Conference Program

ASTFE

4TH THERMAL AND FLUIDS ENGINEERING CONFERENCE

14-17 April 2019

Westin Las Vegas Hotel & Spa, Las Vegas, NV, USA

www.astfe.org/tfec2019/

Preface

On behalf of the conference committee, welcome to the **4th Thermal and Fluids Engineering Conference (TFEC)**. We are enthusiastic to have you join us at Westin Hotel, Las Vegas, NV, USA. The conference is hosted by the American Society of Thermal and Fluids Engineering (ASTFE). There are more than 500 full research papers, extended abstracts and presentations covering a wide range of topics in the thermal and fluids engineering technical communities. National and international experts from academia, industry, and government are attending, along with many students from around the world.

Pre-conference instructional opportunities at the University of Nevada include:

- 3-day short course: Introduction to Finite Element, Boundary Element, and Meshless Methods, April 12-14
- 1-day short course: Physics-Based Compressible Flow on April 13
- 1-day short course: Network Modeling for Design Applications on April 13

The conference will open on Sunday, April 14th with a Welcome Reception at 6:00 PM. Monday through Wednesday morning will begin with our distinguished plenary speakers. Tuesday afternoon will feature ASTFE Awards and Honors: the 2019 ASTFE Thermal Fluids Engineering Award, ASTFE Fellows Awards as well as Best Paper and Best Reviewer Awards. Monday through Wednesday will also feature lectures from widely recognized keynote speakers.

An annual TFEC highlight is the Technology, Entrepreneurship, Communications (TEC) Talks, which have been organized as a single session on Monday afternoon. Panel sessions covering thermal fluid engineering topics are planned for Monday through Wednesday during the morning and afternoon. Please join us on Tuesday afternoon for the ASTFE/TFEC Award Luncheon.

Evening activities include:

- High Roller Las Vegas Observation Wheel on April 15th at 7pm at the conference discounted price of $22 per ticket.
- Mystère by Cirque du Soleil on April 16th at 7pm at the conference discounted price of $75 for category 2 ticket.

We encourage you to enhance your involvement in ASTFE by becoming a member and volunteering to help plan and organize our future conferences and events. The ASTFE Board of Directors and organizing committees thank you for your participation in this exciting conference. Special appreciation goes to Anna Berlinova and other Begell House staff, for their support and dedication, and to the staff and students from University of Nevada for their assistance to make this program a success.

We also wish to thank our conference sponsors: Begell House Publishers, LaVision Inc., and AVL List GmbH for their kind support. We would like to extend our gratitude to the dedication of the session organizers and chairs, reviewers and authors, without whom this conference would not be possible. Finally, we would like to thank the speakers for their time and commitment in traveling to the meeting and sharing their work.

Thank you for your participation and we hope you enjoy the TFEC events!

Yours sincerely,

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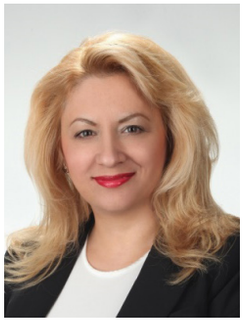

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About ASTFE

The American Society of Thermal and Fluids Engineers (ASTFE) is a U.S. nonprofit organization based in New York City. The organization is operating to arrange professional communications, support conferences and professional communities. It is supported by individual contributors, private foundations and other governmental bodies. ASTFE supports the Open Access movement.

Mission

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.

Vision

The long-term vision of the society is to be a leading organization to bring thermal and fluids engineers together to exchange ideas and present results to impact on new, emerging and challenging problems in research and technology. It is focused on international collaborations, strong interactions with industry and providing a dynamic atmosphere for young and upcoming researchers and engineers in this field.

History

ASTFE was established in July 2014 to promote the science and applications of thermal and fluids engineering and related disciplines. ASTFE cooperates with several awards, such as the William Begell Medal, the Nukiyama Memorial Award, and the Global Energy International Prize.

The William Begell Medal is made possible by the support of the Executive Committee of the International Centre for Heat and Mass Transfer (ICHMT) and the Assembly for International Heat Transfer Conferences (AIHTC) and the generosity of Begell House Inc.

The Nukiyama Memorial Award has been established and sponsored by the Heat Transfer Society of Japan to commemorate outstanding contributions by Shiro Nukiyama as an excellent heat transfer scientist. Nukiyama addressed the challenges of the boiling phenomena and published a pioneering paper which clarified these phenomena in the form of the Nukiyama curve (boiling curve).

The Global Energy Prize annually honors outstanding achievements in energy research and technology from around the world that are helping address the world's various and pressing energy challenges. The Global Energy Prize, founded in 2002, is awarded to the most accomplished minds in the research world.

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Plenary Speakers

SUSAN N. COPPERSMITH

Affiliation: Robert E. Fassnacht and Vilas Professor of Physics, University of Wisconsin-Madison

Title: From Bits to Qubits: a Quantum Leap for Computers

Abstract: The steady increase in computational power of information processors over the past half-century has led to smart phones and the internet, changing commerce and our social lives. Up to now, the primary way that computational power has increased is that the electronic components have been made smaller and smaller, but within the next decade it is expected to reach the fundamental limits imposed by the size of atoms. However, it is possible that further huge increases in computational power could be achieved by building quantum computers, which exploit in new ways of the laws of quantum mechanics that govern the physical world. This talk will discuss the challenges involved in building a large-scale quantum computer as well as progress that we have made in developing a quantum computer using silicon quantum dots.

Bio: Robert E. Fassnacht and Vilas Professor of Physics, University of Wisconsin-Madison. Susan Coppersmith, a theoretical physicist at the University of Wisconsin, Madison, has applied her talents across this span, from modeling the assembly of mollusk shells to programming quantum computers. Coppersmith was elected to the National Academy of Sciences in 2009, and in her Inaugural Article she describes and models the surprising intersecting lines and folds that appear in compressed monolayers of gold nanoparticle.

April 15 2019, Monday
8:45 AM - 9:45 AM — TFEC Plenary Lecture

Acacia A-D Ballroom (2nd floor)

THORNTON D. BARNES

Affiliation: CEO of Startel, Inc.

Title: The genesis of the CIA's Area 51 in Nveada

Abstract: During the Cold War with the Soviet Union, US President Eisenhower authorized the CIA's Project AQUATONE for which the CIA developed Area 51 in Nevada for the U-2 project more highly classified than was the Manhattan Project that developed the atom bomb. Becoming a CIA Station for its newly formed Directorate of Science and Technology (DS&T), the CIA turned its facility into a high tech flight test laboratory. There, CIA Special Projects contractors provided specialized services for customers such as the Air Defense Command, Tactical Air Command, US Navy, USAF Foreign Technology Division, Strategic Air Command, the Nation Air & Space Intelligence Center, and numerous aerospace contractors. Now declassified activities included the multiple Soviet MiG technical and tactical exploitation projects that prompted the Navy to initiate its Top Gun Weapons School, and the Air Force's Red Flag Exercises. The Project Have Blue/F-117 and B-2 bombers, and F-22 fighter furthered the development of stealth.

Bio: Thornton D. "TD" Barnes, author, and entrepreneur, grew up on a ranch at Dalhart, Texas. He served as an Army intelligence specialist in Korea and then continued his education while in the US Army. Barnes's career includes serving as a field engineer at the NASA High Range in Nevada for the X-15, XB-70, lifting bodies and lunar landing vehicles; working on the NERVA project at Jackass Flats, Nevada; and serving in Special Projects at Area 51. Barnes later formed a family oil and gas exploration company, drilling, and producing oil and gas and mining uranium and gold. Barnes currently serves as the CEO of Startel, Inc., a landowner, and is actively mining landscape rock and gold in Nevada. Remains active with oral history projects at the University of Nevada Las Vegas, Central Intelligence Agency, the Defense Intelligence Agency, and the National Reconnaissance Office. He serves as the president of Roadrunners Internationale, an association of Area 51 CIA, Air Force, and contractor veterans, and is the executive director of the Nevada Aerospace Hall of Fame.

April 16 2019, Tuesday
1:00 PM - 2:00 PM — TFEC Plenary Lecture

Acacia A-D Ballroom (2nd floor)

CHRISTIAN SATTLER

Affiliation: Head of Department Solar Chemical Engineering, German Aerospace Center (DLR), Professor for Solar Fuel Production at Technical University of Dresden, Germany.

Title: Concentrated Solar Radiation – An Option for Large Scale Renewable Fuel Production

Abstract: Converting solar energy efficiently into fuels is a key element to develop a sustainable and affordable energy economy. The presentation will give an insight on how concentrated solar radiation can be coupled into fuel production processes. It will discuss the benefits and challenges of using the sunlight directly instead of converting it into other energy vectors. The main focus will be on technologies with the perspective of large scale production at very high temperatures. Therefore solar tower systems for such production processes will be presented. Also the different components like concentrator, receiver, and reactor of the solar production plants will be described, possible locations will be discussed, and synergies with other R&D efforts on using high temperature heat will be shown. Hybrid solutions e.g. from the sulfur industry will demonstrate how concentrated solar radiation can contribute even today to actual industrial business models. As many of the addressed processes have to be operated continuously high temperature heat storage will also be introduced. Especially thermochemical heat storage has the potential for being the ideal technology for heat provision in high temperature production processes. The presented technologies will be put into a global picture to demonstrate the worldwide commitment in developing the technologies.

Bio: Christian Sattler works on technologies for using concentrated and non-concentrated solar radiation for thermochemical and photochemical processes. He is Vice-President of the Hydrogen Europe Research Association and member at large of the Energy Conversion and Storage Segment of the American Society of Mechanical Engineers (ASME).

April 16 2019, Tuesday
8:45 AM - 9:45 AM — TFEC Plenary Lecture
Acacia A-D Ballroom (2nd floor)

ESSAM E. KHALIL

Affiliation: Professor of Energy, Faculty of Engineering, Cairo University

Title: 21st Century CFD Computations of Flow Regimes and Thermal Comfort in 15th Century BC Tombs of the Valley of Kings

Abstract: Airflow characteristics in ventilated and air-conditioned spaces play an important role to attain comfort and hygiene conditions. This paper utilizes a 3D Computational Fluid Dynamics (CFD) model to assess the airflow characteristics in ventilated and air-conditioned archeological tombs of Egyptian Kings in the Valley of the Kings in Luxor, Egypt . It is found that the optimum airside design system can be attained, if the airflow is directed to pass all the enclosure areas before the extraction with careful selection of near wall velocities to avoid any wear or aberration of the tomb-wall paintings. The mode of evaluation should assess the airflow characteristics in any tomb passage according to its position in the enclosure and the thermal pattern and air quality. The airside design and internal obstacles are the focus of the present work. The free air supply and mechanically extracted ducted air play an important role in the main flow pattern and the creation of main recirculation zones. The internal obstacles can offend the airflow pattern by different ways, such as, by increasing the recirculation zones or by deflecting the main airflow pattern.

To design an optimum HVAC airside system that provides comfort and air quality in the air-conditioned spaces with efficient energy consumption is a great challenge. Air conditioning can be identified as the conditioning of the air to maintain specific conditions of temperature, humidity, and dust level inside an enclosed space. The levels of the air conditions to be maintained are dictated by the local environment, type and number of visitors and required climate and the required visitors comfort and property reservation. For the present work, following other earlier similar work, a numerical study is carried out to define the optimum airside design of the tombs air ventilation and conditioning systems, which provides the optimum comfort and healthy conditions with optimum energy utilization. The present paper introduces a description of the computational solver and its validation with steady state results of the previous properly related literatures. Basically, airside design types are considered here for the tomb passage of King Ramsis VII , including different visitors (obstacles) alternative positioning to introduce the capability of the design to provide the optimum flow and thermal regimes characteristics. The primary objective of the present work is to assess the airflow characteristics, thermal pattern and energy consumption in the different tomb ventilation configurations in view of basic known flow characteristics. The paper ends with a brief discussion and conclusions.

Bio: Professor of Mechanical Engineering, Faculty of Engineering, Cairo University, Chairman of National HVAC Code Committee, Ministry of Housing & Development, Coordinator For The National Energy Efficiency Code Committee For HVAC, Chairman National Ventilation Code Committee, Chairman Arab HVAC Code Committee, Consultant ASHRAE Members Council, AIAA Deputy Director International, USA, ASHRAE Director-At-Large, Energy and HVAC Expert at AMG, President “Consulting Engineering Bureau” CEB, Cairo.

April 17 2019, Wednesday
8:45 AM - 9:45 AM — TFEC Plenary Lecture
Acacia A-D Ballroom (2nd floor)

Keynote Speakers

SRINIVAS GARIMELLA

Affiliation: Hightower Chair in Engineering and Director, Sustainable Thermal Systems Laboratory

Title: Waste Heat Recovery and Upgrade: Potential, Limits, and Practical Implementation

Abstract: Waste heat is one of the more abundant sources of energy in the world. It is often thought that it has the potential to offset a considerable fraction of primary energy needs. However, it must be kept in mind that waste heat is indeed energy that is discarded due to practical limitations of the relevant processes. Useful output from waste heat is extremely challenging to extract without potentially crippling capital costs and parasitic loads. These implementation challenges are often overlooked by researchers aiming to exploit waste heat streams. Realistic opportunities, challenges, and innovations in the implementation of low-grade heat powered systems are discussed in this talk. An overall framework for assessing the potential for waste heat without detailed design exercises, and the matching of different kinds of waste heat to a variety of applications are presented. In addition, examples of compact thermal systems that harvest low-grade heat and upgrade it to produce power, cooling, and other end uses are presented.

Bio: Dr. Srinivas Garimella is the Hightower Chair in Engineering and Director of the Sustainable Thermal Systems Laboratory at Georgia Institute of Technology. He received M. S. and Ph.D. degrees from The Ohio State University, and a Bachelor's degree from the Indian Institute of Technology, Kanpur. He has held prior positions as Research Scientist at Battelle Memorial Institute, Senior Engineer at General Motors Corp., and Associate Professor at Western Michigan University and Iowa State University. He is a Fellow of the American Society of Mechanical Engineers, past Associate Editor of the ASME Journal of Heat Transfer, and Editor of the International Journal of Air-conditioning and Refrigeration. He has also served as Associate Editor of the ASME Journal of Energy Resources Technology, and Past Chair of the Advanced Energy Systems Division of ASME. He was an Associate Editor of the ASHRAE HVAC&R Research Journal and Chair of the ASHRAE Technical Committee on Absorption and Heat Operated Machines, and was on the ASHRAE Research Administration Committee. He has mentored over 75 postdoctoral researchers, research engineers and students pursuing their M.S. and Ph.D. degrees, with his research resulting in over 250 archival journal and conference publications, a textbook on Heat Transfer and Fluid Flow in Minichannels and Microchannels (2nd Ed., Elsevier 2014), and a book on Condensation Heat Transfer (World Scientific Publishing, 2015.) He has been awarded eight patents. He is the recipient of the NSF CAREER Award (1999), the ASHRAE New Investigator Award (1998), and the SAE Ralph E. Teetor Educational Award for Engineering Educators (1998). He received the ASME Award for Outstanding Research Contributions in the Field of Two-Phase Flow and Condensation in Microchannels, 2012. He also received the Thomas French Distinguished Educator Achievement Award (2008) from The Ohio State University, and the Zeigler Outstanding Educator Award (2012) at Georgia Tech.

April 15 2019, Monday
10:00 AM - 10:36 AM — Keynote speech

Mesquite 4 room (1st floor)

MARIO F. TRUJILLO

Affiliation: Department of Mechanical Engineering and Department of Engineering Physics, University of Wisconsin-Madison

Title: Understanding Spray Formation and Atomization Through Highly Resolved Simulations

Abstract: It The combined growth in computing power and development of numerical methods have provided an opportunity to study the liquid injection, atomization, and spray formation process at an unprecedented level of detail. Based on these types of simulations commonly referred to as DNS, the present talk focuses on the phenomena occurring in the near field, which are largely responsible for establishing the initial conditions for the spray. Considering highspeed injections, which are relevant to internal combustion engine applications, the first part of the talk presents an examination of the role of interfacial stabilities in the breakup of the injected liquid jet. A main finding from the research shows that while the most unstable modes are captured in the simulations and agree with theoretical predictions, these modes are not directly responsible for fragmenting the liquid core or causing primary atomization. Their action is limited to breaking up the surface of the jet, while the liquid core of the jet remains intact for another 20 jet diameters downstream. A second topic discussed concerns the influence of internal nozzle flow on the atomization process. It is shown that the degree of surface roughness has a significant impact on the near-field jet behavior. For smooth internal profiles, the free surface of the jet does not show any appreciable level of distortion over the first 10 to 20 diameters from the orifice opening. These features are contrasted to results produced from more realistic internal nozzle configurations where

noticeable levels of free surface distortion occur almost immediately beyond the nozzle orifice and are characterized by a much higher degree of turbulent liquid energy. Additionally, flows under more realistic nozzle geometries influence the mean velocity of the issuing jet due to significant asymmetries, which when combined with the higher level of turbulence contribute to much shorter intact liquid lengths in comparison to ideal internal nozzle geometries.

Bio: Mario F. Trujillo is an associate professor in the Department of Mechanical Engineering and has an affiliate appointment in Engineering Physics. He is a former Department of Energy (DoE) Computational Science Graduate fellow and worked at the Los Alamos National Laboratory (T-3 Fluid Dynamics) developing multiphase flow codes for high-pressure conditions. Prior to his appointment at the UW-Madison, he was research faculty in the Computational Mechanics Division of the Applied Research Laboratory at the Pennsylvania State University, where he performed research on modeling bubbly flows, critical droplet vaporization, Lagrangian particle dynamics, Hybrid RANS/LES, and interface tracking methodologies. His current interests revolve around CFD in general, and specifically the numerical development and utilization of fully-resolved interfacial capturing techniques to study multiphase flows exhibiting heat transfer, phase change, and hydrodynamic breakup.

April 15 2019, Monday
2:30 PM- 3:06 PM — Keynote speech
Mesquite 4 room (1st floor)

ROBERT BOEHM

Affiliation: Distinguished Professor of Mechanical Engineering, University of Nevada Las Vegas

Title: Summary of Selected Solar Work

Abstract: The presentation will consist of two parts. The first will be a summary of a few projects, current and previous, that Professor Boehm has directed. These include the current development of a solar–driven supercritical CO2 engine, which is a Brayton derivative, and is believed to be one of the first solar engines of this type. The second project, one where UNLV was the PI and NV Energy and Pulte Homes were Co-PIs, was where a commercial housing development of 164 specially designed houses were built and sold. These houses were designed so that the peak electrical use (very high in many areas of the Southwest US) could be controlled. The talk will end with a brief summary of some solar projects recently reported from around the world.

Bio: Robert Boehm received his Doctorate in Mechanical Engineering from the University of California Berkeley. He was on the staff of the University of Utah for 22 years where he served as Department Chair among other assignments. He has been at the University of Nevada Las Vegas (UNLV) since 1990, and he has played an important part of the growth of the ME Department there. He is the Director of the University's Center for Energy Research which is a soft-money operation. He has won almost every honor and award given by UNLV. These include Distinguished Professor Award, Distinguished Research Award, and Distinguished Teaching Award, as well as many more. He is the author of over 400 technical publications, including five books; and he serves as the Editor of the Journal for Solar Energy Engineering as well as an Associate Editor for Energy-The International Journal.

April 15 2019, Monday
4:15 PM- 4:51 PM — Keynote speech
Mesquite 4 room (1st floor)

STEPHANE ZALESKI

Affiliation: Institut Jean le Rond ∂'Alembert, CNRS, Sorbonne Université

Title: High Performance Simulation of Multiphase Flow

Abstract: Droplets, bubbles and interfaces offer fascinating physical and mathematical problems and are a key part of the microscopic modeling of multiphase flow in thermal fluids and other contexts. The talk will describe how to address these problems numerically, using tools such as the Volume of Fluid method with exactly mass and momentum conserving numerical methods and accurate, well balanced capillary forces. The issues arising from the upscaling of simulations to the most extreme HPC environments will also be discussed. As exemples, I will discuss the problem of microlayer formation in boiling which involves the dynamics of contact line motion. The problem of triple line dynamics is a challenging one for CFD since itrequires adjustement to the method to deal with the viscous stress and pressure singularities. I will also discuss the invasion of porous media and atomizing flows.

Bio: Stéphane Zaleski is Professor of Mechanics at Sorbonne Université, the new Paris university resulting of the merger of Université Pierre et Marie Curie – Paris 6 and Université Paris-Sorbonne – Paris 4, and is currently (February to July 2019) on a visit at KTH in Stockholm. He studied for his doctorate at the Physics Department of Ecole Normale Supérieure in Paris, then held an assistant professor position at the department of mathematics at MIT and a «chargé de recherche» position at Centre National de la Recherche Scientifique in Paris. In 1992 he joined the Laboratoire de Modélisation en Mécanique of Université Paris 6 which later became the Jean Le Rond ∂'Alembert Institute. He investigates various numerical methods for the simulation of multiphase flow with applications for atomization, cavitation, porous media flow, boiling, hydrometallurgy and

droplet impact. He currently investigates several variants of the Volume of Fluid method for interface tracking, expecially for large density ratio flows, and its connection to multiscale modelling. He has written several computer codes for the simulation of two-phase flow including SURFER (with G. Zanetti, R. Scardovelli and D. Gueyffier) and PARIS Simulator (with R. Scardovelli and G. Tryggvason), and was closely connected to the development and use of the Gerris and Basilisk codes by Stéphane Popinet. He is Associate editor of Journal of Computational Physics and of Computer and Fluids. He received the Victor Noury prize of the Paris Academy of Sciences and the Silver Medal of CNRS; he is a Fellow of the American Physical Society. He created with Patrick Huerre a PhD and Master degree program in Fluid Mechanics taught entirely in English, a rarity at a French University. He was head of the Jean Le Rond ∂'Alembert Institute from 2009 to 2018.

April 16 2019, Tuesday
10:00 AM - 11:30 AM — Keynote speech

Mesquite 4 room (1st floor)

ASHWANI K. GUPTA

Affiliation: Department of Mechanical Engineering, University of Maryland

Title: Colorless Distributed Combustion (CDC): Recent Developments and Path Forward

Abstract: Colorless Distributed Combustion (CDC) shows great potential for significant noise reduction, lower NOx emissions, and uniform thermal field from High intensity combustion inn gas turbine applications. The CDC is characterized by distributed reaction zone which leads to uniform thermal field to provide significant improvement in pattern factor, lower sound levels, lower temperature fluctuations, reduced NOx and other pollutants emissions. Basic requirements for CDC are controlled mixing between the combustion air and product gases to form hot and diluted oxidant prior to its rapid mixing with the fuel. In this presentation, results from several combustor geometries will be presented in our quest to develop CDC for gas turbine combustor applications with low noise emission levels and superior pattern factor. The combustor showed fuel flexibility under true distributed combustion conditions. The results will be presented on emissions, acoustic signatures, exhaust emission, global flame signatures and thermal field uniformity. Sample experimental results will be presented using methane and other fuels at normal temperature air and fuel into the combustor under high intensity combustion conditions. Global flames photographs showed no color of the flames under certain input operational parameters. These conditions point towards colorless distribution combustion mode as evidenced from the data obtained on lower sound pressure levels, lower NOx emissions and better thermal field uniformity as compared to the baseline contemporary diffusion flame case. The global flame photographs showed uniform distribution of the flame in the entire combustion volume. This talk will provide recent developments on colorless distributed combustion and near term future research activities.

Bio: Ashwani Gupta is a Distinguished University Professor at the University of Maryland, College Park, USA. He received his PhD from the University of Sheffield, and higher doctorate (DSc) from the University of Sheffield and also from the University of Southampton, UK. He received Honorary doctorate from the University of Wisconsin Milwaukee, King Mungkut University of Technology North Bangkok, bestowed by the Princess of Thailand, and the University of Derby, UK. He is an Honorary Fellow of ASME and Fellow of AIAA, SAE, AAAS and RAeS (UK). He is co-editor of Environmental and Energy Science book series by CRC Press and Associate editor of 4 journals. He served as Director of Propulsion and Energy group at AIAA and also served as a member of Board of Directors at AIAA. He has received several national honors and several best paper awards from AIAA, ASME, ASEE and University of Maryland President Kirwan research award and College of engineering research award. He has published over 750 technical papers, 3 books and edited 13 books. His research interests include high intensity distributed combustion, HiTAC, swirl flows, combustion, sulfur chemistry, wastes and biomass to energy, biofuels, high speed mixing, laser diagnostics and sensors and air pollution.

April 16 2019, Tuesday
2:15 PM - 3:09 PM — Keynote speech

Mesquite 4 room (1st floor)

MICAH J. GREEN

Affiliation: Artie McFerrin Department of Chemical Engineering, Texas A&M University

Title: Carbon Nanomaterials as Local Heaters in Thermosets and Thermoplastics Manufacturing

Abstract: Additive manufacturing through material extrusion (ME), often termed 3D printing, is a burgeoning method for manufacturing thermoplastic components. However, a key obstacle facing 3D-printed plastic parts in engineering applications is the weak weld between successive filament traces, which often leads to delamination and mechanical failure. We have recently demonstrated a novel concept for

welding 3D-printed thermoplastic interfaces using intense localized heating of carbon nanotubes (CNTs) by microwave irradiation. We apply CNT-loaded coatings to 3D printer filaments; after printing, microwave irradiation is shown to improve the weld fracture strength by 275%. These remarkable results have opened up entirely new design spaces for material processing where localized heating is needed. We have recently shown that even low-frequency RF fields can also couple with carbon nanomaterial networks, allowing for simple RF applicators to locally heat monomers, resins, and plastics without any need for electromagnetic shielding. This enables rapid thermoset curing and 3D printing, oven-free automotive welding, curing of pre-ceramic polymers, and even rapid thermal imaging and quantification of printed nanomaterial sensors and electronics.

Bio: Micah J. Green received his bachelor's degree in chemical engineering at Texas Tech in 2002. He then entered the Chemical Engineering Ph.D. program at MIT where he was co-advised by National Academy members Bob Armstrong and Bob Brown. His Ph.D. focused on computational studies of phase behavior and rheology of rodlike liquid crystals; his studies also included a minor in early Christian history at Harvard. After finishing his Ph.D. in 2007, he developed nanotube-based liquid crystals and fibers as an Attwell-Welch Postdoctoral Fellow at Rice University.

After several years on the faculty at Texas Tech, he joined Texas A&M as an Associate Professor in the Artie McFerrin Department of Chemical Engineering in Summer 2014. He has received the NSF CAREER Award, the Young Investigator Award from the Air Force Office of Scientific Research, and the DuPont Young Faculty Award for his work in the area of nanomaterial dispersions and morphology dynamics, with applications to gels, composites, and additive manufacturing. His group combines experiment and simulation to bring the fields of chemical engineering, colloid science, and polymer physics to bear on critical nanotechnology applications.

April 16 2019, Tuesday
4:00 PM - 5:30 PM — Keynote speech

Mesquite 4 room (1st floor)

SUAD JAKIRLIC

Affiliation: Institute of Fluid Mechanics and Aerodynamics, Technische Universität Darmstadt

Title: Scale-Resolving Simulations of Flow and Thermal Fields with Relevance to Automotive Applications

Abstract: The present work is concerned with a comprehensive hybrid LES/RANS (Large-Eddy Simulation / Reynolds-Averaged Navier-Stokes) computational campaign addressing the turbulent flow structure and thermal management by reference to automotive engineering. Both external car aerodynamics, including isolated single car configurations but also the car-truck interference as encountered during an overtaking maneuver, and the motored engine applications accounting for a diversity of associated processes are considered. The latter includes simultaneous consideration of flow, multiphase spray-like fuel injection, wall-film formation, combustion (focusing on flame front propagation and related reaction mechanisms) and water jacket cooling; all listed processes are followed by a high-temperature wall-bounded heat transfer including both fluid and solid described by utilizing a multi-material modelling rationale. The multiplicity of underlying flow and turbulence phenomena taking place in a geometrically very complex environment requires a high-fidelity computational method consisting of specific physical models for all afore-mentioned phenomena and appropriate numerical algorithm. The turbulence modelling part of the FVM-based (Finite-Volume Method) computational method applied focusses on the PANS (Partially-Averaged Navier-Stokes) method representing a variable-resolution hybrid LES/RANS model derived to enable a smooth seamless transition from RANS to LES, that is from a fully-modelled computation to even, in the case of a correspondingly fine spatial resolution, a fully-resolved simulation (corresponding to DNS – Direct Numerical Simulation), in terms of a 'filter-width control parameter' variation, Basara et al. (2011). The RANS-constituent of the PANS methodology, modelling the unresolved turbulence, represents an ERM-related (Elliptic-Relaxation Method) near-wall eddy-viscosity-based turbulence model, upgraded to a numerically-robust formulation by Hanjalic et al. (2004). This model is appropriately modified resulting in a dissipation rate level which suppresses the turbulence intensity towards the residual level and consequent enhancement of the turbulence activity originating from the resolved motion. Herewith, the evolution of the structural features of the turbulence associated with the regions where large coherent structures with a broader spectrum dominate the flow is enabled. The presently utilized numerical algorithm is designed to accurately capture complex boundary movement (caused by driving cars, moving piston and valves) associated with relevant grid generation technique implying different aspects of meshing like the grid arrangement and resolution, with emphasis on the regions near the complex arbitrarily curved walls, and adaptive mesh refinement, especially in relation to expansion/compression cycles and a corresponding treatment of appropriately distorted grid cells. The developed computational methodology possesses a profound theoretical background, but is in the same time highly applicable in everyday engineering practice providing accurate and reliable results in a cost effective way.

Bio: Prof. Jakirlic has received his PhD degree at the University of Erlangen/Nuremberg in 1997 and his Habilitation in Fluid Mechanics at the University of Darmstadt in 2004. Since 1997 he has been heading the group for Modelling and Simulation of Turbulent Flows at the Institute of Fluid Mechanics and Aerodynamics, Technical University in Darmstadt, Germany. He is chairman of a reviewing panel at the European Research Council responsible yearly for 200 starting grant proposals. He is Editor-in-Chief of the Int. Journal of Heat and Fluid Flow (Elsevier Science Publisher) and Coordinator of the ERCOFTAC (European Research Community on Flow, Turbulence and Combustion) Special Interest Group on Turbulence Modelling (SIG15). He is furthermore the Organizing Committee Member of the Conference Series on Turbulence, Heat and Mass

Transfer (THMT) as well as the Advisory Board Member of different scientific conference series (TSFP, ETMM, HRLM). His field of interest is the Computational Fluid Dynamics focussing on the RANS (with special focus on the near-wall second-moment closure models) and hybrid LES/RANS modelling of complex turbulent and transitional, external and internal, single and two-phase flows and heat transfer. Prof. Jakirlic has published about 200 'peer-reviewed' articles in international scientific journals, edited books, bulletins, periodicals and conference proceedings.

April 17 2019, Wednesday
10:00 AM - 11:30 AM — Keynote speech

Mesquite 4 room (1st floor)

BRANISLAV BASARA

Affiliation: Advanced Simulation Technologies, AVL List GmbH

Title: Scale-Resolving Simulations of Flow and Thermal Fields with Relevance to Automotive Applications

Abstract: The present work is concerned with a comprehensive hybrid LES/RANS (Large-Eddy Simulation / Reynolds-Averaged Navier-Stokes) computational campaign addressing the turbulent flow structure and thermal management by reference to automotive engineering. Both external car aerodynamics, including isolated single car configurations but also the car-truck interference as encountered during an overtaking maneuver, and the motored engine applications accounting for a diversity of associated processes are considered. The latter includes simultaneous consideration of flow, multiphase spray-like fuel injection, wall-film formation, combustion (focusing on flame front propagation and related reaction mechanisms) and water jacket cooling; all listed processes are followed by a high-temperature wall-bounded heat transfer including both fluid and solid described by utilizing a multi-material modelling rationale. The multiplicity of underlying flow and turbulence phenomena taking place in a geometrically very complex environment requires a high-fidelity computational method consisting of specific physical models for all afore-mentioned phenomena and appropriate numerical algorithm. The turbulence modelling part of the FVM-based (Finite-Volume Method) computational method applied focusses on the PANS (Partially-Averaged Navier-Stokes) method representing a variable-resolution hybrid LES/RANS model derived to enable a smooth seamless transition from RANS to LES, that is from a fully-modelled computation to even, in the case of a correspondingly fine spatial resolution, a fully-resolved simulation (corresponding to DNS – Direct Numerical Simulation), in terms of a 'filter-width control parameter' variation, Basara et al. (2011). The RANS-constituent of the PANS methodology, modelling the unresolved turbulence, represents an ERM-related (Elliptic-Relaxation Method) near-wall eddy-viscosity-based turbulence model, upgraded to a numerically-robust formulation by Hanjalic et al. (2004). This model is appropriately modified resulting in a dissipation rate level which suppresses the turbulence intensity towards the residual level and consequent enhancement of the turbulence activity originating from the resolved motion. Herewith, the evolution of the structural features of the turbulence associated with the regions where large coherent structures with a broader spectrum dominate the flow is enabled. The presently utilized numerical algorithm is designed to accurately capture complex boundary movement (caused by driving cars, moving piston and valves) associated with relevant grid generation technique implying different aspects of meshing like the grid arrangement and resolution, with emphasis on the regions near the complex arbitrarily curved walls, and adaptive mesh refinement, especially in relation to expansion/compression cycles and a corresponding treatment of appropriately distorted grid cells. The developed computational methodology possesses a profound theoretical background, but is in the same time highly applicable in everyday engineering practice providing accurate and reliable results in a cost effective way.

Bio: Prof. Basara received his PhD degree from the City University of London in 1993 and his Habilitation in Computational Fluid Mechanics at the Technical University in Graz in 2007. Since 1995 he has been working for AVL-List GmbH, in Graz Austria, where he is currently holding the position of CFD Skill Team Leader for the development of the commercial CFD code AVL Fire. He received Privatdozent title from Technical University Graz for the field of fluid mechanics. Presently, he is adjunct professor at the Division of Fluid Dynamics, Chalmers University of Technology, Gothenburg, Sweden. His interest has been in the development of computational methods and turbulence models for industrial flows, with focus on vehicle aerodynamics and engine flows and transport phenomena. He has published to date more than 150 journal and conference articles, on subjects ranging from basic developments to applications in industrial flows.

April 17 2019, Wednesday
10:00 AM - 11:30 AM — Keynote speech

Mesquite 4 room (1st floor)

ASHLEY EMERY

Affiliation: University of Washington

Title: Uncertainty and Validation

Abstract: Modern engineering and design has changed remarkably during the last several years with the ability to couple massive computing power with sophisticated simulation programs. The end result can often be confusing when this approach is used to estimate parameters of the simulation model or used to predict the behavior of a system for parameters that are far from those used in confirming experiments. This

is particularly true when one wants to establish limits on the results. As a simple example, consider the characterization of the associated uncertainties through executing reduced models with Monte Carlo simulations. Firstly, is the reduced model an accurate representation of the full model over the range of parameters?, Secondly, can one afford the large number of computations that the Monte Carlo approach requires?, Thirdly, when comparing to experimental results, are the measurements really a good representation of the models, reduced or true? Finally, are the final recommendations accurately reflected in the conclusions.

A major ingredient in drawing conclusions is the ability to carefully determine the uncertainties associated with the computations and with the confirming experiments. Most of us have learned, possibly the hard way, that weather predictions offered by the evening news can differ substantially from the weather that we experience the next day. The models involve parameter calibration for an existing simulation code and its use in predictions. In short, the application and conclusions require consideration of statistics, probability, numerical analysis, sensitivities, and quantification of model discrepancies.

Current approaches involve not only statistical analysis, but also the application of Bayesian inference. It is common to hear that parameters are correlated, but it is not clear how this can occur in a reduced set of experiments. Maybe it is our estimates that are correlated. If so, what is the impact of this conclusion on the use of complex simulation programs.

The talk will describe how to evaluate uncertainties associated with complex simulations, how to combine them in a way that leads to useful conclusions, how combinations of conclusions lead us to estimate parameters and how the uncertainties affect our conclusions regarding the value of the overall simulation/experiment experience.

Bio: Ashley F. Emery began at University of Washington, 1961. Associate Professor in 1965, Professor in 1969. Associate Dean, College of Engineering, 1990-1994, Chair, Mechanical Engineering, 1994-1997, Program Director NSF, 1997-1999. Vice Chair and Chair, UW Senate Faculty, 2004-2007. Editor, ASME Verification, Validation and Uncertainty Quantification, 2014-present.

Technical areas: Heat Transfer, Fluid Dynamics, Inverse Problems, Fracture Mechanics, Stress Analysis, Uncertainty, Forensic Metrology.

April 17 2019, Wednesday
1:00 PM - 2:30 PM — Keynote speech

Mesquite 4 room (1st floor)

2019 Thermal Fluids Engineering Award

presented to

GRETAR TRYGGVASON

for prolific scholarship focused on numerical analysis of multiphase flow and career-long active engagementwith engineering education

Affiliation: Department Head and Charles A. Miller, Jr. Distinguished Professor, Department of Mechanical Engineering, Johns Hopkins University

Bio: Gretar Tryggvason is the Charles A. Miller, Jr. Distinguished Professor at the Johns Hopkins University and the head of the Department of Mechanical Engineering. He received his PhD from Brown University in 1985 and was on the faculty of the University of Michigan in Ann Arbor until 2000, when he moved to Worcester Polytechnic Institute as the head of the Department of Mechanical Engineering. Between 2010 and 2017 he was the Viola D. Hank professor at the University of Notre Dame and the chair of the Department of Aerospace and Mechanical Engineering. Professor Tryggvason is well known for his contributions to computational fluid dynamics; particularly the development of methods for computations of multiphase flows and for pioneering direct numerical simulations of such flows. He served as the editor-in-chief of the Journal of Computational Physics 2002-2015, is a fellow of APS, ASME and AAAS, and the recipient of several awards, including the 2012 ASME Fluids Engineering Award.

April 16 2019, Tuesday
11:30 AM

Acacia A-D Ballroom (2nd floor)

ASTFE Fellows

Elected ASTFE Fellow March 2019

GOODARZ AHMADI

Distinguished Professor Department of Mechanical and Aeronautical Engineering Clarkson University

Awards: ASTFE Member; ASME Fellow; Iranian Society of Mechanical Engineers Fellow; Iranian Society of Civil Engineers Fellow; ASME Freeman Scholar

Broad contributions to the theory of multi-phase flows touching upon gas-solid flows in industrial, environmental and medical applications; granular flows, turbulent sprays, hot gas filtration.

Leadership in engineering education at the departmental and institutional levels.

Bio: Dr. Ahmadi is a Clarkson Distinguished Professor, and Robert R. Hill Professor of Mechanical and Aeronautical Engineering at Clarkson University. He has obtained his MS and Ph.D. from Purdue University. He is a Fellow of ASME, ISME and ISCE and has been just been elected a Fellow of ASTFE. Among his many awards, he was the recipient of the 2016 ASME Freeman Scholar Award. He has four patents and authored three books and over 680 publications in archival journals. He also has made more than 1200 presentations including 20 plenary and keynotes at national and international technical conferences, and has given more than 160 invited talks and short courses at other institutions. He has been serving as the editor, editorial board and/or editorial advisor board of 12 international journals. His research interests include multiphase flows, particle transport and deposition, turbulence, flow control, granular flows, air pollution, flow through porous and fractured media, random vibrations and structural mechanics. His research has been supported by the National Science Foundation, the Environmental Protection Agency, Department of Energy, NASA, AFOSR, NYSTAR, GE, Corning, IBM, Xerox, Kodak and Dura Pharmaceutical. He has held many administrative at Clarkson University including, MAE Department Chair 1992-1995, Associate Dean of Engineering 2003-2005, Interim Vice Provost for Research 2004-2005, and Dean of Engineering 2005-2015. Earlier he served as Dean of Engineering at Shiraz University.

April 16 2019, Tuesday
11:30 AM

Acacia A-D Ballroom (2nd floor)

Elected ASTFE Fellow March 2019

FRANCINE BATTAGLIA

Professor of Mechanical & Aerospace Engineering University at Buffalo

Awards: ASTFE Member; ASTFE Vice President and Treasurer, Board of Directors; ASME Fellow

For fundamental contributions to the science and technology of building energy utilization and renewable/alternative energy, and turbulent multiphase and reacting flows. Exemplary contributions in research, education and service to the thermal and fluids engineering fields, and through distinguished leadership within ASTFE and ASME.

Bio: Dr. Francine Battaglia is a professor of mechanical engineering at the University at Buffalo, the State University of New York. She received a Ph.D. in mechanical engineering from the Pennsylvania State University (1997). Dr. Battaglia's areas of expertise are in computational fluid dynamics and computational model development with applications in alternative energy production, building energy utilization, gasification processes, and bioinspired flight. She has published over 120 journal and conference papers and recently co-authored a textbook on natural ventilation. Dr. Battaglia is the Editor for the ASME Journal of Fluids Engineering, the Chair of the ASME Congress Steering Committee, and served as Chair of the ASME Fluids Engineering Division (FED). She is also a Fellow of ASME, a recipient of the ASME FED 90th anniversary medal for seminal contributions to the discipline of fluids engineering, and recipient of a 2017 ASME Dedication Service Award.

April 16 2019, Tuesday
11:30 AM

Acacia A-D Ballroom (2nd floor)

Elected ASTFE Fellow March 2019

JAMES F. KLAUSNER

MSU Foundation Professor and Chair Department of Mechanical Engineering
Michigan State University

Awards: ASTFE Member; Member at Large, Board of Directors ASTFE; ASME Fellow

For fundamental contributions through experimentations and visualization of boiling and HDH desalination, and thermo-chemical conversion processes. Exemplary service to the heat transfer community as Chair of the ASME Heat Transfer Division and program development for the DoE ARPA-E initiative.

Bio: Dr. James Klausner is an MSU Foundation Professor and Mechanical Engineering DepartmentChair at Michigan State University (2016-present). He serves on the board of directors for the American Society of Thermal Fluid Engineers (2018-present) and the International Titanium Association Foundation (2016-present), and he formerly served as Chair of the ASME Heat Trasnfer Division (2011-2012). For three and a half years he served as a Program Director at the U.S. Department of Energy Advanced Research Projects Agency-Energy (ARPA-E). Prior to that he held the Newton C. Ebaugh Professorship in Mechanical and Aerospace Engineering at the University of Florida (1989-2015). He received his Ph.D. degree in 1989 from the University of Illinois, Urbana-Champaign. He has made substantial fundamental contributions to understanding the dynamics of vapor bubble incipience, growth, and detachment in boiling heat transfer systems. He has made many applied research contributions in high temperature solar thermochemical storage, waste heat and solar driven desalination, and high heat flux phase-change heat transfer. Dr. Klausner has authored more than 150 refereed publications, and his theoretical work on bubble dynamics is included in the Handbook of Heat Transfer. He is the author of ten patents and four provisional patents. He is a Fellow of the American Society of Mechanical Engineering, and he has served as is a recipient of the ASME Heat Transfer Division 75 th Anniversary Award.

April 16 2019, Tuesday
11:30 AM

Acacia A-D Ballroom (2nd floor)

Elected ASTFE Fellow March 2019

SUMANTA ACHARYA

Professor and Chair

Department of Mechanical, Materials and Aeronautical Engineering
Illinois Institute of Technology

Awards: Member ASTFE; Member at Large, Board of Directors ASTFE; ASME Heat Transfer Memorial Award; AiChE Kern Award; ASME Fellow

For prolific scholarship in fields of heat transfer in gas turbines, computational fluid dynamics, and general topics in heat transfer.

For exemplary leadership as Chair of the ASME Heat Transfer Division and continued service the heat transfer community via ongoing involvement with the HTD and ASTFE.

Bio: Sumanta Acharya (PhD, University of Minnesota, Mechanical Engineering) is the Department Chair of Mechanical, Materials and Aerospace Engineering Department at the Illinois Institute of Technology (IIT) in Chicago, IL (since 2016). He served as the Ring Companies Endowed Chair and Department Chair at the University of Memphis from 2014-2016. From 2010-2014, he served as the Program Director of the Thermal Transport Program in the Directorate of Engineering at the National Science Foundation (NSF). Prior to this, the majority of his academic career was at Louisiana State University (LSU) where he was the L. R. Daniel Professor and the Fritz & Francis Blumer Professor in the Department of Mechanical Engineering. He was the founding Director (in 2003) of the Center for Turbine Innovation and Energy Research (TIER) at LSU which focuses on energy generation and propulsion research. His scholarly contributions include mentoring nearly 85 post-doctoral researchers and graduate students, and publishing nearly 200 refereed journal articles and book chapters and over 250 refereed conference/proceedings papers. Professor Acharya is a Fellow of the ASME, and was awarded the 2015 AIAA Thermophysics Award, the 2014 AIChE Donald Q. Kern Award, the 75th ASME Heat Transfer Division Medal (in 2013), and the 2011 ASME Heat Transfer Memorial Award in the Science category.

April 16 2019, Tuesday
11:30 AM

Acacia A-D Ballroom (2nd floor)

Elected ASTFE Fellow March 2019

DR. K. MURALIDHAR

Senior Professor and Head (Former) of Mechanical Engineering, Former Dean of Research and Development, and Dean of Faculty
Indian Institute of Technology (IIT) Kanpur

Awards: ASTFE Member

Outstanding research contributions to heat transfer and fluid mechanics, particularly to the transport in porous media, jets and bluff-body wakes, crystal growth, biomedical modeling and disease progression, dropwise condensation, liquid-vapor interfacial phenomena over textured surfaces (three-phase contact line), and computational and experimental methods; and leadership to multi-disciplinary, multi-institutional research in solar hydrogen generation, unconventional hydrocarbons, CFD software development based on unstructured grids, and futuristic mechanics.

Bio: K. Muralidhar is Professor, Department of Mechanical Engineering at Indian Institute of Technology Kanpur (India) since 1995. He received a Ph.D. in Applied Sciences from University of Delaware, USA in 1985. He has guided over 20 doctoral students and has completed funded research in the areas of blooming jets and wake transition, extraction of methane from gas hydrates, growth of optical crystals and more recently, on dropwise condensation over textured surfaces. Over hundred and twenty full-length articles arising from this research have been published in well-known international journals. He has written review articles on flow visualization, interferometric tomography and schlieren imaging. Several patents have emerged from his research and these include enriching coarse MRI images of blood flow, imaging chaotic flow in enlarged arteries, and optical determination of thermal diffusivity of complex liquids. He has coordinated a national initiative on solar hydrogen generation, a multi-institutional project on CFD code development on unstructured grids, and an initiative on futuristic mechanics with IGCAR Kalpakkam. He has co-authored monographs on optical measurement techniques, transport in porous media, and mathematical modeling of dropwise condensation. His present work relates to moisture condensation over mesh-like surfaces and blood rheology.

April 16 2019, Tuesday
11:30 AM

Acacia A-D Ballroom (2nd floor)

Elected ASTFE Fellow March 2019

JON LONGTIN

Professor of Mechanical Engineering, 159 Light Engineering Bldg.
Stony Brook University

Awards: ASTFE Member

Extensive contributions to laser-liquid interactions, laser-based optical measurement techniques, laser-based flow visualization, precision materials processing and micromachining using ultrafast lasers, thermoelectric devices using thermal spray, integrated sensors for harsh environments, thermocouple/thermistor sensors for temperature, resistance and capacitance strain gauges, humidity and crack detection sensors, self-powered sensors for nuclear reactors, high performance cooling in air-cooled power plants, improved performance of next-generation residential heating systems, and evaporative cooling for data centers.

Bio: Jon P. Longtin, Ph.D., P.E. — Professor Longtin joined the Mechanical Engineering faculty at Stony Brook University in 1996. He came to Stony Brook after receiving his Ph.D. degree in 1995 from U.C. Berkeley, followed by a one-year postdoc at the Tokyo Institute of Technology in Japan. His research interests include energy conservation, innovative energy transfer and storage, and energy monitoring and diagnostics, as well as laser materials processing, particularly with ultrafast lasers and the development of sensors for harsh environments. His research has been funded by NSF, DOE, ARPA-E, DOD, NASA, NYSERDA, and a variety of industrial sources. He is the author of over 170 technical publications and holds 11 issued and pending patents. He has received the Presidential Early Career Award for Scientists and Engineers, two Excellence in Teaching Awards, and an R&D 100 award. He is a licensed Professional Engineer in New York State, and is a member of the National Academy of Inventors. He serves as a technical advisor to a number of local companies and non-profit organizations.

April 16 2019, Tuesday
11:30 AM

Acacia A-D Ballroom (2nd floor)

TEC Talk speakers

MARTIN R. SCHILLER

Affiliation: Executive Director, Nevada Institute of Personalized Medicine Prabhu Endowed Professor, School of Life Sciences, NIH Principal Investigator, Personalized Medicine in Nevada Center of Biomedical Research Excellence Principal Investigator, Schiller Laboratory of Applied Bioinformatics Nevada Institute of Personalized Medicine University of Nevada, Las Vegas, NV USA

Title: High thoughput molecular function assays on the frontier of big data

Abstract: Investigation of biological systems has historically focused on one-off types of experiments. The advent of more complex instrumentation and computer-based analyses has stimulated the development of impactful high-throughput techniques over the past few decades. A few examples of the major techniques are DNA sequencing, RNA sequencing, genome wide RNAi screens, and high content screens. These techniques enable the omics era of science with widespread analysis of genomes, proteomes, metabolomes, etc. Although there are now about a dozen major high throughput technologies in routine use, There is no high-throughput technology to assay different types of molecular functions with libraries of macromolecules in mammalian cells. This gap is critical because the molecular functions are the most essential to understand mechanisms, the etiology of disease, and for developing therapeutics. Our laboratory has developed an innovative pipeline combining gene editing, fluorescent reporters, flow cytometry, cell sorting, barcoding, and next-generation sequencing (NGS) into a New technology we call the GigaAssay. The GigaAssay can concurrently assay 100,000s of mammalian cells and replicates for effects of a variable in a library upon molecular functions. This single cell approach does not necessitate separating cells as done in a droplet generator. In our proof-of-principle example, we measured the transcriptional activity of ~60,000 Tat missense variants in one experiment with the GigaAssay; Tat is the HIV transcription factor. This technology will vastly accelerate the rate of study of cellular and molecular biology and the etiology of disease.

Bio: Martin R. Schiller received a B.S. from Hofstra University and a Ph.D. from Utah State University, both in Biochemistry. After postdoctoral fellowships at the University of Maryland, National Naval Medical Center, he was a fellow, and eventually appointed to the faculty at The Johns Hopkins University School of Medicine. He was also a faculty member at the University of Connecticut and is now a full professor at the University of Nevada, Las Vegas. Here, he is the founding and executive director of the Nevada Institute of Personalized Medicine. His work is focused on functional genomics, specifically short functional peptides and their role in disease. He has published 70 papers supported mostly by 26 research grants totaling ~$30M, mostly from the NIH. His research has spawned two of the first startup companies from UNLV, Food Genes and Me, LLC and Heligenics LLC. He has taught many classes, mentored many students and faculty, received a number of awards and produced a suite of bioinformatics tools for scientists.

April 15 2019, Monday
1:00 PM- 2:20 PM — TEC talks session

Acacia A-D Ballroom (2nd floor)

ROBERT BOEHM

Affiliation: Distinguished Professor of Mechanical Engineering, University of Nevada Las Vegas

Title: Quick Tour through Solar Issues with Particular Focus on Nevada

Abstract: This presentation covers three general areas. In order, these three include a summary of some details about the general status, benefits and drawbacks of solar applications; some details about the large scale solar power generation current technology with specific applications to a high solar flux area like Las Vegas, Nevada; and ending with a short overview of some the solar research projects that have been accomplished by the Center for Energy Research at the University of Nevada Las Vegas. The presentation contains many photographs pertinent to the presented remarks.

Bio: Robert Boehm received his Doctorate in Mechanical Engineering from the University of California Berkeley. He was on the staff of the University of Utah for 22 years where he served as Department Chair among other assignments. He has been at the University of Nevada Las Vegas (UNLV) since 1990, and he has played an important part of the growth of the ME Department there. He is the Director of the University's Center for Energy Research which is a soft-money operation. He has won almost every honor and award given by UNLV. These include Distinguished Professor Award, Distinguished Research Award, and Distinguished Teaching Award, as well as many more. He is the author of over 400 technical publications, including five books; and he serves as the Editor of the Journal for Solar Energy Engineering as well as an Associate Editor for Energy-The International Journal.

April 15 2019, Monday
1:00 PM- 2:20 PM — TEC talks session

Acacia A-D Ballroom (2nd floor)

ASHWANI K. GUPTA

Affiliation: Department of Mechanical Engineering, University of Maryland

Title: Municipal Solid Waste Management and its Conversion to Clean Energy

Abstract: Solid waste production from any nation can be directly linked to GDP, meaning higher the GDP, higher is the amounts of waste produced. The amounts of solid waste produced n the USA per capita is among the highest in the world with current levels being approximately 4.5 lbs/person/day. The composition and amounts of of solid waste generated can vary significantly and depends on the region and season. This talk will describe magnitude of the problem, how the waste is managed today, and potential new and novel pathways for waste destruction to produce clean energy with minimal emission of harmful pollutants.

Bio: Ashwani Gupta is a Distinguished University Professor at the University of Maryland, College Park, Maryland. He received his PhD from the University of Sheffield, and higher doctorate (DSc) from the University of Sheffield and also from the University of Southampton, UK. He received Honorary doctorate from the University of Wisconsin Milwaukee, King Mungkut University of Technology North Bangkok, bestowed by the Princess of Thailand, and The University of Derby, UK. He is Honorary Fellow of ASME and Fellow of AIAA, AAAS, SAE, and RAeS(UK). He is co-editor of Environmental and Energy Science book series by CRC Press and Associate editor of 4 journals. He served as Director of Propulsion and Energy group and also on Board of Directors at AIAA. He has received several national honors and best paper awards from AIAA and ASME, University of Maryland President Kirwan research award, and College of engineering research award. He has published over 750 technical papers, 3 books and edited 13 books. His research interests include high intensity distributed combustion, HiTAC, swirl flows, combustion, wastes and biomass to energy, biofuels, sulfur chemistry, high speed mixing, laser diagnostics, sensors, and air pollution.

April 15 2019, Monday
1:00 PM- 2:20 PM — TEC talks session

Acacia A-D Ballroom (2nd floor)

WILLIAM CULBRETH

Affiliation: Professor of Mechanical Engineering, University of Nevada, Las Vegas, NC

Title: University UAV Research Flights at the Nevada National Security Site (NNSS)

Abstract: In 2007, the FAA released a Policy Statement that limited the operation of drone aircraft in the United States by commercial entities and this affected the testing of UAV's by university researchers. Federal facilities with restricted air space already had internal policies for the use of drone aircraft and in southern Nevada, the NNSS (Nevada National Security Site) provided our research team at the University of Nevada, Las Vegas, with the opportunity to fly aircraft within their airspace. The NNSS, formally known as the Nevada Test Site, is well known as the nation's major testing facility for above-ground and below-ground testing of nuclear weapons. Our testing campaign at the NNSS underwent safety reviews under both the U.S. Air Force and the NNSS and the staff at the NNSS provided excellent support for our research on the testing of novel UAV platforms powered by a Diesel engine capable of burning conventional military jet fuel. The testing campaign and the experience in working with the administration and support people at the NNSS will be highlighted in this talk.

Bio: Dr. William Culbreth is an Associate Professor of Mechanical Engineering. He received his Ph.D. in mechanical engineering and his M.S. in nuclear engineering from the University of California, Santa Barbara. He completed his B.S. in physics at the California State Polytechnic University in Pomona. He was an assistant professor of mechanical engineering at the U.S. Naval Postgraduate School and worked on research in underwater acoustics at the Naval Research Laboratory that resulted in a patent for active underwater noise cancellation. While at UNLV, he was the first director of the National Supercomputing Center for Energy and the Environment and served as an associate dean for the Howard R. Hughes College of Engineering. He has also been active with the UNLV Faculty Senate and served as the Chair, Vice Chair, and Secretary. His current research interests include development of radiation detectors, design of nuclear fission rockets for space exploration, and simulation of geologic nuclear reactors. He and his students have flown UAV aircraft at the NNSS (Nevada National Security Site) to test airborne radiation detectors and novel aircraft engines.

April 15 2019, Monday
1:00 PM- 2:20 PM — TEC talks session

Acacia A-D Ballroom (2nd floor)

Physics-Based Compressible Flow and Network Modeling for Design Applications

April 13th, 2019

University of Nevada, Las Vegas, NV, USA

www.astfe.org/courses/pbcf2019/

Nonisentropic compressible flows are ubiquitous in many mechanical, chemical, and aerospace engineering applications, including gas turbines in their inlet systems, compressors, combustors, turbines, and exhaust systems. One-dimensional treatment of these flows forms the basis for most preliminary/conceptual designs. They are, however, generally counter-intuitive. For example, it defies common sense that the wall friction accelerates a subsonic compressible flow in a constant-area duct with or without heating. This workshop will provide a comprehensive review and reinforcement of the key concepts of one-dimensional compressible flows with simultaneous area change, friction, heat transfer, and rotation, which is seldom found in a textbook. In addition to the key concepts of thermofluids such as stream thrust, impulse pressure, rothalpy, mass flow functions, impulse functions, and normal shock function, this workshop will present an easy method to compute pressure and temperature changes in a generalized vortex in both rotor and stator reference frames. The workshop will conclude with a design-friendly overview of a compressible flow network featuring internal choking and normal shocks along with robust solution methods. A number of design-relevant examples will also be solved in the workshop. It behooves CFD engineers to use the unique foundation developed in this workshop as a prerequisite for all their 3-D CFD analyses, including physics-based interpretation of boundary conditions and computed results for design applications.

REGISTRATION

- **Fee: $300**
- **Registration will be limited to 30 participants**
- **Five complimentary, autographed copies of Fluid Mechanics: An Intermediate Approach (2015) will be distributed among workshop attendees using a random draw**

Key benefits to participants

1. Will develop a unique intuitive understanding of isentropic and nonisentropic compressible flows, including the coupled effects of area change, friction, heat transfer, and rotation
2. Will develop a strong foundation in the physics-based thermofluids design of various engineered components
3. Will be more knowledgeable in developing physics-based compressible flow models and applying accurate boundary conditions
4. Will be more knowledgeable in correctly interpreting results of their compressible flow design analyses
5. Will develop skills to hand-calculate compressible flow results to perform sanity-checks of predictions by design tools as well as validate these tools during their development
6. Will improve participant's engineering productivity with reduced design cycle time

Who Should Attend

This workshop will be of interest to graduate students, research workers in universities and research institutes, and research and design engineers in industry who are involved in the physics-based thermofluids design and technology development of various components and systems, including high-performance gas turbine components such as inlet systems, compressors, combustors, turbines, diffusers, exhaust systems, internal air systems, and turbine airfoil internal and film cooling.

Workshop Outline

Module 1: Key Concepts of Thermofluids

Module 2: Compressible Flow Functions

Module 3: Isentropic Flows

Module 4: Flows with Gradual Changes in Entropy - Fanno and Rayleigh Flows

Module 5: Flows with Abrupt Changes in Entropy - Normal Shocks

Module 6: Pressure and Temperature Changes in a Generalized Vortex

Module 7: Compressible Flow Network Modeling

Module 8: Design Examples and Discussions

Workshop Instructor

DR. BIJAY K. SULTANIAN

Takaniki Communications, LLC

Dr. Bijay Sultanian is an international authority in gas turbine heat transfer, secondary air systems, and Computational Fluid Dynamics (CFD).
Dr. Sultanian is Founder & Managing Member of Takaniki Communications, LLC, a provider of high-impact, web-based, and live technical training programs for corporate engineering teams. Dr. Sultanian is also an Adjunct Professor at the University of Central Florida, where he has been teaching graduate-level courses in Turbomachinery and Fluid Mechanics since 2006.

3-DAY CERTIFIED COURSE

April 12–14, 2019

University of Nevada Las Vegas,
Las Vegas, NV, USA

Introduction to Finite Element, Boundary Element, and Meshless Methods

An Introductory 3-Day Course with Applications including Hands-on Exercises

www.astfe.org/courses/febemm2019/

This course stems from the experiences in teaching numerical methods to both engineering students and experienced, practicing engineers in industry. The emphasis in this course deals with finite element, boundary element, and meshless methods. Each technique serves as a stand-alone description, but it is apparent to see how each conveniently connects to the other techniques. The intent in this course is to provide a simple explanation of these three powerful numerical schemes, and to show how they all fall under the umbrella of the more universal method of the weighted residuals approach.

REGISTRATION

Fee: $500

The Fee for the course covers instructional material costs, a copy of the book *Introduction to Finite Element, Boundary Element, and Meshless Methods, by D.W. Pepper, A. Kassab, and E. Divo,* ASME Press, 2014, a complete set of computer codes, break refreshments, and lunch each day. Each participant will receive a certificate of the course completion. All fees must be paid in advance at least two weeks before the start of the course. Pay by credit card, check, money order, or request to bill employer.

Please use the form that can be found online at: www.astfe.org/courses/febemm2019/

Course Outline

Overview

Day 1: The Finite Element Method
Day 2: The Boundary Element Method
Day 3: The Meshless Method

Objectives

- Introduce the basic concepts of the finite element method, the boundary element method, and the meshless method utilizing the Method of Weighted Residuals
- Discuss the advantages and limitations of each method
- Demonstrate the capabilities of each method on a variety of problems
- Provide "hands-on" access to simple computer codes that run on PCs
- Emphasize fundamentals through algebraic examples

Who Should Attend

This course is intended for those who wish to understand the basic concepts of the finite element method, the boundary element method, and meshless methods, and how they become implemented in computer programs. The course is suitable for both postgraduate students and graduate engineers and scientists in industry and government. Those with a basic understanding of calculus and a familiarity with PCs (Windows or Mac) will have sufficient background necessary for this course. Students with an engineering or mathematical background should have no difficulty in grasping the underlying principles of the methods and their applications to various fields.

Course Instructors

DR. DARRELL W. PEPPER

The University of Central Florida, Orlando, FL

DR. ALAIN KASSAB

The University of Central Florida, Orlando, FL

DR. EDUARDO DIVO

Embry-Riddle Aeronautical University, Daytona Beach, FL

DEADLINES

07-Sep-19
Abstract Due

10-Sep-19
Notification of Abstract Accept/Decline

07-Oct-19
Draft Paper / Extended Abstract Due

28-Oct-19
Draft Paper / Extended Abstract Reviews Completed

16-Dec-19
Authors Notified of Paper / Abstract Statuse

13-Jan-20
Revised Manuscript Due

13-Jan-20
Presentations Only Abstracts Deadline / Final Paper / Extended Abstract Due

SUBMIT YOUR PAPER ABSTRACT by August 1, 2019 to: http://submission.astfe.org

The 2020 American Society of Thermal and Fluids Engineers (ASTFE) Conference will be held April 5-8, 2020 at the Sheraton Hotel, New Orleans, LA, USA. ASTFE is the premier international society by and for professionals within the thermal and fluids science and engineering community. The 2020 ASTFE conference 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
- 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 HT in
- Biological/Biomedical 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
- Material Issues, Ceramics, Low Thermal Conductivity
- Measurement and Modeling of Environmental Flows
- Multiphase Flow
- 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
- Biomimetic and Bioinspired Engineering

April 14, Sunday

Time	Session	Room
10:00 AM - 6:00 PM	Registration opens	Acacia Hallway (2nd floor)
1:00 PM - 3:00 PM	ASTFE Board of Directors meeting [CLOSED]	Ponderosa room (2nd floor)
3:00 PM - 5:00 PM	ASTFE Board of Directors meeting [OPEN]	Ponderosa room (2nd floor)
6:00 PM - 8:00 PM	Welcome Reception	Casuarina Ballroom (2nd floor)

April 15, Monday

Time	Session	Room	Duration	Title	Author
8:15 AM - 8:30 AM	Welcome to TFEC 2019 - Provost of UNLV	Acacia A-D Ballroom (2nd floor)			
8:30 AM - 8:45 AM	TFEC 2019 Opening Remarks - Dr. Yogesh Jaluria (ASTFE President)				
8:45 AM - 9:45 AM	TFEC Plenary Lecture - Dr. Susan Coppersmith				
9:45 AM - 10:00 AM	Coffee break and walk to sessions	Acacia hallway (2nd floor)			
10:00 AM - 11:30 AM	Micro/Nano Heat/Mass Transfer Chair: Vaibhav Bahadur Co-Chair: Onur Ozkan	Mesquite 1 (1st floor)	10:00 - 10:18	28031 - Hydrothermally coated oxide nanoparticle-containing composite fibers	Yong Gan
			10:18 - 10:36	28143 - Investigation of photothermal characteristics of fe3o4 nanofluid	Jeonggyun Ham
			10:36 - 10:54	28127 - An experimental-statistical study on Thermal Conductivity and Viscosity of Diamond Nanofluids	Farzin Mashali
			10:54 - 11:12	27590 - Mathematical study of convection heat transfer utilizing SWCNT-water nanofluid inside partially heated hexagon cavity	Feroz Ahmed Soomro
			11:12 - 11:30	27948 - Evaluation of Performance Index of Nanofluid-based Multi-Stage HDH Desalination System	Sarit Kumar Das
10:00 AM - 11:30 AM	Refrigerants, AC and Refrigeration - I Chair: Chris Kobus Co-Chair:	Mesquite 2 (1st floor)	10:00 - 10:18	27456 - Material Properties Analysis of Circuit Subassemblies: Quantitative Characterization of Sapphire (a-Al203) and Silicon Nitride (Si3N4) Using Cryogenic Cycling	Kirsten Sims
			10:18 - 10:36	27559 - Experimental study of boiling heat transfer and pressure drop of R410A in micro-fin tubes	Ji-Xin Liu
			10:36 - 10:54	28385 - Cubic and Multiparameter Equations of State Evaluation for Supercritical Flow Modeling	Leandro Magalhaes
			10:54 - 11:12	27495 - A numerical investigation of refrigerant distribution in an R600a domestic refrigerator-freezer cycle under transient conditions	Wonhee Cho
			11:12 - 11:30	-	-
10:00 AM - 11:30 AM	PANEL: Education - Military leaders Chair: Peter Jenkins Co-Chair: Darrell Pepper	Mesquite 3 (1st floor)	10:00 AM	Peter Jenkins (UC Denver) Oscar Barton (Capt. USN retired) Michael Benson (Col. USMA) Cory Cooper (Col, USAFA)	
10:00 AM - 11:30 AM	Energy and Sustainability - I Chair: Anderson Reis Co-Chair: Aziz Rahman	Mesquite 4 (1st floor)	10:00 - 10:36	Keynote speech by Srinivas Garmella titled "Waste Heat Recovery and Upgrade: Potential, Limits, and Practical Implementation"	
			10:36 - 10:54	27959 - Comparing three methods for waste natural gas-based water production: reverse osmosis, thermal desalination and atmospheric water harvesting.	Aritra Kar
			10:54 - 11:12	28111 - Computer-aided working fluid design and power system optimization using the SAFT-G mie equation of state	Christos Markides
			11:12 - 11:30	28493 - Solar driven innovative vacuum technology	Hongling Deng

Time	Session	Room	Duration	Title	Author
10:00 AM - 11:30 AM	**Compact Heat Exchangers - I** Chair: **S.A. Sherif** Co-Chair: **Kashif Nawaz**	Mesquite 5 (1st floor)	10:00 - 10:18	27668 - Polymeric hollow fiber heat transfer surfaces for shell and tube application	Miroslav Raudensky
			10:18 - 10:36	27989 - Numerical modeling and experimental studies on a wire mesh heat exchanger	Sunil Kumar
			10:36 - 10:54	28424 - Evaluation of heat transfer and scaling characteristics of new, ultra-thin low surface energy coatings for heat exchangers	Andrew Guenthner
			10:54 - 11:12	28439 - Inlet flow maldistribution effect on three-fluid cross-flow heat exchanger arrangements.	Jyothiprakash Kh
			11:12 - 11:30	28122 - Evaluation of heat transfer correlations for compact plate and frame heat exchangers	John Simon Iii
10:00 AM - 11:30 AM	**Numerical Multiphase flow** Chair: **Sandra Boetcher** Co-Chair: **Jun Zhou**	Cactus (1st floor)	10:00 - 10:18	27859 - A mixture model for the simulation of thermal-hydraulics bubbly flow	Dia Zeidan
			10:18 - 10:36	27203 - CFD simulation of 90 C° pipe bend for multiphase flow of zinc tailing-water slurry suspension	Paras Verma
			10:36 - 10:54	27975 - CFD-DEM approach to calculate the flow and heat transfer behaviours in fluidized bed with immersed tube at particle scale	Sankaranarayanan Vengadesan
			10:54 - 11:12	28350 - Liquid transfer simulation on mesoscale gravure printing using multi-body dissipative particle dynamics	Anupam Mishra
			11:12 - 11:30	28498 - Numerical analysis of the influence of the jet-to-jet spacing between two adjacent air jets impinging a flat plate	Flavia Barbosa
10:00 AM - 11:30 AM	**Fluid Flow and Heat Transfer in Industrial and Commercial Processes and Material Processing - I** Chair: **Laurie A. Florio** Co-Chair: **Wayne Strasser**	Rosewood (1st floor)	10:00 - 10:18	28009 - Numerical study of the sand removal in an impact plate separator with particle laden crude oil flow	Orlando Ayala
			10:18 - 10:36	27643 - Advances in lightweight heat sinks	Fangyu Cao
			10:36 - 10:54	27931 - Residence time distribution analysis of granular material in rotary kilns	Haozhi Jie
			10:54 - 11:12	28099 - Non-equilibrium evaporation in a vaccum spray flash	Guangyu Guo
			11:12 - 11:30	28079 - Investigation of the effect of pressure drop on calcium carbonate deposition rate in a vertical slot	Pavan Kamble
10:00 AM - 11:30 AM	**Combustion, Fire, Fuel - I** Chair: **Ashwani Gupta** Co-Chair: **Flint Pierce**	Palo Verde A (2nd floor)	10:00 - 10:18	27142 - Numerical study on explosion hazards of clean fuel hydrogen cars in a garage	Chi Wing TO
			10:18 - 10:36	27999 - Effects of nozzle hole number, spray included angle and piston chamber geometry on combustion characteristics in a heavy-duty engine	Min-hoo Choi
			10:36 - 10:54	27261 - Statistical review of fossil fuels consumption for different sectors and forecasting their ending time	Mahsa Farzaneh
			10:54 - 11:12	27457 - Diagnostics and testing to assess the behavior of organic materials at high heat flux	Alexander Brown
			11:12 - 11:30	27461 - Application of active and passive control methods for diffusion jet flames	Artur Tyliszczak
10:00 AM - 11:30 AM	**Fluid Flow/Heat Transfer in Biosystems - I** Chair: **Eduardo Divo** Co-Chair:	Palo Verde B (2nd floor)	10:00 - 10:18	27929 - The effects of pulsating heat source on hyperthermia in a cancerous tissue	Claudio Tucci
			10:18 - 10:36	28010 - Assessment of rheological properties of blood as a function of health status: a novel point of care device for population based screening	Siddharth Singh Yadav
			10:36 - 10:54	28075 - Numeric study of freezing to support development of individual cell-scale thermal analyzer	Gary Solbrekken
			10:54 - 11:12	28506 - Encapsulated microbubbles for contrast ultrasound imaging and drug delivery: from pressure dependent subharmonic to collapsing jet and acoustic streaming	Kausik Sarkar
			11:12 - 11:30	29173 - Surrogate based optimization of thermal damage to living biological tissues by laser irradiation	Nazia Afrin
10:00 AM - 11:30 AM	**Fluid Measurements and Instrumentation - I** Chair: **Yogendra Joshi** Co-Chair: **Ashley Emery**	Willow (2nd floor)	10:00 - 10:18	27619 - On the perturbation of a turbulent boundary layer by two wall-mounted roughness elements: Impact of spacing and height ratio	Ali Hamed
			10:18 - 10:36	27721 - Determination of the heat transfer coefficient in flighted rotary drums	Fabian Herz
			10:36 - 10:54	27530 - Torque maximization of vertical axis wind turbines with variable pitch law	Cinzia Rainone
			10:54 - 11:12	28590 - Aero-Acoustics Modelling of a Constricted Pipe at Low Mach Number Flow	Hansen Mansy
			11:12 - 11:30	-	-

Time	Session	Room	Duration	Title	Author
11:45 AM - 1:00 PM	LUNCH BREAK	Authors are on their own			
1:00 PM - 2:20 PM	TEC talks session Chairs: Darrell Pepper John Lloyd	Acacia A-D Ballroom (2nd floor)			
2:20 PM - 2:30 PM	Break to walk to sessions				
2:30 PM - 3:42 PM	Multiphase Flow - II Chair: Saeed Moghaddam Co-Chair: Sam Subia	Mesquite 1 (1st floor)	2:30 - 2:48	28103 - Effectiveness of micro-droplet train and circular micro-jet impingement in surface cooling	Jorge Alvarado
			2:48 - 3:06	27609 - Effects of system parameters on the two-phase flow and heat transfer behavior in a rod bundle	Grant Garrett
			3:06 - 3:24	28115 - Effects of exhaust port pressure on particulate matter emission and engine performance in gasoline direct injection engine	Ziyoung Lee
			3:24 - 3:42	28088 - Flow and temperature field laser-based measurements of nucleate boiling	Victor Voulgaropoulos
2:30 PM - 4:00 PM	Heat/Mass Transfer Enhancement Techniques - I Chair: Calvin Li Co-Chair: Maulik Shelat	Mesquite 2 (1st floor)	2:30 - 2:48	27279 - The effect of microfin geometry on liquid heat transfer rate and pressure drop	Shima Soleimani
			2:48 - 3:06	27403 - A new absorption model for gold-black	Nazia Munir
			3:06 - 3:24	27502 - Comparison of cooling capacity of the ranque-hilsch vortex tubes with different diameters	Rutika Godbole
			3:24 - 3:42	27658 - Comparison of the experimental results of the interfacial thermal resistance (ITR) in low dimensional materials with the molecular dynamics simulation.	Hossain Ahmed
			3:42 - 4:00	27687 - The effect of porosity on representative volume element for pressure drop in open-cell foams	Marcello Iasiello
2:30 PM - 4:00 PM	PANEL: Thermal Fluids Engineering Research: Trends, Challenges, and Opportunities Chair: James Klausner Co-Chair:	Mesquite 3 (1st floor)	2:30	Jose' Lage (NSF) Mark Spector (DOD) Michael Ohadi (ARPA-E) Avi Shultz (DOE Solar Office)	
2:30 PM - 4:00 PM	Spray and Droplet Phenomena Chair: Mario Trujillo Co-Chair: Wayne Strasser	Mesquite 4 (1st floor)	2:30 - 3:06	Keynote speech by Mario Trujillo titled "Understanding Spray Formation and Atomization Through Highly Resolved Simulations"	
			3:06 - 3:24	28821 - Numerical and experimental study of hydrodynamics of multiple droplet stream impingement for atomization	Jorge Alvarado
			3:24- 3:42	28854 - The effect of nozzle electrification on spray formation from an airblast atomizer	Theodore Heindel
			3:42 - 4:00	28351 - Experimental characterization of multiphase jet flow by particle imaging velocimetry measurement	Feng Gao
2:30 PM - 4:00 PM	Heat/Mass Transfer Enhancement Techniques - II Chair: Patrick Oosthuizen Co-Chair: Yasong Sun	Mesquite 5 (1st floor)	2:30 - 2:48	27650 - Influence of surface roughness on electrostatic suppression of the leidenfrost state	Onur Ozkan
			2:48 - 3:06	27670 - A numerical study of the simultaneous natural convective heat transfer from the top and bottom surfaces of a thin inclined plate having a wavy surface with constant height	Patrick H. Oosthuizen
			3:06 - 3:24	27755 - Effects of asymmetrical vortex interaction by variable swept vortex generator (VSVG) on mass transfer enhancement	Aravind G. P.
			3:24 - 3:42	27777 - Heat transfer characteristics of taylor- couette flow in wavy conical annulus	Aravind G. P.
			3:42 - 4:00	27781 - Numerical study of the formations of the thermal pollution region in the large reservoir from the activities of the power plant	Alibek Issakhov
2:30 PM - 4:00 PM	Fundamentals in Fluid Flow and Heat/Mass and Momentum Transfer - I Chair: Alexander Rattner Co-Chair: Maulik Shelat	Cactus (1st floor)	2:30 - 2:48	27373 - Vertical coalescence characteristics of liquid droplets placed over a hydrophobic surface	Muralidhar Krishnamurthy
			2:48 - 3:06	27388 - An analytical model to determine the maximum allowable point source heating with minimal risk to phase-change of liquids in brain tissue	Smreeti Dahariya
			3:06 - 3:24	27503 - Numerical analysis of heat and mass transfer in packed beds composed of variable size spherical particles	Ewa Szymanek
			3:24 - 3:42	27483 - Investigation of bi-material arrangement using quadrilateral thermal metamaterials	R.J. Yang
			3:42 - 4:00	27675 - Phase change and two-phase flow in porous media: experiments and simulations	Mustafa Hadj-Nacer

Time	Session	Room	Duration	Title	Author
2:30 PM - 4:00 PM	**Computational Methods/Tools in Thermal-Fluid Systems - I** Chair: **Cedric Ophoff** Co-Chair: **Khalil Khanafer**	Rosewood (1st floor)	2:30 - 2:48	27273 - Meshless simulation approach for water management using smoothed particle hydrodynamics	David Greif
			2:48 - 3:06	27299 - Best strategy to simultaneously estimate the thermal diffusivities of orthotropic composite medium embedded in two-layer materials	Elissa EL RASSY
			3:06 - 3:24	27347 - CFD and thermal analysis in the integration of a diverter valve to a combined cycle cogeneration plant	Manuel Gonzalez
			3:24 - 3:42	27348 - Methodology to improve flow distribution and duct burner combustion in heat recovery steam generators	Manuel Gonzalez
			3:42 - 4:00	27993 - A Novel Heat Transfer Nanofluid Model for Application to Mixed Convection	Eiyad
2:30 PM - 4:00 PM	**HVAC, Buildings, and the Environment** Chair: **Saptarshi Basu** Co-Chair: **Fangyo Cao**	Palo Verde A (2nd floor)	2:30 - 2:48	26663 - Fault detection in commercial building VAV AHUs: a case study of an academic building	Suhrid Deshmukh
			2:48 - 3:06	27239 - An advanced hybrid ground source heat pump system for a multi-family residential unit: modeling and optimization	Hessam Taherian
			3:06 - 3:24	27346 - Performance analysis of a hybrid ground source heat pump system with various diverter watch temperatures	Gaoyang Hou
			3:24 - 3:42	27663 - On-line fuzzy control of a multi-room building facility	Danny Clemons
			3:42 - 4:00	28480 - CFD simulation of aerosol transport in an hvac chamber	Guangyu Guo
2:30 PM - 4:00 PM	**Computational Methods/Tools in Thermal-Fluid Systems - II** Chair: **Jun Zhou** Co-Chair: **Hongwei Wu**	Palo Verde B (2nd floor)	2:30 - 2:48	27542 - CFD approach for entrainment prediction in kettle reboilers	Kevin Farrell
			2:48 - 3:06	27616 - Heat transfer analysis of an impinging slot jet on a concave surface	Gérard Poitras
			3:06 - 3:24	28419 - Electrowetting-induced droplet jumping simulation using multi-body dissipative particle dynamics	Ting Liu
			3:24 - 3:42	27614 - Effect of ceiling cooling panels on fire sprinkler response time	Tyler Buffington
			3:42 - 4:00	29332 - Hygrothermal analysis of laminated composite rhombic hypar shell	Danuta Barnat-Hunek
2:30 PM - 4:00 PM	**Thermal Energy Storage - I** Chair: **Fangyu Cao** Co-Chair: **Jon Longtin**	Willow (2nd floor)	2:30 - 2:48	27516 - Novel fin geometry for a latent high temperature thermal energy storage - experimental investigation	Georg Scharinger-Urschitz
			2:48 - 3:06	27521 - Numerical study of CaO/Ca(OH)2 dehydration process with a porous channel	Mengyi Wang
			3:06 - 3:24	27960 - A new hybrid heat storage fixed bed: proof of concept	Yi Ran Lu
			3:24 - 3:42	27998 - Comparison of numerical models for molten salt thermocline thermal energy storage with filler	Christian Odenthal
			3:42 - 4:00	29245 - Numerical analysis on the effects of plates in a stratified thermal energy 3D storage tanks for cooling	Muhammad Tukur Hamisu
4:00 PM - 4:15 PM	**Break to walk to sessions**				
4:15 PM - 5:45 PM	**Fluid Flow/Heat Transfer in Biosystems - II** Chair: **Eduardo Divo** Co-Chair:	Mesquite 1 (1st floor)	4:15 - 4:33	28082 - Study of system parameters on pump performance with the effect of aortic compliance	Sining Li
			4:33 - 4:51	28090 - A numerical bioheat transfer analysis of varying body types in determination of time of death	Saeed Tiari
			4:51- 5:09	28104 - Development of a programmable and cost effective pulsatile pump for mimicking physiological waveforms	Hansen Mansy
			5:09 - 5:27	28558 - Comparison of noninvasive methods of detecting respiratory phase and rate	Hansen Mansy
			5:27 - 5:45	29935 - The role of wall shear stress divergence in lung particle transport	Ali Farghadan
4:15 PM - 5:45 PM	**Multiphase Flow - III** Chair: **Olga Kartuzova** Co-Chair: **Wayne Strasser**	Mesquite 2 (1st floor)	4:15 - 4:33	29278 - Void fraction measurements using gamma ray densitometer for vertical upward two phase flow across tube bundle	Zhaohui Liu
			4:33 - 4:51	28352 - Numerical modeling of the effect of chemical dispersant on oil droplet	Feng Gao
			4:51- 5:09	28384 - Experimental and numerical study of single droplets impinging upon liquid films	Daniela Ribeiro
			5:09 - 5:27	28421 - Positive frictional pressure gradients in a vertical narrow annulus in air-oil slug flow	Marcel Barbosa
			5:27 - 5:45	28120 - Computational fluid dynamics analysis of a liquid piston stirling engine under various operating conditions	Hamidreza Shabgard

Time	Session	Room	Duration	Title	Author
4:15 PM - 5:45 PM	**Computational Methods/Tools in Thermal-Fluid Systems - III** Chair: **Khalil Khanafer** Co-Chair: **Hansen A Mansy**	Mesquite 3 (1st floor)	4:15 - 4:33	27671 - Natural convective heat transfer from two thin vertically spaced two-dimensional isothermal plates for the case where one plate is horizontal and one is inclined	Patrick H. Oosthuizen
			4:33 - 4:51	27703 - A direct coupling technique for numerical simulations of temperature dependent phenomena in a compressible gas flow containing particles	Laurie Florio
			4:51- 5:09	27733 - Numerical study of liquid leakage detection attempt for single and parallel cooling lines	Murat Parlak
			5:09 - 5:27	27454 - Contaminant dispersion validation simulations for an urban inspired scenario	Alexander Brown
			5:27 - 5:45	27254 - Topology enhancement of plate and fins heat exchnagers using a discrete porous media simulation approach	Samer Wakim
4:15 PM - 5:45 PM	**Solar Energy - I** Chair: **Christos Christos** Co-Chair: **Bob Boehm**	Mesquite 4 (1st floor)	4:15 - 4:51	Keynote speech by Bob Boehm titled "Summary of Selected Solar Work"	
			4:51- 5:09	27436 - Year-round solar energy forecasting and storage prediction for non-interrupted power supply	Yasir Alfulayyih
			5:09 - 5:27	27600 - Performance evaluation of a solar-biogas hybrid recuperated microturbine for power generation using aspen	Saad Alshahrani
			5:27 - 5:45	27683 - Low-temperature synthesis of TiO2 particles with different characteristics for dye-sensitized solar cell applications	Saeid Vafaei
4:15 PM - 5:45 PM	**Experimental Methods/Tools and Instrumentation in Fluid Mechanics and Heat/Mass Transfer - I** Chair: **Saeid Vafaei** Co-Chair: **Khalil Khanafer**	Mesquite 5 (1st floor)	4:15 - 4:33	27841 - Low cost device for measuring the thermal conductivity of phase change materials	Basant Sikarwar
			4:33 - 4:51	28516 - Design, manufacturing and experimental testing of a self-cleaning exit port mechanism for a solar reactor	Cedric Ophoff
			4:51- 5:09	27724 - Design and testing of a new cooling device for limbs undergoing teutronic cooling	Ashley Emery
			5:09 - 5:27	27903 - Influence of axial transport on the temperature distribution in rotary kilns	Claudia Meitzner
			5:27 - 5:45	29822 - Applying meshless method and finite element formulations to solve two-dimensional high Reynolds number free surface flows	DL Young
4:15 PM - 5:45 PM	**Turbulent Flows - I** Chair: **Calvin Li** Co-Chair: **Flint Pierce**	Cactus (1st floor)	4:15 - 4:33	28426 - Turbulence modeling of boundary layers subject to very strong Favorable Pressure Gradient (FPG) with passive scalar transport	German Saltar
			4:33 - 4:51	27935 - Resolution quality indices for large eddy simulation in modelling a turbulent free jet	Ronald Barron
			4:51- 5:09	27977 - Numerical investigation of flow in a duct with square ribs and forward step rib mounted on walls	K.Sreekesh
			5:09 - 5:27	28382 - Compressibility effect on spatially-developing turbulent boundary layers via DNS	Guillermo Araya
			5:27 - 5:45	27816 - CFD study of the flow around Ahmed body	Ram Balachandar
4:15 PM - 5:27 PM	**Transportation modeling tools and applications** Chair: **Yaroslav Chudnovsky** Co-Chair: **Dia Zeidan**	Rosewood (1st floor)	4:15 - 4:33	26494 - Cold plate cooling simulation for Lithium-ion semi-passive battery thermal management system	Damon G.m-Chisholm
			4:33 - 4:51	26628 - A systematic instruction for selecting methods to detect pipeline leakages	Hao Fu
			4:51- 5:09	27505 - Transient thermal modeling of a four-stroke internal combustion engine exhaust valve	Mert Alpaya
			5:09-5:27	29964 - Economic analysis of potential charging approaches for hybrid electric aircraft	Matt Steiner
4:15 PM - 5:45 PM	**Electrochemical Energy Systems** Chair: **Todd Otanicar** Co-Chair: **Jon Longtin**	Palo Verde A (2nd floor)	4:15 - 4:33	27560 - Numerical prediction of effective thermal conductivity of catalyst layers in proton exchange membrane fuel cells	Ruiyuan Zhang
			4:33 - 4:51	27413 - Effect of different chemistries of catalyst-coated membranes on the proton transport resistance in membrane-electrode assemblies under various operating conditions	Kazuya Tajiri
			4:51- 5:09	27425 - Numerical analysis of paper-based fuel cells	Danny Clemons
			5:09 - 5:27	27541 - Effect of sample preparation condition on hydrophobicity of catalyst layers in proton exchange membrane fuel cell	Saleel Visal
			5:27 - 5:45	27582 - Enhanced liquid water removal from PEM fuel cell flow channels by superimposing acoustic wave	Mehdi Mortazavi
4:15 PM - 5:45 PM	**Computational Methods/Tools in Thermal-Fluid Systems - VI** Chair: **Jun Zhou** Co-Chair: **Yogendra Joshi**	Palo Verde B (2nd floor)	4:15 - 4:33	27270 - CDF and FEA Based Simulation Approach for Immersion Quenching of Jet Engine Fan Blades	David Greif
			4:33 - 4:51	29992 - Numerical Investigation of Windage Losses during Low Load/Partial Load Operation of Steam Turbine	Sagar Saroha
			4:51- 5:09	27148 - Numerical and Experimental Investigation of Pressure Drop in Horizontal Pipeline for the Flow of Multisized Coal-Water Suspension	Mani Kanwar Singh
			5:09 - 5:27	29968 - Computational Study of Flow and Thermal Characteristics of Turbulence Slot Jet Impingement on a Heated Plate	Anuj Kumar Shukla
			5:27 - 5:45	27992 - Numerical Study on the Effect of Cross Section Profile on the Flow and Heat Transfer of Supercritical Water within a Vertically Upward Tube	Zhao

Time	Session	Room	Duration	Title	Author
4:15 PM - 5:27 PM	**Experimental Methods/Tools and Instrumentation in Fluid Mechanics and Heat/Mass Transfer - II** Chair: **Ethan Languri** Co-Chair: **Farzin Mashali**	Willow (2nd floor)	4:15 - 4:33	27623 - Measurement of boiling heat transfer coefficient of R-134a in a horizontal circular tube using fiber optic temperature sensors	Ethan Matty
			4:33 - 4:51	28526 - The effect of multiphase flow behaviour on a horizontal annulus by integrating high-speed imaging technique	Aziz Rahman
			4:51- 5:09	28527 - Experimental investigation of multiphase flow behaviour in drilling annuli using electrical resistance tomography and high speed visualization technique	Aziz Rahman
			5:09 - 5:27	28076 - Fines migration in the near-inlet region of a flow entering a narrow slot through a porous medium	Lisa Kinsale
			5:27-5:45	27492 - Study of pressure-drop in two phase flow based on experiment and CFD simulation	Yanbo Wang
5:45 PM - 6:00 PM	**Refreshment coffee break**	**Acacia hallway (2nd floor)**			
5:45 PM - 6:45 PM	**TG Committee Meetings**				
	Natural and Built Environment Chair: **Sandra Boetcher** Co-Chair: **S.A. Sherif**	Mesquite 1 (1st floor)			
	Energy and Sustainability Chair: **Wilson Chiu** Co-Chair: **Lorenzo Cremaschi**	Mesquite 2 (1st floor)			
	Education Chair: **Pratap Vanka** Co-Chair: **Zenghui Zhao**	Mesquite 3 (1st floor)			
6:00 PM - 8:00 PM	**Exhibition and Networking**	**Acacia hallway (2nd floor)**			
7:00 PM	**High Roller (tickets at $22)**				

April 16, Tuesday

Time	Session	Room	Duration	Title	Author
8:15 AM - 8:30 AM	**TFEC 2019 - Announcements for the 2nd day of the conference**	**Acacia A-D Ballroom (2nd floor)**			
8:30 AM - 9:30 AM	**TFEC Plenary Lecture - Dr. Christian Sattler**				
9:30 AM - 10:00 AM	**Coffee break and walk to sessions**	**Acacia hallway (2nd floor)**			
10:00 AM - 11:30 AM	**Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids** Chair: **Dia Zeidan** Co-Chair: **Yuwen Zhang**	Mesquite 1 (1st floor)	10:00 - 10:18	28496 - Integration of CFD simulation and experiment to investigate the soil removal characteristic of the tire	Yean-Der Kuan
			10:18 - 10:36	28448 - MHD thin film Oldroyd-B fluid with Heat and viscous dissipation over Oscillating vertical Belts	Hakeem Ullah
			10:36 - 10:54	27129 - Wearable energy-saving systems with excellent flexibility and surface antireflection	Chengjyun Wang
			10:54 - 11:12	27628 - Plasmonic nanofluids based on janus nanosheets and sandwich-structured nanosheets for solar energy harvest	Tianmi Wang
			11:12 - 11:30	-	-
10:00 AM - 11:30 AM	**Energy-Water-Food Nexus** Chair: **Jon Longtin** Co-Chair: **Yaroslav Chudnovsky**	Mesquite 2 (1st floor)	10:00 - 10:18	27533 - Impacts of water quality on vibration-induced water droplet removal for cooling tower water capture	Ryan Huber
			10:18 - 10:36	28149 - Advanced exhaust heat recovery by integration of Heat Transfer and condensation processes	Maciek Baran
			10:36 - 10:54	27549 - Hydrogel polymers: An experimental study for forward osmosis desalination	Adnan Abdullahi
			10:54 - 11:12	28058 - Waste heat recovery of cummins ISL diesel engines using integrated thermoelectric devices - thermal-fluid-electric coupled numerical modeling	Iza Lantgios
			11:12 - 11:30	28148 - Evaporation inside porous medium under heat localization	Divya Susmitha Jaladi

Time	Session	Room	Duration	Title	Author
10:00 AM - 12:00 AM	**PANEL: Education (non-military) leaders** Chair: **Shepard Thomas** Co-Chair: **Wayne Strasser**	Mesquite 3 (1st floor)	10:00 AM	Thomas Shepard (University of St. Thomas) Alison Hoxie (University of Minnesota - Duluth) Amy Betz (Kansas State University) Ashley Emery (University of Washington)	
10:00 AM - 11:30 AM	**Multiphase Flow - IV** Chair: **Stephane Zaleski** Co-Chair: **Darrell Pepper**	Mesquite 4 (1st floor)	10:00 - 10:36	Keynote speech by Stephane Zaleski titled "High Performance Simulation of Multiphase Flow"	
			10:36 - 10:54	28006 - Numerical study of secondary flow of a liquid-liquid two phase fluid through a pipe bend with square cross-sectional area	Orlando Ayala
			10:54 - 11:12	28046 - One dimensional vapour bubble growth model for steady and unsteady pressure fields	Kannan Iyer
			11:12 - 11:30	-	-
10:00 AM - 11:30 AM	**Refrigerants, AC and Refrigeration - II** Chair: **Todd Bandhauer** Co-Chair: **S.A. Sherif**	Mesquite 5 (1st floor)	10:00 - 10:18	26265 - Design and Analysis of a FAME-MLL Vapor-Compression Refrigeration Cycle Compressor	Kevin Anderson
			10:18 - 10:36	28487 - An Experimental and Theoretical Study on the Magnetic Field inside Halbach Magnet Arrays and Heat Transfer Analysis for Magnetic Refrigeration Applications	Serdar Celik
			10:36 - 10:54	28490 - Numerical modeling of natural convection air cooling of a butt-fusion weld	Drake Norman
			10:54 - 11:12	28142 - Feasibility study of effective cooling through Microchannel Heat Sink (MCHS) and nanofluid applications	Darryl Jennings
			11:12 - 11:30	28113 - Additively manufactured heat exchanger for efficent geothermal heating and cooling system	Jiajun Xu
10:00 AM - 11:30 AM	**Heat and Mass Transfer During Phase Change Processes** Chair: **Kashif Nawaz** Co-Chair: **Amy Betz**	Cactus (1st floor)	10:00 - 10:18	26134 - Theoretical analysis of the time-scaling of frost growth and densification on flat surfaces	Christian Hermes
			10:18 - 10:36	26880 - Effect of humidity and airflow velocity on droplets elapsed time and radius at the onset of freezing and frost nucleation for super-hydrophilic and super-hydrophobic surface c	Lorenzo Cremaschi
			10:36 - 10:54	28348 - An investigation on diabatic flow pattern characteristics during convective condensation inside horizontal tubes	Tiago Moreira
			10:54 - 11:12	28066 - Phase-change Heat Transfer under centrifugal force in application to adjustable Heat Transfer wall	David Park
			11:12 - 11:30	27553 - Numerical simulation of bubble formation in a microchannel using a micropillar	Luz Amaya
10:00 AM - 11:30 AM	**Radiation Heat Transfer** Chair: **Bob Mahan** Co-Chair: **Mehran Yarahmadi**	Rosewood (1st floor)	10:00 - 10:18	27584 - An efficient monte carlo-based solver for Thermal Radiation in participating media	Joseph Farmer
			10:18 - 10:36	27904 - Study of flow between two plates with lateral entry Heated by Radiation Flux	Om Singh
			10:36 - 10:54	27524 - The role of the radiation distribution factor PDF in assessing uncertainty in the monte carlo ray-trace method	Mehran Yarahmadi
			10:54 - 11:12	27537 - Design and demonstration of an automated bidirectional reflectometer for low-reflectivity optical coatings	J. R. Mahan
			11:12 - 11:30	28295 - Hydromagnetic pulsating flow of a hybrid nanofluid in a channel with Thermal Radiation	Suripeddi Srinivas
10:00 AM - 11:30 AM	**Energy and Sustainability - II** Chair: **Anderson Reis** Co-Chair: **Aziz Rahman**	Palo Verde A (2nd floor)	10:00 - 10:18	28575 - An analytical model for pressure loss coefficients in tee junction of a solar collector based upon discharge ratio and Reynolds number	Imran Shafi
			10:18 - 10:36	28123 - Technoeconomic Analysis of Tri-Generation in Computer, Electronics, and Electrical Equipment Manufacturing	Alex Grauberger
			10:36 - 10:54	28071 - Finite volume modeling of thermoelectric generators	Edward Ledesma
			10:54 - 11:12	28077 - Optimization method for cross-sectional area of segmented thermoelectric legs to maximize performance	Joanna Rivero
			11:12 - 11:30	28078 - Analytic modeling of waste heat recovery of cummins isl diesel engines using integrated thermoelectric devices	Joshua Cameron
10:00 AM - 11:12 AM	**Experimental Methods/Tools and Instrumentation in Fluid Mechanics and Heat/Mass Transfer - III** Chair: **Paul Titan** Co-Chair: **Hongwei Wu**	Palo Verde B (2nd floor)	10:00 - 10:18	28875 - Boiling Heat Transfer predictio in helical coils under terrestrial gravity with artificial neural network	Hongwei Wu
			10:18 - 10:36	28021 - In-contact continuous temperature measurement probe for non-insulated electric-current carrying conductor	Sowmya Raghu
			10:36 - 10:54	27487 - Experimental 3D analysis of inclined jet in cross-flow. Influence of mass flow rate ratio on coherent structures development.	Gildas Lalizel
			10:54 - 11:12	29982 - Comparative study of linear vs non-linear eddy viscosity model for scale resolving simulation of turbulent flows	Sagar Saroha

Time	Session	Room	Duration	Title	Author
10:00 AM - 11:30 AM	**Solar Energy - II** Chair: **Aziz Rahman** Co-Chair: **Christos Markides**	Willow (2nd floor)	10:00 - 10:18	27750 - Conjugate heat transfer analysis of an open double glazing unit in semi-arid climatic conditions	Miguel Angel Gijon Rivera
			10:18 - 10:36	27879 - Heat Transfer and Fluid Flow in A Water-Filled Glass Louver	Yi Nan
			10:36 - 10:54	27407 - Enhanced vacuum freezing for thermal desalination at the triple point	Fangyu Cao
			10:54 - 11:12	26682 - Solar and Multi-Generation Modeling Based on a Natural Gas Driven Internal Combustion Engine	Hessam Taherian
			11:12 - 11:30	28414 - Heat Transfer Analysis of Water Droplets on Photovoltaic Panels	Serdar Celik
11:30 AM - 1:00 PM	**Luncheon Awards and Honors**	**Acacia A-D Ballroom (2nd floor)**			
1:00 PM - 2:00 PM	**TFEC Plenary Lecture: TD Barnes**				
2:00 PM - 2:15 PM	**Break to walk to sessions**				
2:15 PM - 3:45 PM	**Experimental Methods/Tools and Instrumentation in Fluid Mechanics and Heat/Mass Transfer - IV** Chair: **Paul Titan** Co-Chair: **Hongwei Wu**	Mesquite 1 (1st floor)	2:15 - 2:33	27324 - Thermodynamic modeling and experimental validation of fatty organic systems solid-liquid equilibrium	Clément Mailhé
			2:33 - 2:51	27352 - A Robust and High Resolution Method for Measuring Spatio-Temporal Convective Heat Transfer	Jason Ostanek
			2:51 - 3:09	27406 - Thermal analysis of preform fabrication for Flow Mold Casting	Jingru Benner
			3:09 - 3:27	27546 - Use of Optical Distributed Temperature Sensors for Condensation Heat Transfer Measurements of R134a in Circular Channels	Tabeel Jacob
			3:27 - 3:45	27555 - Thermal Management of a Railgun Armature Using Phase Change Materials	Matthew Jouffray
2:15 PM - 3:45 PM	**Fluid Measurements and Instrumentation - II** Chair: **Yuwen Zhang** Co-Chair: **Hansen A Mansy**	Mesquite 2 (1st floor)	2:15 - 2:33	26131 - Analysis of Pressure Distribution along Pipeline Blockage Based on the CFD Simulation	Hao Fu
			2:33 - 2:51	28164 - Thermometry of flow fields using a two-color ratiometric plif technique	Steven Eckels
			2:51 - 3:09	28249 - Mount Interference Effects on Total Temperature Probes	Reuben Quickel
			3:09 - 3:27	27744 - An experimental study for liquid leakage detection attempt in a cold plate	Mert Turan
			3:27 - 3:455	28038 - A Self-Guarded Hot-Plate Thermal Measurement System for Low-Thermal-Conductivity Materials	Jeffrey Engerer
2:15 PM - 3:45 PM	**Compact Heat Exchangers - II** Chair: **S.A. Sherif** Co-Chair: **Kashif Nawaz**	Mesquite 3 (1st floor)	2:15 - 2:33	27625 - Room Air Conditioner Simulation Models for Heat Exchanger Design and Indoor Air-flow Control Development	Hajime Ikeda
			2:33 - 2:51	30096 - Tube Shape & Topology Optimization for Air-to-Refrigerant Heat Exchangers	Vikrant Aute
			2:51 - 3:09	28512 - Local Optimum Channel Height for Pressure Drop and Heat Transfer in the Herringbone Wavy Channel	Hie-Chan Kang
			3:09 - 3:27	28437 - Thermodynamics Based Optimization of a Three-Fluid Cross-Flow Heat Exchanger	Jyothiprakash Kh
			3:27 - 3:45	28491 - Modeling and optimization of heat transfer enhancement by winglet type vortex generator in fin and tube heat exchangers	Ahmad Elhares
2:15 PM - 3:45 PM	**Combustion, Fuel, Fire - II** Chair: **Kevin R. Anderson** Co-Chair: **Stephane Zaleski**	Mesquite 4 (1st floor)	2:15 - 2:51	Keynote speech by Ashwani Gupta titled "Colorless Distributed Combustion (CDC): Recent Developments and Path Forward"	
			2:51 - 3:09	27649 - Composite material combustion modeling in SNL Sierra low Mach module Fuego using thermally interacting, chemically reactive Lagrangian particles	Flint Pierce
			3:09 - 3:27	27654 - Effect of Heat Extraction on Flame Position in Counterflow Porous Burner	Abhisek Banerjee
			3:27 - 3:45	-	-
2:15 PM - 3:27 PM	**Flow Instability** Chair: **Todd Bandhauer** Co-Chair: **Mario F. Trujillo**	Mesquite 5 (1st floor)	2:15 - 2:33	27216 - Liquid Rope Coiling with Multiple Viscous Jets	Majid Molki
			2:33 - 2:51	28012 - Bifurcation Analysis of the Super-critical Carbon Dioxide Flow in Heated Channel.	Om Singh
			2:51 - 3:09	28033 - Symmetric and antisymmetric characterization of turbulent flow past a square cylinder of low aspect ratio	Fei Wang
			3:09 - 3:27	28677 - The investigation in the density-wave instability of a uniformly heated channel at a supercritical pressure using a three-region nonlinear model	Jin-Der Lee

Time	Session	Room	Duration	Title	Author
2:15 PM - 3:45 PM	**Advanced Energy Systems - I** **Chair: Aziz Rahman** **Co-Chair: Anderson Reis**	Cactus (1st floor)	2:15 - 2:33	27551 - Exergy Analysis of the Alumina Nanofluid through a Ribbed Annular Channel	Nastaran Barhemmati
			2:33 - 2:51	27586 - Performance Evaluation on a Closed Brayton Cycle with different working fluid	Huisheng Zhang
			2:51 - 3:09	28994 - Solar-powered condensation vacuum technology	Guangyu Guo
			3:09 - 3:27	29477 - Thermodynamic modeling and assessment of allam cycle utilizing natural gas	Najmus Saquib Sifat
			3:27 - 3:45	28981 - Visualisation of large-scale Heat Exchanger Networks to support energy retrofit	Timothy Walmsley
2:15 PM - 3:45 PM	**Fundamentals in Fluid Flow and Heat/Mass and Momentum Transfer – II** **Chair: Ri Li** **Co-Chair: Laurie A. Florio**	Rosewood (1st floor)	2:15 - 2:33	27627 - Nanofluid Viscosity and Effective Parameters	Austin Schelfhout
			2:33 - 2:51	27865 - Numerical investigation on local heat transfer characteristics of S-CO2 in horizontal semicircular microtube	Tenglong Cong
			2:51 - 3:09	28479 - Interpretation of local mass transport in evaporation process in a slit-like pore based on molecular energy transport mechanism	Kunio Fujiwara
			3:09 - 3:27	27572 - Numerical investigation of the droplet condensation on the horizontal surface with adaptive fraction control of patterned wettability	Jae Yong Cho
			3:27 - 3:45	29275 - Recursion-based Finite Element Methods in Heat Transfer	Sogol Pirbastami
2:15 PM - 3:45 PM	**Computational Methods/Tools in Thermal-Fluid Systems - V** **Chair: Ethan Languri** **Co-Chair: Jay Muthusamy**	Palo Verde A (2nd floor)	2:15 - 2:33	28008 - Numerical investigation of heat transfer in dense fixed beds of arbitrary shaped particles with immersed boundary methods	Jan Bassen
			2:33 - 2:51	28053 - Numerical simulations of condensing R134a flows in horizontal pipes	Christos Markides
			2:51 - 3:09	28039 - Numerical analysis of a turbulent reacting flame using comprehensive modeling approaches: rans, les and hybrid rans-les	Francine Battaglia
			3:09 - 3:27	28150 - A Study on the Transient Flow in a Buoyancy-Driven Wall Plume	Yogesh Jaluria
			3:27 - 3:455	28525 CFD Simulation of Two Phase Annular Flow in Natural Gas Wells	Aziz Rahman
2:15 PM - 3:45 PM	**Heat Transfer and Thermal Processes in Electronics and Power Applications** **Chair: Murat Parlak** **Co-Chair: Jeff Engerer**	Palo Verde B (2nd floor)	2:15 - 2:33	27387 - Pool-boiling heat transfer enhancement using modulated wick structures	Smreeti Dahariya
			2:33 - 2:51	27602 - Creating Vortex Generators using Preferential Surface Wettability Patterning for Air-Side Heat Transfer Enhancement	Andrew Koopman
			2:51 - 3:09	27991 - Experimental study on stability of different nanofluids by using different nanoparticles and basefluids	Harkirat Sandhu
			3:09 - 3:27	27962 - Thermal and hydraulic performance of longitudinal perforated rectangular fins with perforations shapes and sizes variation	Mohammad Reza Safaei
			3:27 - 3:45	28550 - A hybrid heat sink for thermal management of hot-spots - Flow Visualization	Aziz Rahman
2:15 PM - 3:45 PM	**Thermal Energy Storage - II** **Chair: Christos Markides** **Co-Chair: Anderson Reis**	Willow (2nd floor)	2:15 - 2:33	28063 - Sensitivity Analysis and Parameter Estimation for Battery Kinetic and Thermophysical Parameters	Serhat Bilyaz
			2:33 - 2:51	30347 - Hydropower - Today's Challenges and Tomorrow's Successes	Anna Le
			2:51 - 3:09	28083 - Discharging Process of a High-Temperature Heat Pipe-Assisted Thermal Energy Storage System with Nano-Enhanced Phase Change Material	Saeed Tiari
			3:09 - 3:27	28102 - On the Effects of Porous Inserts on the Improvement of Latent Heat Thermal Energy Storage Systems performance	Mahboobe Mahdavi
			3:27 - 3:455	27711 - Development of effectively designed latent heat thermal energy storage system using flexible thin pouches	Sarng Karng
3:45 PM - 4:00 PM	**Break to walk to sessions**				
4:00 PM - 5:30 PM	**Aerospace Applications** **Chair: Yasong Sun** **Co-Chair:**	Mesquite 1 (1st floor)	4:00 - 4:18	27883 - Assessing Effects of Wind Angle of Attack on Airplane Wing Precipitation Collection Efficiency Using Airfoil Pressure Profiles	Mushrif Choudhury
			4:18 - 4:36	27887 - Designing a Flying Ambulance	Mohammed Mayeed
			4:36 - 4:54	29182 - A Dynamic Electrothermal Model of a Thermopile Detector for Earth Radiation Budget Applications	Brian Vick
			4:54 - 5:12	29986 - CFD Simulation of Supersonic Blunt Shaped Re-entry Vehicle Configuration	Sagar Saroha
			5:12 - 5:30	27866 - Towards Real-Time CFD Simulation of In-Flight Icing	Wagdi Habashi

Time	Session	Room	Duration	Title	Author
4:00 PM - 5:30 PM	**Fundamentals in Fluid Flow and Heat/ Mass and Momentum Transfer - III** Chair: **Hansen A Mansy** Co-Chair: **Chen Li**	Mesquite 2 (1st floor)	4:00 - 4:18	27044 - Force interaction of boiling dispersed emulsion particles	Anatoliy Pavlenko
			4:18 - 4:36	28472 - Numerical investigation of EHD instability of natural convection in a vertical dielectric fluid saturated anisotropic porous layer	B.M. Shankar
			4:36 - 4:54	27361 - Influence of surface properties on cooling of hot bodies in liquids	Arslan Zabirov
			4:54 - 5:12	28973 - Characterization of the dynamics of vapor bubble collapse	Raunak Bardia
			5:12 - 5:30	28974 - Analysis of the physical validity of dns benchmark tests for phase change	Mario Trujillo
4:00 PM - 5:30 PM	**PANEL: Clean power generation in a carbon constrained world** Chair: **Ashwani Gupta**	Mesquite 3 (1st floor)	10:00 AM	Ashwani Gupta (UMD) Ronald W. Breault (NETL) Subith Vasu (University of Central Florida) Marcelo de Lemos (ITA, Brazil)	
4:00 PM - 5:30 PM	**Fluid FLow and Heat Transfer in Industrial and Commercial Processes and In Material Processing - II** Chair: **Mario F. Trujillo** Co-Chair: **Calvin Li**	Mesquite 4 (1st floor)	4:00 - 4:36	Keynote speech by Micah Green titled "Carbon nanomaterials as local heaters in thermosets and thermoplastics manufacturing"	
			4:36 - 4:54	27640 - Numerical Optimization of Drying of Latex Paint Films on Solid Substrates	Alexei Saveliev
			4:54 - 5:12	28049 - Simulating and minimizing back and bottom wall vortices for sump pumps	Jle Cui
			5:12 - 5:30	28441 - Boron mixing in a reactor core and downcomer	Tae-Soon Kwon
4:00 PM - 5:30 PM	**Fluid Flow/Heat Transfer in Biosystems - III** Chair: **Eduardo Divo** Co-Chair:	Mesquite 5 (1st floor)	4:00 - 4:18	29976 - Thermal micro-sensor technique to measure transient temperature changes at cellular level for early cancer detection	Rohini Atluri
			4:18 - 4:36	29961 - Lagrangian wall shear stress structures and convective mass transport in atherosclerosis	Mostafa Mahmoudi
			4:36 - 4:54	29924 - Thermal analysis of a cochlea during magnetically-guided cochlear implant surgery	Fateme Esmailie
			4:54 - 5:12	29962 - Residence-time and blood flow stagnation in aneurysms	Mirza Md Symon Reza
			5:12 - 5:30	-	-
4:00 PM - 5:30 PM	**Nano and Micro Fluid Applications** Chair: **Amy Betz** Co-Chair: **Chris Kobus**	Cactus (1st floor)	4:00 - 4:18	27581 - Behavior of gold nanofluid triple line	Saeid Vafaei
			4:18 - 4:36	27583 - Controlled microstructures of porous TiO2 films with sintering process using multi-TiO2 particles-based nanofluids	Saeid Vafaei
			4:36 - 4:54	27691 - Analysis of convective heat transfer in a nanofluid saturated porous medium	Mohammad Mansur Rahman
			4:54 - 5:12	27726 - Crystal growth control of anatase and rutile Tio2 nanoparticles using a low-temperature solution synthesis	Saeid Vafaei
			5:12 - 5:30	28501 - A Dissipative Particle Dynamics Model of Liquid-bridge Formed between AFM Tip and Substrate	Ahmed Hemeda
4:00 PM - 5:30 PM	**Education in Thermal and Fluid Engineering** Chair: **Ahmad Fakheri** Co-Chair: **Yogesh Jaluria**	Rosewood (1st floor)	4:00 - 4:18	26793 - The integration of a power plant analysis project as part of a training period at sea	Henry Stewart
			4:18 - 4:36	29931 - Using Virtual Reality to create a virtual fluid mechanics laboratory	Yitong Zhao
			4:36 - 4:54	27161 - Undergraduate Experiential Learning Experience through Industrial Sponsored Capstone Project on Thermal-Fluids Science	Jiajun Xu
			4:54 - 5:12	27539 - Undergraduate Internal Flow Convection Heat Transfer Laboratory	Briana Fisk
			5:12 - 5:30	27644 - Experimental Study of a Turbulent Impinging Jet in an Undergraduate Heat Transfer Laboratory	Michael Benson
4:00 PM - 5:12 PM	**Heat Pipes** Chair: **Chen Li** Co-Chair: **Alexander Rattner**	Palo Verde A (2nd floor)	4:00 - 4:18	28502 - Capillary Evaporation on Nanoporous Membrane: a Molecular Dynamics Research	Rohini Atluri
			4:18 - 4:36	28029 - Experimental investigation of Heat Pipe Heat Exchanger (HPHE) for waste heat recovery application	Titan Paul
			4:36 - 4:54	28322 - Experimental investigation of circulating motion on the thermal performance of a pulsating Heat Pipe	Fateme Esmailie
			4:54 - 5:12	28464 - Fabrication of a polymer-based flexible pulsating Heat Pipe using silane coupling agent	Mirza Md Symon Reza
			5:12 - 5:30	-	-

Time	Session	Room	Duration	Title	Author
4:00 PM - 5:30 PM	**Fundamentals in Fluid Flow and Heat/Mass and Momentum Transfer -IV** Chair: **Hansen A Mansy** Co-Chair: **Chen Li**	Palo Verde B (2nd floor)	4:00 - 4:18	28007 - Numerical study of the secondary flow formation of a fluid passing through a 90â° elbow with square cross section	Manuel Ayala
			4:18 - 4:36	27953 - An experimental study on the dynamics of a liquid film under shearing force and thermal influence	Ke Wang
			4:36 - 4:54	28074 - The convergent path of streamlines for the flow approaching a rectangular orifice through a porous region	Yishak Yusuf
			4:54 - 5:12	28764 - Characteristics of electrical charging and breakup of water droplets impacting on the electrode surface	Hong Wang
			5:12 - 5:30	27968 - DNS study of turbulent heat transfer over super-hydrophobic and liquid-infused surfaces	Umberto Ciri
4:00 PM - 5:30 PM	**Computational Methods/Tools in hermal-Fluid Systems - VI** Chair: **Nesrin Ozalp** Co-Chair: **Khalil Khanafer**	Willow (2nd floor)	4:00 - 4:18	28517 - A conservative phase-field lattice Boltzmann formulation for multiphase flows	M. Wasy Akhtar
			4:18 - 4:36	28455 - Unsteady wake characteristics in flow past two inline surface mounted circular cylinders	Prashant Kumar
			4:36 - 4:54	29015 - Evaluation of cfd algorithms for solving a canonical problem of flow over a square cylinder	Lauren Olsen
			4:54 - 5:12	27428 - Numerical investigation on static flash evaporation	Qingzhong Yan
			5:12 - 5:30	28486 - Transient FEM Simulation Of 316L Stainless Steel Fabricated By Selective Laser Melting With Different Processing Parameters.	Emmanuel Amoako
5:30 PM - 6:30 PM	**TG Committee Meetings**				
	Science, Research and Engineering Fundamental and Methodology Chair: **Nesrin Ozalp** Co-Chair: **Darrell Pepper**	Mesquite 1 (1st floor)			
	Equipment: Design and Processes Chair: **Ahmad Fakheri** Co-Chair: **T.S. Ravigururajan**	Mesquite 2 (1st floor)			
5:30 PM - 6:30 PM	**Exhibition and Networking**	**Acacia hallway (2nd floor)**			
7:00 PM	**Mystère by Cirque du Soleil (tickets: $75)**				

April 17, Wednesday

Time	Session	Room	Duration	Title	Author
8:15 AM - 8:30 AM	**TFEC 2019 - Announcements for the 3rd day of the conference**	**Acacia A-D Ballroom (2nd floor)**			
8:30 AM - 9:30 AM	**TFEC Plenary Lecture - Dr. Essam E Khalil**				
9:30 AM - 10:00 AM	**Coffee break and walk to session**	**Acacia hallway (2nd floor)**			
10:00 AM - 11:30 AM	**Electric, Magnetic, Flow and Thermal Phenomena in Micro and Nano-Scale Systems - I** Chair: **Sam Subia** Co-Chair: **Brian Iverson**	Mesquite 1 (1st floor)	10:00 - 10:18	27860 - Whispering gallery mode silica sensors for superconductive tape temperature measurement	Yihua Hao
			10:18 - 10:36	29983 - Near-field radiative heat transfer devices	Mathieu Francoeur
			10:36 - 10:54	29981 - Design of an indium arsenide cell for near-field thermophotovoltaics	Daniel Milovich
			10:54 - 11:12	28328 - Heat Transfer enhancement using a two-stage electrohydrodynamic gas pump operated at uneven applied voltage	Feng C Lai
			11:12 - 11:30	29984 - Spectral shift of thermally generated surface phonon polariton resonance mediated by a nonresonant film	Vahid Hatamipour

Time	Session	Room	Duration	Title	Author
10:00 AM - 11:30 AM	**HVAC, Buildings, and the Environment - II** Chair: **Saptarshi Basu** Co-Chair: **Fangyo Cao**	Mesquite 2 (1st floor)	10:00 - 10:18	28065 - Effect Of Mushy Zone Constant In Solidification/Melting Model For PCM	Vinit Prabhu
			10:18 - 10:36	29365 - Asphalt foaming by the addition of mesoporous materials an example of a technology based on the principles of sustainable development in road construction	Agnieszka Woszuk
			10:36 - 10:54	27938 - Comparison of Energy Use Intensity of UAB Buildings with National Data	Zoë Penko
			10:54 - 11:12	28497 - Development of City-Scale Urban Building Energy Modeling (CS-UBEM) using Virtual Information Fabric Infrastructure (VIFI)	Yong Tao
			11:12 - 11:30	29797 - Increasing Effective Thermal Resistance of Building Envelope Insulation Using Polyurethane Foam Incorporated with Phase Change Material	Yassine Houl
10:00 AM - 12:00 AM	**PANEL: Industrial Multiphase CFD Panel** Chair: **Wayne Strasser** Co-Chair:	Mesquite 3 (1st floor)	10:00 AM	Ron Grover (GM) Quan Yuan (Dow) Maulik Shelat (Praxair) Olga Kartuzova (NASA) Mingkan Zhang (ORNL)	
10:00 AM - 11:30 AM	**Numerical Heat Transfer and CFD Simulations** Chair: **Branislav Basara** Co-Chair: **Yuwen Zhang**	Mesquite 4 (1st floor)	10:00 - 10:36	Keynote speech by Suad Jakirlic and Branislav Basara titled "Scale-resolving simulations of flow and thermal fields with relevance to automotive applications"	
			10:36 - 10:54	28169 - Numerical investigation of heat transfer enhancement with wings in microchannels	Nandakrishnan Sasi Leyju
			10:54 - 11:12	29987 - An Open FOAM based comparison of near wall-modeling techniques in simulating separated flow past a square cylinder.	Sagar Saroha
			11:12 - 11:30	28147 - Numerical Simulation of Rayleigh-Taylor Mixing Zone Structure	Carlton Adam
10:00 AM - 11:30 AM	**Refrigerants, AC and Refrigeration - III** Chair: **Todd Bandhauer** Co-Chair:	Mesquite 5 (1st floor)	10:00 - 10:18	29407 - Daytime Passive Radiative Cooling in a Humid Subtropical Climate	Chi Yan TSO
			10:18 - 10:36	29928 - Frost modeling under cryogenic conditions	Sungjoon Byun
			10:36 - 10:54	29929 - Dependence of the frost distribution on the position of the evaporator of a household refrigerator	Haijun Jeong
			10:54 - 11:12	27209 - Flow condensation of R134a in smooth horizontal tubes	Hessam Taherian
			11:12 - 11:30	-	-
10:00 AM - 11:30 AM	**Electric, Magnetic, Flow and Thermal Phenomena in Micro and Nano-Scale Systems - II** Chair: **Sam Subia** Co-Chair: **Brian Iverson**	Cactus (1st floor)	10:00 - 10:18	28742 - A Novel Design for Enhancing Droplet Transport Efficiency in Electrowetting-based Digital Microfluidic System	Yin Guan
			10:18 - 10:36	29939 - Numerical study of free Convection in a triangular cavity filled with magnetized nanofluid governed by Arrhenius kinetics	Muhammad Raees ul Haq
			10:36 - 10:54	27234 - Effect of internal heat source on magneto-convection of couple stress fluid under magnetic field modulation	Om Prakash Keshri
			10:54 - 11:12	29985 - Force-induced acoustic phonon heat transport across vacuum gaps: Theory	Takuro TOKUNAGA
			11:12 - 11:30	27620 - A parametric study on drag reduction using engineered microtextures in viscous laminar flow	Carlos Hidrovo
10:00 AM - 11:30 AM	**Computational Methods/Tools in Thermal-Fluid Systems - VII** Chair: **Jun Zhou** Co-Chair: **Hongwei Wu**	Rosewood (1st floor)	10:00 - 10:18	28069 - Simulation of a volumetric solar absorber using the thernal non-equilibrium hypothesis	Marcelo J. S. de Lemos
			10:18 - 10:36	27397 - Characterization of the temperature response of mixed material with different emissivity in an intermodal container	Ken Blecker
			10:36 - 10:54	27385 - Optimizing Combustion Operation in Homogeneous Charge Compression Ignition Engine using Exhaust Gas Recirculation: A Study of Variation in Product Species & Related Parameters	Malav Thakore
			10:54 - 11:12	28495 - Modular one-dimensional simulation tool for oscillating flow and thermal networks in Stirling engines	Steven Middleton
			11:12 - 11:30	28507 - Stress analysis of gas turbine blade with film cooling	Xianchang Li

Time	Session	Room	Duration	Title	Author
10:00 AM - 11:30 AM	**Thermal Energy Storage - III** Chair: **Fangyu Cao** Co-Chair: **Jon Longtin**	Palo Verde A (2nd floor)	10:00 - 10:18	26116 - Advanced thermal desalination system	Abdelnasser Aboukhlewa
			10:18 - 10:36	-	-
			10:36 - 10:54	27379 - Performance analysis of a metal hydride-thermal energy storage system for concentrating solar power plants	Talal Alqahtani
			10:54 - 11:12	28485 - Performance analysis of nano-enhanced phase change material (NEPCM) based thermal battery for waste heat recovery in temperature range of 100 °C — 150 °C	Vikram Soni
			11:12 - 11:30	29936 - Exergetic Relationship between the Thermal Properties of Direct Contact Membrane Distillation	Danielle Perdue
10:00 AM - 11:30 AM	**Advanced Energy Systems - II** Chair: **Aziz Rahman** Co-Chair: **Anderson Reis**	Palo Verde B (2nd floor)	10:00 - 10:18	29001 - Exergy Analysis of a Gas Turbine Power Plant using Jatropha Biodiesel, Conventional Diesel and Natural Gas	Aisha Sa'ad
			10:18 - 10:36	27594 - Comparison Technique for Thermodynamic Performance of Heat Activated Cooling Systems	Shane Garland
			10:36 - 10:54	28089 - Evaluation of a low temperature stirling engine using a discontinuous thermodynamic cycle	Michael Nicol-Seto
			10:54 - 11:12	27554 - An Improved Design for a Water Recycling System	Luz Amaya
			11:12 - 11:30	-	-
10:00 AM - 11:30 AM	**Combustion, Fire, Fuel - III** Chair: **Ashwani Gupta** Co-Chair: **Flint Pierce**	Willow (2nd floor)	10:00 - 10:18	27525 - Analysis Of Homogeneous Charge Compression Ignition Engine With Emphasis On Combustion Timing And Reaction Rate	Arunim Bhattacharya
			10:18 - 10:36	28030 - Pyrolysis Under Extreme Heat Flux Characterized by Mass Loss and Three-Dimensional Scans	Jeffrey Engerer
			10:36 - 10:54	28056 - Numerical Modelling of Overheating of Spent Fuel Pool	Kannan Iyer
			10:54 - 11:12	27612 - Heat Transfer Characterization of a Hot Cylinder on an Inert Substrate	Savannah Wessies
			11:12 - 11:30	-	-
11:30 AM - 12:45 PM	**LUNCH BREAK**	**Authors are on their own**			
12:45 PM - 1:00 PM	**Break to walk to sessions**				
1:00 PM - 2:30 PM	**Experimental Methods/Tools and Instrumentation in Fluid Mechanics and Heat/Mass Transfer - V** Chair: **Ethan Languri** Co-Chair: **Farzin Mashali**	Mesquite 1 (1st floor)	1:00 - 1:18	28093 - Simultaneous laser induced fluorescence and particle image/tracking velocimetry in phase-changing pipe flows	Victor Voulgaropoulos
			1:18 -1:36	28431 - Experimental investigation on transpiration cooling with phase change in a supersonic wind tunnel	Zhiyuan Liao
			1:36 - 1:54	27585 - Creation of porous anatase TiO2 films using TiO2 nanofluid	Saeid Vafaei
			1:54 - 2:12	28064 - Numerical Analysis of Bio-inspired Thermal Storage System Using Phase Change Materials	Vinit Prabhu
			2:12 - 2:30	28483 - Influence of particle shape on the void fraction of randomly packed beds	Bassem Hallak
1:00 PM - 2:30 PM	**Multiphase Flow - V** Chair: **Stephane Zaleski** Co-Chair: **Darrell Pepper**	Mesquite 2 (1st floor)	1:00 - 1:18	28096 - Numerical investigation on the effect of surface wetting properties on Gas-liquid two-phase flow in microchannel using level set method	Mouna Zaidani
			1:18 -1:36	28427 - Modeling of Spray/Wall Interactions	Andre Silva
			1:36 - 1:54	28444 - An experimental investigation of tube diameter effect on the steam condensation with non-condensable gas	Jinhoon Kang
			1:54 - 2:12	27974 - Mechanisms for Central Jet Formation during Droplet Impact on a High-temperature Solid Surface	Aiqing Lan
			2:12 - 2:30	30490 - A Comparative Study of Flow Boling Heat Transfer in Coated and Uncoated Plate Heat Exchangers	Francesco Coletti

Time	Session	Room	Duration	Title	Author
1:00 PM - 2:30 PM	**Fundamentals in Fluid Flow and Heat/ Mass and Momentum Transfer – V** **Chair: Matthew Barry** **Co-Chair: Branislav Basara**	Mesquite 3 (1st floor)	1:00 - 1:18	28098 - Natural and mixed convection in rectangular enclosures and channels containing liquid metals and partition walls	Milorad Dzodzo
			1:18 -1:36	28400 - Optimization of turbulent heat transfer based on exergy destruction minimization principle	Hui Xiao
			1:36 - 1:54	28436 - Flow visualization around mesoscale solid particle within a moving droplet using multi-body dissipative particle dynamics	Anupam Mishra
			1:54 - 2:12	28059 - A predictive Approach for Maximizing Energy Scavenging with a Flexible Plate from Tangentially-Advecting Vortices	Alireza Pirnia
			2:12 - 2:30	27997 - Analysis of thermal and mass transfer characteristics of air gap diffused seawater desalination	Ping Wang
1:00 PM - 2:30 PM	**Fluid Measurements and Instrumentation - III** **Chair: Yogendra Joshi** **Co-Chair: Ashley Emery**	Mesquite 4 (1st floor)	1:00 - 1:36	Keynote speech by Ashley Emery titled "Uncertainty and Validation"	
			1:36 - 1:54	27563 - Frequency characteristics of a natural convection boundary layer of Pr=0.7 Adjacent to a vertical isothermal surface	Peng Zhao
			1:54 - 2:12	27622 - Study the boundary of two-phase flow regime from bubble to slug flow	Yanbo Wang
			2:12 - 2:30	27543 - Hydrodynamic characteristics of a double helically coiled heat exhanger	Veera Manek
1:00 PM - 2:30 PM	**Turbulent Flows - II** **Chair: Calvin Li** **Co-Chair: Flint Pierce**	Mesquite 5 (1st floor)	1:00 - 1:18	27599 - Double — bi-stability in the airwake of a SFS2 frigate	Sinisa Krajnovic
			1:18 -1:36	28428 - Numerical and Experimental Study of a Plunging Airfoil	Jorge Barata
			1:36 - 1:54	28070 - Investigation of the Velocity Field of a Free Jet Issuing From a High Aspect-Ratio Slot	Carlos Mendez
			1:54 - 2:12	28196 - DNS of Thermal Channel flow up to Re_\tau=4000 for medium and low Prandlt numbers	Francisco Alcántara Ávila
			2:12 - 2:30	-	-
1:00 PM - 2:30 PM	**Education in Thermal and Fluid Engineering - II** **Chair: Ahmad Fakheri** **Co-Chair: Yogesh Jaluria**	Cactus (1st floor)	1:00 - 1:18	28152 - Engaging K-12 students in heat transfer hands-on STEM experiences	Chris Kobus
			1:18 -1:36	28153 - Research Experience for Teachers (RET) Program in Energy and Automotive Systems	Chris Kobus
			1:36 - 1:54	27160 - Design and Test of a Direct-Metal-Laser-Sintering (DMLS) Fabricated Microchannel Heat Exchanger for Advanced Cooling	Jiajun Xu
			1:54 - 2:12	29339 - Carnot heat engine efficiency, exergy, and exergy grade line (XGL)	Yongjian Gu
			2:12 - 2:30	-	-
1:00 PM - 2:30 PM	**Heat/Mass Transfer Enhancement Techniques - III** **Chair: Calvin Li** **Co-Chair: Maulik Shelat**	Rosewood (1st floor)	1:00 - 1:18	29923 - Effects of ultrasound on the desorption of water from Zeolite 13X and 4A	Hooman Daghooghi Mobarakeh
			1:18 -1:36	29926 - Dependency of thermal performance on heat sink installation method	Youngchan Yoon
			1:36 - 1:54	29927 - Enhancement of flow distribution to remove remaining water from dry storage	Seounghwan Hyeon
			1:54 - 2:12	29947 - Water Vapor Transport in Polyurethane Silica Nano-Composite for Air Dehumidification	Omar Almahmoud
			2:12 - 2:30	29950 - Investigations of Encapsulated Phase Change Material in Boron Nitride Nanotubes	Nastaran Barhemmati-Rajab
1:00 PM - 2:30 PM	**Combustion, Fire and Fuels - IV** **Chair: Alex Brown** **Co-Chair: Olga Kartuzova**	Palo Verde A (2nd floor)	1:00 - 1:18	27571 - Fully compressible combustion simulation of RCM in hierarchical Cartesian mesh system by Immersed boundary method	Wei-Hsiang Wang
			1:18 -1:36	27611 - A Bayesian Method for Determining the Fire Evolution within a Compartment	Jan-Michael Cabrera
			1:36 - 1:54	27746 - CT (computer tomography) measurement of 3D density distributions of flame: obtaining vertical gradient schlieren brightness from horizontal gradient for image-noise reduction	Ahmad Zaid Nazari
			1:54 - 2:12	28909 - Fire and explosion modelling following the accidental failure of high pressure ethylene transportation pipelines	Haroun Mahgerefteh
			2:12 - 2:30	27187 - Effects of Temperature and Time on Properties of Solid Biomass Product by Torrefaction	Shuichi Torii

Time	Session	Room	Duration	Title	Author
1:00 PM - 2:30 PM	**CO2 Heat Transfer in Energy Systems and Applications** **Chair: Todd Otanicar** **Co-Chair: Jon Longtin**	Palo Verde B (2nd floor)	1:00 - 1:18	29786 - Investigation of the Thermodynamic Performance of the Supercritical Recompression Brayton Cycle with Carbon Dioxide Based Mixtures as Working Fluids	Kenta Noma
			1:18 -1:36	28041 - Experimental study of supercritical CO2 based naturally circulated solar water heating system	Siddharth Singh Yadav
			1:36 - 1:54	27494 - Irreversibility and exergy analysis of a recompression supercritical CO2 cycle coupled with dry cooling system	Mohammad Monjurul Ehsan
			1:54 - 2:12	27547 - Experimental Investigation of Supercritical Carbon Dioxide in Horizontal Micro Pin Arrays with Non-Uniform Heat Flux Boundary Conditions	Saad Jajja
			2:12 - 2:30	-	-
2:30 PM - 3:00 PM	**Break**				
3:00 PM - 3:30 PM	**CLOSING CEREMONY**	**Acacia A-D Ballroom (2nd floor)**			

Registration Information

REGISTRATION WILL BE AT THE FOLLOWING HOURS

April 14, Sunday
10:00 AM – 6:00 PM
Acacia Hallway (2nd floor)

April 15, Monday
8:00 AM – 6:00 PM
Acacia Hallway (2nd floor)

April 16, Tuesday
8:00 AM – 6:00 PM
Acacia Hallway (2nd floor)

Upcoming Conferences of Interest to the Thermal and Fluids Engineering Communities

2019 UPCOMING CONFERENCES

14th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics
Powerscourt Hotel Resort & Spa, Wicklow, Ireland
July 22 – 24, 2019

The 14th International Symposium on Numerical Analysis of Fluid Flows, Heat and Mass Transfer - Numerical Fluids 2019
Rhodes, Greece
September 23 – 28, 2019

The 2nd Pacific Rim Thermal Engineering Conference
Hyatt Regency Maui Resort & Spa, Maui, Hawaii, USA
December 13 – 17, 2019

25th National and 3rd International ISHMT-ASTFE Heat and Mass Transfer Conference
IIT Roorkee, India
December 28 – 31, 2019

2020 UPCOMING CONFERENCES

5th Thermal and Fluids Engineering Conference (TFEC)
Sheraton Hotel, New Orleans, LA, USA
April 5 – 8, 2020

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