SHTC
Summer Heat Transfer Conference

ICNMM
International Conference on Nanochannels, Microchannels, and Minichannels

FEDSM
Fluids Engineering Division Summer Meeting

CONFERENCE
July 13–15, 2020

Virtual, Online

Program

https://event.asme.org/SHTC
https://event.asme.org/ICNMM
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Dear Colleagues

We are pleased to welcome you to the Heat Transfer Division's (HTD) Summer Heat Transfer Conference (SHTC 2020). This annual assembly is one to which we all look forward. This year the meeting will be held in collaboration and co-location with our friends and colleagues from the Fluids Engineering Division (FED) and the International Conference of Nanochannels, Microchannels and Minichannels (ICNMM).

At the time of this writing, the decision has just been made to hold the meeting in virtual format rather than gathering in-person in Orlando as originally planned. Obviously this decision was required by the risks and consequences of the COVID-19 pandemic. In-person attendance, even if permitted, would have been severely limited, particularly for our international participants and many of our academic colleagues. Nonetheless, as in past years, an excellent collection of papers and presentations has been prepared which will expand the knowledge of heat transfer and enrich our community.

ASME staff and the volunteer organizers from HTD, FED and ICNMM have worked to create an on-line platform and process which will enable us all to take part in this new meeting format, share in the results of the assembled contributions and find the usual intellectual stimulation and social interaction that are always the richest part of the meeting. We urge you to register and experience what could become a more frequent format for the future of technical meetings.

We have planned some special events for this year's conference including a Students and Early Career Opportunities Panel. The panelists will be from industry, academia, national labs, and other government agencies. We hope to provide students with the tools to explore many different career paths and to understand how to navigate the job market. We are also organizing a special Symposium in memory of Professor Ephraim Sparrow. The collection of presentations and publications include personal recollections from all three of the collocated conference programs. In this year's Awards Ceremony, we will honor the contributions and life's work of our colleagues for furthering the field of heat transfer.

Contributions were received from nearly all of the Division's technical K-Committees. We thank the Committee leaders and the many track and topic organizers for their diligent efforts to recruit, review and organize the resulting 250 papers and presentations. Special thanks go to the ASME staff, particularly Lori Lee, Mary Jakubowski and the publications team as we all dealt with the difficulties and frustrations attendant on the use of a new, on-line tool for handling the contributions and the challenge of developing the virtual format.

We hope to see you in July, unfortunately not in-person, but on-screen. We look ahead to HTD participation in IMECE 2020 and next year's SHTC. Stay well.

John S. Maulbetsch, Conference General Chair
Kevin Dowding, Conference Co-Chair
Columbia Mishra, Technical Program Chair

On behalf of the ICNMM organizing committee, we welcome you to the 18th ASME International Conference on Nanochannels, Microchannels and Minichannels (ICNMM 2020). This year's meeting is co-located with the Heat Transfer Division's Summer Heat Transfer Meeting (SHT), and the Fluids Engineering Division's Summer Meeting (FEDSM). With all three meetings co-located this year, there is much larger program of special speakers and track offerings. 2020 has posed significant challenges for all, everywhere, but we are striving to deliver you another exciting meeting to share the latest research in the theme of our annual conference. Though we have moved the meeting online for 2020, we expect to back in person for 2021. Please tune into all of our Plenary, Keynote, and regular talks. With over 120 technical talks ICNMM 2020 is expected to be as exciting as ever!

ICNMM provides a global platform for researchers to exchange information and identify research needs in the emerging areas of micro- and nanoscale transport processes and systems encompassing engineering, basic sciences, and bio-medical disciplines. This field of science is becoming extremely important in a number of emerging technologies. It has already found applications in microprocessor chip cooling, biological sciences (DNA detection), pharmaceutical sciences (micromixers and micro-reactors), fuel cells (multiphase flow microchannels and gas diffusion layer), and micro-power generation.

Our program provides a unique opportunity for interdisciplinary researchers to exchange ideas and discuss future directions, in both fundamental science and applications, with academic and industrial leaders. ICNMM 2020 is filled with rich content, innovative research, and presentations. This year's program contains three Plenary Speakers, fifteen Keynote Talks, and a Student Poster Competition. This year's Plenary speakers include Adrian Bejan (Duke University), Satish Kandlikar (Rochester Institute of Technology), and Evelyn Wang (Massachusetts Institute of Technology). This year's program also includes a special Symposium Honoring Satish Kandlikar and his outstanding and illustrious career in research, along with being the founder of the ICNMM annual conference.

Our special gratitude is extended to all of the volunteers whose hard work has made this conference happen including: the Organizing Committee consisting of the General Committee Organizers; the Technical Program Committee consisting of Technical Track, Topic, and Session Organizers; the ICNMM Advisory Committees; the Plenary and Keynote Speakers; Panel Moderators and Panelists; Technical Paper Authors and Co-Authors; "Technical Presentation Only" Speakers; and, finally, to all the technical reviewers whose contributions ensured the quality of the conference.

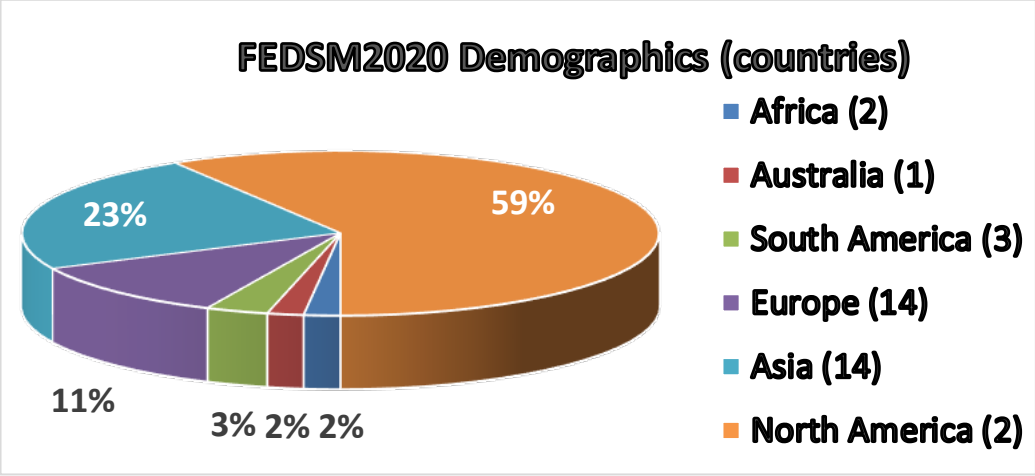
We hope you enjoy the conference. With our very best wishes.

Yuri Muzychka, Conference Chair
Patty Weisensee, Conference Co-Chair
Amy Betz, Technical Program Chair

Welcome to FEDSM2020!

Welcome to the 2020 Fluids Engineering Division's (FED) Summer Meeting - our first virtual event - where FED continues to strive to meet the challenges of disseminating timely technical information by organizing technical conferences and conducting workshops and panel discussions. This year we are collaborating with the ASME Heat Transfer Division and the International Conference on Multi-Mini-and Nano Channels. Prior collaborations in our recurring cycle include: AJK2019 with the Japanese and Korean engineering societies, FEDSM2018 with European societies, and FEDSM 2017 a FED focused event. FED also participates annually in the ASME International Mechanical Engineering Congress and Exposition each November.

For 2020, our conference is truly international. The globalization and international participation include 36 countries spanning six continents with ~400 presentations. The State-of-the-Art in the world of Fluids Engineering will be presented from industrial, academic, and governmental researchers.



Our FED plenaries feature

- 2020 ASME Fluids Engineering Awardee: Howard Alvin Stone, Princeton University. *Seeking Intersections Between Disciplines: "Boundaries" in Multiphase Flows*
- 2020 ASME Henry R. Worthington Medal Awardee: Ryoichi S. Amano, University of Wisconsin Milwaukee. *How Can We Reduce Cavitation in Hydro Machines?*
- 2019 ASME Fluids Engineering Awardee: Nadine Aubry, Tufts University. *From Reduced Turbulence Models to Microfluidics*
- 2020 ASME Freeman Scholar: Alfredo Soldati, Institute of Fluid Mechanics and Heat Transfer, Vienna, Austria. *Modelling and Computation of Interfaces in Multiphase Turbulent Flows*
- Barton Smith, Mechanical and Aerospace Engineering, Utah State University. *The Effect of Baseball Seams on Pitches and Home Runs.*

Including plenaries from ICNMM

- Evelyn Wang, MIT. *Nanoengineered Materials and Thermal Engineering for Advanced Energy and Water Technologies*
- Satish Kandlikar, Rochester Institute of Technology. *Can Infrared Imaging Improve Breast Cancer Detection?*
- Adrian Bejan, Duke University. *Evolutionary Design and Freedom.*

Our conference is organized around our technical committees: Fluid Applications and Systems, Fluid Measurement and Instrumentation, Fluid Mechanics, Multiphase Flow, Computational Fluid Dynamics, and Micro-Nano Fluid Dynamics. This year the program includes 30 keynote speakers who will introduce topics and provide insight regarding research direction in that area. Our Awards Program will recognize Best-Papers, Flow-Visualization, and Graduate-Student Scholars and Returning Scholars. You are invited to participate in our Towne Hall Meeting where we provide an update of the direction FED is pursuing and to join and participate in our committee meetings to network and help organize our future conferences. For FEDSM2020 we especially thank our 125 topic organizers and co-organizers who make FEDSM2020 possible by inviting presenters, organizing sessions and reviewing papers.

We very much look forward to interesting and though provoking cutting edge presentations, panels, and discussions as well as networking and meeting virtually and feel sure this will be a rewarding and exciting meeting. See you soon!

FEDSM2020 Conference Chair
Judith Ann Bamberger, FASME

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Day 1 - Monday, July 13 - Eastern Daylight Time						
TECHNICAL APPLICATIONS (Session Room)						
10:00	10:10	**Welcome - Tom Costabile, Introduces Judith Bamberger**				
10:10	10:15	**Moderator - Judith Bamberger, Fluids Engineering Division Summer Meeting, Chair**				
10:15	10:30	Keynote 1.1	Shankar	Mahalingam	A Computational and Experimental Investigation of Fire Behavior Within and Around Isolated and Groups of Shrubs	The University of Alabama in Huntsville
10:30	10:45	Keynote 1.2	Michael	Sprague	Exawind Open-Source Computational Fluid Dynamics for Wind Turbines and Wind Farms	National Renewable Energy Laboratory
10:45	11:00	Keynote 1.3	Martin	Wosnik	Wind Turbine Wake Physics and Wind Farm Fluid Dynamics	University of New Hampshire
11:00	11:15	Keynote 1.4	Mehrdad	Zangeneh	Multi-Objective, Multi-Disciplinary Inverse Design Based Automatic Optimization of Turbomachinery	University College London
11:15	11:30	Keynote 1.5	Svetlana	Boriskina	Meso-scale Fabric Engineering for Passive Cooling via Conduction, Radiation, and Evaporation	Ph.D Massachusetts Institute of Technology
11:30	11:45	Keynote 1.6	Hans Josef	Dohmen	Supercritical Carbon Dioxide in Energy Systems	University of Duisburg-Essen
11:45	11:55	Q&A				
11:55	12:05	Break				
INFRARED IMAGING (Session Room)						
12:05	12:10	**Moderator - Zhongquan Zheng, Fluids Engineering Summer Meeting, Chair**				
12:10	12:45	Plenary 1.1	Satish Pradyumna	Kandlikar Phatak	ICNMM Can Infrared Imaging Improve Breast Cancer Detection?	Professor of Mechanical Engineering at Rochester Institute of Technology Chief of Medical Oncology and Hematology at the Rochester General Hospital
12:45	12:55	Q&A				
12:55	1:05	Break				

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CHANNELS (Session Room)						
1:05	1:10	**Moderator, Norbert Kockmann, Prof. Dr.-Ing International Conference on Nanochannels, Microchannels, and Minichannels**				
1:10	1:25	Keynote 2.1	Keisha	Walters	Examining Impacts of Nano- and Micro-Structures on Macro-Scale Fluid Rheology in Complex Fluids	University of Oklahoma
1:25	1:40	Keynote 2.2	Jiangtao	Cheng	Governing Mechanisms and Mathematical Description of Nanoscale Transport of Interfacial Liquids on a Solid Surface	Virginia Tech
1:40	1:55	Keynote 2.3	Hugh	Fan	Microfluidic Devices for Isolating Circulating Tumor Cells From Clinical Samples	University of Florida
1:55	2:10	Keynote 2.4	Ram	Mohan	Compact Multiphase Separation Technology – From the Lab to the Field	University of Tulsa
2:10	2:25	Keynote 2.5	Gherhardt	Ribatski	Thermohydraulic Performance of a Polymer-Matrix Composite Heat Sink Based on Convective Boiling in Microchannels	Ph.D University of São Paulo, Brazil
2:25	2:35	Q&A				
2:35	2:55	Break				

SOLID-FLUID INTERACTIONS						
2:55	3:00	**Moderator, Raj Manglik, Summer Heat Transfer Conference**				
3:00	3:40	Plenary 2.1	Webb	Marner	HT Heat Transfer (1919-2019): The Contributions of Boelter and McAdams.	UCLA School of Engineering and Applied Science
3:40	4:20	Plenary 2.2	Barton	Smith	FED The Effect of Baseball Seams on Pitches and Home Runs	Utah State University
4:20	4:30	Q&A				
4:30	5:00	**Welcome Reception & Networking**				

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Day 2 - Tuesday, July 14 - Eastern Daylight Time						
MULTIPHASE (Session Room)						
10:00	10:05	**Welcome**				
10:05	10:10	**Moderator, Patricia Weisensee, International Conference on Nanochannels, Microchannels, and Minichannels, Co-Chair**				
10:10	10:25	Keynote 3.1	Joseph	Katz	On the Breakup and Transport of Crude Oil by Surface Waves and Subsurface Plumes	Johns Hopkins University
10:25	10:40	Keynote 3.2	Jonathan	Boreyko	Bridging the Gap: From Jumping Droplets to Jumping Frost	Ph.D Virginia Polytechnic Institute
10:40	10:55	Keynote 3.3	Danesh	Tafti	Fluid Forces in Spherical and Non-Spherical Particle Assemblies	Virginia Tech
10:55	11:10	Keynote 3.4	Siamack	Shirazi	Wonderful World of Solid Particle Erosion Testing and Modeling	University of Tulsa
11:10	11:25	Keynote 3.5	Xianming Simon	Dai	Bioinspired Surfaces for Sustainable Water Harvesting	Ph.D University of Texas at Dallas
11:25	11:35	Q&A				
11:35	11:45	Break				

MULTI-PHASE PHENOMENA						
11:45	11:50	**Moderator - Judith Bamberger, Fluids Engineering Division Summer Meeting, Chair**				
11:50	12:25	Plenary 3.1	Ryoichi S	Amano	FED ASME 2020 Henry R. Worthington Medal Recipient How Can We Reduce Cavitation in Hydro Machines?	Director of Industrial Assessment Center University of Wisconsin Milwaukee
12:25	1:00	Plenary 3.2	Alfredo	Soldati	FED ASME 2020 Freeman Scholar What Can Numerical Simulations Tell Us About Turbulent Flows With Drops and Bubbles?	Institute of Fluid Mechanics and Heat Transfer, Vienna, Austria
1:00	1:15	Q&A				
1:15	1:25	Break				

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CFD and MODELING (Session Room)						
1:25	1:30	**Moderator, John Maulbetsch, Summer Heat Transfer Conference, Chair**				
1:30	1:45	Keynote 4.1	Keith	Walters	A Primer on Dynamic Hybrid Rans-Les	University of Oklahoma
1:45	2:00	Keynote 4.2	Gocha	Chochua	Application of CFD for Multi-Physics Virtual V&V Tests, Multi-Disciplinary Design Optimization, and Digital Transformation	Schlumberger
2:00	2:15	Keynote 4.3	Marcus	Herrmann	Numerical Methods for Atomization in High Speed Compressible Flows	Arizona State University
2:15	2:30	Keynote 4.4	Prashant	Khare	Turbulent Combustion of Liquid Fuels: High-Fidelity Les Modeling and Machine Learning Based Design Space Exploration	University of Cincinnati
2:30	2:45	Keynote 4.5	Dustin	House	Cad Repair and Thermal-Fluidic Cooling Model of a Vacuum Sub-System Within an Analyzer for Clinical Diagnostics	Abbott Laboratories
2:45	2:55	Q&A				
2:55	3:05	Break				
TBD (Session Room)						
3:05	3:10	**Moderator, Masahiro Kawaji, AiChE**				
3:10	3:45	Plenary 4.1	Adrian	Bejan Ph.D	ICNMM Evolutionary Design with Freedom	J.A. Jones Distinguished Professor of Mechanical Engineering at Duke University
3:45	4:20	Plenary 4.2	Francis	Kulacki	Boiling of Dilute Emulsions: Mechanisms and Applications.	University of Minnesota
4:20	4:30	Q&A				
4:30	5:00	**Conference Networking**				


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Day 3 - Wednesday, July 15 - Eastern Daylight Time						
MEASUREMENTS / FUNDAMENTALS (Session Room)						
10:00	10:05	**Welcome**				
10:05	10:10	**Moderator, Kevin Anderson, Fluids Engineering Division Summer Meeting**				
10:10	10:25	Keynote 5.1	Joel	Park	Theory of Uncertainty Analysis With Application to Naval Hydrodynamics	Naval Surface Warfare Center Carderock Division
10:25	10:40	Keynote 5.2	Theodore J.	Heindel	Noninvasive Measurements in Multiphase Flows Using X-Rays	Iowa State University
10:40	10:55	Keynote 5.3	Eduardo	Divo	A Model-Integrated Meshless Solver (Mims) for Large-Scale Conjugate Heat Transfer Problems	Daytona College of Engineering at Embry-Riddle Aeronautical University
10:55	11:10	Keynote 5.4	Wei	Li	Experimental Study of Evaporation Frictonal Pressure Drop in Horizontal Enhanced Tube	Zhejiang University
11:10	11:25	Keynote 5.5	Kamran	Siddiqui	Turbulent Flow Structure in Mixed-Convection Flow Regime	University of Western Ontario
11:25	11:35	Q&A				
11:35	11:45	Break				
MICROSCALE THERMAL-FLUID ENGINEERING						
11:45	11:50	**Moderator, Amy Betz, International Conference on Nanochannels, Microchannels, and Minichannels**				
11:50	12:25	Plenary 5.1	Nadine	Aubry	FED ASME 2018 Fluids Engineering Award From Reduced Turbulence Models to Microfluidics	Provost and Senior Vice President, Professor of Mechanical Engineering, Tufts University
12:25	1:00	Plenary 5.2	Evelyn	Wang Ph.D	ICNMM Nanoengineered Materials and Thermal Engineering for Advanced Energy and Water Technologies	Professor and Department Head in the Mechanical Engineering Department at MIT
1:00	1:15	Q&A				
1:15	1:25	Break				

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FUNDAMENTALS (Session Room)						
1:25	1:30	**Moderator, Yuri Muzychka, ICNMM International Conference on Nanochannels, Microchannels, and Minichannels, Chair**				
1:30	1:45	Keynote 6.1	S.A.	Sherif	Review of the Pedagogy of Undergraduate Fluid Mechanics	University of Florida
1:45	2:00	Keynote 6.2	Corin	Segal	Fuel-Air Mixing in a High-Speed Flows	University of Florida
2:00	2:15	Keynote 6.3	Ramin	Golestanian	Emergent Behaviour in Active Fluids	Max Planck Institute for Dynamics and Self-Organization
2:15	2:30	Keynote 6.4	Konrad	Rylaczewski	Fundamentals and Applications of Soft Heat Exchangers	Ph.D Arizona State University
2:30	2:45	Keynote 6.5	Saeed	Moghaddam	Deciphering the Physics of Critical Heat Flux (CHF) – Towards a Universal Model	Ph.D University of Florida
2:45	2:55	Q&A				
2:55	3:05	Break				
CAREER PATHS FOR STUDENTS & EARLY CAREER ENGINEERS (Session Room)						
3:05	3:10	**Moderator, Columbia Mishra, Heat Transfer, Co-Chair**				
3:10	3:25	Panelist 6.1	Jayathi Y.	Murthy	Ronald and Valerie Sugar Dean, Henry Samueli School of Engineering and Applied Science, UCLA (Formerly in FLUENT (Startup)	UCLA Henry Samueli School of Engineering and Applied Science
3:25	3:40	Panelist 6.2	Ankur	Jain	Associate Professor, The University of Texas at Arlington (Formerly in Industry: 2006-2012: Freescale/AMD/Molecular Imprints)	University of Texas, Arlington
3:40	3:55	Panelist 6.3	Marianne	Francois	Research & Development Manager, Los Alamos National Labs	Los Alamos National Laboratory
3:55	4:10	Panelist 6.4	Ravi	Prasher	Associate Lab Director, Energy Technologies Area Office, Lawrence Berkeley National Labs/ Former VP, Sheetak Inc. (Startup)/ Intel (1999-2010)	Lawrence Berkeley National Laboratory (Berkeley Lab)
4:10	4:30	Q&A				
4:30	5:00	**Awards HT, FED, ICNMM**				

Thank You
For Your Participation At
SHTC-ICNMM-FEDSM 2020