Paper 206	Ruitao Su, Zhaokun Zhang, Brian Love, and Albert Shih	Fused Filament Fabrication of Nylon beyond the Glass Transition Temperature in a Thermally-Insulated Machine
Paper 195	Varad Maitra and Jing Shi	Predictability Assessment of As-built Hardness of Ti-6Al-4V Alloy Fabricated Via Laser Powder Bed Fusion
Paper 208	Nicholas Babich, Daryl DeCohen, Hao Sun, and Omar Faruk Emon	Effect of printing parameters on the sensing performance of a 3D printed elastomeric pressure sensor

09:00-10:15 MU-211	**NAMRC - TRACK 1 MANUFACTURING SYSTEMS - Session 2** *Session Chair: Ray Zhong	Session Co-Chair: Yi Cai*	
Paper 17	Kai Kang and Ray Y. Zhong	Production Analysis based on the RFID-collected Manufacturing Big Data
Paper 32	Zhongyuan Liao, Tao Li, Yingjun Wang, and Yi Cai	Soft Pneumatic Actuator Optimal Design Based On Isogeometric Analysis
Paper 60	Doowon Kim, Majid Tabkhpaz, Simon S. Park, and Jihyun Lee	Development of a Vision-based Automated Hole Assembly System with Quality Inspection

10:35-11:50 AB-2160	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 11** *Session Chair: Yong Chen	Session Co-Chair: Yingbin Hu*	
Paper 162	Chang Liu, Partha Pandit, Yunze Li, Weilong Cong, and Yingbin Hu	Insights into the Effects of an Acoustic Field-Assisted on Inkjet Printing of Graphene-reinforced Polydimethylsiloxane Composites
Paper 169	Tahmina Keya, Ilias Bikmukhametov, Andrii Shmatok, Greyson Harvill, Luke Brewer, Gregory Thompson, Mohanish Andurkar, Scott Thompson, Valentina O'Donnell, John Gahl, and Barton Prorok	Evolution of Microstructure and its Influence on the Mechanical Behavior of LPBF Inconel 625 upon Direct Aging
Paper 83	Wenchao Du, Brey C. Caraway, Ming Li, Guanxiong Miao, Zhijian Pei, and Chao Ma	Preparation of Granulated Powders via Freeze Drying at Different Levels of Slurry Solid Loading and Comparison of their Powder Bed Quality in Roller-compaction-assisted Binder Jetting

NAMRC TECHNICAL SESSIONS

THURSDAY JUNE 15, 2023

10:35-11:50 MU-204	NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 9 *Session Chair: Tony Schmitz | Session Co-Chair: Stefania Bruschi*	
Paper 173	Mason Ma, Alisa Ren, Christopher Tyler, Jaydeep Karandikar, Michael Gomez, Tony Shi, and Tony Schmitz	Integration of discrete-event dynamics and machining dynamics for machine tool: modeling, analysis and algorithms
Paper 133	Murat Güner, Sven-Erik Lang, and Dirk Bähre	Influence of Selective Process Interfering on the Workpiece Fixture Dynamics in Precision Honing
Paper 132	Kadephi Vuyolwethu Mjali and Zwelinzima Andrew Mkoko	Varying Rotational Speeds and their Effect on the Mechanical Properties of Friction Stir Welded 6082-T651 Aluminium Alloy Plates

10:35-11:50 MU-208	NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 9 *Session Chair: Chenhui Shao | Session Co-Chair: Yan Wang*	
Paper 108	Fengfeng Zhou, Xingyu Fu, Siying Chen, and Martin Jun	Detection and Identification of Particles on Silicon Wafers Based on Light Scattering and Absorption Spectroscopy and Machine Learning
Paper 109	Sungjin Hong, Yanglong Lu, Robert Dunning, Sung-Hoon Ahn, and Yan Wang	Adaptive Fusion based on Physics-Constrained Dictionary Learning for Fault Diagnosis of Rotating Machinery
Paper 116	Michael Ogunsanya, Joan Isichei, and Salil Desai	Grid Search Hyperparameter Tuning in Additive Manufacturing Processes

10:35-11:50 MU-210	NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 12 *Session Chair: Albert Shih | Session Co-Chair: Mohammed Shafae*	
Paper 221	Jiacong Li, Nan Kang, Xin Lin, Mohamed El Mansori, Zehao Qin, Yang Cao, and Weidong Huang	A novel crack-free in-situ nano-TiB2 reinforced 7050Al matrix composite with high strength and ductility prepared by selective laser melting
Paper 220	Nazmul Hasan, Md Habibor Rahman, Andrew Wessman, Timothy Smith, and Mohammed Shafae	Process Defects Knowledge Modeling in Laser Powder Bed Fusion Additive Manufacturing: An Ontological Framework
Paper 213	Blake Ray, Boris Oskolkov, Chenang Liu, Zacary Leblanc, and Wenmeng Tian	FFF-based Metal and Ceramic Additive Manufacturing: Production Scale-up from a Stream of Variation Analysis Perspective

NAMRC TECHNICAL SESSIONS

THURSDAY JUNE 15, 2023

10:35-11:50 MU-211	**NAMRC - TRACK 1 MANUFACTURING SYSTEMS - Session 3** *Session Chair: Yuqian Lu | Session Co-Chair: Sangkee Min*	
Paper 125	Saahil Chand and Yuqian Lu	Dual task scheduling strategy for personalized multi-objective optimization of cycle time and fatigue in human-robot collaboration
Paper 75	Shodai Yamada and Sangkee Min	Assessment of repeatability in newly developed ultra-precision tool setting method using electrical breakdown for ultra-precision machining
Paper 119	Panayiotis Kousoulas and Y.B. Guo	A statistics of extremes based method to predict the upper bound of geometrical defects in powder bed fusion

13:50-15:05 AB-2160	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 13** *Session Chair: Tsz Ho Kwok | Session Co-Chair: Yiwei Han*	
Paper 87	Shima Akhondi, Christopher-Denny Matte, and Tsz Ho Kwok	A Study on Mechanical Behavior of 3D Printed Elastomers with Various Infills and Densities
Paper 93	Nusrat Yasmin, Shan Jiang, and Yiwei Han	High-Resolution Hybrid Printing of Polymer and Molten Metal ink for Printed Electronics
Paper 96	Lily Raymond, Erick Bandala, Ryan Coulter, Naima Valentin, Kellen Mitchell, Weijian Hua, Cheng Zhang, Danyang Zhao, and Yifei Jin	Hybrid Direct Ink Writing/Embedded Three-Dimensional Printing of Smart Hinge from Shape Memory Polymer

13:50-15:05 MU-204	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 10** *Session Chair: Wei Li | Session Co-Chair: Till Clausmeyer*	
Paper 182	Dean Huang, Derick Suarez, Putong Kang, Kornel Ehmann, and Jian Cao	Robot forming: automated English wheel as an avenue for flexibility and repeatability
Paper 186	Saheem Absar and Hongseok Choi	Controlling Size and Shape of Pores During Metal Solidification for Manufacturing of Functionally Graded Metal Foams
Paper 11	Nanzhu Zhao, Sandeep Patil, Mohan Parthasarathy, and Wei Li	Manufacturing Driven Design Optimization for End-Use and Tooling Parts in Automotive Applications

NAMRC TECHNICAL SESSIONS
THURSDAY JUNE 15, 2023

13:50-15:05 MU-208	**NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 10** *Session Chair: Yan Wang	Session Co-Chair: Jorge Arinez*	
Paper 123	Niloofar Zendehdel, Haodong Chen, and Ming Leu	Real-Time Tool Detection in Smart Manufacturing Using Yolo
Paper 118	Sourabh Deshpande, Shailesh Padalkar, and Sam Anand	IIoT based Framework for Data Communication and Prediction using Augmented Reality for Legacy Machine Artifacts
Paper 137	Dehao Liu and Yan Wang	Physics-Constrained Neural Networks with Minimax Architecture for Multiphysics Dendritic Growth Problems in Additive Manufacturing

13:50-15:05 MU-210	**NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 11** *Session Chair: Xun Xu	Session Co-Chair: Gregory Purdy*	
Paper 211	Madison Evans and Gregory Purdy	Architectural Development of a Cyber-Physical Manufacturing Range
Paper 212	Ali Hosseinzadeh, F. Frank Chen, Mohammad Shahin, and Hamed Bouzary	A Predictive Maintenance Approach in Manufacturing Systems via AI-based Early Failure Detection
Paper 128	Huarun You, Junhong Zhang, Xun Xu, and Holger Heinzel	Horizontal integration for steel fabrication compliance process

13:50-15:05 MU-211	**NAMRC - TRACK 1 MANUFACTURING SYSTEMS - Session 4** *Session Chair: Kundan K. Singh	Session Co-Chair: Yuqian Lu*	
Paper 205	Shimin Liu, Pai Zheng, and Suiyan Shang	A novel bionic decision-making mechanism for digital twin-based manufacturing system
Paper 160	Zhaojun Qin and Yuqian Lu	A Knowledge Graph-based knowledge representation for adaptive manufacturing control under mass personalization
Paper 204	Gururaja S, Umar Ahmad, and Kundan K. Singh	Development of Automated Impact System for Modal Analysis of Micro-End Mill

NAMRC TECHNICAL SESSIONS

THURSDAY JUNE 15, 2023

15:25-16:40 AB-2160	NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 14	
	*Session Chair: Tsz Ho Kwok	Session Co-Chair: Jia Liu*	
Paper 97	Rakesh Kumar, Dattatraya Bombe, and Anupam Agrawal	A Data-Driven ANN Model for Estimation of Melt-Pool characteristics in SLM Process
Paper 110	Tianyu Gao, Anyi Li, Xinyu Zhang, Gregory Harris, and Jia Liu	A data-driven process-quality-property analytical framework for conductive composites in additive manufacturing
Paper 112	Conor Porter, Fred M. Carter, Dominik Kozjek, Samuel J. Clark, Kamel Fezaaa, Jon-Erik Mogonye, and Jian Cao	Qualitative analysis of potential pore healing phenomenon in L-PBF using operando high speed X-ray imaging

15:25-16:40 MU-204	NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 11	
	*Session Chair: Yang Du	Session Co-Chair: Douglas Bristow*	
Paper 219	Gianluca Buffa, Davide Campanella, Muhammad Adnan, Umberto La Commare, Giuseppe Ingarao, and Livan Fratini	Enhancing industrial applicability of aluminum alloys chips recycling through Friction Stir Extrusion: thin wires production process design
Paper 218	Philip Olubodun, Mitchell Woodside, and Douglas Bristow	Procedures and Performance of a Robotic Machining System with Metrology-in-the-Loop Feedback Control
Paper 127	Mert Ozdemir, Burak Sencer, and Yang Guo	A simulation-based analysis on the cooling effect and the tool temperature distribution in modulated turning (MT)

15:25-16:40 MU-208	NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 12	
	*Session Chair: Jorge Arinez	Session Co-Chair: Xun Xu*	
Paper 164	Chen Li, Tian Yu, Hua-Tzu Fan, Guoxiaon Xiao, Jorge Arinez, and Qing Chang	Dynamic Bottleneck Identification and Production Loss Evaluation for Assembly Lines
Paper 153	Asmaa Harfoush, Ali Tabei, Karl Haapala, and Iman Ghamarian	A Framework for Predicting Grain Morphology during Incremental Sheet Metal Forming using Generative Adversarial Networks
Paper 138	Wenbo Wu, Yongkui Liu, Lin Zhang, Xun Xu, and Lihui Wang	Deep Discriminative Clustering and Structural Constraint for Cross-domain Fault Diagnosis of Rotating Machinery

NAMRC TECHNICAL SESSIONS

THURSDAY JUNE 15, 2023

15:25-16:40 MU-210	NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 13
	*Session Chair: Zhaoyan Fan	Session Co-Chair: Chenang Liu*

Paper 200	Mengfei Chen and Weihong Guo	DCGAN-CNN with Physical Constraints for Porosity Prediction in Laser Metal Deposition with Unbalanced Data
Paper 199	Dileep Parvathaneni, Syed Ahmed, and Iqbal Shareef	Scanning problems in production parts transfer within the smart factory
Paper 203	Zehao Ye, Chenang Liu, and Chen Kan	Stereo Vision enabled Flexible In-situ Process Authentication of Additive Manufacturing

MSEC SPECIAL SESSIONS

THURSDAY JUNE 15, 2023

09:00-10:15 AB-2400	**Doctoral Symposium - 1** *Session Chairs: Chinedum Okwudire and Binil Starly*	
09:00-09:25	Alexander Riensche *Virginia Tech*	Physics-Based Process Optimization and Monitoring in Laser Powder Bed Fusion
09:25-09:50	Inwoong Noh *Sungkyunkwan University*	A Study on Robust Fault Diagnosis Model of Robotic Spot-Welding (RSW) Process Based on Transfer Learning (TI) Method
09:50-10:15	Kaidong Song *University of Florida*	Study of Gelatin Microgel-Assisted Extrusion Fabrication System for 3d Bioprinting

10:35-11:50 AB-2400	**Doctoral Symposium - 2** *Session Chairs: Chinedum Okwudire and Binil Starly*	
10:35-11:00	Mengfei Chen *Rutgers University*	Data-Driven Optimization Solutions for In-Situ Monitoring, Prognostics, and Optimization in Production Systems: Addressing Randomness from Micro to Macro Level
11:00-11:25	Dharneedar Ravichandran *Arizona State University*	Polymer Solution-Based Composite 3d Printing with Multilayered System for Shape Memory
11:25-11:50	Benjamin Bevans *Virginia Tech*	In-Situ Part Qualification in Metal Additive Manufacturing

MSEC TECHNICAL SESSIONS
THURSDAY JUNE 15, 2023

09:00-10:15 AB-2125	MP6-6: Physics-Informed Data-Driven Manufacturing - 1	
	Session Chair: Ankit Agarwal	
MSEC2023-105175	Shubham Vaishnav and K A Desai	Physics-Informed Machine Learning Model for In-Process Estimation of Cutter Runout Parameters in End Milling
MSEC2023-104529	Mahtab Heydari, Pei Ching Kung, Bruce Tai, and Nien-Ti Tsou	Real-Time Temperature Prediction of a Moving Heat Source Problem Using Machine Learning
MSEC2023-104565	Esha Francis, Charles Ma, Jianfeng Ma, Muhammad Abdun Nafi, Mahmud Karim, and Muhammad Jahan	An Experimental Investigation on Nanosecond Laser Ablation of Single Crystalline Silicon Wafers

09:00-10:15 MU-111	ADM1-3: Metal Additive Manufacturing - 3	
	Session Chair: Ala Qattawi	
MSEC2023-105104	Jiaqi Lyu, Javid Akhavan, Youmna Mahmoud, Ke Xu, Chaitanya Krishna Prasad Vallabh, and Souran Manoochehri	Real-Time Monitoring and Gaussian Process-Based Estimation of the Melt Pool Profile in Direct Energy Deposition
MSEC2023-105182	Majed Ali, Abdalmageed Almotari, Anwar Al Gamal, Ala'Aldin Alafaghani, Hossein Abedi, and Ala Qattawi	Effect of In-Situ Laser Polishing on Microstructure, Surface Characteristics, and Phase Transformation of LPBF Martensitic Stainless Steel
MSEC2023-105190	Abdalmageed Almotari, Ala'Aldin Alafaghani, Majed Ali, Anwar Al Gamal, Hossein Abedi, and Ala Qattawi	Influence of Modified Heat Treatments and Build Orientations on the Microstructure of Additively Manufactured In718

09:00-10:15 MU-114	BIOM3-1: Additive Manufacturing of Bioinspired Functional Structures - 2	
	Session Chair: Yayue Pan	
MSEC2023-105248	Ali Sotoodeh, Yiran Yang, and Lei Di	Design of 3D Printable Led Heat Sink Inspired by Firefly Wings
MSEC2023-105866	Ketki Lichade and Yayue Pan	Acoustic Assembly Photopolymerization of Bioinspired Multifunctional Devices with Programmable Adhesion
MSEC2023-100737	Geethapriyan T, Jhasketan Badhai, Sibi Karthik, Avinash Sonawane, and I A Palani	Biocompatibility and Mechanical Behaviour Studies on Wire-Arc Additive Manufactured Stainless Steel 316l and Shape Memory Alloy (Niti) Materials for Biomedical Implants

MSEC TECHNICAL SESSIONS
THURSDAY JUNE 15, 2023

09:00-10:15 MU-212	**MEA5-1: Equipment, Control and Automation - 2** *Session Chair: Lei Zhou*	
MSEC2023-104869	Jacob Brooks, M. M. Towfiqur Rahman, and Erina Baynojir Joyee	Design and Construction of a Belt-Assisted Vertical Extrusion Based Fused Deposition Modeling 3d Printer for Automated Part Removal
MSEC2023-105528	Bin Wei	Control System Design and Analysis of Robotic Arm for Human-Robot Interaction in Manufacturing
MSEC2023-105270	Meghana Sagare, Victoria Wilson, Zhao Yu, and Satyandra Gupta	Rapidly Reconfigurable Suction Gripper for Sheet Pick and Place Operations

09:00-10:15 MU-213	**MS7-4: Digital Twins for Adv. Manufacturing - 1** *Session Chair: Shaw Feng*	
MSEC2023-101127	Guodong Shao, Simon Frechette, and Vijay Srinivasan	An Analysis of the New Iso 23247 Series of Standards on Digital Twin Framework for Manufacturing
MSEC2023-101130	Shaw Feng, Albert Jones, and Guodong Shao	Data Requirements for Digital Twins in Additive Manufacturing Metaverse
MSEC2023-105613	Hankang Lee and Hui Yang	Digital Twin Simulation and Optimization of Manufacturing Process Flows

10:35-11:50 AB-2125	**MP6-5: Assisted and Augmented Manufacturing - 1** *Session Chair: Rajiv Malhotra*	
MSEC2023-104689	Eriel Perez Zapico, Alessandro Ascari, Erica Liverani, Alessandro Fortunato, and Vincenzo Dimatteo	Laser Welding with and Without Filler Wire of Aluminum Thin Sheets in Different Semi-Finished Formats
MSEC2023-104931	Jeremy Cleeman, Weihong Guo, and Rajiv Malhotra	Magnetically Assisted Laser Induced Plasma Micromachining (M-Lipmm)
MSEC2023-105504	Tianhe Wang, Lei Chen, Hong Lu, Shaojun Wang, Zhangjie Li, Wei Zhang, and Jiangnuo Mei	Finite Element Dynamic Model and Vibration Signal Simulation of Rolling Bearing with Local Faults

MSEC TECHNICAL SESSIONS

THURSDAY JUNE 15, 2023

10:35-11:50 MU-111	QR9-1: Quality and Reliability in Smart Manufacturing - 1 *Session Chair: Martin Byung-Guk Jun*	
MSEC2023-100969	Mohamed Kashef (Hany), Richard Candell, and Karl Montgomery	Industrial Wireless Cyberphysical Systems Performance Using Deep Learning
MSEC2023-101060	Ulfa Fairuz Izdihar, Brijesh Patel, Zih Fong Huang, Chih-Ho Yeh, and Po Ting Lin	Review of Recent Methods and Learning Techniques in Prediction of Tool Life
MSEC2023-101213	Changheon Han, Heebum Chun, Chabum Lee, and Martin Byung-Guk Jun	Stroboscopic Data-Driven, Integrated, and Intelligent Machine Learning-Based Algorithms for Semiconductor Wafer Inspection

10:35-11:50 MU-114	BIOM3-2: Manufacturing of Biomedical Devices - 4 *Session Chair: Yi Cai*	
MSEC2023-105162	Zhen Wang, Tian Xu, and Yong Lei	A Force Sensor-Less Method for Identifying the Young's Modulus of Soft Tissue
MSEC2023-105870	Leihan Zhang, Yi Wang, and Yi Cai	A Bionic Design with Wing Structures to Assist Flexible Microelectrode Implantation
MANU-22-1539	Taekwang Ha, Torgeir Welo, Geir Ringen, and Jyhwen Wang	On Kinematics in Sequential Three-Dimensional Stretch Bending: Analytical Springback Model

10:35-11:50 MU-212	MEA5-1: Equipment, Control and Automation - 3 *Session Chair: Jianfeng Ma*	
MSEC2023-105311	Sahil J Choudhari, Sujay B J, Swarit Anand Singh, and K A Desai	Comparative Assessment of Vision-Based Object Detection Algorithms in Abnormality Identification for CNC Milling Machines
MSEC2023-101825	Enoch Lai and Jianfeng Ma	Intelligent Uncertainty Handling Using Artificial Neural Networks in a Programmatic Logic Controller-Based Automation System
MSEC2023-104752	Taiyu Su, Zhijing Zhang, Jian Xiong, Erbo Li, and Qimuge Saren	Submicron Motion Measurement Based on Nonlinear Identification of Diffractive Optical Features

MSEC TECHNICAL SESSIONS
THURSDAY JUNE 15, 2023

10:35-11:50 MU-213	**MP6-8: Advanced Manufacturing Processes - 1** *Session Chair: Ramin Sabbagh*	
MSEC2023-111117	Shilan Jin	Vibration Signal-Assisted Endpoint Detection for Long-Stretch, Ultraprecision Polishing Processes
MSEC2023-111133	Ramin Sabbagh, Alec Stothert, S.V. Sreenivasan, and Dragan Djurdjanovic	Optical Critical Dimension Metrology for Large-Area Nanostructure Arrays with Complex Patterns
MSEC2023-110630	Xiaochun Li and Yitian Chi	Nanoparticle-Enabled Wire-Arc Directed Energy Deposition of Aluminum Alloy 7075

13:50-15:05 AB-2125	**MP6-5: Assisted and Augmented Manufacturing - 2** *Session Chair: Rajiv Malhotra*	
MSEC2023-105521	Jun Zhang, Hong Lu, Zidong Wu, Yanglei Tan, Meng Liu, Dingzhong Li, Yuxi Niu, and Shaojun Wang	Complex Shaped Detection and Reconstruction Algorithm Considering Uncertain Factors
MSEC2023-106174	Mengfei Chen, Rajiv Malhotra, and Weihong Guo	Transfer Learning for Predictive Quality in Laser-Induced Plasma Micro Machining
MSEC2023-105645	Liangfeng Li and Yansong Zhang	Hybrid Laser-Arc Welding-Induced Distortions Analysis of Large-Scale Thin-Walled Cruise Ship Structures

13:50-15:05 MU-111	**QR9-1: Quality and Reliability in Smart Manufacturing - 2** *Session Chair: Shenghan Guo*	
MSEC2023-104888	Gerald Fattah, David Newton, Guixiu Qiao, and Dennis Leber	Anomaly Detection for Industrial Robot Prognostics and Health Management
MSEC2023-105080	Naichen Shi, Raed Kontar, and Shenghan Guo	Process Signature Characterization and Anomaly Detection with Personalized PCA in Laser-Based Metal Additive Manufacturing
MSEC2023-106171	Rong Lei, Yuebin Guo, and Weihong Guo	Physics-Guided Long Short-Term Memory Networks for Emission Prediction in Powder Bed Fusion

MSEC TECHNICAL SESSIONS
THURSDAY JUNE 15, 2023

13:50-15:05 MU-114	**ADM1-2: Smart Additive Manufacturing - 4** *Session Chair: Molong Duan*	
MSEC2023-100739	Mehdi Kabir, Ryan Walker, Chance Eden, Fisseha Gebre, and Jiajun Xu	Experimental Investigation of Capillary Performance of Additively-Manufactured Lattice Structures for Fluid Wicking Applications
MSEC2023-104775	Molong Duan and Shuaiyin He	Continuous Fiber Path Optimization in Composite Additive Manufacturing via a Finite Element Model With B-Spline Fiber Parameterization
MSEC2023-104786	Molong Duan, Siqi Chen, and Yuexin Yang	Thermal-Image-Enabled Additive Manufacturing Process Monitoring and Extrusion Trajectory Compensation

13:50-15:05 MU-212	**ADM1-4: Additive Manufacturing of Polymers and Composites - 1** *Session Chair: John Wentz*	
MSEC2023-101823	Ryan Van Domelen, Duy Le, Andrew Broman, Sandra Hawley, and John Wentz	Tunable Stiffness in Material Extrusion of Thermoplastic Urethane
MSEC2023-102275	Alexandra Marnot, Jaehyun Cho, and Blair Brettmann	Print Speed Optimization for UV-Assisted 3d Printing of Lunar Regolith Simulant Composite Inks
MSEC2023-105526	Maxwell Blais, Scott Tomlinson, and Bashir Khoda	Investigation of the Interfacial Adhesion Strength of Parts Additively Manufactured on Fabrics

13:50-15:05 MU-213	**MP6-3: Lightweight Materials Joining - 1** *Session Chair: Jingjing Li*	
MSEC2023-104457	Yi-Mo Ho, Chun-Wei Yang, Jeng-Rong Ho, Chih-Kuang Lin, Pi-Cheng Tung, and Yuan-Shin Lee	Evaluation of Bonding Performance of Laser Welding Between Glass and Aluminum
MSEC2023-104706	Erbo Li, Xiao Chen, Taiyu Su, Qimuge Saren, and Zhijing Zhang	Stress-Free Micro-Gluing Method for Thin-Walled Wolter-I Focusing Telescopes
MSEC2023-105586	Tianle Lyu, Yunjun Xia, Yongbing Li, and Songlin Wang	Quality Prediction and Model Explanation of Resistance Spot Welding Process Under Varying Fit-Up Conditions

MSEC TECHNICAL SESSIONS

THURSDAY JUNE 15, 2023

15:25-16:40 AB-2125	**MP6-6: Physics-Informed Data-Driven Manufacturing - 2** *Session Chair: Gregory W. Vogl*	
MSEC2023-101504	Prince Kumar Rai and Ankur Gupta	Development of a Model for Prediction and Optimization of Hardness of Electrodeposit Cu/sic Composite Using Rsm and Ann-Pso
MSEC2023-102616	Zane Hughes and Hector R. Siller	Process Planning for Hybrid Manufacturing: Ball Nose End Milling and Direct Energy Deposition of Stainless Steel
MSEC2023-105178	Jeremy Cleeman and Rajiv Malhotra	Highly Parsimonious Multi-Fidelity Learning of Process Parameter-Performance Relationships: A Case Study with Fused Filament Fabrication

15:25-16:40 MU-111	**QR9-2: Quality and Reliability in Smart Manufacturing - 3** *Session Chair: Yinan Wang*	
MSEC2023-101281	Matthew Russell and Peng Wang	Normalizing Flows for Intelligent Manufacturing
MSEC2023-102011	Dongqing Yan, Eddie Taewan Lee, Somayeh Pasebani, and Zhaoyan Fan	A Study of the Laser Powder Bed Fusion Manufactured Surface Roughness Prediction and Optimization Based on Artificial Neural Network
MSEC2023-102678	Partha Protim Mondal, Placid Matthew Ferreira, Shiv Gopal Kapoor, and Patrick N Bless	Sequential Learning of Bayesian Network Structure with Knowledge Source Integration for Multistage Process Monitoring and Diagnosis

15:25-16:40 MU-114	**ADM1-3: Metal Additive Manufacturing - 4** *Session Chair: Ho Yeung*	
MSEC2023-105627	Ho Yeung, Felix Kim, and Alkan Donmez	Application of Digital Twins to Laser Powder Bed Fusion Additive Manufacturing Process Control
MSEC2023-105582	Lisa Dewitte and Katherine Fu	A Prediction Method for Catchment Efficiency Loss Due to Coaxial Nozzle Wear in Powder Fed Directed Energy Deposition Systems
MSEC2023-104929	Md Saidur Rahman Roney and AMM Nazmul Ahsan	Modeling and Characterizing a Novel Hybrid Infill Pattern for Additive Manufacturing

15:25-16:40 MU-212	**ADM1-4: Additive Manufacturing of Polymers and Composites - 2** *Session Chair: Omar Faruk Emon*	
MSEC2023-103018	Achint Thakkar, Ritik Jamghare, Ravi Mishra, and Omar Faruk Emon	An Inexpensive 3d Printing System for Functional Inks Used in Electronics and Bio Applications
MSEC2023-104858	Junyu Hua, Yujie Shan, Shaocheng Wu, and Huachao Mao	3D Printed Diffraction Gratings Drop Coated by Different Resins and Their Mechanism
MSEC2023-105478	Kun Fu	Additive Manufacturing of Continuous Carbon Fiber/thermoset Composites

15:25-16:40 MU-213	**MP6-3: Lightweight Materials Joining - 2** *Session Chair: Vinh Nguyen*	
MSEC2023-104127	Vinh Nguyen	Explainable Artificial Intelligence for Prediction of tool Wear in Turning
MSEC2023-105603	Zhuoran Li, Ruiming Chen, Yujun Xia, Lin Qi, Ming Lou, and Yongbing Li	Improve Resistance Spot Weld Quality of Press Hardened Steel by Using Stepped Current Pulse and External Magnetic Field

LEM&P TECHNICAL SESSIONS

THURSDAY JUNE 15, 2023

10:35-11:50 AB-4225	**LEM&P: Track 4-1 Nano/Micro Measurement and Intelligent Instruments** *Session Chair: Shotaro Kadoya*	
LEMP2023-008	Tsutomu Uenohara, Makoto Yasuda, Yasuhiro Mizutani, and Yasuhiro Takaya	In-process depth measurement in laser ablation using a photonic nanojet
LEMP2023-016	Ryuichi Saito and Soichi Ibaraki	Identification of a new kinematic model of an articulated arm coordinate measuring machine using the R-test instrument
LEMP2023-019	Yuki Shimizu, Tomoki Kitazume, Lue Quan, and Wei Gao	Investigation of the influence of the optical frequency fluctuation on the pitch deviation evaluation of a diffraction grating based on optical angle sensors

13:50-15:05 AB-2225	**LEM&P: Track 6-1 Digital Design and Digital Manufacturing (CAD/CAM)** *Session Chair: Hayato Yoshioka*	
LEMP2023-021	Ken Okamoto, Hideaki Ishihara, and Koichi Morishige	Cutter location data generation for all types of barrel tool in five-axis machining
LEMP2023-025	Rei Matsumura, Isamu Nishida, and Keiichi Shirase	Process design and tool path generation for end milling considering tool life
LEMP2023-040	Tomoya Suzuki, Hiroaki Honda, Yuya Nakaoka, and Toshitake Tateno	Curved wall infill structure for improving shape accuracy in metal extrusion of additive manufacturing

13:50-15:05 AB-4225	**LEM&P: Track 4-1 Nano/Micro Measurement and Intelligent Instruments** *Session Chair: Tsutomu Uenohara*	
LEMP2023-022	Shuohan Wang, Atsushi Tanaka, Kosaku Tao, Fuminobu Kimura, and Yusuke Kajihara	Evaluation of the polymer orientation via terahertz polarization measurement
LEMP2023-036	Yizhao Guan, Shuzo Masui, Shotaro Kadoya, Masaki Michihata, and Satoru Takahashi	Numerical simulation of self-assembled nanoparticles substrate for plasmonic structured illumination microscopy
LEMP2023-047	Jingwei Wang, Takanori Yazawa, Tatsuki Otsubo, Tatsushi Mori, and Toshiaki Yasaka	Research on non-contact total length measurement of elongated pins at processing worksites

LEM&P TECHNICAL SESSIONS

THURSDAY JUNE 15, 2023

15:25-16:40 AB-2225	LEM&P: Track 6-1 Digital Design and Digital Manufacturing (CAD/CAM) *Session Chair: Isamu Nishida*	
LEMP2023-054	Hayato Yoshioka, Teruto Hifumi, and Shingo Tajima	Identification and grouping defects for complement in measuring of workpiece with 3D scanner
LEMP2023-059	Tong Zhang, Masahiko Onosato, and Fumiki Tanaka	Continuous representation of machining process using 4-dimensional geometric models - Cutter-workpiece engagement analysis and processing surface estimation in Spatio-Temporal space –

15:25-16:40 AB-4225	LEM&P: Track 4-1 Nano/Micro Measurement and Intelligent Instruments LEM&P: Track 4-2 Monitoring of Machining Process *Session Chair: Yuki Shimizu*	
LEMP2023-055	Shotaro Kutomi, Panart Khajornrung, and Hibiki Fujishima	Single sub-100 nm particle detection on micro-porous surface by means of optical interference
LEMP2023-056	Daiki Goto, Panart Khajornrung, Thitipat Permpatdechakul, Aran Blattler, and Yuki Ohta	Verification of nano-particle absolute height position measurement from a surface with invisible reference tilt resin by multi-wavelength evanescent fields
LEMP2023-018	Shota Matsui, Nobutoshi Ozaki, Toshiki Hirogaki, Eiichi Aoyama, and Ryo Matsuda	A study on the effect of cutting force during threading with wireless holder system

FRIDAY JUNE 16, 2023

Time	Location	Event
8:30-12:00	AB East 2nd Floor Atrium	Registration
09:00-10:15	AB and MU	Technical Session 12
10:15-10:35	AB East 2nd Floor Atrium MU 1st Floor Hallway	Morning Break
10:35-11:50	AB and MU	Technical Session 13
12:00-13:00	AB East 2nd Floor Atrium MU 1st Floor Hallway	Boxed Lunch

NAMRC TECHNICAL SESSIONS

FRIDAY JUNE 16, 2023

09:00-10:15 AB-2160	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 15** *Session Chair: Amber Shrivastava | Session Co-Chair: Yash Gopal Mittal*	
Paper 114	Yash Gopal Mittal, Pushkar Kamble, Gopal Gote, Yogesh Patil, Avinash Kumar Mehta, and K. P. Karunakaran	A Novel Analytical Model for Screw Extrusion of Thermoplastic ABS with Emphasis on Additive Manufacturing
Paper 120	Ajay V, Jignesh Nakrani, Neeraj Mishra, and Amber Shrivastava	Fatigue Crack Growth Behavior of SS316L Deposition from Wire Arc Additive Manufacturing
Paper 113	Angshuman Deka and John Hall	Predictive modeling of mechanical properties for Fused Deposition Modeling parts : A focus on processing and environmental parameters

09:00-10:15 MU-204	**NAMRC - TRACK 3 MANUFACTURING REMOVAL - Session 3** *Session Chair: Muhammad Jahan | Session Co-Chair: Ankit Agarwal*	
Paper 135	Aash M Shah, Ankit Agarwal, and Laine Mears	Tool wear area estimation through in-process edge force coefficient in trochoidal milling of Inconel 718
Paper 148	Trilochan Prasad Nanda and Amitava Ghosh	Dry grinding of Al-SiCP composite with patterned diamond wheel
Paper 143	Charles Ma, Lesly Aguilar, Mahmud Karim, Muhammad Abdun Nafi, Jianfeng Ma, and Muhammad Jahan	Experimental Investigation of Nanosecond Laser Machining of 3D Printed Carbon Fiber Reinforced Polymer (CFRP) Composite

09:00-10:15 MU-208	**NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 14** *Session Chair: Till Clausmeyer | Session Co-Chair: Liwen Hu*	
Paper 171	Liwen Hu, Robert Gao, and Y.B. Guo	Transfer Learning Enhanced Gaussian Process Model for Surface Roughness Prediction with Small Data
Paper 167	Jan Gerlach, Till Clausmeyer, Alexander Schowtjak, Waqas Muhammad, Abhijit P. Brahme, Lena Koppka, Kaan Inal, and A. Erman Tekkaya	Data-driven ductile damage model for damage-induced material degradation in forming
Paper 174	Abdullah Al Mamun, Mahathir Mohammad Bappy, Linkan Bian, Sara Fuller, TC Falls, and Wenmeng Tian	Missing Signal Imputation for Multi-channel Sensing Signals on Rotary Machinery by Tensor Factorization

NAMRC TECHNICAL SESSIONS

FRIDAY JUNE 16, 2023

09:00-10:15 MU-210	NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 15 *Session Chair: Robert Landers	Session Co-Chair: Ali Hosseinzadeh*	
Paper 210	Qiyang Ma and Zimo Wang	Characterizing heterogenous microstructures of fiber reinforced composite materials using an advanced image processing-based approach through optical microscopic images
Paper 216	Joseph Fischer, Douglas Bristow, and Robert Landers	Layer-to-Layer Norm-Optimal Control of Incremental Sheet Forming with a Data-Driven Model
Paper 214	Mohammad Shahin, F. Frank Chen, Hamed Bouzary, and Ali Hosseinzadeh	Deploying Convolutional Neural Network to Reduce Waste in Production System

09:00-10:15 MU-211	NAMRC - TRACK 1 MANUFACTURING SYSTEMS - Session 5 *Session Chair: Azadeh Haghighi	Session Co-Chair: Andreas Jobst*	
Paper 41	Suyog Ghungrad, Abdullah Mohammed, and Azadeh Haghighi	Energy-efficient and quality-aware part placement in robotic additive manufacturing
Paper 25	Andreas Jobst and Marion Merklein	Stability of forming induced residual stresses in stainless steel components under mechanical load
Paper 19	Rifat Bin Hasan, Hany Osman, Ahmed Azab, and Fazle Baki	Improvement to an existing multi-level capacitated lot sizing problem considering setup carryover, backlogging, and emission control

10:35-11:50 AB-2160	NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 16 *Session Chair: Yash Gopal Mittal	Session Co-Chair: Liam White*	
Paper 126	Marwan Haddad, Aslan Bafahm Alamdari, Karan Vinod Kankaria, Hui Wang, Benjamin Gould, and Sarah J. Wolff	Gas Bubble Coalescence in Laser Directed Energy Deposition of Irregular HDH Titanium Alloy Powder Feedstock
Paper 136	Kossi Loic M. Avegnon, Andrew Menendez, Jingfu Liu, Yash Gopal Mittal, K.P. Karunakaran, and Michael Sealy	Patterned Keyhole Porosity Formation in Laser Powder Bed Fusion Caused by Local Disturbances in the Shielding Gas Flow
Paper 223	Liam White, Bryan Quaife, and Michael Borish	A Novel Approach for Adaptive Skeleton Path Generation

10:35-11:50 MU-204	**NAMRC - TRACK 3 MANUFACTURING REMOVAL - Session 4** *Session Chair: Tony Schmitz	Session Co-Chair: Yihao Zheng*	
Paper 166	Patrick Chernjavsky, Rohit Dey, Jack Shanks, and Yihao Zheng	Hydrodynamic flexible spindle (HydroFlex) polishing for internal surfaces of complex channels with high aspect ratio
Paper 152	Rajesh Ranjan Ravi, Chinmoyee Datta, and D.S. Srinivasu	Machine vision based burr length measurement in abrasive waterjet trepanning
Paper 163	Chunlei Song and Xiaoliang Jin	Nonlinearity and Periodicity in Machining Carbon Fiber Reinforced Polymer

10:35-11:50 MU-208	**NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 16** *Session Chair: K A Desai	Session Co-Chair: Zimo Wang*	
Paper 189	Xinchen Wang, Huimin Zhou, Jia Deng, and Zimo Wang	A sensor-based monitoring approach to predict surface profile of vibration-assisted atomic force microscopy (AFM)-based nanofabrication
Paper 193	Aitha Sudheer Kumar, Sunidhi Dayam, and K A Desai	Wear Monitoring Solution for End Mills Using Deep Learning and Mobile Application
Paper 198	Sourabh Deshpande, Aditi Roy, Joshua Johnson, Ethan Fitz, Manish Kumar, and Sam Anand	Smart Monitoring and Automated Real-Time Visual Inspection of a Sealant Applications (SMART-VIStA)

10:35-11:50 MU-210	**NAMRC - TRACK 5 SMART MANUFACTURING & CYBER-PHYSICAL SYSTEMS - Session 17** *Session Chair: Robert Landers	Session Co-Chair: Martin Jun*	
Paper 222	Sara Shonkwiler, Xiang Li, Richard Fenrich, and Sara McMains	Deep reinforcement learning for stacking sequence optimization of composite laminates
Paper 63	Donna Guillen, Asa Monson, and Brennan Harris	Development of a digital twin for digital light process printing of ceramics
Paper 168	Chandra Nath, John Murphy, and Martin Jun	Design and Evaluation of a Non-invasive Manufacturing Monitoring System based on Internal Sound Sensor and Artificial Intelligence

MSEC TECHNICAL SESSIONS

FRIDAY JUNE 16, 2023

09:00-10:15 MU-111	**QR9-2: Quality and Reliability in Smart Manufacturing - 4** *Session Chair: Jiong Tang*	
MSEC2023-105105	Qianyu Zhou and Jiong Tang	Part Surface Inspection Through Semi-Supervised Learning to Overcome Limited Data Challenge
MSEC2023-105565	Vivian Wen Hui Wong, Sang Hun Kim, Junyoung Park, Jinkyoo Park, and Kincho H. Law	Generating Dispatching Rules for the Interrupting Swap-Allowed Blocking Job Shop Problem Using Graph Neural Network and Reinforcement Learning

09:00-10:15 MU-114	**MP6-8 & QR9-3: Aspects of Additive Manufacturing and Advanced Manufacturing Processes** *Session Chair: Zhaohui Geng*	
MSEC2023-117661	Aamer Kazi	The Effects of Plasma Pre-Cracking on Drilling of Hard Rocks: A Single Insert Cutting Experiment
MANU-22-1369	Durant Fullington, Linkan Bian, and Wenmeng Tian	Design De-identification of Thermal History for Collaborative Process-defect Modeling of Metal-based Additive Manufacturing
MSEC2023-106628	Dongchun Qiao, Xi-Ying Zhang, Bo Wang, Qing Yu, Zhaohui Geng, Jianzhi Li, Wesley Mitchell, Jan Petrich, and Griffin Jones	Qualification and Certification for Additive Manufacturing Supported by Model-Based Approach

09:00-10:15 MU-212	**ADM1-4 & BIOM3-2: Aspects of Additive Manufacturing and Biomedical Manufacturing** *Session Chair: Jida Huang*	
MSEC2023-104984	Sina Rastegarzadeh and Jida Huang	Novel STL-Free Design Paradigm for High-Resolution Multi-Scale Architected Materials in Additive Manufacturing
MSEC2023-106511	Haiyu Liu, Yancheng Wang, Senyu Qian, and Deqing Mei	Polymer-Derived Sic Ceramic with Triply Period Minimal Surface Structure Fabrication Through Digital Light Processing

MSEC TECHNICAL SESSIONS

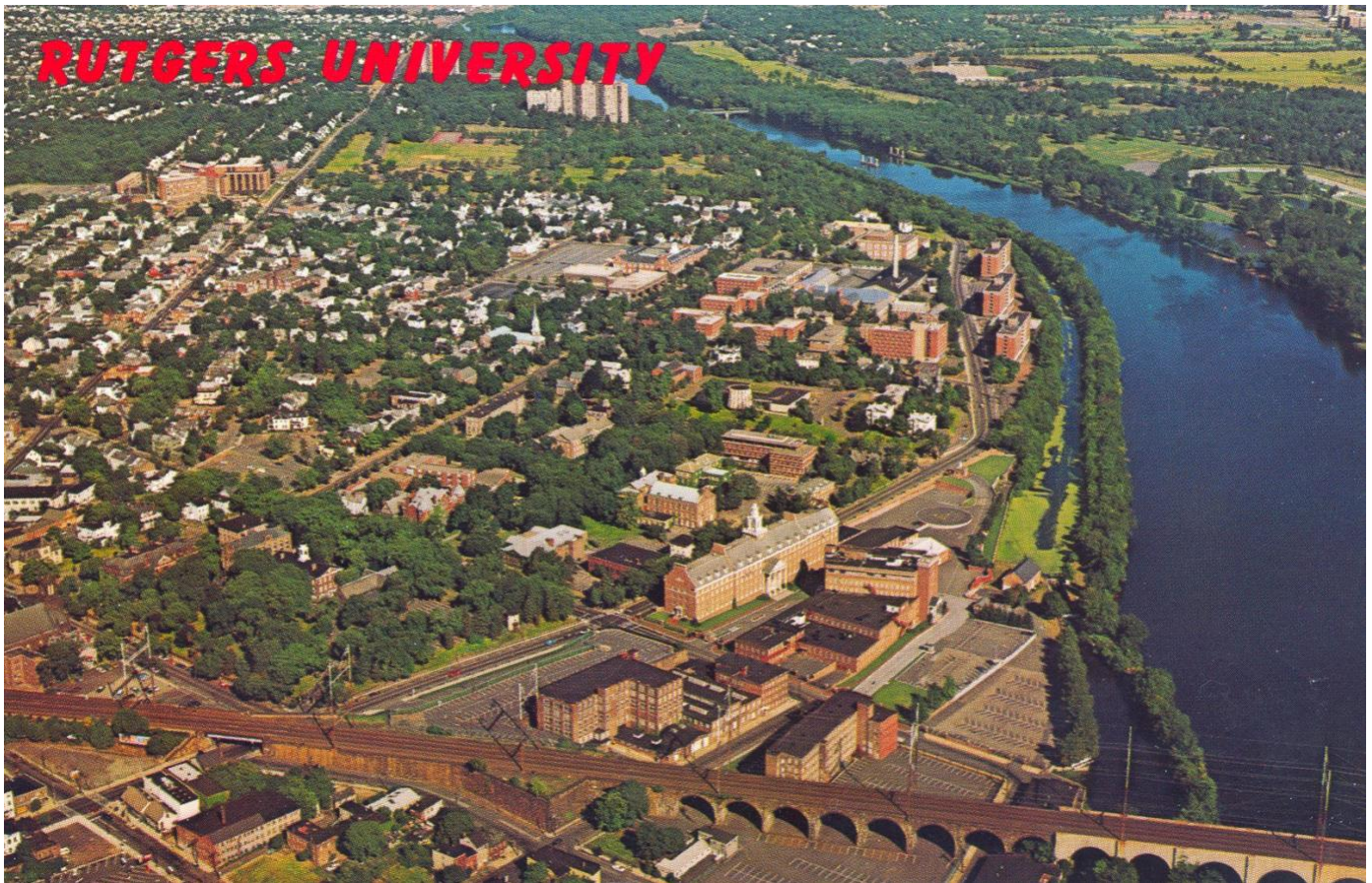| 09:00-10:15 MU-213	MP6-4: Advances in Surface Engineering - 4 Session Chair: Beiwen Li	
MSEC2023-104618	Xin Zhang, Xin Li, Xueping Zhang, and Zhenqiang Yao	Grinding Force Prediction Model by Discretizing Stochastic Grains
MSEC2023-104554	Xin Li, Xueping Zhang, Zhenqiang Yao, and Rajiv Shivpuri	Grinding Mechanism Evolution Based on Abrasive-Bond Dynamic Contact Behavior
MSEC2023-105876	Deepak Pahwa, Umut Dur, and Binil Starly	Stable Matching with Contracts for a Dynamic Two-Sided Manufacturing-as-a-Service (MaaS) Marketplace

LEM&P TECHNICAL SESSIONS

FRIDAY JUNE 16, 2023

09:00-10:15 AB-4225	**LEM&P: Track 4-2 Monitoring of Machining Process** **LEM&P: Track 4-3 Nondestructive Evaluations of Materials, Structures and Processing** *Session Chair: Tatsuro Kosaka*	
LEMP2023-026	Kuan-Ming Li, Guan-Liang Lin, and Yi-Yen Lin	Meta-learning for tool wear prediction under varying cutting conditions with small data
LEMP2023-028	Takahiro Ohashi	Feature extraction for machine learning dedicated for detection of scrap floating in stamping with an accelerometer
LEMP2023-012	Zeyu Dong, Weikun Chen, Osamu Saito, Fengming Yu, and Yoji Okabe	Disbond detection in honeycomb sandwich structures through laser-ultrasonic wavefield analysis

10:35-11:50 AB-4225	**LEM&P: Track 4-3 Nondestructive Evaluations of Materials, Structures and Processing** *Session Chair: Kuan-Ming Li*	
LEMP2023-060	Kanna Omae, Takahiro Yamazaki, Chiemi Oka, Junpei Sakurai, and Seiichi Hata	Grain size estimation based on magnetic Barkhausen noise analysis using machine learning
LEMP2023-064	Tatsuro Kosaka and Fumiya Tajiri	Monitoring of delamination of FRP by rayleigh scattering-based sensors

NAMRC 51 | MSEC 2023 | LEM&P 2023
June 12-16, 2023
Rutgers University-New Brunswick, New Jersey, USA