Conference Program

ASTFE

8TH THERMAL AND FLUIDS ENGINEERING CONFERENCE (HYBRID)

March 26-29, 2023

www.astfe.org/tfec2023/

Preface

The 2023 American Society of Thermal and Fluids Engineers (ASTFE) Conference (Hybrid) will be held on March, 26-29, 2023 partially online virtual and in person at University of Maryland, College Park, MD, USA. ASTFE is the premier international society by and for professionals within the thermal and fluids science and engineering community. The 2023 ASTFE conference, TFEC 2023 provides an international forum for the dissemination of the latest research and knowledge in the thermal and fluid sciences.

Authors are invited to submit abstracts covering, but not limited to, the following areas:

- Advanced Energy Systems
- Aerospace Applications
- Atomization
- Combustion, Fire and Fuels
- Computational Methods/Tools in Thermal-Fluid Systems
- Cryogenics
- Electric, Magnetic, Flow and Thermal Phenomena in Micro and Nano-Scale Systems
- Energy and Sustainability
- Energy Storage Systems
- Energy-Water-Food Nexus
- Engineering Equipment and Environmental Systems
- Engineering Fundamentals and Methodology
- Experimental Methods/Tools and Instrumentation in Fluid Mechanics and Heat/Mass Transfer
- Flow and Heat Transfer in Biological Systems
- Flow and Heat Transfer in Materials Processing Science and Manufacturing
- Flow in Internal Multiphase Flows
- Flow Instability
- Fluid Flow and Heat Transfer in Industrial and Commercial Processes
- Fluid Flow and Heat Transfer Multiphase Phenomena
- Fluid Measurements and Instrumentation
- Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids
- Fuel Cells
- Fundamentals in Fluid Flow and Heat/Mass and Momentum Transfer
- Heat Exchangers: Compact, Novel, Networks
- Heat Pipes
- Heat Pumps
- Heat/Mass Transfer Enhancement Techniques
- Industry Problems: CO_2 Capture
- Material Issues, Ceramics, Low Thermal Conductivity
- Measurement and Modeling of Environmental Flows
- Multiphase Flows
- Nano and Micro Fluids Applications
- Natural and Built Environments
- Plasma Physics and Engineering
- Refrigeration, Air Conditioning Systems, and Refrigerants
- Solar Energy Equipment and Processes
- Thermo-economic Analysis of Energy Systems
- Thermo-Fluid Education
- Transportation
- Turbulent Flows
- Wind Turbines Aerodynamics and Control

Organizing Committee

Samuel Graham
Conference Chair
University of Maryland
samuelg@umd.edu

Nesrin Ozalp
Conference Co-chair
Purdue University Northwest
nozalp@pnw.edu

Vikrant C. Aute
Conference Co-chair
University of Maryland
vikrant@umd.edu

Kevin R. Anderson
Technical Program Chair
Calif State Polytechnic Univ, Pomona
kranderson1@cpp.edu

M. Reza Shaeri
Technical Program Co-chair
Advanced Cooling Technologies, Inc.
mohammadreza.shaeri@1-act.com

Krishna Kota
Technical Program Co-chair
New Mexico State University (NMSU)
kkota@nmsu.edu

About ASTFE

The American Society of Thermal and Fluids Engineers **(ASTFE)** was established in July 2014 to promote the science and applications of thermal and fluids engineering and related disciplines.

ASTFE aims at providing opportunities to promote the dissemination of information and knowledge regarding thermal and fluids engineering, both nationally and internationally. It aligns itself with globally collaborative activities in the traditional areas of heat transfer and fluids engineering, as well as, in emerging areas such as those related to energy, environmental sustainability, manufacturing, thermal management, and micro- and nano-scale transport phenomena.

ASTFE encourages the personal and professional development of young scientists and engineers, and promotes cooperation with other engineering and technical societies to enhance interactions with industry, government agencies and the public at large. Of particular interest to the Society is the organization of conferences and workshops that bring together diverse groups in these fields.

American Society of Thermal and Fluids Engineers **(ASTFE)** is the U.S. nonprofit organization based in New York operating on web 2.0 IT platform to arrange professional communications, support conferences and professional communities. The organization is supported by individual contributors, private foundations and other governmental bodies. All contributions and donations are tax deductible. **ASTFE** supports Open Access movement.

News

"Executive Committee" formed by ASTFE

April 2022 — The American Society of Thermal and Fluids Engineers **(ASTFE)** has formed an Executive Committee (EC) to assist in leading the Society forward. Reporting to the **ASTFE** Board of Directors, the EC serves in a significant leadership role and aims to develop innovative approaches to advance thermal and fluid scientist and engineer engagement within the **ASTFE** community. The EC will work with **ASTFE** members to appoint conference organization committees, technical committees, and working groups. EC members will also collaborate with other societies on conferences and workshops and focus on enhancing **ASTFE** membership outreach and communication.

The inaugural members of the EC were nominated by the **ASTFE** Board of Directors and include **Prof. Wilson Chiu** (University of Connecticut), **Prof. Lorenzo Cremaschi** (Auburn University, EC-chair), **Prof. Jon Longtin** (Stony Brook University), **Prof. Nesrin Ozalp** (Purdue University Northwest) and **Prof. Ting Wang** (University of New Orleans).

If you are interested in having more information, or if you would like to get involved with **ASTFE** activities, please contact **Dr. Lorenzo Cremaschi** (email: lorenzo.cremaschi@auburn.edu).

Board of Directors

OFFICERS

President:
Yong Tao
Cleveland State University

Vice President:
Francine Battaglia
University at Buffalo

Managing Director:
Anastasia Paulsen
American Society of Thermal and Fluids Engineers (ASTFE)

Past President:
Yogesh Jaluria
The State University of New Jersey

MEMBERS AT LARGE

Michael Plesniak
The George Washington University

Sumanta Acharya
Illinois Institute of Technology

Vish Prasad
University of North Texas

S.A. Sherif
University of Florida

Wayne Strasser
Liberty University

James Klausner
Michigan State University

EXECUTIVE COMMITTEE

Lorenzo Cremaschi
Auburn University

Jon Longtin
Stony Brook University

Wilson K. S. Chiu
University of Connecticut

Nesrin Ozalp
Purdue University Northwest

Ting Wang
University of New Orleans

ADVISORY BOARD

John Lloyd
Michigan State University

Jinkook Lee
President Cryo Turbomachinery Consulting, LLC.

Stathis Michaelides
Texas Christian University

Gang Chen
Massachusetts Institute of Technology

James Liburdy
Oregon State University

Pamela Norris
The George Washington University

PUBLISHER

Yelena Shafeyeva
Begell House, Inc.

Thermal Fluids Engineering Award

A Thermal and Fluids Engineering Award has been established to recognize substantial contributions to thermal and fluids engineering. This is the part of the honors bestowed by the society on its members for their contributions.

2023 TFEC AWARD WINNER

Jacob Chung
University of Florida

ASTFE Early Career Researcher Award

2023 AWARD WINNER

Yi Zheng
Northeastern University

Fellowship

ELECTED ASTFE FELLOW 2023

Nesrin Ozalp
Purdue University Northwest

Vish Prasad
University of North Texas

Yong Tao
Cleveland State University

SA Sherif
University of Florida

Plenary Speakers

SREEKANT NARUMANCHI

Affiliation: National Renewable Energy Laboratory

Title: Advanced Power Electronics and Electric Machines for Electric-Drive Mobility Applications

Abstract: Electronics, power electronics, and electric machines are becoming important for an array of mobility/transportation, renewable energy and energy efficiency applications. In this presentation, I will provide an introduction to NREL and my Group. Then, I will describe some challenges and opportunities for power electronics, electric machines and electric drives for mobility applications in particular. After that, I will give a brief overview of my Group's research activities in these areas with focus on thermal management and reliability aspects.

Bio: Sreekant Narumanchi is the Group Manager of the Advanced Power Electronics and Electric Machines (APEEM) Group within the Center of Integrated Mobility Sciences at the National Renewable Energy Laboratory, where he is currently in his 18th year. He leads a Group of 15 researchers focused on electro-thermal, thermal-fluids, thermo-mechanical and reliability aspects of power electronics and electric machines. This includes investigation of various cooling technologies, thermal interface materials/interfaces, interconnects, as well as reliability of these components. His broad research interests include heat transfer, power electronics and electric machines thermal management, packaging and reliability. Over the years, his Group has collaborated with numerous institutions cutting across industry, universities, national labs, and other research institutions.

Sreekant is an ASME Fellow, an IEEE Senior Member, and has published over 90 peer-reviewed journal and conference papers and book chapters. Professionally, he is active as an Associate Editor for the ASME Journal of Electronic Packaging, as an organizer for InterPACK (Topic, Track Chair, Technical Program Co-Chair, Conference General Chair) and ITherm conferences, on the ASME K-16 Committee on Heat Transfer in Electronic Equipment, as Guest Editor of the IEEE Components, Packaging, and Manufacturing Technologies Journal, on the Thermal Working Group of the IEEE Heterogeneous Integration Roadmap Committee, serving on the Scientific Advisory Board of the POETS NSF Engineering Research Center, serving on the External Advisory Board of the Washington State University School of Mechanical and Materials Engineering, as well as a reviewer for numerous journals and federal agencies. He is also part of the Executive Committee of the ASME Electronic and Photonic Packaging Division.

Some of the external awards Sreekant has received include the 2022 THERMI Award, the 2020-21 Associate Editor of the Year Award from the ASME Journal of Electronic Packaging, 2018 ASME EPPD-K16 Clock Award, a 2016 R&D 100 Award, the Best Paper Award from the ASME Journal of Electronic Packaging (2003), and the ASME 2013 InterPACK Conference Outstanding Paper Award. Within NREL, he received the 2013 NREL Outstanding Business Collaboration Award, and the 2009 NREL Staff Award for Outstanding Performance. Sreekant received a Ph.D. from Carnegie Mellon University (2003), M.S. from Washington State University (1999), and B. Tech. from Indian Institute of Technology Kanpur (1997), all in Mechanical Engineering.

Monday — March 27, 2023
8:30 AM - 9:30 AM

Plenary Lecture at Colony Ballroom, 2nd floor

ADELA BEN-YAKAR

Affiliation: University of Texas, Austin

Title: Ultrafast Laser Surgery for Clinical Translation

Abstract: The precision of ultrafast laser surgery holds great promise to multiple biomedical applications in the clinic, ranging from spine surgeries to scarred vocal fold treatments with high precision. The recent efforts in the development of miniaturized ultrafast laser surgery probes bring us a step closer to clinical translation.

The spatial and thermal confinement of ultrafast lasers are the major distinguishing characteristic that enables control of very high precision ablations without damaging the out-of-focus matter. Nano- and micro-surgery applications primarily rely on plasma-mediated ablation. One of the major aims in ultrafast laser micro-surgeries for clinical applications is maximizing the material removal rate (MRR), while keeping thermal damage negligible. Research group of Professor Adela Ben-Yakar of University Texas at Austin has developed three generations of fiber-coupled ultrafast laser surgical probes for clinical applications in hard-to-reach areas in the body surgical probes.

Bio: Adela Ben-Yakar is Harry Kent Professor in the Mechanical and Biomedical Engineering Departments at the University of Texas at Austin. She received her Ph.D. from Stanford University (2000) and was a postdoc-

toral Fellow at Stanford and Harvard Universities in the Applied Physics Departments (2000-2004). Her research focuses on ultrafast optics, microscopy, and microfluidics for a broad range of biomedical applications. She holds several issued and pending patents, and published in high impact journals (Nature, Nature Methods, Nature Communications, Nano Letters). She is an SPIE, Optica, and AIMBE Fellow and the recipient of Fulbright, Zonta Amelia Earhart, NSF Career, Human Frontier Science Program Research, and NIH Director's Transformative Awards.

Tuesday — March 28, 2023
8:15 AM - 9:15 AM

Plenary Lecture at Colony ballroom, 2nd floor

REINHARD RADERMACHER

Affiliation: University of Maryland

Title: Thoughts on the Future of Heat Pumps and Their Heat Exchangers

Abstract: The renewed push for decarbonization of our energy infrastructure raised dramatically the awareness of and attention paid to heat pumps as an energy efficient and viable heating technology. But even without this huge opportunity the IEA already predicted that by 2050 the number of heat pumping systems in service will triple to 5+ billion units worldwide.

Traditional methods for heat pumping and refrigeration are around for over a century and are well understood, their implementation is routine, and many industry insiders see the technology as having limited improvement potential in the sense that we are in a period of diminishing returns.

This presentation explores the challenges and opportunities that need to be addressed to enable dramatic improvement on all aspects of the technology. Topics range from compressors to system integration and advanced cycles with a particular focus on heat exchanger integration. There is huge potential for new developments and breakthrough improvements in terms of cost, performance and implementation.

So, what does all this mean for the air-conditioning and heat pumping system in your life? It is quite likely that the air-conditioner in your backyard, may have a third of the weight of the current unit, and half its size while performing at the same or better level!

Bio: Reinhard Radermacher conducts research in heat transfer and working fluids for energy conversion systems - in particular heat pumps, air-conditioners, refrigeration systems, and integrated cooling heating and power systems. His work resulted in more than 600 publications, numerous invention records, and 16 patents. He has co-authored three books. His research includes the development of software for the design and optimization of heat pumps and air-conditioners, which is now in use at more than 80 companies worldwide. He has raised more than $44 million in research funding from government and industrial sponsors over the years. Dr. Radermacher holds a Ph.D. in physics and is Minta Martin Professor of Mechanical Engineering and director and co-founder of the Center for Environmental Energy Engineering. He was awarded the Institute of Refrigeration J&E Hall Gold Medal and the IIR Gustav Lorentzen Medal for his innovation in the field of refrigeration. He is a co-operating agent of the International Energy Agency's (IEA) HPT Annex 53 project. He is Fellow ASHRAE and holds memberships in ASME, SAE, DKV, and IIR. He is a lifetime member of IJR and ASHRAE and is CEO of Optimized Thermal Systems. For 17 years was the editor of the ASHRAE journal, Science and Technology for the Built Environment, and led the strategic planning committee for ASHRAE Research.

Wednesday — March 29, 2023
8:15 AM - 9:15 AM

Plenary Lecture at Colony Ballroom, 2nd floor

ASTFE-NSF IRES Project Student Poster Session

This session showcases student presenters who participated in the NSF-funded IRES Track III project focused on International Research Experience and Professional Development in Built Environment Sustainability. Administered by Louisiana State University in collaboration with ASTFE and the National University of Singapore, the project offers students the opportunity to conduct research in Singapore on various topics related to built environment sustainability after receiving training through the Center of Leadership Development in Built Environment Sustainability. The session will highlight the experiences of these students and their research findings.

Chairs: Yimin Zhu, *Louisiana State University*; Yong Tao, *Cleveland State University*
Co-Chairs: Vish Prasad, *University of North Texas*; Tyree Mitchell, *Louisiana State University*; Tracey Rizzuto, *Louisiana State University*
Speakers: Amanda Wojtasiak, *Florida International University*; Vishal Muralidharan, *Iowa State University*; Thomas Firsich, *Texas A&M University*; Richard Kimball, *Drexel University*; Zachary Colligan, *Washington State University*

Monday — March 27, 2023
3:15 PM - 4:45 PM at session 1I

Calvert, 2nd floor

Keynote Speakers

BASIL HASSAN

Affiliation: Sandia National Labs

Title: Role of Thermal and Fluids Technologies in Support of National Security and Energy Applications

Abstract: Sandia National Laboratories is a multi-program national laboratory run for the United States Department of Energy. While Sandia's roots hail from the Manhattan Project of the 1940's, the Laboratories have evolved into providing support for a wide variety of national security and energy related areas of interest to the Nation. This talk will review Sandia's history and highlight the role that Sandia plays in the development of state-of-the-art thermal and fluids capabilities that address a variety of engineering applications of national importance, including energy, homeland security, and defense.

Bio: Dr. Hassan is a native of Raleigh, North Carolina. He earned his bachelor's degree in 1988, his master's degree in 1990, and his Doctorate in Aerospace Engineering from North Carolina State University in 1993. He is currently the Director of the Chief Research Office and serves as Sandia's Deputy Chief Research Officer. In this role, Dr. Hassan leads Sandia's research strategy development including the execution of the Laboratory Directed Research and Development program and oversees Sandia's external partnership and technology transfer programs. Dr. Hassan has been employed at Sandia since 1993 and has managed all phases of research, development, and applications work. He has focused predominately on the thermal, fluid, and aero science technology areas helping Sandia to accomplish its national security mission.

Dr. Hassan has served in a variety of positions in research and development (R&D) in the areas of aerodynamics and aerothermodynamics of high-speed flight vehicles, drag reduction for low-speed ground transportation vehicles, and high- velocity oxygen fuel thermal sprays. He has overseen all aspects of engineering sciences R&D and applications work at Sandia. Most notably, he helped support National Aeronautics and Space Administration (NASA) in determining the cause of the Space Shuttle Columbia accident in 2003 and was part of the team that shutdown the Deepwater Horizon oil well after the explosion and spill in 2010.

Dr. Hassan is a Fellow of the American Institute of Aeronautics and Astronautics (AIAA) and serves on the Institute's Board of Trustees as the Immediate Past President (2022-2023). Previously, he served on AIAA's Board as Director and Vice President from 2008-2017, President-Elect from 2019-2020, and President from 2020-2022. He currently serves as the Chair of the AIAA Foundation Board of Trustees. In addition, Dr Hassan has served on several national review boards for the National Academies, NASA, DARPA, and Air Force Office of Scientific Research, and has participated as an external member of the NASA Engineering and Safety Center since 2004. Dr. Hassan currently serves on the North Carolina State University's Engineering Foundation Board and the Mechanical and Aerospace Engineering Educational Advisory Board and has served on similar boards for New Mexico State University, Texas A&M University, the University of Texas at Austin, the University of New Mexico, and the Georgia Institute of Technology. He was the 2008 recipient of the AIAA Sustained Service Award and a 2017 recipient of North Carolina State University's Distinguished Engineering Alumnus Award.

Monday — March 27, 2023
9:45 AM - 10:35 AM

Keynote Speech at Colony Ballroom, 2nd floor

CHRIS DAMES

Affiliation: UC Berkeley

Title: Overview of the Theory and Experimental Characterization of Heat Conduction in Highly Anisotropic Materials

Abstract: I will present a broad overview of the theory and experimental characterization of heat conduction in highly anisotropic materials, ranging from layered (e.g., graphite) to chain-like (e.g. highly-drawn polyethylene). Beginning with modeling, Neumann's principle relates the symmetries of a material's crystal unit cell to the symmetries of its thermal conductivity tensor used in the anisotropic form of Fourier's law. For highly anisotropic crystals, the concept of phonon focusing leads to useful intuitions about the crystal's minimum thermal conductivity as well as thermal boundary conductance. Effective-medium averaging rules for polycrystals made of randomly oriented anisotropic grains will also be discussed. Turning to experimental techniques, I will show several examples of how the geometry of the heat input and temperature measurement locations can be jointly adjusted to improve the measurement sensitivity to various components of a sample's unknown thermal conductivity tensor. This discussion will cover traditional techniques that use one heater and measure one temperature response at a time, like the electrothermal

"3 omega" and laser-based "FDTR" methods, as well as our more recent work developing a "structured illumination, thermal imaging" (SITI) method with thousands of pixels of optical heating and thermometry.

Bio: Chris Dames is Department Chair and Howard Penn Brown Professor of Mechanical Engineering at UC Berkeley, with a joint appointment at the Lawrence Berkeley National Laboratory in the Materials Science Division. His research focuses on fundamental aspects of the thermal sciences at the nanoscale and other challenging regimes. He earned his PhD from MIT in 2006 under Gang Chen, following a BS and MS (under Arun Majumdar) from UC Berkeley. Prof. Dames' recognitions include an NSF CAREER Award, DARPA Young Faculty Award, Viskanta Fellowship and heat transfer lectureship at Purdue University, and selection to the Faculty Leadership Academy at UC Berkeley.

Monday — March 27, 2023
10:45 AM - 11:35 AM

Keynote Speech at Colony Ballroom, 2nd floor

RODERICK JACKSON

Affiliation: National Renewable Energy Laboratory

Title: Smart Buildings and Neighborhoods Enabling a Sustainable Energy Future

Abstract: Residential and commercial buildings account for almost one-third of total global energy consumption worldwide. Recent IEA analysis has suggested that energy intensity in the buildings industry must decrease five times more quickly over the next 10 years than it did in the previous 5 years to reach targets in the Net Zero Emissions by 2050 Scenario. To achieve these aggressive goals, significant development and deployment of smart, connected, and efficient buildings and communities are required. Even more, these buildings and communities must synergistically interact in real time with the electric grid to provide demand flexibility that enables a more optimized, resilient, reliable, and affordable energy system. However, because significant energy inequities are persistent throughout the buildings sector, as a science and engineering community, we must prioritize a transition to a sustainable energy future where the benefits, as well as costs, are equitably distributed.

This talk will discuss smart building and neighborhood technologies and solutions that can enable a sustainable energy future for all communities. It will highlight current Department of Energy and national laboratory research, development, and deployment efforts that advance these clean energy goals. The talk will conclude by challenging the scientific community to look through a lens of equity that prioritizes an equitable distribution of benefits and costs for a sustainable energy future for all.

Bio: Dr. Roderick Jackson is the laboratory program manager for buildings research at NREL. He sets the strategic agenda for NREL's buildings portfolio, while working closely with senior laboratory management. The portfolio includes all research, development, and market implementation activities, which aim to improve the energy efficiency of building materials and practices. He also guides discussions with the U.S. Department of Energy (DOE) Building Technologies Office to expand research ranging from grid-interactive efficient buildings to mechanical and thermal properties of building materials. He helps identify industry partnership opportunities to advance building envelope and equipment technologies.

At NREL, Dr. Jackson was recognized as a Distinguished Member of Research Staff. In 2022, he received a Black Engineer of the Year Award (BEYA), recognized with a BEYA Professional Achievement in Government Award.

He is serving a three-year appointment to the American Council for an Energy-Efficient Economy (ACEEE) Research Advisory Board, which began in 2021. He has been a member of the American Society of Heating, Refrigerating and Air-Conditioning Engineers and has received several awards in his career, including the National GEM Consortium Alumni of the Year and Greater Knoxville Business Journal's 40 under 40. In 2022, he joined the board of directors for the Southwest Energy Efficiency Project (SWEEP).

Dr. Jackson came to NREL from Oak Ridge National Laboratory, where he was the group manager for Building Envelope Systems Research. He was on the forefront of connected communities research, leading an effort that established Alabama Power's Smart Neighborhood. Working with Southern Company and DOE, it was the first project in the southeastern United States to connect high-performance homes with a community microgrid, deploying a transactive microgrid approach.

Another of Dr. Jackson's notable industry accomplishments is a result of his role as the technical lead for the Additive Manufacturing Integrated Energy (AMIE) demonstration project at Oak Ridge National Laboratory. With his leadership, AMIE brought together experts from multiple research teams across the lab, 20 partners from industry, and DOE scientists to design, develop, and demonstrate a 3D-printed house that shares power wirelessly with a 3D-printed electric vehicle. The first-of-its-kind research was completed in just nine months.

Monday — March 27, 2023
11:45 AM - 12:35 PM

Keynote Speech at Colony Ballroom, 2nd floor

ROHINI BALA CHANDRAN

Affiliation: University of Michigan Ann Arbor

Title: Thermal Transport and Chemical Phenomena in Solar Reactors: Enabling Sun to Heat, Fuels and Nutrients

Abstract: Understanding transport phenomena — mass, momentum, energy, radiative intensity, and charge — and chemical reactions is crucial to boost the performance of a host of solar energy technologies. I will discuss our discoveries and knowledge gained from thermal transport models and measurements for two applications: (a) particle-based concentrated solar power and (b) (photo)electrochemical hydrogen production and nutrient recovery. For the first application, low-cost ceramic particles are leading contenders as heat-transfer and thermal storage media for the next generation of concentrated solar power plants. My group's focus has been to understand, predict and manipulate radiative and multimode heat transfer in granular flows with these particles. We have developed unique modeling capabilities that combine data-driven radiative transport models with Lagrangian particle tracking to capture the flow behavior. This framework gives us unparalleled capabilities to probe materials—morphology—flow—radiation coupling in these systems. To further quantify multimode heat-transfer behavior, we measure high-temperature radiative material properties and leverage this knowledge to perform operando and non-contact thermal measurements for granular flows. For the second application, I will highlight a unique framework developed to model the effects of competing electron-transfer reactions in Z-scheme photocatalytic systems for solar hydrogen production. For this application, we have also identified a powerful strategy to achieve selective reaction interfaces by controlling mass transport of aqueous ions to reaction sites. Finally, I will touch on some recent work where we propose and analyze a new solar-driven approach to transform wastewater nitrates to ammonia to recover nitrogen nutrients. Collectively, these innovations can inform new and improved materials and reactor design/operation for solar to heat, fuel, and nutrient technologies.

Bio: Rohini Bala Chandran is an Assistant Professor in Mechanical Engineering at the University of Michigan since January 2018. Previously, she was a postdoctoral research fellow at Lawrence Berkeley National Lab and obtained an M.S. (2010) and Ph.D. (2015) from the University of Minnesota, Twin Cities, in Mechanical Engineering. At Michigan, Prof. Bala Chandran leads the Transport and Reaction Engineering for Sustainable Energy Lab (TREE Lab) to pursue multidisciplinary research in the areas of thermal and fluid sciences, multiscale computational modeling, electrochemical engineering, and semiconductor physics.

Dr. Bala Chandran is a recipient of the NSF-CAREER award (2022), a Doctoral New Investigator award from the American Chemical Society Petroleum Research Fund (2021), and one of 100 selected attendees at the US Frontiers of Engineering meeting organized by the National Academy of Engineering (2020). Research in her group has been funded by the US Advanced Research Projects Agency – Energy (ARPA-E), US Department of Energy Solar Energy Technologies Office (DOE-SETO) and the Fuel Cell Technologies Office (DOE-FCTO), and startup funding from the University of Michigan, Ann Arbor.

Tuesday — March 28, 2023
9:30 AM - 10:20 AM

Keynote Speech at Colony Ballroom, 2nd floor

PATRICK E. HOPKINS

Affiliation: University of Virginia

Title: Coupled Heat Transfer Processes of Materials in Extreme Environments

Abstract: The heat transfer processes in materials when subjected to extreme heat fluxes, electromagnetic fields, oxidizing species, and ion irradiation play the critical role in the performance and efficacy in a wide range of materials and technologies, from nano-to-macro scales. In these environments, the large perturbations in energy density imparted on materials lead to coupled thermal transport processes that play a major role in thermal dissipation and management. For example, the high temperatures and power fluxes typical in hypersonic flight and jet engines can lead to coupled radiative and conductive processes that are critical to enhance for leading edge cooling or restrict for thermal barriers of turbine blades, respectively. At surfaces and interfaces, coupled processes also dictate thermal resistances on the nanoscale. As another example, nonequilibrium thermal processes induced by plasma or short pulsed irradiation of materials are critical for manufacturing, catalysis and material synthesis.

Clearly, coupled thermal transport processes dictate the thermal transport of materials ranging from nano-to-macro scales in extreme environments. In this talk, I will discuss our recent research efforts in developing experimental metrologies to measure the heat transfer processes of materials and across interfaces when subjected to thermal and environmental fluxes typical in extreme environments, from nanoscales to macroscales and picoseconds to seconds. I will focus on the following directions:

-Measuring the thermal conductivity and emissivity of materials up through their melting point: Derived from our recently developed Steady-State Thermoreflectance (SSTR) technique, we have developed a method to simultaneously measure the thermal conductivity, hemispherical emissivity and melting temperature of materials up to 4,000 K. We demonstrate this on W and Mo standards, and extend these measurements to a novel high entropy carbide of interest for hypersonic applications, demonstrating the near-record setting melting temperature of this high entropy ceramic.

-Thermal transport at surfaces during plasma irradiation and "plasma cooling": Using thermoreflectance-based metrologies, we measure the temperature change on the surface of a metal irradiated with a plasma flux. The complex plasma environment consisting of high energy photons, ions, and neutrals leads to a transiently varying source of energy during the plasma irradiation. We show the possibility of "plasma cool-

ing", in which the initial flux of energy delivered by a plasma, which is primarily photonic, leads to a transient evaporative cooling-like effect that results in a transient temperature drop at a surface. This cooling effect is followed by subsequent heating when the sluggish heavy particles in the plasma impart their energy to the material.

-Electron-phonon nonequilibrium at interfaces for mid-IR plasmonics and polaritonics: Ultrafast laser pulses give rise to extreme conditions of non-equilibrium between the electrons and phonons in a material, often resulting in thousands of degrees in the temperature difference between these two thermal systems. At interfaces, differences in photon-electron-phonon coupling can lead to the emergence of a novel process, "Ballistic Thermal Injection" (BTI), in which nonequilibrium electrons can deposit their excess energy across an interface without the net flow of charge. We show that BTI can be used to unidirectionally control heat flow across interfaces (i.e., a transient thermal diode effect), and lead to thermally driven control of plasmon and phonon-polariton absorption in the mid-IR, paving the wave for novel method to control mid-IR responses of materials with heat.

Bio: Patrick E. Hopkins is a Professor in Department of Mechanical and Aerospace Engineering at the University of Virginia, with courtesy appointments in the Department of Materials Science and Engineering and the Department of Physics. Patrick received his Ph.D. in Mechanical and Aerospace Engineering at the University of Virginia in 2008 under the mentorship of Professor Pamela Norris. After his Ph.D., Patrick was one of two researchers in the nation to receive a Truman Fellowship from Sandia National Laboratories in 2008, working under the mentorship of Dr. Leslie Phinney. In 2011, Patrick returned to the University of Virginia and joined the faculty. Patrick's current research interest are in energy transport, charge flow, laser-chemical processes and photonic interactions with condensed matter, soft materials, liquids, vapors and their interfaces. Patrick's group at the University of Virginia uses various optical thermometry-based experiments to measure the thermal conductivity, thermal boundary conductance, emissivity, thermal accommodation, strain propagation and sound speed, and coupled electron, phonon, and photon mechanisms in a wide array of bulk materials and nanosystems. In 2021, Patrick co-founded Laser Thermal, Inc., a company based in Charlottesville Virginia that is commercializing thermal conductivity measurement systems that provide non-contact, automated metrologies for thermal properties of thin films, coatings and bulk materials.

In the general fields of nanoscale heat transfer, laser interactions with matter, and energy transport, storage and capture, Patrick has authored or co-authored over 285 technical papers (peer reviewed) and been awarded 5 patents focused on materials, energy and laser metrology for measuring thermal properties. Patrick has been recognized for his accomplishments in these fields via AFOSR and ONR Young Investigator Awards, the ASME Bergles-Rohsenhow Young Investigator Award in Heat Transfer, and a Presidential Early Career Award for Scientists and Engineering (PECASE). Patrick is a fellow of ASME and was recently awarded the ASME Gustus L. Larson Memorial Award. During 2021-2022, Patrick was awarded a Humboldt Fellowship to work on laser thermometry of materials in extreme environments at the Joint Research Center in Karlsruhe, Germany.

Tuesday — March 28, 2023
10:30 AM -11:20 AM

Keynote Speech at Colony Ballroom, 2nd floor

ANKUR JAIN

Affiliation: University of Texas at Arlington

Title: Thermal Transport in Li-ion Batteries

Abstract: Li-ion cells offer high-efficiency electrochemical energy storage, and therefore, may play a central role in meeting the energy challenges of the future such as storage of renewable energy and electric vehicles. Li-ion cells pose several interesting scientific questions related to thermal and fluid transport that directly affect their performance and safety. Understanding and optimizing the nature of multiscale heat transfer in Li-ion cell materials, components and systems remains a critical challenge.

This talk will summarize ongoing experimental and theoretical research on thermal transport in Li-ion cells. Multiscale thermal conduction measurements that identify poor thermal transport across the cathode-separator interface as the fundamental root cause of the low thermal conductivity of Li-ion cells will be discussed. A molecular bridging technique that improves this interfacial thermal transport by 4X will be discussed. System-level multiphysics simulations that model and predict the highly non-linear thermal runaway phenomenon in a battery pack will be discussed. Finally, motivated by thermal runaway in Li-ion cells, stability analysis of multilayer diffusion-reaction problems will be discussed. Key outcomes of this theoretical work include derivation of a new non-dimensional number to predict the occurrence of thermal runaway, and analysis of the existence of multiple but finite number of imaginary eigenvalues in such problems.

Bio: Ankur Jain is an Associate Professor in the Mechanical and Aerospace Engineering Department at the University of Texas, Arlington. His research interests include energy conversion in Li-ion batteries, additive manufacturing, electrochemistry and theoretical heat/mass transfer. He has published 118 journal papers, and given over 62 invited talks, seminars and tutorials. His research has helped better understand key thermal transport processes in battery materials and during polymer additive manufacturing. He has also helped develop new analytical techniques for heat/mass diffusion and convection problems, including the concept of imaginary eigenvalues in certain multilayer problems. He received the UT Arlington President's Award for Excellence in Teaching (2022), UT Arlington College of Engineering Lockheed Martin Excellence in Teaching Award (2018), UT Arlington College of Engineering Outstanding Early Career Award (2017), NSF CAREER Award (2016) and the ASME EPP Division Young Engineer of the Year Award (2013). He received his Ph.D. (2007) and M.S. (2003) in Mechanical Engineering from Stanford University, where he received the Stanford Graduate Fellowship, and B.Tech. (2001) in Mechanical Engineering from Indian Institute of Technology, Delhi with top honors.

Tuesday — March 28, 2023
11:30 AM - 12:20 PM

Keynote Speech at Colony Ballroom, 2nd floor

DEVESH RANJAN

Affiliation: Georgia Tech

Title: Turbulent Mixing in Shock-Driven Variable-Density Flow—From Supernova Explosion to Fusion System

Abstract: Mixing is central to several important phenomena in nature and engineering. Rayleigh-Taylor (RT) and Richtmyer-Meshkov (RM) driven wrinkles at the interface of materials lie at the heart of an overarching science for material mixing that stretches from oil trapping salt domes, that develop over tens of millions of years, to degradation of Inertial Confinement Fusion (ICF) capsule performance in 10 -12 ns. RT and RM are insidious instabilities that start with exponential growth (power-law function of time for RM) of small-scale perturbations, and end in a fully turbulent mixing process. Shock tube experiments allow us to explore the effects of Mach number and initial conditions on unsteady variable-density mixing. I will describe here the results from recent experiments which quantifies the effect of initial conditions on the transition to turbulence in RMI driven flows The evolving density and velocity fields are measured simultaneously using high spatial resolution planar laser-induced fluorescence (PLIF) and particle image velocimetry (PIV) techniques. For the first time, we have acquired simultaneous PIV-PLIF measurements at 60KHz in such a transient flow system. Density, velocity, and density–velocity cross-statistics are calculated using ensemble averaging to investigate the effects of additional modes on the mixing and turbulence quantities. The density and velocity data show that a distinct memory of the initial conditions is maintained in the flow before interaction with reshock.

Bio: Devesh Ranjan is the Eugene C. Gwaltney Jr. School Chair in the Woodruff School of Mechanical Engineering at Georgia Institute of Technology. Ranjan joined the faculty at Georgia Tech in 2014. Ranjan also served as Interim Vice-President for Interdisciplinary Research (Feb 2021-June 2021) at Georgia Tech. Before coming to Georgia Tech, he was a director's research fellow at Los Alamos National Laboratory (2008) and Morris E Foster Assistant Professor in the Mechanical Engineering department at Texas A&M University (2009-2014). He earned a bachelor's degree from the NIT-Trichy (India) in 2003, and master's and Ph.D. degrees from the UW-Madison in 2005 and 2007 respectively, all in mechanical engineering.

Ranjan's research focuses on the interdisciplinary area of power conversion, complex fluid flows involving shock and hydrodynamic instabilities, and the turbulent mixing of materials in extreme conditions, such as supersonic and hypersonic flows. Ranjan is a Fellow of the American Society of Mechanical Engineers (ASME), and has received numerous awards for his scientific contributions, including the DOE-Early Career Award (first GT recipient), the NSF CAREER Award, and the US AFOSR Young Investigator award. He was invited to participate in the National Academy of Engineering's 2016 US Frontiers in Engineering Symposium. At Georgia Tech, Ranjan served as a Provost's Teaching and Learning Fellow (PTLF) from 2018-2020, and was named 2021 Governor's Teaching Fellow. He was also named Diversity, Equity and Inclusion (DEI) Fellow for 2020-21.

Wednesday — March 29, 2023
9:30 AM - 10:20 AM

Keynote Speech at Colony Ballroom, 2nd floor

MICHAEL OHADI

Affiliation: University of Maryland

Title: Next Generation Heat Exchangers for Sustainable Decarbonization/Electrification of Energy Conversion Systems

Abstract: Heat exchangers are critical to efficient thermal energy exchange in numerous industrial applications and everyday life, with significant applications in building energy systems, transportation, petrochemical processing, electricity generation, waste heat recovery, among others. Meanwhile, the urgent need for substantial reducing/elimination of CO2 and other greenhouse gases is now a global high priority across industries and at all levels. Decarbonization of energy conversion systems through technologies such as energy efficiency, electrification, renewable energy and/or carbon neutral fuels requires novel technologies that may not exist today. Of particular interest are heat exchangers that are light and compact offering reduction of size, weight, and power consumption, and ultimately the cost (SWAP-C) for wide-spread next-generation high efficiency and light energy conversion systems. This presentation will offer a review of recent progress, a vision on future needs for select key energy conversion processes, and the respective research gaps, challenges, and opportunities.

Bio: MICHAEL OHADI is the Minta Martin Professor of Mechanical Engineering at the University of Maryland, College Park. Ohadi's research has involved active and passive process intensification of fluid/thermal processes utilizing multi-scale design optimization, materials, and manufacturing techniques. In 1991 Prof. Ohadi co-founded the Center for Environmental Energy Engineering (CEEE) to advance innovative solutions in support of energy efficiency and carbon emission reduction. For more than 25 years he has led an industrial consortium in Advanced Heat Exchangers and Process Intensification techniques within the CEEE, with member companies from the U.S., Europe, and Asia. From 2016 to 2020, Ohadi served as Program Director (PD) at the U.S. Department of Energy, Advanced Research Project Agency-energy (ARPAE) where he led the development of programs in advanced heat exchangers and energy conversion systems, and lightweight and ultra-efficient electric motors, drives, and associated thermal management systems. Prof. Ohadi is a Fellow of the American Society of Mechanical Engineers (ASME) and the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE). He has published more than 300 peer reviewed technical articles in his fields of expertise.

Wednesday — March 29, 2023
10:30 AM - 11:20 AM

Keynote Speech at Colony Ballroom, 2nd floor

ALEXANDER RATTNER

Affiliation: Penn State

Title: Thermal Engineering to Enable Advanced Spacecraft Power Generation Technologies

Abstract: Historically, spacecraft have operated with relatively low power density sources, such as solar photovoltaics, electrochemical batteries, and radioisotope thermoelectric generators (RTGs). New mission concepts call for mass-efficient power solutions to operate in extreme environments, such as the cryogenic lunar night cycle or on the 470°C Venus surface. Emerging space power technologies, including nuclear fission lunar surface power (FSP) and nuclear electric propulsion (NEP) will operate at unprecedented power densities, requiring efficient and low mass heat rejection technologies. This presentation will share two collaborative projects aligned with these needs: (1) Development of alkali-metal chemical-fueled spacecraft power systems and (2) Demonstration of additively manufactured radiators with embedded heat pipe networks for mass-optimized high temperature heat rejection.

Alkali-metal fueled combustion spacecraft power systems: The Advanced Lithium-Powered Venus Explorer (ALIVE) lander concept would employ a combustion heat engine for power generation and refrigeration, enabling surface missions up to 120 hours. A key feature of this technology is that the Venus atmosphere (~95% CO2) spontaneously reacts with lithium at temperature, allowing in-situ resource utilization for the oxidizer. However, the underlying Li-CO2 batch reaction process has been poorly characterized. In this project, an experimental campaign was performed to quantify feasible reaction yields, system specific energy, and heat delivery temperatures. Based on these findings, matched heat engine and refrigeration cycles were identified. In collaboration with the NASA Jet Propulsion Laboratory, this concept is being extended to a self-contained Li-SF6 heat and power system for lunar night survival. Initial reactor designs have been experimentally assessed, and future efforts seek to couple these with high-efficiency free-piston Stirling converters.

Monolithic additively manufactured heat-pipe-radiators for high temperature heat rejection: Emerging spacecraft power and propulsion technologies require new solutions for high temperature radiative heat rejection. For example, the Kilopower liquid-metal cooled nuclear reactor will reject heat at 500 – 600 K; intensified free-piston Stirling engines could approach cold-side temperatures of 700 – 800 K. State-of-the-art radiators have been demonstrated based on Ti-H2O heat pipes bonded to metal panels at 400 K. However, new higher temperature concepts are sought that can avoid thermal stress failures at bond-interfaces and minimize mass.

In this collaborative project, we are exploring additively manufactured monolithic heat pipe radiators (HPRs). These HPRs can be produced from high temperature corrosion-resistant materials (e.g., Inconel, Monel, Ti) in a single additive process (e.g., powder-bed fusion) that forms vapor-flow passages, porous liquid-wicking structures, and fin sections. Embedded heat pipes would operate with high temperature phase-change fluids (e.g., pressurized H2O, alkali metals). This eliminates material interfaces and can achieve nearly isothermal surface temperatures with branching heat pipes. Progress will be shared on computational modeling and prototype fabrication. Initial artifacts have been tested in vacuum environments with heat input up to 508 K, validating this concept for thermal- and mass-efficient spacecraft heat rejection.

Bio: Alexander Rattner is an Associate Professor of Mechanical Engineering at Penn State University and the principal investigator of the Multiscale Thermal Fluids and Energy Lab. He received the 2016 Frederick A Howes Scholar award in computational science and an NSF CAREER grant (2017-2023). His research expertise includes waste heat recovery, absorption refrigeration, supercritical CO2 power cycles, spacecraft thermal management and power systems, and experimental and computational multiphase flow heat and mass transfer.

Wednesday — March 29, 2023
11:30 AM - 12:20 PM

Keynote Speech at Colony Ballroom, 2nd floor

SATISH KUMAR

Affiliation: Georgia Tech

Title: Thermal Management of Electric Machines for Sustainable Green Transportation

Abstract: Stringent greenhouse gas emission legislations have accelerated the need for the electrification of ground and air transportation. Since electric motors are one of the electric drivetrain's core components, improving their performance is a key enabler of better performance metrics. High heat generation in electric motors, especially at high power density, as a consequence of electromagnetic losses, limits motor efficiency and longevity by ultimate aging of the winding wire insulation and premature demagnetization of the magnets. Therefore, enhanced cooling technology is essential to increase motor power and torque density while keeping the peak winding temperature below the winding insulation temperature threshold. In this presentation, liquid cooling concepts to extract heat directly from the winding of electric motors will be discussed, which dramatically reduces the thermal resistances between the winding and the coolant, leading to significantly higher current density while operating within the thermal limit of materials employed in the electric motor.

Bio: Dr. Satish Kumar is currently a Professor at George W. Woodruff School of Mechanical Engineering at Georgia Tech. Prior to joining Georgia Tech in 2009 as an Assistant Professor, he worked at IBM Corporation, where he was responsible for the thermal management of electronic devices. Kumar received his Ph.D. in Mechanical Engineering and M.S. degree in Electrical and Computer Engineering from Purdue University, West Lafayette in 2007; and B.Tech. degree in Mechanical Engineering from the Indian Institute of Technology, Guwahati in 2001. His research interests include electro-thermal transport study in electronic devices and materials, e.g., wide band-gap devices, electric motors, etc. He is the author or co-author of over 150 journal or conference publications. Dr. Kumar is an ASME Fellow and recipient of the 2005 Purdue Research Foundation Fellowship, 2012 Summer Faculty Fellow from Air Force Research Lab, 2014 Sigma Xi Young Faculty Award, 2014 DARPA Young Faculty Award, 2017 Woodruff Faculty Fellow, and 2020 ASME K-16 Clock Award.

Wednesday — March 29, 2023
12:30 PM - 1:20 PM

Keynote Speech at Colony Ballroom, 2nd floor

Darrell W. Pepper Memorial Reception

Darrell Pepper, College of Engineering, University of Nevada, Las Vegas, NV, USA

Moderators: David Carrington, *Los Alamos National Laboratory;* Akshai Runchal, *President and Founding Partner, ACRi*

Darrell earned his degrees in Mechanical Engineering from the University of Missouri, Rolla where he received a Doctorate in Mechanical Engineering in 1973, a Master's degree in Aerospace Engineering 1970, and Bachelor of Science in Mechanical Engineering in 1968. Darrell was commissioned as 2nd Lt. US Army and from 1974 to 1976 was a Captain in the US Army Reserves.

Professor Pepper began teaching as an adjunct while working at E. I. DuPont de Nemours (1973). He taught at University of South Carolina, Georgia Institute of Technology, California State University and at UNLV (starting in 1992). Darrell served as Chairman of Mechanical Engineering Department for 6 years, and Interim Dean for the College of Engineering. Hel served on the ABET Engineering Accreditation Commission, where he was not only a member but also as Commissioner.

Darrell worked in many areas, mostly in computational methods and computer codes for solving fluid dynamics, heat transfer, propulsion, and environmental problems including working on the National Aerospace Plane Program where he gave briefing to President Reagan's Science Advisor on application of CFD for aerospace vehicle design.

Darrell's served as the ASME Congressional Fellow where he was senior advisor too Senator Feinstein's interacting with energy and natural resources Congressional committees and offices at DOE, DOD, EPA, NIST, NOAA, and NASA.

Darrell Pepper was an **Editor-in-Chief, Editor, and Associate Editor** of many of the heat transfer engineering journals.

Darrell Pepper has over 350 journal publications, over 150 reviewed conference proceedings. Dr. Pepper co-authored 4 textbooks on the Finite Element Method, a book on Indoor Air Pollution Modeling, and a book on Finite Element, Boundary Element, and Meshless Methods. Professor Pepper produced over 10 invited chapters ranging in subjects from hypersonic to environmental flow, to different numerical methods for solutions of heat and mass transfer.

Professor Pepper was recognized by his efforts; he received among many awards the following: **George Westinghouse Medal; AIAA Energy Systems Award; AIAA Sustained Service Award**; College of Engineering Distinguished Scholar Award; **Harry Reid Silver State Award; Elected** to Academy of Mechanical and Aerospace Engineers; **Eric Reissner Medal (ICCES); Tau Beta Pi** Distinguished Researcher; **Barrick Distinguished Scholar Award; Distinguished Scholar Award** College of Engineering; **Outstanding** Faculty Member, Regents of UCCSN; **Fellowship** National Science Foundation.

Professor Pepper was a consultant for over 20 companies and laboratories and participated in many organizations, including:

- Life Fellow of ASME
- Fellow of the Royal Aeronautical Society, FRAeS
- Associate Fellow AIAA
- Fellow of Wessex Institute of Technology

Tuesday — March 28, 2023
6:00 PM - 8:00 PM

Colony Ballroom, 2nd floor

TEC Talk Speakers

TECHNOLOGY I ENTREPRENEURSHIP I COMMUNICATION
FROM IDEA TO TECHNOLOGY TO PRODUCT

VICTOR CHIRIAC

Affiliation: Global Cooling Technology Group

Title: Advanced Cooling Solutions for Mobile and Compact Computing Devices

Abstract: The emergence of several new technologies, including mobile hyper-connectivity, advanced telecommunication avenues, Artificial Intelligence (AI), Internet of Things (IoT), cloud computing and big data requires higher performance, more data, faster processors! Heterogeneous Computing involves the central processing units (CPUs), the graphics processing units (GPUs), high speed interconnects and other elements that push forward the computing industry. The rise of 6G leads to a significant rise in mobile communication, IoT technology, providing the infrastructure needed to carry huge amounts of data, allowing for a smarter and more connected world. Advanced thermal management solutions are presented for the mobile computing devices of the future.

Bio: A fellow of the American Society of Mechanical Engineers (ASME) since 2014, Dr. Victor Adrian Chiriac is a co-founder and a managing partner with the Global Cooling Technology Group since 2019. He previously held technology/engineering leadership roles with Motorola (1999-2010), Qualcomm (2010 - 2018) and Futurewei USA (2018 - 2019). Delivered innovative R&D projects, implementing new methodologies and creating feature enhancements to ensure solutions align with corporate goals. Enthusiastic leader of cross-functional teams, providing direction on advanced thermal technologies used by consumers worldwide. Dr. Chiriac was elected Chair of the ASME K-16 Electronics Cooling Committee in 2016 and was elected the Arizona and New Mexico IMAPS Chapter President in 2010. He is a leading member of the organizing committees of ASME/InterPack, ASME/ IMECE and IEEE/CPMT ITherm Conferences. He holds 22 U.S. issued patents, 2 US Trade Secrets and 1 Defensive Publication and has published over 107 papers in scientific journals and at conferences.

Monday — March 27, 2023
2:00 PM - 3:00 PM

TEC Talk Session at Colony Ballroom, 2nd floor

OZAN ÖZDEMIR

Affiliation: Northeastern University

Title: Flexible Advanced Manufacturing Technologies for Industry 4.0 and the Role of Thermal-Fluids Sciences in Their Development

Abstract: Industry 4.0 requires flexible advanced manufacturing technologies and schemes that will realize a connected and distributed manufacturing infrastructure that will rapidly respond to national and global manufacturing needs with the use of artificial intelligence and machine learning. In manufacturing complex components, additive manufacturing (AM) technologies are ideal for their ability to rapidly configure a variety of products. Furthermore, AM systems can be equipped with sensory systems for data driven optimization, anomaly detection, and feeding data into AI and ML algorithms tied to local, state, and national cyber-physical manufacturing systems. However, the current state-of-the-art of an increasing number of AM methods and systems require nationally and globally accepted codes and standards from design to quality control that will increase confidence in the use of AM. Lack of such codes inhibit the wide adaptation of AM technology in producing load bearing components. Moreover, the large number of variables associated with AM processes creates challenges in standardization efforts. In addressing these challenges, physics and data informed process monitoring and control systems are expected to play a critical role. In this talk, Dr. Ozdemir discusses the role of thermal and fluids sciences in decoding AM process sensitivities and applying the knowledgebase to develop physics-informed quality control procedures with examples from Cold Spray Metal Additive Manufacturing.

Bio: Dr. Ozan Özdemir is an assistant professor in the Department of Mechanical and Industrial Engineering of Northeastern University (NU), and he is an all-around expert with a decade of experience in Cold Spray Additive Manufacturing (CSAM) and a background in multiphase high velocity flows. He has heavily focused on the design and optimization of CSAM processes for material deposition efficiency, manufacturing rates, and product quality. Dr. Özdemir's research is actively funded by the Department of Commerce, the Department of Energy, the Department of Defense, and Industrial Partners. His research has yielded numerous publications with over 400 citations in CSAM related topics and has co-edited and co-authored the textbook "Practical Cold Spray" (2021). Furthermore, he teaches Additive Manufacturing and advises Capstone Design students at Northeastern University. Dr. Özdemir is also an active member of the scientific and engineering community and serves as a member of the Training Committee of the ASM International Thermal Spray Society and the Secretary of ASM International Boston Chapter.

Monday — March 27, 2023
2:00 PM - 3:00 PM

TEC Talk Session at Colony Ballroom, 2nd floor

YOONJIN WON

Affiliation: University of California, Irvine

Title: Scientific Machine Learning Approaches for Two-Phase Heat Transfer

Abstract: Phase changes are a common occurrence in both nature and industry, from dew condensation on insects to water droplet harvesting and electronics cooling in data centers. Unveiling the thermofluidic principles behind these phase changes has been a long-standing challenge. Central to this understanding is the extraction of interpretable and rich datasets from dynamic and fast-moving liquid-vapor interfaces, represented as bubbles or droplets. Our research group aims to address this challenge by combining artificial intelligence, machine vision, data, and materials design to provide a comprehensive understanding of thermofluidic physics related to dynamic phase change processes. In this talk, we will showcase our key approaches related to autonomous feature extraction, physics-informed models, and their These approaches will provide a comprehensive understanding of two-phase heat transfer by enabling new scientific discoveries. The success of the proposed research will offer a blueprint for designing microstructures with targeted thermal management, even for heterogeneous and dynamic heating conditions, potentially leading to significant advances in phase change heat transfer.

Bio: Dr. Yoonjin Won is an Associate Professor of Mechanical and Aerospace Engineering at the University of California, Irvine. She has courtesy appointments in Electrical Engineering and Computer Science and Materials Science Engineering. Dr. Won's overarching research goal is to gain fundamental insights into nanoscale transport and interfacial physics, centering on key- words—AI for science, Graphic-driven physics, data-driven approach, and materials design. The research efforts aim to bring transformational efficiency enhancements in energy, water, manufacturing processes, and electronics cooling. Dr. Won is recognized with an NSF CAREER in 2018 and has also received several awards including the ASME EPPD Early Career Award 2018, The Emerging Innovation/Early Career Innovator of the Year 2020 from UCI Beall Innovation Center, ASME EPPD Women Engineer Award 2020, ASME ICNMM Outstanding Leadership Award 2019, UCI Samueli Career Development Fellowship, and numerous best paper and poster awards. She received a B.S. degree in Mechanical and Aerospace Engineering from Seoul National University, and M.S. and Ph.D. degrees in Mechanical Engineering from Stanford University.

Monday — March 27, 2023
2:00 PM - 3:00 PM

TEC Talk Session at Colony Ballroom, 2nd floor

SHANNON YEE

Affiliation: Georgia Tech

Title: Reinventing the Toilet: a Global Collaboration Turning an Infrastructure into an Appliance

Abstract: Indoor plumbing and sewer sanitation technologies have enabled healthy and productive lives for billions residing in developed nations. However, globally there are ~3.6B people without access to improved sanitation. This is largely because the infrastructure to provide connected sanitary sewers and centralized treatment facilities is too expensive for those living in poverty. For the last decade, the Bill & Melinda Gates Foundation has championed this global equity issue though the reinvent the toilet challenge (RTTC) initiative. Through this program, several success stories have emerged resulting in container-sized treatment systems that process waste at the community level. However, the single-user reinvented toilet (SURT) has remained elusive. This SURT essentially needs to do everything that a large container or centralized sewage treatment facility does, but within the space constraints of the toilet and washing machine. Additionally this must be accomplished at a cost that is acceptable to the world's poorest people. With that goal in mind, Prof. Shannon Yee leads the Generation 2 Reinvented Toilet (G2RT) program, where a global team of scientists and engineers are taking a second look at the reinventing the toilet solution space and integrating the best concepts developed across the RTTC program with the goal of realizing a low-cost SURT solution. Come and learn how this large global team is approaching the problem through international collaboration bringing expert engineering to bear to turn an infrastructure into an appliance.

Bio: Dr. Shannon Yee is an Associate Professor at the G.W.W. School of Mechanical Engineering at the Georgia Institute of Technology. Dr. Yee joined Georgia Tech in 2014 directly from his PhD at the University of California Berkeley. In the midst of his studies, he joined the US. Dept. of Energy's Advanced Research Projects Agency for Energy (ARPA-E) during its inaugural year as the first ARPA-E Fellow. Dr. Yee completed his MS in Nuclear Engineering in 2008 and his BS in Mechanical Engineering in 2007, both from The Ohio State University. In 2008, he was awarded a prestigious Hertz Fellowship. In 2015, Dr. Yee was selected for an AFOSR Young Investigator Award to develop polymer thermoelectrics. Dr. Yee is the recipient of the 2017 ASME Pi-Tau-Sigma Gold Medal award for "outstanding contributions to the field of Mechanical Engineering in the first decade of one's career." In 2019, Shannon was selected for an ONR Young Investigator Award to develop polymer thermal switches. Most recently, Dr. Yee is directing the Generation II Reinvent the Toilet (G2RT) program supported by the Bill & Melinda Gates Foundation and was recognized as one of Bill Gate's Heroes in the Field in 2021.

Monday — March 27, 2023
2:00 PM - 3:00 PM

TEC Talk Session at Colony Ballroom, 2nd floor

Invited Special Talk Speakers

MARCELLO IASIELLO

Affiliation: University of Naples

Title: Heat Transfer Multi-Objective Optimization via CFD Analysis

Abstract: The objective function to be optimized in Multi-Objective Optimization (MOO) can be made up by single functions that have to be either maximized or minimized depending on the input design variables. MOO is carried out with well-established approaches, such as weighted-sum or Pareto front. However, the number of variables and single functions to be employed, as well as the need of predictive models linking the variables with the objective function, strongly affects the closure of the optimization problem.

First, some multi-objective optimization problems that need a CFD approach to derive the fitness function, will be presented. The enhancement of the heat transfer performance by means of numerical optimization techniques, as well as the present status and the research development, will be highlighted.

Then, the attention will be focused on numerical optimization methods used to reduce computational times required by the heavy CFD analysis. Some examples of recent numerical optimization techniques employed to improve heat transfer in industrial applications, such as heat exchangers and heat sinks, will also be reported.

In conclusion, the role played in the future by numerical multi-objective optimization in heat transfer will be underlined.

Bio: Marcello Iasiello joined in 2017 the Industrial Engineering Department of the Università Degli Studi di Napoli Federico II, Italy, as an Assistant Professor. At the same University he earned M. S. and Ph. D. degrees in Mechanical Engineering in 2012 and 2016, respectively. He was a visiting researcher at Universitat Politecnica de Valencia (10/2019 – 11/2019), and a visiting scholar at both University of California, Riverside (03/2014-09/2014) and University of Connecticut (05/2012-08/2012), respectively.

His research activity focuses on heat and mass transfer in innovative porous materials, latent thermal energy storage systems, and bioengineering applications. As of August 2022, he is currently coauthor of 75 scientific articles, namely 35 journal articles, 36 conference papers, 3 book chapters and 1 review article. Among his honors, in 2017 he achieved the 2015-2016 best Ph.D. thesis prize from the Unione Italiana Termofluidodinamica (UIT) thanks to its thesis titled "Transport Phenomena in Porous Media: From Industrial Applications to Bioengineering". In 2021, he won the Graham de Vahl Davis Best Paper Award at the 8th International Symposium on Advances in Computational Heat Transfer (CHT-21). He was the local congress chair at the 9th International Conference on Heat Transfer and Fluid Flow (HTFF'22) conference in Prague, Czech Republic, in 2022. He is currently associate editor of Special Topics & Reviews in Porous Media.

Tuesday — March 28, 2023
12:45 PM - 1:45 PM

Invited Special Talk at Colony Ballroom, 2nd floor

Panel on Multiphase CFD: Risks, Rewards, and Remorse

Please join us for the 5th consecutive annual panel on Multiphase CFD: Risks, Rewards, and Remorse. From 1:45 PM to 3:15 PM on Wednesday — March 29, 2023. As computer processors and memory improve, CFD has become a valuable tool for analyzing fluid flow and heat transfer. However, as with any other numerical tool, the use of CFD is interlaced with the good, the bad, and the ugly. With the proliferation of highly commercialized CFD tools, there is a tendency to produce results without understanding and avoiding pitfalls. Here, we explore some recent successes and failures in this arena. This year's impressive panelist line-up includes (in alphabetical order) Goodarz Ahmadi from Clarkson University, Marcelo de Lemos from the Sao Paulo School of Advanced Science on Renewable Energies, Rob Kunz from Penn State University, and Ting Wang from University of New Orleans.

Moderator: Wayne Strasser, *Liberty University*

Panelists: Wayne Strasser, *Liberty University*; Ting Wang, *University of New Orleans*; Goodarz Ahmadi, *Clarkson University*; Marcelo de Lemos, *Instituto Tecnológico de Aeronáutica*; Robert Francis Kunz, *Penn State University*

Wednesday — March 29, 2023
1:45 PM - 3:15 PM

Colony Ballroom

National Science Foundation

Generous financial support from

National Science Foundation (NSF)

is gratefully acknowledged.

This funding provided support for many students and early career faculty/ researchers to attend the conference.

ASTFE
American Society of Thermal and Fluids Engineers

8TH Thermal and Fluids Engineering Conference (Hybrid)

March 26 – 29, 2023
www.astfe.org/tfec2023/

INTRODUCTION TO MODERN COMPUTATIONAL FLUID DYNAMICS

WORKSHOP OUTLINE

Module 1: Background & Brief History

Module 2: The Governing Equations

Module 3: The Finite Volume Method

Module 4: Essential Numerical Concepts

Module 5: Turbulence

Module 6: Promises & Pitfalls

Module 7: Emerging Trends and CFD of the Future

MARCH 26, 2023
University of Maryland, MD, USA (from 10 AM to 4 PM)

Dr. Akshai Runchal
President and Founding Partner, ACRi

ASTFE
American Society of Thermal and Fluids Engineers

8TH Thermal and Fluids Engineering Conference (Hybrid)

March 26 – 29, 2023
www.astfe.org/tfec2023/

MESHLESS METHODS FOR FLUID FLOW SIMULATIONS IN COMPLEX DOMAINS

WORKSHOP OUTLINE

Module 1: Interpolation of scattered data, global and cloud-based methods. Accuracy and stability

Module 2: Solution of heat conduction equation, multidomain methods

Module 3: Explicit and Semi-implicit fractional step methods for fluid flows

Module 4: Multilevel meshless method

MARCH 26, 2023
University of Maryland, MD, USA (from 12 PM to 4 PM)

Pratap Vanka
Department of Mechanical Science and Engineering, UIUC

ASTFE
American Society of Thermal and Fluids Engineers

8TH Thermal and Fluids Engineering Conference (Hybrid)

March 26 – 29, 2023
www.astfe.org/tfec2023/

The Center of Leadership Development in Built Environment Sustainability

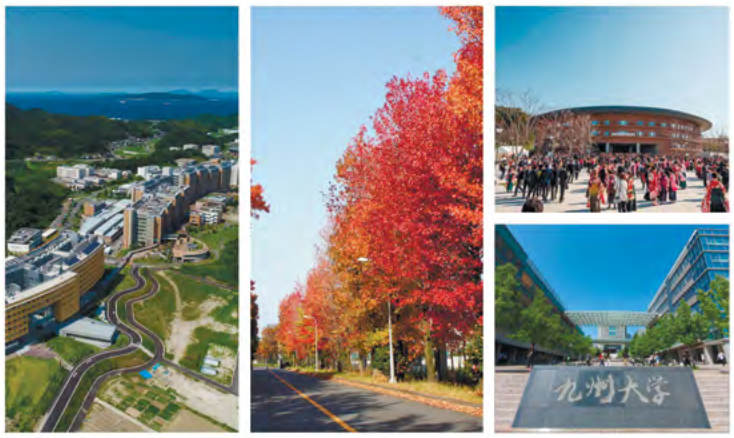
ASTFE
American Society of Thermal and Fluids Engineers

Graduate Students APPLY TODAY

cldbes.org

Fukuoka, Japan

NSF LSU KYUSHU UNIVERSITY



If you would like to experience the cultural diversity, build you leadership skills, and have an interest in built environment sustainability be sure to check out our webpage: **https://www.cldbes.org/** for information and application.

Email us with any questions at **Us.hk.ldbes@gmail.com**

Kyushu University

July 16 - August 12, 2023
https://www.tj.kyushu-u.ac.jp/

- Research in Built Environment Sustainability
- Develop Leadership Skills
- Experience Collaborative Learning

Eligible applicants must be a U.S. citizen or permanent resident.

Monday at 3:15 PM - 4:45 PM

at session 1I: ASTFE-NSF IRES Project Student Poster session
at Calvert, 2nd floor

All the times are in the US Eastern Time Zone

Sunday — March 26, 2023

Time	Session	Room	Author
12:00 PM - 4:00 PM	Conference Registration	Stamp Student Union Bldg, UMD, Main Lobby 1st floor	
10:00 AM - 4:00 PM	Course on Intro to Modern CFD	Jimenez Hall at JMZ 0220	**Akshai Runchal** President and Founding Partner, ACRi
12:00 PM - 2:00 PM	ASTFE Board of Directors Meeting (Closed)	Calvert Room, 2nd floor	
12:00 PM - 4:00 PM	Course on Meshless Methods for Fluid Flow Simulations in Complex Domains	Thurgood Marshall, 2nd floor	**Pratap Vanka** Department of Mechanical Science and Engineering, UIUC
2:00 PM - 3:00 PM	ASTFE Executive Committee Meeting (Closed)	Calvert Room, 2nd floor	
3:00 PM - 4:00 PM	ASTFE Board of Directors Meeting and Executive Committee Meeting (Open)	Calvert Room, 2nd floor	
4:00 PM - 6:00 PM	**Welcome Reception** (Dean Samuel Graham, University of Maryland; Yong Tao, President of ASTFE; Lorenzo Cremaschi, Chair of ASTFE Executive Committee, Reza Shaeri, Technical program overview, Vikrant Aute, Conference Tools, Venue, Events Overview; Krishna Kota on NSF funding; Akshai Runchal: Brief on the Course on Into to Modern CFD; Pratap Vanka: Brief on the Course on Meshless Methods, Ashwani Gupta: Into on IJECE journal; Wilson Chiu: Into on CTS journal; Exhibitors and Sponsors: Begell House, publishers and Flownex Simulation Environment)	Colony Ballroom, 2nd floor	

Monday — March 27, 2023

Time	Session	Room	Title	Author
8:00 AM - 10:00 AM	Breakfast and coffee	Colony Ballroom, 2nd floor		
8:00 AM - 8:30 AM	Welcome Address	Colony Ballroom, 2nd floor	Dean Samuel Graham, University of Maryland; President of University of Maryland; Yong Tao, President of ASTFE; Nesrin Ozalp, Technical Program overview; Vikrant Aute: Conference Tools, Venue and Events Overview	
8:30 AM - 9:30 AM	Plenary Lecture 1	Colony Ballroom	Advanced Power Electronics and Electric Machines for Electric-Drive Mobility Applications	**Sreekant Narumanchi** National Renewable Energy Laboratory **Moderator: Samuel Graham** University of Maryland
9:30 AM - 9:45 AM	Break			
9:45 AM - 10:35 AM	Keynote 1	Colony Ballroom	Role of Thermal and Fluids Technologies in Support of National Security and Energy Applications	**Basil Hassan** Sandia National Labs **Moderator: Jon Longtin** Stony Brook University
10:45 AM - 11:35 AM	Keynote 2		Overview of the Theory and Experimental Characterization of Heat Conduction in Highly Anisotropic Materials	**Chris Dames** UC Berkeley **Moderator: Nesrin Ozalp** Purdue University Northwest
11:45 AM - 12:35 PM	Keynote 3		Smart Buildings and Neighborhoods Enabling a Sustainable Energy Future	**Roderick Jackson** National Renewable Energy Laboratory **Moderator: Kevin Anderson** Calif State Polytechnic Univ, Pomona
12:45 PM - 1:45 PM	Luncheon - ASTFE Technical Committee Meetings - Open at Colony Ballroom			**Moderator: Wilson Chiu** University of Connecticut
1:45 PM - 2:00 PM	Break			
2:00 PM - 3:00 PM	TEC Talks **Moderator: Vikrant Aute** University of Maryland	Colony Ballroom, 2nd floor	Advanced Cooling Solutions for Mobile and Compact Computing Devices	**Victor Chiriac** Global Cooling Technology Group
			Flexible Advanced Manufacturing Technologies for Industry 4.0 and the Role of Thermal-Fluids Sciences in Their Development	**Ozan Özdemir** Northeastern University
			Scientific Machine Learning Approaches for Two-Phase Heat Transfer	**Yoonjin Won** University of California, Irvine
			Reinventing The Toilet: a Global Collaboration Turning an Infrastructure Into an Appliance	**Shannon Yee** Georgia Tech
3:00 PM - 3:15 PM	Break			

Time	Session	Room	Title	Author
Technical Session 1				
EARLY SESSIONS				
3:15 PM - 4:45 PM	**SESSION 1A** **Energy Systems** **Chair:** **Haipeng Zhang,** University of Illinois Chicago	Pyon Su, 2nd floor	46392 - On a double-effect absorption cogeneration cycle with an adjustable cooling-to-power ratio	Abdulmajeed Alghamdi University of Florida
			46352 - Fabrication of see-through thin film photovoltaic solar cells	David Hwang State University of New York at Stony Brook
			45870 - Thermodynamic performance of a humidification-dehumidification unit integrated with ejector refrigeration cycle for cooling energy and freshwater production	Ramy H. Mohammed University of Missouri-Columbia
			45917 - Evaporation of Water from Ottawa Sand Using Air Flows Above and Below the Sand Layer	Dylan Paap Kansas State University
3:15 PM - 4:45 PM	**SESSION 1B** **Numerical Modeling Applications / Energy Systems** **Chair:** **Mahsa Farzaneh,** University of Florida	Margaret Brent A, 2nd floor	44665 - Multiphysics simulation of rich versus lean charge mixtures ignited by nanosecond pulsed transient plasma ignition systems	Genesis Ponce California State Polytechnic University, Pomona
			45771 - Thermal analysis of a Trigeneration System having combined Heating, Cooling and Power Generation	Pankaj Kumar Srivastava Rewa Engineering College, India
			45958 - Development of The Bombardier Beetle Fire Extinguisher: CFD Model Investigation	Elijah Yoder Liberty University
			46541 - The effect of premixed ethanol ratio based on the same heating value on the combustion and exhaust emissions characteristics in the rcci engine for carbon emission reduction	Se Hun Min Inha University
			47431 - Implications of Building Energy Performance Rankings in Reducing GHG Emissions and Improving Energy Efficiency	Aditya Ramnarayan University of Maryland
			46048 - Laminar and Turbulent Nuermical Analysis on Tree Shaped Disc Heat Convection with Different Solid/Fluid Configurations	Dias do Amaral Junior Bridgewater College
3:15 PM - 4:45 PM	**SESSION 1C** **Applications of Thermal / Fluids, Heat Transfer Engineering** **Chair:** **Ozan Cagatay Ozdemir,** Northeastern University	Margaret Brent B, 2nd floor	45784 - Vortical Structures in a Pro-Atherogenic High-Risk Carotid Artery Bifurcation Model	Nora Caroline Zalud The George Washington University
			45912 - Simulation of Heat Transfer of High-Concentration Al2O3/Water Nanofluid-Effect of Reynolds Number	Nihad Dukhan University of Detroit Mercy
			45913 - Analysis of Sphere of Influence (SoI) and Pressure drop parameter in VoM-PhyS framework	Rohan Amare Kansas State University
			46003 - The effect of thermoregulation on the aerodynamics of bumblebees	Isa Gan University at Buffalo
			46020 - Effect of hydrostatic pressure on the degassing performance of vacuum bubbling process	Yong-Du Jun Kongju National University
			46102 - An Initial Investigation of Endothermic Surface Emissions of Wake Bound Particles by means of Computational Fluid Dynamics	Ryan Hanc US ARMY DEVCOM-AC
3:15 PM - 4:45 PM	**SESSION 1D** **Computational Methods/Tools in Thermal-Fluid Systems** **Chair:** **Ken Blecker,** CCDC-AC	Thurgood Marshall, 2nd floor	45483 - XGBoost-Based Model for Prediction of Heat Transfer Coefficients in Liquid Cold Plates	Mohammad Reza Shaeri Advanced Cooling Technologies, Inc.
			46319 - Stress and Fatigue Analysis of Air-to-Refrigerant Heat Exchangers with Non-Round Tube Shapes	Mingkan Zhang Oak Ridge National Laboratory
			46431 - Computational modeling of red blood cell dynamics using a mesoscopic membrane model with the immersed boundary method	Pooja Vilas Bhagawat Virginia Polytechnic Institute and State University (Virginia Tech)
			47142 - Thermohydraulic Performance Comparison of 3D Printed Circuit Heatsinks With Conventional Integral Fin Heatsinks	Abdallah Sofiane Berrouk Khalifa University
			46425 - Transient simulation of glaze ice accretion on an aircraft wing: a quasi-steady approach	Arash Shad University of Florida
			45920 - Characterization of the variation of remaining effective stabilizer in an assembly of propellant increments	Ken Blecker CCDC-AC

Time	Session	Room	Title	Author
3:15 PM - 4:45 PM	**SESSION 1E** **Heat/Mass Transfer Enhancement Techniques** **Chair:** **Darshan Pahinkar** Florida Institute of Technology	Charles Carroll B, 2nd floor	45892 - Slow and rapid heterogeneous nucleation of hfe-7100 at one atmosphere	Tali Bar-Kohany Tel-Aviv University & NRCN, Israel
			45893 - Rapid heating, nucleation and bubble growth in a rapidly composite droplet	Tali Bar-Kohany Tel-Aviv University & NRCN, Israel
			46398 - Analysis of viscous sublayer thickness and roughness enhanced heat transfer	Emmanuel Hitimana Heat Transfer Research, Inc.
			46304 - Evaluation of three measurement techniques for water-vapor mass transfer in case of droplet condensation	Konstantin Niehaus German Aerospace Center
			46415 - Studying Heat and Mass Transfer of Phase Changing Multicomponent Droplet Using Acoustic Levitation Technique	Zilong Fang Northeastern University
			47318 - Viscosity of Adsorbent Slurries	Darshan G. Pahinkar Florida Institute of Technology
3:15 PM - 4:45 PM	**SESSION 1F** **Energy Storage Systems /Fuel Cells / Applications in Thermal Fluids Engineering** **Chair:** **Maryam Shafahi** California State University, Pomona	Charles Carroll A, 2nd floor	45905 - Performance comparison of battery thermal management system based on numerical simulation	Sowmya Raghu University of South Carolina
			46060 - Using Three Variable State Equations to Gain Insight Into PEM Fuel Cell Membrane Thermodynamics	Nicholas Ingarra Oakland University
			46064 - Separating the Effect of Thermal Osmosis in PEM Fuel Cell Membrane Mixed-Mode Dynamics	Nicholas Ingarra Oakland University
			47257 - Ammonia sorption heat pump for PEM fuel cell thermal management in heavy-duty transport	Christian Bosser Chalmers University of Technology
			45528 - Perovskite thermochromic transparent wood smart window for building energy efficiency and sustainability	Yuwei Du City University of Hong Kong
			45967 - Leveraging In Situ Sensors in Laser Additive Manufacturing to Extract Thermal Diffusivity of Functional Materials Undergoing Rapid Melting and Solidification	Bengisu Sisik The George Washington University
3:15 PM - 4:45 PM	**SESSION 1G** **Multiphase Flows /Heat Pipes / Cryogenics** **Chair:** **Richard Bonner** Advanced Cooling Technologies, Inc.	Juan Ramon Jimenez, 2nd floor	45896 - Development of a flat evaporator loop heat pipe for electronics cooling applications	Tayyab Mamtaz Newcastle University
			46325 - Wettability-Patterned Surfaces for High-Performance, Wickless Vapor-Chamber Heat Spreaders	Constantine Megaridis University of Illinois Chicago
			47262 - Analytic solutions of heat and mass transfer in flat heat pipes with porous wicks and evaporator and condenser regions	Salar Saadatian Louisiana State University
			46035 - Experimental Study and Analysis of the Desublimation of CO2	Michael Oyinloye King Abdullah University of Science and Technology
			46515 - Bubble Nucleation and Departure in Cryogenic Annular Flows - An Experimental Investigation	Sean Orchuk The University of Toronto
			46891 - Validation of multiphase flow modelling approaches using experimental test-rig and in-house algorithm	Agata Widuch Silesian University of Technology
3:15 PM - 4:45 PM	**SESSION 1H** **Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids /Turbulent Flows** **Chair:** **Aarthi Sekaran** SUNYPolytechnic Institute	Nanticoke, 1st floor	45916 - Hydrogels for tissue engineering: bridging the insights from acoustics and rheology	Megan Anderson George Washington University
			45988 - Transition between passing to tumbling trajectories of a pair of viscous drops in a viscoelastic medium in free shear: simulation and an analytical model	Kausik Sarkar George Washington University
			46058 - Hydrodynamic forces acting on a spherical atomic force microscopy probe indenting a soft viscoelastic substrate in a liquid environment	Anik Tarafder The George Washington University
			46159 - An experimental study on the influence of additive volume on mixing performance in turbulently stirred vessels using Electrical Resistance Tomography	Sorosh Mirfasihi The University of Manchester
			46000 - Semi-Analytical Solution for Statistical Turbulent Boundary Layer over an Isothermal Horizontal Flat Plate	Suraj Krishnamurti University of Maryland
			47420 - Surface Roughness Effect on Development of an Additively-Manufactured Microchannel Heat Exchanger	Zhengda Yao University of Maryland
3:15 PM - 4:45 PM	This session showcases student presenters who participated in the NSF-funded IRES Track III project focused on International Research Experience and Professional Development in Built Environment Sustainability. Administered by Louisiana State University in collaboration with ASTFE and the National University of Singapore, the project offers students the opportunity to conduct research in Singapore on various topics related to built environment sustainability after receiving training through the Center of Leadership Development in Built Environment Sustainability. The session will highlight the experiences of these students and their research findings. **SESSION 1I** **ASTFE-NSF IRES Project Student Poster Session** **Chairs:** **Yimin Zhu,** Louisiana State University **Yong Tao,** Cleveland State University **Co-Chairs:** **Vish Prasad,** University of North Texas **Tyree Mitchell,** Louisiana State University **Tracey Rizzuto,** Louisiana State University	Calvert, 2nd floor	47371 - Design Optimization of Parametric and Interlocking Block System Using Polymer 3D Printing	Amanda Wojtasiak Florida International University
			47368 - Building Energy Simulation Component for a Green Facade	Vishal Muralidharan Iowa State University
			47422 - Grid-Interactive Building Controller	Thomas Firsich Texas A&M University
			47354 - NUS Baba House: A Case for Heritage to High Efficiency	Richard Kimball Drexel University
			47418 - This is Why I'm Hot: The Systematic Adaptation of Micro-Ecological Momentary Assessment Procedure to Improve the Accuracy of Collected Data	Zachary Colligan Washington State University
4:45 PM - 5:00 PM	**Break**			

Time	Session	Room	Title	Author
Technical Session 2				
LATER SESSIONS				
5:00 PM - 6:30 PM	**SESSION 2A** **Energy Systems** **Chair:** **Faisal Altwijri** University of Florida	Pyon Su, 2nd floor	45781 - Viability and accessibility of nyc urban heat island over current TMY weather data for accurate energy demand predictions.	Yong Tao Cleveland State University
			46264 - Performance Analysis of a Packed Bed Latent Heat Thermal Energy Storage with Encapsulated Silica as PCM: Numerical Investigation	Titan Paul University of South Carolina Aiken
			46336 - Numerical analysis of a latent heat thermal energy storage unit assisted with porous fins	Saeed Tiari Gannon University
			45386 - Investigation of relative humidity influence on sorption-based atmospheric water harvesting performance by passive radiative condensers	Shengxi Bai City University of Hong Kong, SEE
			45492 - CFD Investigation of a Novel Underground Irrigation Technique in Porous Soil	Henry Sommer California State Polytechnic University, Pomona
			45813 - Examination of the performance of a thermal compressor using CFD analysis	Pradeep Paljibhai Vaghela University at Buffalo
5:00 PM - 6:30 PM	**SESSION 2B** **Fluid Flow and Heat Transfer in Industrial and Commercial Processes / Heat and Mass Transfer Enhancement Technicques** **Chair:** **Richard Bonner** Advanced Cooling Technologies, Inc.	Margaret Brent A, 2nd floor	47310 - Novel Experimental Technique for an Analogous Three-Phase System	Scott Giese University of Northern Iowa
			46173 - Axial Fan Cooling for Data Center I/O Interconnect	Taolue Zhang Molex LLC.
			46391 - Calibration of a 1D Ejector Model from full-scale Experiments	Jan Van den Berghe von Karman Institute for Fluid Dynamics
			45715 - Effect of inclined dimple arrangement and Aspect ratio on flow and heat transfer in a Rectangular Duct	Samson Abiodun Aasa Olabisi Onabanjo University
			45829 - Numerical Investigation of Different Shaped Microchannel Heat Sinks Embedded Inside Silicon Substrate of High-Power Density GaN Power Amplifiers	Orcun Yildiz Aselsan Inc.
			45998 - Pumped, Hybrid Two-phase Cooling System for High Heat Flux Electronics	Michael Ellis Advanced Cooling Technologies, Inc.
5:00 PM - 6:30 PM	**SESSION 2C** **Fluid Flow and Heat Transfer Multiphase Phenomena** **Chair:** **Ozan Ozdemir** Northeastern University	Margaret Brent B, 2nd floor	46092 - A New CFD Solver for Simulating Phase-Change and Two-Phase Flow in Porous Media	M Iffat Hasan University of Nevada Reno
			47414 - High Flux Thermal Management of electronic devices with Two-Phase Manifold-Microchannel Cooling	Harsimranjit Singh University of Maryland
			45982 - A Combined Active (High-frequency Piezos) and Passive (Microstructuring) Enhanced Micro-nucleation Rate Flow- boiling Approach for Stable High Heat-flux Cooling	Amitabh Narain Michigan Technological University
			45992 - Comparing the Heat Removal Efficiency of Microchannel Heat Sinks Produced by CNC Milling Versus Powder Bed Fusion	Stephen Pierson University of Arkansas
			45876 - Fin Optimization by Approximate Asymptotic Method	Hatim Alrifaai Kansas State University
			45906 - Non-Newtonian WAVE Atomization in Twin-Fluid Injector	Daniel Wilson Liberty University
5:00 PM - 6:30 PM	**SESSION 2D** **Computational Methods/Tools in Thermal-Fluid Systems** **Chair:** **Akanksha Menon** Georgia Tech	Thurgood Marshall, 2nd floor	45898 - Numerical simulation of fluid flow in heat exchangers with complex geometry	Krystof Mraz Brno University of Technology
			45937 - Inverse flow prediction using pinns in an enclosure containing heat sources	Jerol Soibam MDU
			44799 - Effects of Gaseous Radiation Heat Transfer on Non-premixed Combustion of Ammonia in Porous Media	Genesis Ponce California State Polytechnic University, Pomona
			46012 - Numerical study of Oxyfuel Ion-Currents using coupled Electric field, Fluid flow and Species Transport	S M Mahbobur Rahman Virginia Tech
			46074 - A generalized characterization of radiative properties of a porous media using engineered features and neural network	Farhin Tabassum Stevens Institute of Technology
			46100 - Accurate estimation of radiation heat transfer in heterogeneous packed beds using data-driven modeling	Farhin Tabassum Stevens Institute of Technology

Time	Session	Room	Title	Author
5:00 PM - 6:30 PM	**SESSION 2E** **Aerospace Applications** **Chair:** **Vikrant Aute** University of Maryland	Charles Carroll B, 2nd floor	46042 - Numerical study of the complete operating map of ejectors in Ultra High Bypass Ratio (UHBR) engine bleed systems	Matthieu Duponcheel Universite catholique de Louvain
			46452 - Numerical study on the effect of the pylon downstream of the cavity-based scramjet combustor	Vinod Narayanan IIT Gandhinagar
			47402 - Numerical and experimental investigation on thermal performances by various geometric shapes for electric propulsion motor	Sungjin Yang Korea Electronics Technology Institute
			47425 - Numerical studies for thermal performances and torque losses of outer-rotating afpm motor for a personal air vehicle	Jongrak Choi Korea Electronics Technology Institute
			47390 - Failure Pressure Identification of Additively Manufactured Polymer-Metal Composite Cross-Media Heat Exchangers: A Design of Experiments	Veeresh Ayyagari University of Maryland
5:00 PM - 6:30 PM	**SESSION 2F** **Heat Exchangers: Compact, Novel, Networks** **Chair:** **Maryam Shafahi** California State University, Pomona	Charles Carroll A, 2nd floor	45915 - Polymeric hollowfibers serving as a cross-flowheat exchanger in liquid-to-gas applications	Jiri Hvozda Brno University of Technology
			46009 - Effect of overall geometry on direct contact crossflow packed bed condenser	Andre Benard Michigan State University
			46018 - Thermal performance analysis in offset strip fin heat exchanger for electric vehicle waste heat recovery	Jun Hyuk Kim Korea University
			46080 - Influence of Header Configuration on Flow Distribution within a U-type Plate Heat Exchanger	Mohammed Mizanur Rahman Michigan State University
			47419 - Heat Sink Design Improvement using Topology Optimization	Zhengda Yao University of Maryland
			46284 - Experimental investigation of two-phase pressure drop and flow regime visualization in chevron-type plate heat exchangers	Stefano Passoni Politecnico di Milano
5:00 PM - 6:30 PM	**SESSION 2G** **Fundamentals & Applications in Fluid Flow and Heat/Mass and Momentum Transfer** **Chair:** **Keith Walters** University of Arkansas, Mechanical Engineering	Juan Ramon Jimenez, 2nd floor	45747 - Analysis of vapor concentration of ethanol-water mixture droplet for inkjet technology: experiment and simulation	Panus Jongleartrakull Tokyo Institute of Technology
			46072 - Vortex-induced vibrations of an elliptic cylinder at different angles of incidence	Himalaya Sarkar IIT(ISM) Dhanbad
			46463 - On frost formation and heat transfer in turbulent moist air flow using direct numerical simulations	Mahsa Farzaneh University of Florida
			46053 - Experimental investigation of co2 hydrate formation in the presence of zn-al ldh nanofluid	Ayaj Ahamad Ansari IIT Kanpur
			47381 - Electrically Triggered Droplet Coalescence for Dew Harvesting	Sang W. Joo Yeungnam University
			46017 - Battery cooling plate design with the diverging channel and oblique fins	Hongseok Choi Korea University
5:00 PM - 6:30 PM	**SESSION 2H** **Fundamentals & Applications in Fluid Flow and Heat/Mass and Momentum Transfer** **Chair:** **Aarthi Sekaran** SUNYPolytechnic Institute	Nanticoke, 1st floor	47332 - Anomalous behavior in the critical region: from subcritical liquid to supercritical fluid	Vish Prasad University of North Texas
			45925 - Thermal property estimation of thin layered structures via the pump-probe transient thermoreflectance and network identification methods.	Joao Vitor Thomsen Silveira Tokyo Institute of Technology
			45993 - Modeling near-field radiative heat transfer between dielectric particles	Lindsay Walter University of Utah
			46023 - Analysis of Joule Heating Characteristics in Nanowire Networks Measured by Thermoreflectance Imaging Method	Kanji Tamai Kyoto Univeristy
			47287 - Investigating the effects of modifying surface tension on breakup length and droplet size in irrigation nozzles	Emily Stallbaumer-Cyr Kansas State University
			46087 - Instability of a fluid saturated anisotropic porous layer using thermal non-equilibrium model	Anas Altawallbeh The University of Jordan
8:00 PM - 10:00 PM	**The Nightingale's Sonata at The Clarice Smith Performing Arts Center**			**Optional**

Tuesday — March 28, 2023

Time	Session	Room	Title	Author
8:00 AM - 10:00 AM	Breakfast and coffee	Colony Ballroom		
8:00 AM - 8:15 AM	Day 2 Announcements	Colony Ballroom	Kevin Anderson: Overview of Day 1 and Day 2 plan. Vikrant Aute: Conference Tools, Venue and Events Announcement	
8:15 AM - 9:15 AM	Plenary Lecture 2	Colony Ballroom	Ultrafast Laser Surgery for Clinical Translation	**Adela Ben-Yakar** University of Texas, Austin **Moderator: Nesrin Ozalp** Purdue University Northwest
9:15 AM - 9:30 AM	Break			
9:30 AM - 10:20 AM	Keynote 4	Colony Ballroom	Thermal Transport and Chemical Phenomena in Solar Reactors: Enabling Sun to Heat, Fuels and Nutrients	**Rohini Bala Chandran** University of Michigan Ann Arbor **Moderator: Kevin Anderson** Calif State Polytechnic Univ, Pomona
10:30 AM - 11:20 AM	Keynote 5		Coupled Heat Transfer Processes of Materials in Extreme Environments	**Patrick E. Hopkins** University of Virginia **Moderator: Vikrant Aute** University of Maryland
11:30 AM - 12:20 PM	Keynote 6		Thermal Transport in Li-ion Batteries	**Ankur Jain** University of Texas at Arlington **Moderator: Reza Shaeri** Advanced Cooling Technologies, Inc.
12:30 PM - 2:30 PM	Awards Luncheon - Open at Colony Ballroom			
12:45 PM - 1:45 PM	Invited Luncheon Talk	Colony Ballroom	Heat Transfer Multi-Objective Optimization via CFD Analysis	**Marcello Iasiello** University of Naples **Moderator: Wilson Chiu** University of Connecticut
1:45 PM - 2:15 PM	Awards (TFE Award, Early Career Researcher Award, The ASTFE Fellows, Best Paper, Best Reviewer)			**Moderator: Jon Longtin** Stony Brook University
2:15 PM - 2:30 PM	Break			
Technical Session 3				
EARLY SESSIONS				
2:30 PM - 4:00 PM	**SESSION 3A** **Refrigeration, Air Conditioning Systems, and Refrigerants & Heat Pumps** **Chair:** **Arash Shad** University of Florida	Pyon Su, 2nd floor	46091 - Review on Void Fraction Models and Charge Estimation for Grooved Tubes	Suraj Krishnamurti University of Maryland
			46129 - An experimental investigation on spray evaporation of R1234ze(E)/POE-68 mixture on an enhanced tube bundle	Jerin Robins Ebanesar Auburn University
			46162 - High Efficiency Refrigerator with Cold Thermal Energy Storage	Samuel Amoafo-Yeboah Southern University and A&M College
			45851 - Energy performance analysis of air-assisted surface-water source heat pump systems using heat source compensation strategies	Hyun Ho Shin Korea University
			46340 - A Dynamic Energy Model for Display Cases in Supermarkets for Low GWP Refrigeration	Yanfei Li ORNL
2:30 PM - 4:00 PM	**SESSION 3B** **Experimental Methods/Tools and Instrumentation in Fluid Mechanics and Heat/Mass Transfer** **Chair:** **Ramy H. Mohammed** University of Missouri-Columbia	Margaret Brent A, 2nd floor	46339 - Experimental Study of a Two Stage EHD Gas Pump in a Square Channel	A K M Monayem Mazumder Saginaw Valley State University
			46345 - An experimental study on a novel direct contact freeze-desalination unit	Reza Kaviani University of Oklahoma
			47319 - Porous Adsorbent Layers using UV-Curing Photopolymer Resin	Darshan G. Pahinkar Florida Institute of Technology
			46031 - Correlations among characteristics of gyroid-type cellular foam structures	Marcello Iasiello Università degli Studi di Napoli Federico II
			46263 - Boiling enhancement using water jet impingement on porous media columnar post surface	Kyosung Choo Youngstown State University
			45910 - Influence of loading and mudflap on the wake of a simplified earthworks dump truck	Bachar Obeid ESTACA'LAB

Time	Session	Room	Title	Author
2:30 PM - 4:00 PM	**SESSION 3C** **Computational Methods/Tools in Thermal-Fluid Systems** **Chair:** **Titan Paul** University of South Carolina Aiken	Margaret Brent B, 2nd floor	46142 - Optimization of Regularization in Inverse Heat Conduction Analysis	Keith A Woodbury University of Alabama
			47396 - DimNet: an interpretable neural network for generating thermal-fluid correlation	Lingnan Lin NIST
			46333 - A comparison of results for the Lattice Boltzmann method and a Navier-Stokes solver: Natural convection in a 2D porous cavity	Parimah Kazemi Heat Transfer Research, Inc.
			45769 - Efficient modeling of radiative transfer in heterogeneous media with hot point by combining Monte Carlo methods and Bayesian neural networks	Alex Royer Université de Lorraine, LEMTA, France
			45964 - Incorporating cfd and artificial neural network methods to predict thermal characteristics of flow through pipes	Gerald Schneider University of Waterloo
			45836 - Cooling enhancement of additively manufactured injection moulds using basic and triply periodic minimal surface-based lattices	Gerard McGranaghan ATU Sligo
2:30 PM - 4:00 PM	**SESSION 3D** **Fluid Flow and Heat Transfer in Industrial and Commercial Processes / Turbulent Flows** **Chair:** **Abdulmajeed Alghamdi** University of Florida	Thurgood Marshall, 2nd floor	45968 - Analysis the behavior of horizontal multiphase flow in the presence of a dense gas	Roberto da Fonseca Junior Petrobras
			46290 - Synthetic Turbulence Generation for Scale-Resolving CFD Simulations Using a Modified Statistically-Targeted Forcing Method	Keith Walters University of Arkansas, Mechanical Engineering
			45945 - Experimental study of nucleate boiling dynamics in a rectangular mini-channel set-up	Valentin Scheiff Mälardalen University
			46158 - Thermally driven phase transitions for desalination and brine concentration	Akanksha Menon Georgia Tech
			45777 - Numerical study for a mode-2 ISW propagating over a trapezoidal obstacle with different slopes	Robert R. Hwang National Taiwan Ocean University
			45886 - Comparative Assessment of Published Models for Equivalent Sand-Grain Roughness Height based on Surface Statistics	Sangram Kumar Samal Indian Institute of Technology Bombay
2:30 PM - 4:00 PM	**SESSION 3E** **Combustion / Numerical Modeling** **Chair:** **Alexandrina Untaroiu** Virginia Tech	Charles Carroll B, 2nd floor	46152 - Hazard Assessment of Fire Consequences from a Fuel Storage Explosion	Alexander Brown Sandia National Labs
			46246 - Smoke Measurements from a High-flux Ignition Experiment	Alexander Brown Sandia National Labs
			46341 - Automated, Intelligently Modulating Woodstoves (AIMS) for Improved Heating Efficiency and Reduced Emissions	Jason Loprete Stony Brook University
			45463 - Analysis of local heat transfer in quenching of moving sheets with flat sprays	Bilal Mehdi Otto-von-Guericke University
			46138 - Characteristics of Flow in the Upper Airway during High Flow Nasal Cannula Oxygen Therapy	Robert Kacinski Liberty University
2:30 PM - 4:00 PM	**SESSION 3F** **Enrgy Systems / Computer Simulations** **Chair:** **Genesis Ponce** California State Polytechnic University, Pomona	Charles Carroll A, 2nd floor	46011 - Using Machine Learning in predicting the melt-pool depth using structural data in laser powder bed fusion (LPBF)	Feiyang Bai UDC CAM-STAR
			46413 - On the use of a parabolic trough solar collector with v-shaped ribs	Faisal Altwijri University of Florida
			46484 - Numerical study on thermal comfort in a large office room with passive displacement cooling system	Lin Qiao National University of Singapore
			46519 - Numerical study of air supply duct length for a novel passive displacement cooling system	Shuai Guo National University of Singapore
			46309 - Modeling the thermal radiation penetration into the liquid fuels for fire simulations	Farid Alinejad Aalto University
2:30 PM - 4:00 PM	**SESSION 3G** **Energy and Sustainability / Applications in Thermal Fluids Heat Transfer Engineering** **Chair:** **Marayam Shafahi** California State University, Pomona	Juan Ramon Jimenez, 2nd floor	45929 - Analysis of bank characteristics in a hydrogen refueling station	Sarng Woo Karng Korea Institute of Science & Technology
			45874 - Temperature Distribution in Micro-Finned Surface Duct Using PLIF Technique	Hatim Alrifaai Kansas State University
			45978 - An All-Fiber Frequency-Domain Thermoreflectance System for Nanoscale Thermal Characterization of Soft and Biological Materials	Lian Dunlevy USNA
			45749 - Influence of the Prandtl Number on Heat Transfer at Liquid Film Flows Down Smooth and Rough Surfaces	Giorgi Gigineishvili Georgian Technical University
			46330 - Impact of Diverse Electricity Generation, Heating, Cooling, and Storage Technologies on Building Energy Use	Rachel Gray The George Washington University
			46124 - Scalability of ANSYS Fluent on Various High-Performance Computing Hardware Types	Reid Prichard liberty University

Time	Session	Room	Title	Author
2:30 PM - 4:00 PM	**SESSION 3H** **Professional Development for Students** **Chair:** **Ankur Jain** University of Texas at Arlington	Nanticoke, 1st floor	Giving Effective Presentations	**Ankur Jain** University of Texas at Arlington
			Writing for Success	**Ankur Jain** University of Texas at Arlington
4:00 PM - 4:15 PM	**Break**			
Technical Session 4				
LATER SESSIONS				
4:15 PM - 5:45 PM	**SESSION 4A** **Energy and Sustainability /Heat and Mass Transfer Enhancement Techniques** **Chairs:** **Reza Shaeri** Advanced Cooling Technologies, Inc.	Pyon Su, 2nd floor	47412 - A sustainable polycogeneration prototype for decentralized production of electricity, distilled water and biodiesel	Carolina Palma Naveira-Cotta UFRJ
			45114 - A Key Parameter in Design and Operation of Ocean Thermal Energy Conversion Plants	Yongjian Gu US Merchant Academy
			46202 - Development of Nano-Enhanced Micro-Encapsulated Phase-Change Materials for Passive Thermal Management and Storage	Patrick Adegbaye UDC CAM-STAR
			45881 - Dewatering of sludge using supercritical carbon dioxide	Sai Kiran Hota Advanced Cooling Technologies
			46097 - Feasibility analysis of water main geothermal heat pump system for residential building applications	Brian Kohut Cleveland State University
4:15 PM - 5:45 PM	**SESSION 4B** **Energy and Sustainability** **Chair:** **Henry Sommer** California State Polytechnic University, Pomona	Margaret Brent A, 2nd floor	46156 - Alleviating critical water scarcity with mud bricks	Andrew Caratenuto Northeastern University
			46408 - Numerical Study of a Solar-Assisted sCO2 Brayton Cycle for Power Generation	Kenneth Weddle East Carolina University
			46642 - An ease-to-fabricate radiative/evaporative photonic hydrogel	Yanpei Tian King Abdullah University of Science and Technology
			46083 - Thermally Informed Motion Planning to Enhance Mission Endurance of Mobile Robots	Juan Ordonez FAMU-FSU College of Engineering
4:15 PM - 5:45 PM	**SESSION 4C** **Energy and Sustainability** **Chair:** **Akanksha Menon** Georgia Tech	Margaret Brent B, 2nd floor	46157 - Thermochemical energy storage for building heat decarbonization	Akanksha Menon Georgia Tech
			46326 - Performance evaluation of gray-box and machine learning models for a dynamic wall integrated with active insulation and thermal energy storage system	Borui Cui Oak Ridge National Laboratory
			47424 - Energy Consumption Analysis of Select Maryland Transit Administration Buildings for Energy Efficiency Improvements	Jordan Higgins Smart and Small Thermal Systems Lab (S2TS)
			45826 - A techno-economic analysis of a thermally regenerative ammonia-based battery	Holkan Vazquez-Sanchez King Abdullah University of Sciences and Technology
			45989 - Numerical Investigation of Hydrodynamic and Thermal Performance of Gravity Driven Dilute Flow in a Straight Channel	Muhammad Umer The Pennsylvania State University
			46007 - Studying the Potential of Deploying Integrated Humidification-Dehumidification Desalination System with Solar Thermal System	Mahyar Abedi Michigan State University Dept of Mechanical Engineering
4:15 PM - 5:45 PM	**SESSION 4D** **Fluid Flow and Heat Transfer Multiphase Phenomena** **Chair:** **Krishna Kota** New Mexico State University (NMSU)	Thurgood Marshall, 2nd floor	47750 - Extraordinary Two-phase Heat Transfer Enhancement using Femtosecond Lasar Surface Processed (FLSP) Metallic Surfaces: Pool Boiling Inversion and Hysteresis	George Gogos University of Nebraska Lincoln
			46121 - Anti-corrosive surfaces for enhanced desalination of highly saline waters	Krishna Kota New Mexico State University (NMSU)
			46245 - Simulating the Plume Quench for Plasma Spray Applications	Alexander Brown Sandia National Labs
			46636 - Hybrid volume of fluid (VOF) and Lagrangian approach for simulating interactions between dispersed bubbles and large interfaces in two-phase flow	Xiang Zhang Penn State University
			47408 - Integral Transform of Heat Conduction in Anisotropic Heterogeneous Media: Application to Thermal Metamaterials	Renato M. Cotta Federal University of Rio de Janeiro

Time	Session	Room	Title	Author
4:15 PM - 5:45 PM	**SESSION 4E** **Energy and Sustainability / Applications in Thermal Fluids Engineering** **Chair:** **Prahit Dubey** Nikola Motor Company	Charles Carroll B, 2nd floor	47430 - Purification of molten MgCl2-KCl-NaCl salt by thermal decomposition for concentrating solar power	Michael Bichnevicius Massachusetts Institute of Technology
			46082 - Lab scale demonstration of thermal energy storage using desalination waste salt	Reza Baghaei Lakeh Cal Poly Pomona
			45921 - Room Air-Flow Interactions by an Air-Sanitizing Device: Computations and Qualitative Experiments	Devdatta Kulkarni University at Buffalo
			45877 - Pinch Analysis to recover waste heat in the supercritical desalination process	Michael Trapani East Carolina University
			42113 - Flow Augmentation and Thermohydraulic Performance of Internal Angled Dimple Heat Transfer Enhancement in Rectangular Conduit	Samson Aasa Olabisi Onabanjo University
4:15 PM - 5:45 PM	**SESSION 4F** **Applicatons in Thermal Fluids / Heat Transfer Engineering** **Chair:** **Saeid Vafaei** Bradley University	Charles Carroll A, 2nd floor	46315 - Effect of thermophysical and dielectric properties of a liquid droplet on continuous motion in the presence of an electric field	Muralidhar Krishnamurthy IIT Kanpur (India)
			46322 - Disturbance waves behavior in vertical downward annular flow	Rigoberto Morales NUEM - UTFPR
			46323 - A Study of Hop Kilning Energy Consumption with Respect to Drying Temperatures in the Pacific Northwest	Matthew Thomas Oregon State University
			46324 - Experimental study of the effect of gas density on horizontal liquid-gas flow	Moises Marcelino Neto NUEM-Multiphase Flow Research Center
			47930 - Progress on condensation heat transfer: Horizontal Tubes	Hafiz Muhammad Ali King Fahd University of Petroleum and Minerals
4:15 PM - 5:45 PM	**SESSION 4G** **Multiphase Flows / Nano Fluids / Heat Pipes** **Chair:** **Thomas Tran** Indiana Institute of Technology	Juan Ramon Jimenez, 2nd floor	45918 - Validation of VOF-to-DPM Methodology Using a Flow-Blurring Atomizer	Wayne Strasser Liberty University
			45985 - Shear-induced gradient diffusivity of a red blood cell suspension: effects of cell dynamics from tumbling to tank-treading	Kausik Sarkar George Washington University
			46044 - Effect of manifold configurations on the entropy generation in recharging microchannel heat sink	Sangram Kumar Samal Indian Institute of Technology Bombay
			47309 - Prediction of critical heat flux of mixtures flowing in channels	Mirza Mohammed Shah Engineering Research Associates
4:15 PM - 5:45 PM	**Darrell W. Pepper Memorial Session: Numerical Methods in Heat, Mass and Momentum Transfer (reception to follow presentations)** **Chairs:** **David Carrington** Los Alamos National Laboratory **Akshai Runchal** President and Founding Partner, ACRi	Colony Ballroom	47018 - Validation of Computer Simulation of Complex Thermal Transport Problems: A Tribute to Professor Darrell Pepper	Yogesh Jaluria Rutgers University
			45871 - High Accuracy Meshless Method for Heat Transfer and Fluid Flow in Complex Domains: Progress and Future	Surya P Vanka UIUC
			46899 - Simulating Spray Dynamics Related to Internal Combustion Engines Using a Finite Element Method and LES	David Carrington Los Alamos National Laboratory
			46949 - A Meshless Multiscale Method for Simulating Hemodynamics	Kyle Beggs University of Central Florida
			46980 - Droplet statistical analysis for the Breakup of Liquid Jet in a Crossflow	Ashoke De IIT Kanpur
			47021 - On Computational Modelling for Modern Urban Drainage Systems	Madhukar Rao ACRi
			47035 - Accuracy Assessment of Fluid Flow Simulations on Virtual Finite Volumes based on the Voronoi Tesselation	Madhukar Rao ACRi
			47044 - Physics-Informed Deep Neural Network Model for Steady, Saturated Groundwater Flow	Madhukar Rao ACRi
			47250 - Impact of passive walls boundary conditions on turbulent natural convection flow of dry and humid air inside a differentially heated cavity	Victoria Timchenko The University of New South Wales
			CFD Modeling for Solar Hydrogen Reactor Design & Optimization: A Tribute to Professor Darrell Pepper	Nesrin Ozalp Purdue University Northwest
5:45 PM - 6:00 PM	**Break**			
6:00 PM - 8:00 PM	**Darrell W. Pepper Memorial Reception**	Colony Ballroom		**Moderators:** **David Carrington** Los Alamos National Laboratory **Akshai Runchal** President and Founding Partner, ACRi

Wednesday — March 29, 2023

Time	Session	Room	Title	Author
8:00 AM - 10:00 AM	Breakfast and coffee	Colony Ballroom		
8:00 AM - 8:15 AM	Day 3 Announcements	Colony Ballroom	Kevin Anderson: Overview of Day 1, 2, and plan for Day 3. Vikrant Aute: Conference Tools, Venue and Events Announcement	
8:15 AM - 9:15 AM	Plenary Lecture 3	Colony Ballroom	Thoughts on the Future of Heat Pumps and Their Heat Exchangers	**Reinhard Radermacher** University of Maryland **Moderator: Wilson Chiu** University of Connecticut
9:15 AM - 9:30 AM	Break			
9:30 AM - 10:20 AM	Keynote 7	Colony Ballroom	Turbulent Mixing in Shock-Driven Variable-Density Flow—From Supernova Explosion to Fusion System	**Devesh Ranjan** Georgia Tech **Moderator: Nesrin Ozalp** Purdue University Northwest
10:30 AM - 11:20 AM	Keynote 8		Next Generation Heat Exchangers for Sustainable Decarbonization/ Electrification of Energy Conversion Systems	**Michael Ohadi** University of Maryland **Moderator: Nesrin Ozalp** Purdue University Northwest
11:30 AM - 12:20 PM	Keynote 9		Thermal Engineering to Enable Advanced Spacecraft Power Generation Technologies	**Alex Rattner** Penn State **Moderator: Kevin Anderson** Calif State Polytechnic Univ, Pomona
12:30 PM - 1:20 PM	Keynote 10		Thermal Management of Electric Machines for Sustainable Green Transportation	**Satish Kumar** Georgia Tech **Moderator: Vikrant Aute** University of Maryland
1:30 PM - 1:45 PM	Break			
1:45 PM - 3:15 PM	Panel on Multiphase CFD: Risks, Rewards, and Remorse	Colony Ballroom	Panelists: Drs. Wayne Strasser, Ting Wang, Goodarz Ahmadi, Marcelo de Lemos, Robert Francis Kunz Moderator: Wayne Strasser, Liberty University	
3:15 PM - 3:30 PM	Break			
3:30 PM - 4:00 PM	Closing Ceremony with conference participants Draw Prize Raffle	Colony Ballroom	Dean Samuel Graham: Overview and closure; Yong Tao, ASTFE President: Closure and Draw Prize Raffle; Nesrin Ozalp: Closure; Kevin Anderson: Closure; Wilson Chiu: Closure	

THANKS TO OUR EXHIBITORS AND SPONSORS

Friday — March 31, 2023

Time	Session	Title	Author
		Virtual Session 1	
		EARLY SESSIONS	
10:00 AM - 12:00 PM	**SESSION V-1A** **Aerospace Applications / Heat Pipes and Cryogenics** **Chair:** **Ravinder Yerram** General Electric Gas Turbines	46347 - A numerical study of different Jet tab configurations for Thrust vector control in supersonic vehicles	Jyothy V M Karunya University
		45933 - Numerical prediction of the performance of the high-pressure transonic axial turbine with purge flow passage	Pitchai Pillai Sharmila Indian Institute of Technology Madras
		47364 - Two-phase flows Driven by Temperature Gradient in Oscillating Heat Pipes	Frank Feng University of Missouri
		45873 - Effect of liquid-vapor interaction on the thermal performance of a flat grooved heat pipe	Barbaros Cetin Bilkent University Mech. Eng. Dept.
		46135 - FSAE Single Seater Race Car Disc Brake Numerical Thermal Analysis A Case Study	Murat Otkur American University of Middle East Kuwait
		47405 - A heat and mass transfer model for meat foods during one sided heating process	Wei Yang University of Science and Technology of China
		47407 - Modeling of heat and mass transfer process and l ge deformation during baking of dough	Luo Zhang University of Science and Technology of China
10:00 AM - 12:00 PM	**SESSION V-1B** **Computational Methods/Tools in Thermal-Fluid Systems** **Chair:** **Puxuan Li** Kansas State Uniersity	46362 - Understanding The Differences Between Classical and Bayesian Statistics Applied to Thermally Formed Polymeric Materials	Ashley Emery Univ. Washington
		46296 - A study on combustion characteristics according to the change in the secondary air input angle in an air-cooled combustion furnace	Young-Jae Kim Sungkyunkwan University
		46433 - On Demand Formulation of The Gradient Adaptive Transfinite Elements for Flow Field Problems	Nesrin Sarigul-Klijn Univ of California Davis
		45999 - Effect of Heat Exchanger and Engine Geometry on Power Output of a Low Temperature Difference Stirling Engine	Linda Hasanovich University of Alberta
		45639 - CFD analyses for various sts early target cooling channel concepts	Min-Tsung Kao Oak Ridge National Laboratory
		45775 - A Method of Utilizing Characteristics of Flow Structures to Analyzing Heat Transfer Efficiency on Micro-fin Enhanced Surfaces	Puxuan Li Kansas State Uniersity
		46310 - Performance analysis of non-gray radiation models SLW and WSGG at the limit of smallest computational cost	Soroush Rashidzadeh Aalto University
10:00 AM - 12:00 PM	**SESSION V-1C** **Energy and Sustainability** **Chair:** **Gayathri Shivkumar** AbbVie Inc.	46508 - Study on series integrated power-absorption refrigeration system with adjustable concentration and source/sink pressure	Adityabir Singh Indian Institute of Technology Ropar
		46078 - Design and performance analysis of Slinky type foundation heat exchangers for space heating and cooling in a cold climate	Shayan Davani University of Minnesota Duluth
		45838 - Identifying Key Design Parameters for Anthropogenic Heat Emssion and Energy Consumption from Building to Support Decision Making Toward Urban Heat Island Reduction	Mansour Alhazmi Arizona State University
		45841 - Comparison of different fluids for a hybrid cooling strategy of cylindrical lithium-ion batteries	Seham Shahid Ontario Tech University
		47406 - Computational Analysis of cylinder liner spray lubrication in large two-stroke marine diesel engines	Bjorn Christian Dueholm Aalborg University
		47370 - Optimization of an Atmospheric Water Harvesting Device for Potable Water Production	Ademola Adeyanju University of the West Indies
		46313 - An experimental setup for plasma gasification of sewage sludge	Flavia Barbosa University of Minho
10:00 AM - 12:00 PM	**SESSION V-1D** **Experimental Methods/Tools and Instrumentation in Fluid Mechanics and Heat/Mass Transfer** **Chair:** **Sreenivasa Rao Gubba** University of Dayton	46002 - Concurrent spectroscopic measurement of emissivity and temperature of burning single coal particles	Yuan Yao Northeastern University
		45753 - Experimental investigation of drag reduction over superhydrophobic surfaces in an open channel flow	Ahmed Faraj Alarbi Alsharief Memorial University of Newfoundland
		45806 - Mass flow rate measurements using engineering principles	Elizabeth Clifford The University of Akron
		45965 - Three-Dimensional Investigation of Particle Agglomeration during Gravity Settling	Kostiantyn Ostapchuk Florida Atlantic University
		46122 - Spray flash vacuum distillation: modeling principles and cycle design	Mohammad Mohammadzadeh Moghanjooghi New Jersey Institute of Technology
		46123 - Numerical analysis and two-phase flow vof modeling of non-linear vacuum condensation of water vapor in parallel plate condenser	Mohammad Mohammadzadeh Moghanjooghi New Jersey Institute of Technology

Time	Session	Title	Author
10:00 AM - 12:00 PM	**SESSION V-1E** **Fluid Flow and Heat Transfer in Industrial and Commercial Processes** **Chair:** **Khalil Khanafer** University of Michigan - Flint	46295 - Thermal transport property at a solid-liquid interface with atomic structures: step, cluster, vacancy, and adatom	Kunio Fujiwara Osaka University
		46381 - Annual Performance of a Simulated Multi-Mode SDHW/SAHP System with Various Control Options	Julian Howarth University of Waterloo
		47247 - Numerical simulation of turbulent flow over airfoil and its optimization design	Xingchuan Ma Portsmouth Abbey School
		45947 - Evaluation of literature correlations for heat transfer coefficients in jacketed stirred tank reactors	Rachael C. Lowe The University of Leeds
		45962 - Design and Analysis of a Tunnel Kiln for Dhokra Craft	Abhay Pratap Singh IIT Delhi
		46113 - Efficient utilization of phase change materials to optimize energy in buildings	Khalil Khanafer University of Michigan - Flint
10:00 AM - 12:00 PM	**SESSION V-1F** **Fundamentals in Fluid Flow and Heat/Mass and Momentum Transfer** **Chair:** **Aziz Raman** Texas A&M University at Qatar	45894 - Flow and Heat Transfer from a Heated Cylinder Moving Adjacent to Wall in Yield Stress Fluids	Preeti Suri Indian Institute of technology Ropar
		45657 - Anti-icing performance of a superhydrophobic and electrothermal coating on metallic substrates	Xili Duan Memorial University
		47239 - Predictive mode for the maximum spreading factor of droplet impact hydrophobic pillar surface	Xin Zhou Chongqing University
		45966 - Natural Convective Heat Transfer from Horizontal Two-Dimensional and Circular Thin Two-Sided Plates Having Different Thermal Boundary Conditions on the Plate Surfaces	Patrick H Oosthuizen Queen's University
		45997 - Role of Large-Scale Circulating Structures in Mixed Convection of Poiseuille-Rayleigh-Benard Convection	Sina Kashanj University of Alberta
		46041 - Numerical investigation of flow over a low aspect ratio elliptical cylinder near a moving wall	Saurabh Kukreti Indian Institute of Technology Roorkee
		46104 - Investigation of a Solid Particle Deposition Velocity in Drag Reducing Fluids With Salinity	Aziz Raman Texas A&M University at Qatar
10:00 AM - 12:00 PM	**SESSION V-1G** **Heat/Mass Transfer Enhancement Techniques** **Chair:** **Like Li** Mississippi State University	45908 - Performance evaluation of a bubble absorber in a vars with swirl entry of refrigerant vapour	Narasimha Reddy Sanikommu IIT Madras
		46008 - Heat Transfer Enhancement of a Coil Heat Exchanger using Nanofluids with Metal Oxide Nanoparticles dispersed in Water, Oil and Ethylene Glycol	Carlos Ivan Rivera Solorio Instituto Tecnológico y de Estudios Superiores de Monterrey
		45872 - Effects of Hydrophobic Area Fraction in a Wettability-Patterned Evaporator for an Ultrathin Vapor Chamber	Huihe Qiu The Hong Kong University of Science and Technology
		46614 - Numerical investigation of heat transfer enhancement from a plane surface using annular jet impingement with crossflow	David Korba Mississippi State University
		45984 - Tomography-based pore-scale model and prediction of flow and thermal transport properties for thermochemical energy storage materials	David Korba Mississippi State University
10:00 AM - 12:00 PM	**SESSION V-1H** **Multiphase Flows / Nano and Micro Fluids Applications** **Chair:** **Joe Cor** Penn State	46315 - Effect of thermophysical and dielectric properties of a liquid droplet on continuous motion in the presence of an electric field	Krishnamurthy Muralidhar IIT Kanpur
		45897 - Visualization of quantum dots' diffusion inside silica gel	Yusaku Abe Waseda University
		45963 - Enhancement of droplet mixing using serpentine microchannel with inner-wall ridges	Xiang Cao Southeast University
		46262 - Use of Pulsed Currents for Electropolishing and Shaping of Micro-mould Tools to Reduce Demoulding Defects	Sana Zaki UCD Connect
		45977 - Dynamic spreading and infiltration of a molten sand droplet on a porous surface	Rahul Babu Koneru University of Maryland College Park

Time	Session	Title	Author
10:00 AM - 12:00 PM	**SESSION V-1I** **Refrigeration, Air Conditioning Systems, and Refrigerants & Heat Pumps / Energy Storage** **Chair:** **Wahiba Yaici** CanmetENERGY Research Centre	46410 - Optimum freeze desalination configuration for maximum theoretical energy efficiency	Aly Elhefny The University of Oklahoma
		45922 - Long-term thermal performance analysis of a horizontal foundation heat exchanger for space heating and cooling in extremely cold climates	Amirhossien Darbandi University of Calgary
		46500 - Comparative assessment of various dual-phase cycles used for space-cooling	Gaurav Singh Indian Institute of Technology Ropar
		46040 - An experimental study over frost formation: transient heat transfer analysis via dimensionless numbers	Alper Saygin Ozyegin University
		46019 - Improving Low-temperature Performance of Vanadium Flow Battery through Thermal Activation of Electrodes	Pavan Kumar Vudisi Indian Institute of Technology Madras
		46242 - Healthy and Energy-saving Design in a University Library	Yu-Kai Huang National Taipei University of Technology
		46443 - Evaluation of Phase-change Material Performance in Hot and Dry Climate for Building Efficiency	Inzamam Ahmad Indian Institute of Technology Gandhinagar
		45951 - Hydrodynamic Analysis of a Novel Circular Split Serpentine Planar Flow Field	Ammu Usha Manasa IIT Madras
10:00 AM - 12:00 PM	**SESSION V-1K** **Applcations of Thermal Fluids Heat Transfer Engineering** **Chair:** **Eduardo Divo** College of Engineering, Embry-Riddle Aeronautical University	45832 - Numerical Study of Thermal Performance of Double-Roof Design	Weihan Zhang Winchester College
		46327 - Does liquid film temperature affects single drop impact dynamics?	Andre Silva Universidade da Beira Interior
		46426 - Simulation of heat transfer characteristics in a t-shape enclosure with different boundary conditions	Emel Selamat OSU
		46442 - Development of novel self-suction boiling heat exchanger	Chaobin Dang University of Fukui
		46615 - Study of Transport Phenomena on Cooling of Flat Plate using Swirl Jet Impingement with Crossflow	Maximos Rizk Ain Shams University
		47409 - Analysis of Ammonia Recovery from Ammonia-nitrogen Wastewater based on Air-gap Diffusion Distillation	Xingyu Wu Dalian University of Technology
		46588 - Numerical investigation of heat exchanger enhanced with different peripherally-cut twisted tapes by using nanofluids	Xinyu Ma Dalian University of Technology
12:00 PM - 12:30 PM	Break		
LATER SESSIONS			
12:30 PM - 2:30 PM	**SESSION V-2A** **Combustion, Fire and Fuels** **Chair:** **Joe Cor** Penn State	45733 - Modeling the Novel Jones Engine Toroidal Concept in Homogeneous Charge Compression Ignition (HCCI) and Spark Ignition (SI) Combustion Modes	Dan DelVescovo Oakland University
		46043 - The effect of aerodynamics on air blast atomizer in co and counter rotating flow on spray flames	Mebougna Drabo Alabama A&M University
		46112 - Advanced chemical kinetics of thermite reactions	Kesiany Souza Non-member
		45036 - Effect of Geometric Parameters on The Heat Transfer Performance of Computer CPU Coolers	Shuva Das Southern Illinois University Edwardsville
		46444 - Experimental investigation of the performance of 10kWe non-catalytic diesel autothermal reformer for marine fuel cell system applications	Ravinder Kumar Indian Institute of Technology Gandhinagar
		46243 - The Evaluation of the Wind Loads on a Wind Turbine under Different Wind Conditions	Shuo-You Xiao National Taipei University of Technology
		46275 - Numerical Simulation on the Flame Merging Behavior of the Multiple Pool Fires on Two Adjacent LNG Tanks with FLACS	Xin Tang Southwest Petroleum University
12:30 PM - 2:30 PM	**SESSION V-2B** **Computational Methods/Tools in Thermal-Fluid Systems** **Chair:** **Laurie Florio** US ARMY DEVCOM AC	45496 - Modeling multi-component discrete particulates	Laurie Florio US ARMY DEVCOM AC
		45497 - Comparison of results with varying solution methods for flow over a wedge	Laurie Florio US ARMY DEVCOM AC
		45800 - Parametric Modeling of Anomalous Heat Transfer at Material Interfaces	Edward Michaelchuck US Naval Research Laboratory
		46025 - Multi-objective optimization of staggered arrays of streamlined pin fins in a flat rectangular cooling duct for electric vehicle power modules	Retta Ito The University of Kitakyushu
		44953 - A shock tube with the driver gas pressure introduced through an inlet port	Majid Molki Southern Illinois University Edwardsville
		45140 - Shock bifurcation in a tube with a high inlet pressure	Majid Molki Southern Illinois University Edwardsville

Time	Session	Title	Author
12:30 PM - 2:30 PM	**SESSION V-2C** **Energy and Sustainability / Heat Transfer Enhancement** **Chair:** **Gayathri Shivkumar** AbbVie Inc.	46093 - Microfluidic Analysis of Seawater-based Concrete Solution for Carbon Capture and Storage	Abhishek Ratanpara Florida Atlantic University
		46261 - Method for synthesizing a gas with a predictable composition	Anatoliy Pavlenko Kielce University of Technology
		45701 - Energy harvesting improvement of a flexible airfoil with active control	Kiana Kamrani-Fard Oregon State University
		45960 - Numerical investigation of the effect of winglet configurations on the blade performance for horizontal axis wind turbine	Bayu Kusuma Wardhana University of Miyazaki
		45828 - Fluid engineering issues in the design of industrial-scale flow batteries	Maruthi Prasanna M IIT Madras
		46614 - Numerical investigation of heat transfer enhancement from a plane surface using annular jet impingement with crossflow	Omar Gamaleldeen Kaoud Ain Shams University
12:30 PM - 2:30 PM	**SESSION V-2D** **Flow Instability & Turbulence** **Chair:** **Assaad Alsahlani** Engineering Technical College of Al–Najaf, Al–Furat Al–Awsat Technical University (AUT)	47365 - Marangoni stability of a thin film flowing down above or below a thick wall with slip	Luis Antonio Davalos-Orozco Instituto de Investigaciones en Materiales, Universidad Nacional Autonoma de Mexico
		46071 - Flow instability in buoyancy-assisted and opposed flows through a vertical pipe in the laminar regime of mixed convection-a numerical study	Somenath Gorai Indian Institute of Technology Ropar, Punjab
		46388 - Simultaneous measurements of velocity and temperature in a turbulent plane wake of a heated plate.	Madjid Sehaba Laval University
		46070 - Study on the heat transfer and pressure drop power curves for entropy generation rate in the laminar, transitional, and turbulent flow regimes	Sogo Mayokun Abolarin University of The Free State
		40806 - Thermo-Viscoelastic Peformance of a Liquid Metal Polymer Composite	Ashley Emery University Washington
12:30 PM - 2:30 PM	**SESSION V-2E** **Fluid Flow and Heat Transfer Multiphase Phenomena** **Chair:** **Mathieu Francoeur** University of Utah	45807 - Numerical analysis of finite porous journal bearing considering cavitation	Elizabeth Clifford The University of Akron
		46293 - A comprehensive validation of CFD-based wet steam approach for the modelling of steam ejectors	Rafal Fingas Politecnico di Milano
		45607 - The effects of the gravity and airflow on the thickness profile and shape of the curved liquid film	Weiwei Yuan Beihang University
		45608 - An experimental investigation on the liquid film formed by the oblique impingement of multiple liquid jes onto a wall	Hongzhou Zhang Beihang University
		46308 - Phase distribution and interphase mass transfer of carrier fluids in T-junction of carbon dioxide sublimation system	Ning Xia Wang Tianjin University of Commerce
		46314 - Impact of energy stored in the insulating material during a hydrate plug displacement through one-sided depressurization in gas-condensate two-phase flow	Angela O. Nieckele PUC-Rio, Pontifical Catholic University of Rio de Janeiro
		47404 - High-precise Reconstruction of Target Temperature History in Electron Beam Thermal Assessment	Hongxin Yao University of Science and Technology of China
12:30 PM - 2:30 PM	**SESSION V-2F** **Fundamentals in Fluid Flow and Heat/Mass and Momentum Transfer** **Chair:** **Aziz Raman** Texas A&M University at Qatar	46059 - MHD and viscous dissipation effects due to Graphene based nanofluid flow in concentric cylinders	Susmitha Priyadharshini D R Indian Institute of Information Technology Tiruchirappalli
		46027 - Aerodynamic interference of vertical axis wind turbines in array configuration	Zakria Toor King Fahd University of Petroleum and Minerals
		46328 - Effect Of Coatings On Transient Thermal Spreading Resistance In A Circular Flux Tube	Lisa Steigerwalt Lam Memorial University
		46096 - Inhibiting Mechanisms of Aqueous Corrosion Product Adhesion to a Ceramic Substrate	Daniel Brooker Villanova University
		45880 - A Numerical Study of Natural Convective Heat Transfer from Thin Horizontal Rectangular Plates having Various Aspect Ratios	Koustav Bandyopadhyay Queen's University
		46104 - Investigation of a Solid Particle Deposition Velocity in Drag Reducing Fluids with Salinity	Aziz Raman Texas A&M University at Qatar

Time	Session	Title	Author
12:30 PM - 2:30 PM	**SESSION V-2G** **Heat/Mass Transfer Enhancement Techniques** **Chair:** **Like Li** Mississippi State University	45946 - Effect of Inclination Angle of Butterfly-Wing Vortex Generator on Entropy-generation in a Rectangular Microchannel	Ananta Kumar Das IIT Madras
		45954 - An experimental investigation on the effect of adding nanoparticles to seawater in rapid cooling systems	Latefa Alhassan Kuwait University
		46084 - The impact of pot lids on small cookpot energy usage during simmering	Kenneth Bryden Ames Laboratory
		46335 - Role of Thermosyphon's Design for Passive Cooling of High-Power LED Panels	Sohail Zaidi San Jose State University
		46588 - Numerical investigation of heat exchanger enhanced with different peripherally-cut twisted tapes by using nanofluids	Xinyu Ma Dalian University of Technology
		45935 - The Optimization of a Jet Impingement and Micropost Hybrid Cooling System for High Heat Flux Semiconductors	Seungwoo Kim Korea Advanced Institute of Science and Technology (KAIST)
12:30 PM - 2:30 PM	**SESSION V-2H** **Multiphase Flows / Nano and Micro Fluids Applications** **Chair:** **Saeid Vafaei** Bradley University	45840 - Experimental Investigation of Heat Transfer of Al2O3 Nanofluids in Pool Boiling	Sohel Murshed Instituto Superior Técnico
		46434 - Three-dimensional flow transition around a heated diamond-shaped cylinder in mixed convective flow regime: a dns study	Sanjeev Sanghi Indian Institute of Technology
		46436 - Effect of isotropic and anisotropic porous media on drag reduction in Taylor-Couette flows	Sanjeev Sanghi Indian Institute of Technology
		46153 - Optimization of Hybrid Nanofluids for Thermal Management Applications	Gabriel Herrera Bradley University
		46154 - Nanofluid heat transfer coefficient: Effects of nanofluid characteristics	Gabriel Herrera Bradley University
		47289 - Microfabrication of Multilayer Flexible Liquid Metal Absorber	Mohammad Salman Parvez University of Texas at Dallas
12:30 PM - 2:30 PM	**SESSION V-2I** **Flow and Heat Transfer in Biological Systems / Fluid Flow and Heat Transfer Multiphase Phenomena** **Chair:** **Khalil Khanafer** University of Michigan	45594 - Study of Biomagnetic fluid flow and heat transfer containing magnetic particles over a cylinder subject to prescribed heat flux	Jahangir Alam Department of Applied Mathematics, University of Dhaka
		45850 - Investigation on the thermal performance enhancement with leif-vein-like porous network structure	Qun Han Southeast University
		45903 - A novel Approach for Patient Treatment Planning of Localized Cancer	Pradyumna Ghosh IIT(BHU), Varanasi, India
		47397 - Modeling of Liquid Microlayer Region in a Dewetting Water Bubble	Ermiyas Lakew University of Cincinnati
		45944 - Analysis of impingement jet heating and cooling of thermomagnetic material	Jonathan Hey Agency for Science Technology and Research Singapore
		46077 - Dual-Tracer Laser-Induced Fluorescence Thermometry for Understanding Bubble Growth during Nucleate Boiling	Mahyar Ghazvini Florida Atlantic University
		46626 - Analysis of the effect of ZnO-H2O on thermal performance of a forced-circulation flat plate solar water heating system	Kevin Nwaigwe University of Botswana
2:30 PM - 3:00 PM	**Break**		
3:00 PM - 3:30 PM	**Closing**		

ASTFE

American Society of Thermal and Fluids Engineers

The 2024 American Society of Thermal and Fluids Engineers (ASTFE) Conference (Hybrid) will be held in April 21-24, 2024 partially online virtual and in person at Oregon State University, Corvallis, OR, USA. ASTFE is the premier international society by and for professionals within the thermal and fluids science and engineering community. The 2024 ASTFE conference, TFEC 2024 provides an international forum for the dissemination of the latest research and knowledge in the thermal and fluid sciences. Authors are invited to submit abstracts covering, but not limited to, the following areas:

- Advanced Energy Systems
- Aerospace Applications
- Atomization
- Combustion, Fire and Fuels
- Computational Methods/Tools in Thermal-Fluid Systems
- Cryogenics
- Electric, Magnetic, Flow and Thermal Phenomena in Micro and Nano-Scale Systems
- Electronics Cooling
- Energy and Sustainability
- Energy Storage Systems
- Energy-Water-Food Nexus
- Engineering Equipment and Environmental Systems
- Engineering Fundamentals and Methodology
- Experimental Methods/Tools and Instrumentation in Fluid Mechanics and Heat/Mass Transfer
- Flow and Heat Transfer in Biological Systems
- Flow and Heat Transfer in Materials Processing Science and Manufacturing
- Flow in Internal Multiphase Flows
- Flow Instability
- Fluid Flow and Heat Transfer in Industrial and Commercial Processes
- Fluid Flow and Heat Transfer Multiphase Phenomena
- Fluid Measurements and Instrumentation
- Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids
- Fuel Cells
- Fundamentals in Fluid Flow and Heat/Mass and Momentum Transfer
- Heat Exchangers: Compact, Novel, Networks
- Heat Pipes
- Heat Pumps
- Heat/Mass Transfer Enhancement Techniques
- Industry Problems: CO2 Capture
- Machine Learning and AI
- Material Issues, Ceramics, Low Thermal Conductivity
- Measurement and Modeling of Environmental Flows
- Multiphase Flows
- Nano and Micro Fluids Applications
- Natural and Built Environments
- Nuclear Energy and Systems
- Ocean and Climate Science
- Plasma Physics and Engineering
- Refrigeration, Air Conditioning Systems, and Refrigerants
- Solar Energy Equipment and Processes
- Thermo-economic Analysis of Energy Systems
- Thermo-Fluid Education
- Transportation
- Turbulent Flows
- Wind Turbines Aerodynamics and Control

Authors will have options to present their research work as presentation only, extended abstract (maximum of 4 pages), or full-length paper (5-10 pages). The conference proceedings will contain both peer-reviewed extended abstracts and papers, and will be distributed in a digital form, the ASTFE Digital Library. Authors will also have the option to submit their full conference papers to a technical journal of their choice after the conference. The full conference papers should have significant changes made before submitting to any journals. The same full conference papers cannot be submitted to any journal publications. Authors may share their original manuscripts with the public but must include a citation and a link to the published paper (conference paper or journal paper).

SUBMIT YOUR PAPER ABSTRACT BY SEPTEMBER 17, 2023: http://submission.astfe.org

Please check http://astfe.org/tfec2024/ regularly for conference updates or contact any member of the organizing committee for further inquiries.

DEADLINES

September 17, 2023
Abstract Due

September 27, 2023
Notification of Abstract Accept / Decline

October 20, 2023
Draft Paper / Extended Abstract Due

November 17, 2023
Draft Paper / Extended Abstract Reviews Completed

December 8, 2023
Authors Notified of Paper / Abstract Status

January 12, 2024
Revised Manuscript Due

January 21, 2024
Presentations Only Abstracts Deadline / Final Paper / Extended Abstract Due

ORGANIZING COMMITTEE

Conference Chair:
Dr. Jayathi Y. Murthy, Oregon State University

Conference Co-Chair:
David L. Blunck, Oregon State University

Conference Co-Chair:
Nesrin Ozalp, Purdue University Northwest

Technical Program Chair:
Hamidreza Najafi, Florida Institute of Technology

Technical Program Co-Chair:
Patrick Mensah, Southern University and A&M College

Technical Program Co-Chair:
Kevin R. Anderson, Calif State Polytechnic Univ, Pomona

Conference Program

8TH THERMAL AND FLUIDS ENGINEERING CONFERENCE (HYBRID)

March 26–29, 2023

www.astfe.org/tfec2023/

UPCOMING CONFERENCES

17th International Heat Transfer Conference

Cape Town International Convention Centre, Cape Town, South Africa
August 14 – 18, 2023

The 18th International Symposium on Numerical Analysis of Fluid Flows, Heat and Mass Transfer - Numerical Fluids 2023

Heraklion, Greece
September 11 – 17, 2023

27th National and 5th International ISHMT-ASTFE Heat and Mass Transfer Conference

IIT Patna, India
December 14 – 17, 2023

9th Thermal and Fluids Engineering Conference (Hybrid)

Oregon State University, Corvallis, OR, USA
April 21-24, 2024

ASTFE
American Society of Thermal and Fluids Engineers

167 Madison Ave, Suite 501
New York, NY 10016
Tel.: +1 212 288 9200
Fax: +1 212 427 0300
www.astfe.org
info@astfe.org

50 North Street
Danbury, CT 06810
Tel.: +1 203 456 6161
Fax: +1 203 456 6167
www.begellhouse.com
orders@begellhouse.com

begell house inc publishers