TFESC 15 New York

First Thermal and Fluids Engineering Summer Conference

August 9-12, 2015, Roosevelt Hotel, New York

ASTFE
American Society of Thermal and Fluids Engineers

Conference Program

www.astfe.org/tfesc

Preface

Welcome to the inaugural **2015 Thermal and Fluids Engineering Summer Conference (TFESC)**. We are so glad to have you joining us in beautiful New York City to celebrate our collective contributions to the rich tradition of exchanging research knowledge in thermal and fluids engineering. This year marks the first conference hosted by the new American Society of Thermal and Fluids Engineering (ASTFE) since it was founded in 2014.

We have nearly 300 full research papers, short papers and presentations covering a wide range of topics of interest to the thermal and fluids engineering technical communities that consist of academic, industrial, governmental, and other organizational participants. In particular, we have seven plenary speakers from both academia and industry, who are renowned scientists and engineers in the field of thermal and fluids engineering (see Page 3 for more details about their expertise and topics of presentations). The program also includes two special panel sessions. One is the industry and technology innovation focused panel session, chaired by Dr. John Lloyd, outlining the challenges and opportunities for thermal and fluids engineering research to be transferred to technology and business. The other is a panel on federal funding opportunities and challenges, chaired by Prof. S.A. Sherif. The panelists include program directors and managers from DOD, NSF, DOE, and other funding agencies.

Most importantly, this conference will provide a unique opportunity for participants to interact and network in the context of finding a new way of getting involved in ASTFE and presenting new ideas at future conferences, events and activities that benefit the research communities at large. For that we provide a few dedicated time slots for meetings. Please check the on-site announcements for any updated information.

On behalf of the organazing committee and the Board of Directors of ASTFE, we thank you for your participation in this exciting conference. Special appreciation goes to the ASTFE staff and those who assisted them, Anna Berlinova, Andrey Kuchinsky, and Hanna Gustrin for their dedication and effort to make this program a success. We also thank our conference sponsors; Begell House Inc. Publishers, Flownex Simulation Environmnet, and Dantec Dynamics Inc. for their contributions to make this conference possible.

Best regards,

Yogesh Jaluria
President, ASTFE

Yong X. Tao
Conference Chair

Yaroslav Chudnovsky
Conference Co-Chair

John Lloyd
Chair, Advisory Board, ASTFE

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.

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.

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.

Thermal and Fluids Engineering Summer Conference Committees

Plenary Speakers

HOWARD R. BAUM

Affiliation: Emeritus Scientist, National Institute of Standards and Technology, Department of Fire Protection Engineering, University of Maryland, and a NIST Fellow

Title: Simulating Fire Effects in Large Buildings

Abstract: The purpose of this lecture is to assess the current state of our ability to simulate the consequences of a fire in a large building, and suggest some areas where improvement is needed. Attention is focused on the coupling of fire dynamics simulations and heat transfer analyses to each other and to structural analyses of the damaged building. The methodology used in the National Institute of Standards and Technology (NIST) investigation into the collapse of the World Trade Center Towers will be described from this perspective.

An overview of the NIST Fire Dynamics Simulator (FDS), the world's most widely used CFD based tool for simulating fires is presented. The model employs a number of simplifications of the governing equations that allow for relatively fast simulations of practical fire scenarios. The hydrodynamic model consists of the low Mach number large-eddy simulation sub-grid closure with either a constant or dynamic coefficient eddy diffusivity. Combustion is typically treated as a mixing- controlled, single-step reaction of fuel and oxygen. The radiation transport equation is written in terms of a spectrally-averaged grey gas. Applications of the model include the design of fire protection systems in buildings and the reconstruction of actual fires.

The techniques used to couple the fire simulation to a detailed thermal analysis of the building structure and to perform that analysis are considered next. The coupling is non-trivial not only due to the complexity of the codes employed, but also due to large disparities in the length and time scales on which flow and thermal phenomena evolve. The temperature distribution in the load bearing structural elements in all floors of the buildings affected by the fire were calculated using the commercial code ANSYS, because it has the ability to perform both thermal and structural analyses in complex geometries, and because NIST structural analysts were familiar with its use.

Finally, limitations in both the simulation tools and the strategies used to apply them to the scenario under study are discussed. Research needs are emphasized by examination of some basic problems in fire–structure interactions. Although some of these limitations are being addressed, much work remains to be done. The intent of the lecture is not to summarize the results of the investigation, but rather to provide a specific context that illustrates the strengths and weaknesses of the methodologies employed.

Bio: Dr. Howard R. Baum is a NIST Fellow in the Engineered Fire Safety Group of the Fire Research Division (FRD) of the Engineering Laboratory (EL) at the National Institute of Standards and Technology (NIST). Dr. Baum has research interests in the fluid mechanics of fires, turbulent combustion, convective and radiative heat transfer, smoke transport, and microgravity combustion. He was a Lecturer and then Assistant Professor in the Division of Engineering and Applied Sciences at Harvard University from 1964 to 1971. He then spent four years as a Senior Scientist at Aerodyne Research, Inc., Billerica, Massachusetts before joining NIST.

Dr. Baum has published over one hundred forty papers and reports. His analysis of ventilation in containership holds is the technical basis of an international standard for containership ventilation. He is the co-developer (with R. Rehm) of what are now known as the low Mach number combustion equations, the starting point for most theoretical and computational work in that field. He has been involved in the development of large eddy simulation models for both building and outdoor fires at NIST since its inception. He also developed the first multiple fire model for urban environments that actually distinguishes individual fires.

Dr. Baum has served on National Research Council Panels convened by the Naval Studies Board in 1986 and 1991 to consider Office of Naval Research Opportunities in Solid and Fluid Mechanics, and a Panel in 1987 to consider the Status of Nuclear Winter Research. He was a member of the U.S. Delegation to the 1991 Japan-U.S. Heat Transfer Joint Seminar, and an invited participant in the 1994 U.S. Japan Seminar "Modeling in Combustion Science" sponsored by the National Science foundation and the Japan Society for the Promotion of Science. He was an invited lecturer at the SIAM Sixth International Conference on Numerical Combustion in 1996, at the 50th anniversary symposium of the National Research Institute of Fire and Disaster in Japan in 1998, and at the Emmons Memorial Symposium in San Antonio in 2000. He was also a member of the U.S. Panel of the UJNR Panel on Fire Research and Safety at the 13th meeting in 1996, the 14th meeting in 1998, and the 15th meeting in 2000. He was a Senior Visitor at the University of Minnesota Institute for Mathematics and its Applications (IMA) in 1999 and organizer of the IMA Fire Modeling Workshop. He is currently a member of the Editorial Board of the journals Combustion and Flame and Combustion Theory and Modeling.

Dr. Baum has been the recipient of many honors and awards. They include the U.S. Department of Commerce Silver Medal Award in 1981 and a Gold Medal Award in 1985. He was named Russell Severance Springer Visiting Professor at the University of California, Berkeley in 1985. He was awarded a Japan Society for the Promotion of Science Fellowship in 1994 for a visit to the University of Tokyo Institute of Industrial Science. He received the Medal of Excellence from the International Association for Fire Safety Science in 1991 and 1999. He was awarded the 1999 Arthur B. Guise Medal of the Society of Fire Protection Engineers. He was elected a Fellow and Chartered Physicist of the Institute of Physics in 1999. Dr. Baum was elected to membership in the National Academy of Engineering in 2000. His biography is listed in American Men and Women of Science, and Who's Who in America.

JOSEPH KATZ

Affiliation: William F. Ward Sr. Distinguished Professor of Engineering at the Department of Mechanical Engineering, Whiting School of Engineering, at Johns Hopkins University

Title: Common Features in the Flow Structure and Turbulence of Tip Leakage Flows in Axial Turbomachines

Abstract: Tip leakage flows adversely affect the overall performance of axial turbomachines, and are major contributors to noise, vibrations, onset of stall in compressors, and cavitation breakdown in pumps. Consequently, considerable efforts have already been invested in studying them, and developing techniques to alleviate these undesirable effects. Measurements of flow within rotating machinery have been a challenge due to limitations in visual access to the interior of rotor passages and reflections from boundaries. We have resolved this problem by constructing a unique facility, in which the refractive index of transparent rotor is matched with that of the fluid – a concentrated aqueous solution of sodium iodide. This arrangement facilitates unobstructed flow measurement at any point within the machine using 2D, stereo, holographic and tomographic particle image velocimetry (PIV). This presentation focuses on common features in the flow structure and turbulence in the tip region of several axial turbomachines. They have been observed in a series of experiments performed within machines with different sizes, speeds, load distributions and tip-gap sizes. These observations follow the evolution of the backward leakage flow across the narrow tip gap, its rollup into a tip leakage vortex (TLV) near the suction side of the blade, and the dynamics of this vortex within the rotor passage. Several notable phenomena include: (i) in instantaneous realizations, the vicinity of the TLV center contains multiple interlacing structures that never roll up into a single vortex; (ii) the TLV migrates from the suction side of one blade to the pressure side of the neighboring blade; (iii) vortex breakup/bursting occurs in regions of adverse pressure gradients, rapidly spreading TLV fragments over substantial fraction of the tip region; (iv) Endwall casing boundary layer separation occurs when the leakage flow meets the main passage flow, feeding counter rotating vorticity into a layer that surrounds the TLV center; (v) the (anisotropic and inhomogeneous) turbulence levels are high in the shear layer connecting the TLV to the suction-side corner of the blade, near the TLV center, and in the region of endwall boundary layer separation. Specific mechanisms dominating the turbulence production will be introduced and discussed.

Bio: Joseph Katz received his Ph.D. and M.S. from the California Institute of Technology and his B.S. at the Tel-Aviv University. He is the William F. Ward Sr. Distinguished Professor of Engineering at the Department of Mechanical Engineering, Whiting School of Engineering, at Johns Hopkins University. He is Director and co-Founder of the Center for Environmental and Applied Fluid Mechanics (CEAFM) at JHU, and he manages the Laboratory for Experimental Fluid Dynamics, and the new Hopkins Heart Initiative. Dr. Katz also serves as the Chair, Board of Journal Editors of the American Society of Mechanical Engineers (ASME). He is a Fellow of ASME and of the American Physical Society (APS), as well as a JHU Gilman Scholar. He has advised numerous graduate students and post-docs, most of which currently hold academic, industrial and government research positions around the world. He has received several awards including the 2004 ASME Fluids Engineering Award, and several best paper awards. Dr. Katz research extends over a wide range of fields, with a common theme involving experimental fluid mechanics, and development of advanced optical diagnostics techniques for laboratory and field applications. His research groups has studied laboratory and oceanic boundary layers, flows in turbomachines, flow induced vibrations, behavior of marine plankton in the laboratory and in the ocean, as well as multiphase flows, including cavitation, bubble, and droplet dynamics in turbulent flows. He has co-authored more than 320 Journal and conference papers.

MUKUND KARWE

Affiliation: Professor and Chair of the Food Science Dept. at Rutgers, and a Fellow of Institute of Food Technologists.

Title: Thermal Transport in Selected Food Processing Operations

Abstract: Many food processing operations involve application of heat to process foods for making them safer to consume or to impart specific organoleptic attributes such as color, flavor, etc. This presentation will give an overview of the current state of knowledge of thermal transport in selected food processing operations such as batch and continuous microwave processing, hybrid jet impingement-microwave baking, ohmic heating, aseptic processing, extrusion, and high pressure processing. Results obtained from mathematical models and numerical simulations, including their limitations and experimental challenges will be discussed.

Bio: Dr. Mukund V. Karwe is a Professor of Food Engineering and the Dean of International Programs at the School of Environmental and Biological Sciences of Rutgers University, New Jersey. Over the last three decades, Dr. Karwe's research has covered areas such as Food Extrusion, Microwave and Hybrid Baking, Fortification of Foods with Omega-3 fatty acids, High Pressure Food Processing, Effect of Processing on Nutraceuticals in Foods, Cold Plasma Processing, and Flow of Food in human GI tract. He has published over 110 research articles and book chapters, including one co-edited book. His research has been supported by USDA, US Army, and Food Industry. Dr. Karwe has given research seminars in Argentina, Australia, Brazil, China, France, Greece, India, Italy, Kuwait, S. Korea, Turkey, and UK. Dr. Karwe is a fellow of the Institute of Food Technologists (IFT) USA, and a recipient of IFT's highest Teaching Excellence award.

SANJIVA LELE

Affiliation: Professor of aeronautics and astronautics and of mechanical engineering, Center for Turbulence Research, Department of Mechanical Engineering, Stanford University

Title: Simulations of Shock-Turbulence Interactions: From Canonical Problems to Engineering Applications

Abstract: Many applications in engineering and physical sciences involve situations where a turbulent flow interacts with shock waves. High-speed flows around aerodynamic bodies and through propulsion systems for high-speed flight are bound with interactions of shear-driven turbulence with complex shock waves. Prediction of shock-induced separation, unsteady loads and heat-transfer in such systems is a significant engineering challenge. Numerical simulations of such physical phenomena impose conflicting demands on the numerical algorithms. Capturing broadband spatial and temporal variations in a turbulent flow suggests the use of high-bandwidth schemes with minimal dissipation and dispersion, while capturing a flow discontinuity at a shock wave requires numerical dissipation. Results from DNS of a canonical shock-turbulence interaction problem, i.e. the interaction of isotropic turbulence with a (nominally) normal shock, are discussed first, highlighting the effect of shock strength and turbulence intensity, and contrasted with linear theory where possible. Significant non-linear effects in the post-shock region are observed and explored. Results from the interaction of a spherical blast wave and a converging shock wave with turbulence will be contrasted with the planar problem. Finally as a bridge from simpler, idealized cases of shock-turbulence interaction to applications in engineering, some highlights from LES of jet injection and mixing in a supersonic crossflow, oblique shock wave interaction with a turbulent boundary layer, supersonic flow in a compression ramp, and shock-induced unsteadiness in an over-expanded nozzle will be discussed. The physical insights enabled by DNS and LES of high-speed compressible turbulent flows will be emphasized and open questions and modeling issues discussed along the side.

Bio: Professor Lele's research combines numerical simulations with analytical modeling to study fundamental unsteady flow phenomena, turbulence, flow instabilities, and flow-generated sound. Recent projects include shock-turbulence interaction, exploitation of flow instabilities for enhanced mixing and for reducing the vortex-wake hazard from an airplane, new approaches for active noise control, and the development of high-fidelity prediction methods for engineering applications.

SANJOY BANERJEE

Affiliation: Distinguished Professor of Chemical Engineering Director of the CUNY Energy Institute, The City College of New York

Title: Heat and Mass Transfer across Turbulent Gas-Liquid Interfaces

Abstract: Scalar exchange between turbulent gas and liquid streams separated by deformable and breaking interfaces is of central importance in many environmental and industrial processes. For example, ocean uptake of greenhouse gases is largely governed by liquid-side mass transfer coefficients at the atmosphere water surfaces. Because measurements and analysis of fluid motion and scalar fields very close to deforming interfaces is difficult, our understanding of the governing phenomena is still poor compared to what we know about transport processes in solid-fluid boundary layers. We will discuss recent developments in direct numerical simulations and particle imaging velocimetry that have elucidated turbulence behavior at wavy gas-liquid surfaces. The results indicate that the surface renewal and surface divergence models, which are commonly used to parameterize liquid side controlled transfer rates are inadequate when interfaces micro-break. Theoretical approaches, which combine elements of the surface renewal and divergence models, will be discussed and compared with recent experimental data. The range of applicability of existing surface renewal small models will be discussed as well in the context of the new data.

Bio: Sanjoy Banerjee is a CUNY distinguished professor of chemical engineering and director of the CUNY Energy Institute, whose headquarters is at The City College of New York. The author of more than 190 articles, book chapters and refereed conference proceedings and the holder of four patents, he has a BS in chemical engineering from the Indian Institute of Technology and a PhD from the University of Waterloo in Canada. Until March 2008, Banerjee was professor above scale in the chemical engineering department, with joint appointments in the mechanical engineering department and the Bren School of Environmental Science, at the University of California, Santa Barbara, where he had been since 1980. Banerjee was vice chair of chemical engineering from 1982-84, chair from 1984-90 and is largely responsible for bringing the UCSB chemical engineering department into the top 10 in the country. Previously, he held appointments at the University of California, Berkeley, McMaster University in Canada and Atomic Energy of Canada, ultimately serving as its acting director of applied science. He is a member of the U.S. Advisory Committee on Reactor Safeguards, which is congressionally mandated to maintain oversight over nuclear power. He also is on the Reference Board of the Norwegian Govt.-Oil Industry Consortium for Oil-Gas Flow Assurance Project. Banerjee also helped to establish several companies based on research collaborations, including Metaheuristics LLC (www.metah.com), which develops highly parallelizable software aimed at very large fluid/thermal simulations, Mindflash

Technologies (www.mindflash.com), which applies artificial intelligence techniques to learning systems software, and Gas Reaction Technologies Inc. (www.grt-inc.com), which uses novel metal oxide catalysts to convert natural gas to a variety of liquid products, including gasoline and benzene/toluene/xylene. These spinoffs are profitable, with GRT's being recently acquired by a major oil company. Banerjee also has served or serves as a consultant to several oil companies, including ExxonMobile (Houston), Shell (Amsterdam), Statoil (Stavanger), Det Norske Veritas (Oslo), Reliance (Mumbai) and ENI (Milano), as well as many chemical/pharma companies, including Hoffmann LaRoche, Novartis and Novo Nordisk (Denmark). He has helped these companies with technical and operational issues as well as high-level due diligence related to acquisitions and projects.

JOHN S. ABBOTT

Affiliation: Senior Engineering Associate, Advanced Modeling and Analysis at Corning Incorporated

Title: Modeling Thermal and Fluids Problems Arising in Industry

Abstract: As computational capability continues to dramatically increase, we are able to support experimentation and analysis of manufacturing processes with practical but evermore detailed numerical models. This talk explores real-life thermal and fluids problems arising in the variety of businesses at Corning Incorporated, including the manufacture of catalytic converters for pollution control, optical fibers for telecommunication, and flat glass panels both large and small for displays. The problems include extrusion, the chemical reactions involved in the firing of ceramics, combustion synthesis and particle deposition, and drawing and forming of molten glass. As in other companies, development times are being shortened by incorporating analysis and modeling to drive testing and early experiments; in addition, process improvement and optimization benefits from the increased emphasis on fundamentals and a science-based approach.

Bio: John Abbott is a Senior Engineering Associate at Corning Incorporated. After finishing a B.S. in math from Caltech in 1974, he earned a Ph.D. in applied math at MIT with a dissertation in the area of nonlinear waves. Starting at Corning in 1979, he has worked on process engineering and fundamentals for a broad spectrum of Corning businesses, and has US and foreign patents in areas related to process, measurements, and product design. For 15 years he was in the division engineering group for Optoelectronics, focusing on the manufacturing process for optical fibers for telecommunications and the performance of the final fiber in optical links. Most recently he has contributed to improvements in manufacturing and measurements for glass designed for LCD displays and Gorilla Glass ® used in displays for handheld devices.

WAYNE STRASSER

Affiliation: Associate chemical engineer at Eastman Chemical Company

Title: CFD Application to Large-Scale Industrial Multiphase Flows: Miracles Do Happen

Abstract: Specialized Eulerian-Eulerian modeling frameworks based in the commercial solver backbones Fluent and CFX are used extensively for reaction engineering within Eastman Chemical Company. Four examples will be elucidated: 1) optimization of a transonic three-stream self-sustaining pulsatile coaxial airblast injector, 2) mitigating thermal runaway in an evaporative trickle bed reactor with an external temperature control loop, 3) improving yield in a slurry bubble column oxidizer in heterogeneous flow with potential oxygen starvation, and 4) identifying mass transfer limitations in a dual-blade bubbly continuous stirred tank reactor. The unit operations involved in these studies represent very large scale process equipment and multi-million dollar annual revenue streams. Additionally, the physiochemical complexities and momentum sources associated with simulating these systems create strong non-linear coupling and stretch the bounds of available numerical recipes. Modeling risks abound; therefore, judicious and validated computational methods are essential. In each of these examples, methods and data used for anchoring CFD to process reality are provided. It is shown that although these models are not designed to incorporate the complete physical picture at all scales, they are capable of guiding designs and providing results that contribute to Eastman's bottom line.

Bio: Wayne Strasser has provided solutions to problems related to fluids, reactions, and phase change for Eastman Chemical Company's global sites for 20 years, resulting in increased energy utilization and improved product yield valued at tens of millions (USD) annually. The thrusts of his current research (PhD, Virginia Tech, 2015) include optimization of a transonic self-sustaining pulsatile airblast atomizer and hybrid RANS-LES modeling of primary atomization. He chaired the ASME Fluid Applications and Systems Technical Committee and currently serves on the ASME Honors and Awards Committee. He organizes two ASME symposia annually related to Industrial and Environmental flows, and he actively reviews articles for at least a dozen journals. He has 34 patents in the US, plus those abroad. He is a registered P.E. in three US states, an ASME Fellow, and operates a private CFD consulting company. He also enjoys lively philosophical debate on the origin and meaning of life.

Technology, Entrepreneurship, Communications, (TEC) Talks

Electricity for the developing world

VALERIO DE ANGELIS

Valerio De Angelis, PhD, is Vice President of Products at Urban Electric Power (UEP) and serves as the Executive Director of the CUNY Energy Institute. Together, CUNY and UEP have developed ultra-low cost batteries to increase access to renewable power and improve electricity reliability in the developing world. Dr. De Angelis will discuss how UEP's batteries can meet India's growing energy needs and share strategies for transforming a new technology into a disruptive product.

Communicating the Value of Thermal-Fluids Research to a Diverse Audience

PAMELA M. NORRIS

After receiving her Ph.D. from Georgia Tech in 1992 and completing post-doctoral studies at UC Berkeley, Dr. Norris joined the faculty at UVa in 1994, where she founded both the Nanoscale Energy Transfer Lab and the Aerogel Research Lab. She holds patents for applications of aerogels in areas ranging from biological warfare detection, to lab-on-a-chip, to thermal insulation, along with patents for innovative thermal management techniques for jet-blast deflectors. Norris has served as the PI or Co-PI on over 45 sponsored research projects representing well over $25M from DOD, NSF, Industry and Foundations. She is Fellow of ASME and also chairs the ASME Long Range Directions and Issues in Heat Transfer Committee.

Learning to Unlearn: Personal Experiences in Entrepreneurship, Manufacturing and Business Growth

SANJEEV SATHE

Dr. Sanjeev Sathe has held Engineering and Executive Positions at IBM and at Advanced Semiconductor Engineering, helping to grow ASE from US $ 1.5 B to US $ 3.2 B in 4 years. He has a Ph.D. in Mechanical Engineering and is an ASME Fellow with over 40 US patents issued. He presently teaches and coaches US Naval Officers at the US Naval Postgraduate School, CA on a wide variety of topics in Thermodynamics, Heat Transfer, Fluid Mechanics, Supply Chain Management, Business Growth and Strategy and Manufacturing. Dr. Sathe will talk about his experiences in entrepreneurship, manufacturing and business growth.

Heat Exchanger Design Handbook: Past, Present and Future in the Digital Era

FRANCESCO COLETTI

Francesco holds a Laurea degree in Chemical Engineering from the University of Padova, Italy, an MSc in Process Systems Engineering and a PhD in Chemical Engineering from Imperial College London. Francesco is the Chief Technology Officer of Hexxcell Ltd. an Imperial College London spin-off company operating in the area of heat transfer and energy efficiency. Prior to Hexxcell, Francesco has worked as a Development Specialist in the Cryogenic Systems R&D group at Praxair Inc., a Fortune 500 company, in Buffalo, NY where he focused on mathematical optimization of cryogenic multi-stream heat exchangers and air separation units.

Reinventing Water As A Mineral

JOHN VOELLER

Mr. Voeller has been with Black and Veatch for 40 years and has held positions from nuclear engineer to Head of Engineering Computing (12 years), CTO (10 years) and CKO (10 years). He currently acts as advisor to CEO, Chairman and Board levels of international companies on strategic and technology planning 10-20 years out and sits on the Boards of four technology corporations. Mr. Voeller has been a consultant to the Department of Homeland Security Office of Science and Technology since the creation of DHS. In 2003, Voeller was made an ASME White House Fellow in Office of Science and Technology Policy, Executive Office of the President which continued until 2008. In these two roles, Voeller developed strategic and tactical plans for agency, inter-agency and national initiatives and promoted collaboration and deliberation processes to ensure multi-agency interface and investment optimization.

Mr. Voeller has received numerous awards including the James Porter Award for Lifetime Achievement in Technology and Innovation, 2010, the Award of Excellence from Engineering News Record magazine for 1998, and the CIO Enterprise Value Award for 1997 from CIO magazine (first ever awarded). Voeller has a Bachelor's of Science in Mechanical Engineering from the Georgia Institute of Technology and is a member of the Institute's Engineering Hall of Fame. Voeller is a registered professional engineer in Kansas and Michigan.

Thermal and Fluids Engineering Summer Conference Technical Program

			Session Title	Room	Session Chair	Presenter
SUNDAY - AUGUST 9, 2015						
12:30pm-3:00pm		**ASTFE Board of Directors meeting [CLOSED]**		**York Suite**		
3:00pm-6:00pm		**ASTFE Board of Directors meeting [OPEN]**		**York Suite**		
6:00pm-9:00pm		**Welcome Reception for Thermal and Fluids Engineering Community [provided by ASTFE]**		**Ballroom, Lobby**		
MONDAY - AUGUST 10, 2015						
8:00am - 9:00am		**Plenary Lecture: "Heat and Mass Transfer Across Turbulent Gas-Liquid Interfaces" by Prof. Sanjoy Banerjee**		**Ballroom, Lobby**		
9:00am - 9:15am		**Tech-Talk Session: "Electricity for the developing world" by Dr. Valerio De Angelis**		**Ballroom, Lobby**		
9:15am - 9:45am		**Coffee Break**		**2nd Floor Foyer**		
9:45am	12541	Transient growth of bubbles in saturation boiling of PF-5060 dielectric liquid on rough surfaces	Heat Transfer Enhancement I	East End	Raj Manglik	Mohamed El-Genk
	12607	Heat transfer enhancement to air flows in plate channels with wire-mesh inserts				Renju Kurian
	12717	Heat transfer enhancement of surfaces for pool boiling using additive manufacturing				Kin Keong Wong
	12753	Heat transfer and hydraulic resistance in channels with spherical protrusions				Igor Popov
	12755	Heat transfer enhancement and critical heat fluxes at boiling of various liquids on microstructurized surfaces				Igor Popov
	12569	A numerical study of the coupled thermal boundary layers adjacent to a wavy conducting partition placed vertically in a square cavity				Suvash Saha
9:45am	12536	Scale modeling experiments on limited ventilation fire in a train car with parallel goods	Combustion and Fuels I	Broadway	Yogesh Jaluria	W.K. Chow
	12970	Schlieren 3D-CT measurement of an instantaneous density distribution of a high-speed premixed turbulent burner flame (Effect of flow velocity on 3D-shape of flame front)				Yojiro Ishino
	13170	Model of transport and chemical kinetics in a solar reactor to split carbon dioxide				Rohini Bala Chandran
	13233	Bayesian inference of soot volume fraction through laser-induced incandescence				Kyle Daun
	12802	The burning characteristics of N-butanol, gasoline, and N-butanol gasoline mixture droplets				Yuhao Xu
	12499	Measurements of pulverized coal flames generated by a staged feed-gas burner under air-fired and oxy-fired conditions				Rodrigo Correa da Silva
	13510	A simplified combustion model for single biomass particle				Yousef Haseli
9:45am	12545	Turbulent water-air interaction and mixing within a rectangular enclosure	Computational Methods and Tools in Thermal Fluids Sciences I	Sutton	Kevin Dowding	Majid Molki
	12605	The effect of surface temperature on the vortex shedding in flow past circular cylinder				Sayooj AP
	12614	Perturbation-iteration solution for a third-grade fluid flowing between parallel plates				Mehmet Pakdemirli
	12634	Thermoconvective instabilities of 2D Poiseuille-Rayleigh-Benard for supercritical fluids in micro/macro -channels				Djilali Ameur
	12635	Numerical analysis of air flow past an unmanned aerial vehicle with internal propulsion system				Luis Velazquez-Araque
9:45am	12703	Coupled temperature and velocity measurements and use of the POD for the estimation of turbulent heat fluxes in a differentially heated cavity	Fundamentals in Heat, Mass and Momentum Transfer I	Vanderbilt	Chen-Xian Lin Francine Battaglia (Co-Chair)	Pierre Belleoud
	12714	A numerical study on the effects of the heat spreader thickness and the heat sink size on the thermal performance of a cooling device for a CPV module				Kyu Hyung Do
	12715	Flow distribution of fuel nozzles for a combustor in a micro gas turbine				Tae Hoon Kim
	13200	Effect of freestream turbulence on recovery factor of a cylindrical temperature probe				Matthew Stinson
	13226	Analytical solutions of branching fins				Ahmad Fakheri
	13329	Transient thermo-capillary convection around a vapor bubble in a liquid pool: A numerical investigation				Raj Manglik

			Session Title	Room	Session Chair	Presenter
9:45am	12710	Multiphysics simulation of palladium hydride isotope exchange in non-uniform particle beds	Transport Phenomena in Porous Media I	Riverside	Ehsan Languri	Patricia Gharagozloo
	12732	Distinctive flow regions in crossform fracture model in shale gas reservoir using numerical density derivative part 3				Victor Torkiowei Biu
	12733	Using numerical density derivatives to improved diagnosis of flow regimes and estimation of reservoir properties for multiphase flow				Victor Torkiowei Biu
	12803	A generalized model for flow through tight porous media with Klinkenberg's effect				Li Chen
	13041	Numerical simulation of unsaturated flow in swelling porous media				Nadia Laredj
	13059	Study on fluid flow in sandstone reservoirs with multi-level flow medium				Yuetian Liu
	12570	Potentials of cellular vortex element modeling of fluid flow in confined 2D aquifer				Adeaga Oyetunde
9:45am	12959	Bubble nucleation of methanol, ethanol, butanol, and N-heptane by pulse-heating a thin film platinum heater on a low stress sin membrane	Multiphase and Phase Change Phenomena I	Fashion	Sumanta Acharya	C Thomas Avedisian
	12978	Heterogeneous surfaces with engineered wettability for controlling wetting dynamics during condensation				Matthew McCarthy
	12980	Boiling heat transfer enhancement on structured surfaces with engineered thermal gradients and nucleation sites				Matthew McCarthy
	13067	Flow boiling instabilities of low-latent heat of vaporization liquids in single microchannels				Antonio Moreira
	13076	Nucleate pool boiling from selective laser melted microgrooves/microcavities surfaces with HFE-7000				Kai Choong Leong
	13053	Experimental study of the ebullition heat transfer in the small plat exchanger				Madani Brahim
9:45am	12726	Performance evaluation of H2O-LiBr absorber operating with microporous membrane technology	Micro and Nanoscale Thermal Sciences and Engineering	Fifth Avenue	Dong Liu	Mercedes de Vega
	12857	Effects of surface modification using CNTs on fluid flow and heat transfer performance behavior in micro-channel heat sink				Taha Taha
	12859	Nucleate boiling heat transfer enhancement with electrowetting				Dong Liu
	13139	Mathematical and numerical modeling of nanoparticles transport				Rachid Boudhan
	13032	Molecular dynamics simulation of methane adsorption in shale matrix				Zhong-zhen Li
	13257	Convective flow of nanofluid past an inverted cone through a porous medium: Solutions by OHAM				Salman Saleem
	12769	Analysis of rectangular microchannel in forced convection heat transfer condition using refrigerant R-22				Dhanapal Kamble
	13138	Improvement of an Iranian oil recovery in the GAGD process using NanoSilica particles				Naser Akhlaghi
9:45am	12685	Numerical modeling of non-linear thermal stress in direct metal laser sintering process of titanium alloy products	Industrial Processes and Advanced Manufacturing	Lexington	Yaroslav Chudnovsky	Xinran Zhao
	12903	An energy based analytical model for multi-pass laser micro channeling on PMMA				Subrata Kumar
	12557	Formation of liquid sheets by deposition of mono-disperse sprays on a flat surface				Alireza Dalili
	12675	Numerical simulations of fluid flow and heat transfer in polymer isolation processes of steam contactors				Kelly Gabor
	12957	Humidification of industrial process flows by means of waste heat recovery				Serge Zvenigorodsky
11:15am - 11:30am		**Coffee Break**				
11:30am - 12:30pm		**Plenary Lecture: "Simulations of Shock-Turbulence Interactions: From Canonical Problems to Engineering Applications" by Prof. Sanjiva Lele**		**Ballroom, Lobby**		
12:30pm - 12:45pm		**Tech-Talk Session: "Heat Exchanger Design Handbook: Past, Present and Future in the Digital Era" by Dr. Francesco Coletti**		**Ballroom, Lobby**		
12:45pm - 1:45pm		**Lunch - Individual**				
1:45pm - 2:45pm		**Plenary Lecture: "Common Features in the Flow Structure and Turbulence of Tip Leakage Flows in Axial Turbomachines" by Prof. Joseph Katz**		**Ballroom, Lobby**		
2:45pm - 3:00pm		**Tech-Talk Session: "Communicating the Value of Thermal-Fluids Research to a Diverse Audience" by Dr. Pamela Norris**		**Ballroom, Lobby**		
3:00pm - 3:15pm		**Refreshment Break**		**2nd Floor Foyer**		

			Session Title	Room	Session Chair	Presenter
3:15pm	12725	On the applicability of a triple thermochromic liquid crystal layer for transient heat transfer experiments	Fundamentals in Heat, Mass and Momentum Transfer II	Vanderbilt	SA Sherif	Alexandros Terzis
	12749	Natural convection minimization in irregular enclosures for air conditioning power saving				Ehsan Languri
	12754	Natural convection heat transfer from inclined non-circular cylinders				Mohamed Ali
	12778	Effect of nanostructures and electrostatic interactions on meniscus shape and disjoining pressure of thin liquid films				Han Hu
	13009	Analysis of steady turbulent triple jet flow with temperature difference				Nassira Nouali
	13172	Educational workshops for correcting heat transfer misconceptions				Tom Diller
3:15pm	12952	Investigation of the influence of flux distribution on the heat transfer within a solar thermal receiver	Heat Transfer Enhancement II	East End	Matthew McCarthy	David Rodriguez-Sanchez
	12963	Full field thermal performance of a side mounted piezoelectric fan				Mark Kimber
	12981	Heat transfer enhancement using grooves				Sumanta Acharya
	12990	Heat transfer enhancement in turbulent flow through circular tube with various arrangement of delta winglet vortex generators				Sarkar Rashid
	13539	The effects of nozzle-to-plate spacing on heat transfer and fluid flow of jet impingement				Kyosung Choo
	12906	Numerical study on forced ferroconvection in a pipe under different axial magnetic field				Yahya Sheikhnejad
3:15pm	12843	Gas turbine lean premixed combustion: Principles of modelling in the context of the Kolmogorov's legacy in turbulence	Combustion and Fuels II	Broadway	Yogesh Jaluria	Vladimir Zimont
	12854	Self-ignition and quenching limits and sensitivity analysis of a catalytic micro-structured burner				Vladimir Zimont
	12948	Contaminant entrainment in a liquid fuel fire				Alexander Brown
	12950	Non-gray radiation modelings in Eulerian-Lagrangian methods for pulverized coal flames				Jian Cai
	12546	Optical determination of temperature and species concentration for homogeneous turbulent gas medium				Tao Ren
	12894	Low-temperature ignition of microparticles at adiabatic compression of fuel/air mixtures				Oleg Penyazkov
	13144	Hydrogen-assisted catalytic micro-combustion of CH4/air mixtures over metal foam monolithic catalyst				Chaoming Luo
3:15pm	12656	Effect of swirl generating nozzle on the particulate flow inside a solar reactor	Computational Methods and Tools in Thermal Fluids Sciences II	Sutton	Kevin Dowdings	Güven Öğüş
	12666	A set of manufactured solutions for coupled radiation (SPn) and conduction problems				John Tencer
	12670	A platform that accepts sub-grid models as plugins to enable the testing of LES models against DNS data				Igor Grossman
	12677	Real time solution for inverse heat conduction problems in a two-dimensional plate with multiple heat fluxes at the surface				Hamidreza Najafi
	13060	Simulation methods of two-phase flow based on a hyperbolic two-fluid model				Moon-Sun Chung
	13191	Numerical model for quenching of hot surface by the falling cryogenic liquid film				Aleksandr Pavlenko
	12658	Parameter study on longitudinal heat conduction in a cross-wavy primary surface heat exchanger				Qiuwang Wang
3:15pm	12493	Heat transfer measurements and correlations assessment for downward inclined gas-siquid two-phase flow	Multiphase and Phase Change Phenomena II	Fashion	Steve Cai Yuwen Zhang (Co-Chair)	Afshin J Ghajar
	12494	Heat transfer measurements and correlations assessment for upward inclined gas-liquid two-phase flow				Afshin J Ghajar
	12561	Saturation nucleate boiling of PF-5060 on inclined dimpled surfaces				Mohamed El-Genk
	12649	Effect of tube bundle layout on kettle reboiler effectiveness using Eulerian multiphase simulation				Kevin Farrell
	12691	Semi-empirical model of micro water droplet on low-surface-energy solid under the natural evaporation				Yukihiro Yonemoto
3:15pm	12646	Effect of graphene on the near-field thermophotovoltaic device	Micro and Nanoscale Thermal Radiation	Fifth Avenue	Bong Jae Lee, Zhoumin Zhang (Co-Chair)	Bong Jae Lee
	12831	Design of solar thermal absorber using Kriging method with basis screening				Bong Jae Lee
	12877	Heating of noble metal nanostructures on a dielectric surface due to plasmonic resonance and effect of AFM probe				Hakan Erturk
	12913	Time resolved laser induced incandescence for sizing aerosolized silver nanoparticles				Nigel Singh
	13149	Near-field radiative heat transfer between two quartz plates				Hakan Salihoglu

			Session Title	Room	Session Chair	Presenter
3:15pm	12692	Development of cooling technology in a megasonic cleaning system for flat panel display	Engineering Equipment and Environmental Systems I	Riverside	Ahmad Fakheri, Chen-Xian Lin (Co-Chair)	Hyunse Kim
	12876	How to make liquid metal transparent? A neutron radiography method for scaled-down metallurgical equipment				Mihails Scepanskis
	12555	Characteristics of radio frequency capacitively coupled discharge operating on water-vapour and in helium-water mixtures				Ziane Kechidi
	13250	An iris mechanism driven temperature control of solar thermal reactors				Nesrin Ozalp
	12839	Quasi-stationary plasma accelerators of a new generation and their potentialities in modification of materials surface properties				Oleg Penyazkov
	12780	Models and analyses of emissions of the carbon dioxide on example of metallurgical processes				Vladimir Lisienko
	12783	Thermal evaluation of perlite and pumice based building insulation materials using reverse heat leak method				Serdar Celik
3:15pm	12701	The influence on engine pool fire dynamics due to external sources	Aerospace Applications I	Lexington	David Pratt	Norman Toy
	12731	Effect of fold density on the total radiative heat rate for origami-inspired, variable-emissivity surfaces				Brian Iverson
	12761	Performance analysis and modeling of the two-stage wave disk engine				Pejman Akbari
	12910	Water recovery with the heat melt compactor in a microgravity environment				Eric Golliher
	12900	Activation of detonation-to-deflagration transitions in pulsed detonation combustor by wall heating				Oleg Penyazkov
4:45pm - 5:00pm		**Break**				
5:00pm - 5:15pm		**Tech-Talk Session: "Learning to Unlearn: Personal Experiences in Entrepreneurship, Manufacturing and Business Growth" by Dr. Sanjeev Sathe**		**Ballroom, Lobby**		
5:15pm - 6:45pm		**Plenary Panel: Opportunities and Challenges in Federally-Funded Research**		**Ballroom, Lobby**		
6:45pm - 7:00pm		**Tech-Talk Session: "Reinventing Water As A Mineral" by John Voeller, Senior VP, Black & Veatch**		**Ballroom, Lobby**		
7:00pm - 8:00pm		**Exhibition and Networking**		**2nd Floor Foyer**		
TUESDAY - AUGUST 11, 2015						
8:00am - 9:00am		**Plenary Lecture: "CFD Application to Large-Scale Industrial Multi-Phase Flows: Miracles Do Happen" by Dr. Wayne Strasser**		**Ballroom, Lobby**		
9:00am - 9:30am		**Coffee Break**		**2nd Floor Foyer**		
9:30am	12797	Experimental study of forced convection heat transfer during upward and downward flow of helium at high pressure and high temperature	Fundamentals in Heat, Mass and Momentum Transfer III	Sutton	Chen-Xian Lin	Masahiro Kawaji
	12872	Investigation of helium flow laminarization at high temperatures and high pressures in a graphite flow channel				Masahiro Kawaji
	12816	Flow structures and heat transfer in laminar jet impingement				Wilko Rohlfs
	12598	Error reduction in the "thermal cube" heat flux sensor used in wildland forest fires				Shammawi Anderson
	12660	Heat transfer of developing flow in the transitional flow regime				Marilize Everts
	12496	Analytical modeling of compressible gas flow-induced conductivity damage in a propped hydraulic fracture coupled with heat transfer				Hailong Jiang
	12786	The theory of equivalence measures and stochastic theory of turbulence for non-isothermal flow on the flat plate				Artur Dmitrenko
9:30am	12762	Effects of curvature radii and aspect ratios on cooling channels heat transfer for liquid rocket engines	Heat Transfer Enhancement III	Riverside	David Pratt	Pejman Akbari
	12775	Thermal optimization of internally finned-tube in natural convection				Younghwan Joo
	12796	Frost layer densification on hydrophilic and hydrophobic surfaces				Andrew Sommers
	13065	Thermal conductivity of nanofluids: A study using MD simulation coupled with stochastic analysis				M. M. Ghosh
	12532	Heat transfer enhancement in a circular finned two-phase closed thermosyphon (TPCT) using ethylene glycol and nano particle mixture				Alagappan Narayanan
	12785	Optimization of tube arrangement in fin-triangular tube heat exchangers				Ardalan Mashi
	12792	Enhancement of heat transfer in a U-shaped channel with a completely open circular cavity in the turning point				Sergey Isaev

			Session Title	Room	Session Chair	Presenter
9:30am	12518	Numerical modeling of thermal characteristics in a MEMS-based micro-initiator with intermetallic thin film layers	Numerical and Experimental Studies in Thermal Fluids Processes	Vanderbilt	Yong Tao John Lloyd (Co-Chair)	Kyoungjin Kim
	12563	Numerical and experimental investigation of bubble attachment to a substrate				Javad Esmaeelpanah
	13873	Stagnation-point flow of an upper convected Maxwell fluid towards a vertical stretching/shrinking sheet				Mohammad Mansur Rahman
	13207	Study of a vertical plane plate cooling with an impinging jet				Mahfoud Kadja
	12610	Numerical study of equivalence ratio and swirl effect on the performance and emissions of a HCCI engine				Andhra Pradesh
	12722	Correlation of velocity and scalar fields in confined flows				Andrei Chorny
	12738	Similarity solution of boundary layer flow over a stretching cylinder saturated with a nanofluid				Rashid Pourrajab
9:30am	12704	Numerical simulations of natural convection in a laterally-heated cylindrical reactor	Computational Methods and Tools in Thermal Fluids Sciences III	East End	Francine Battaglia Wayne Strasser (Co-Chair)	Hooman Enayati
	12708	Rise and deformation of a gas bubble in a non-Newtonian fluid in a square duct				Surya P Vanka
	12709	A multi-GPU based accurate algorithm for simulations of gas-liquid flows				Surya P Vanka
	13040	Numerical study of coupled heat and mass transfer in building envelopes based on temperature and capillary pressure gradients				Mustapha Maliki
	13842	Application of a dynamic LES model with an H-adaptive FEM for fluid and thermal processes				Jiajia Waters
9:30am	12465	Integrated additive manufacturing and laser micromachining to fabricate thermoelectric generators directly onto waste-heat components	Energy Conversion Systems I	Broadway	Bong Jae Lee Ronggui Yang (Co-Chair)	Mahder Tewolde
	12599	Performance analysis of volumetric solar collector using plasmonic nanofluid				Bong Jae Lee
	12642	Closed form solutions to investigate ionic conductivity in porous fuel cell electrode microstructures				Matthew DeGostin
	12674	Modelling and optimization of a multi-tubular solar receiver for solar-driven high temperature electrolysis				Meng Lin
	12752	Directional selectivity as an alternative to concentration for high efficiency solar thermal systems				Lee Weinstein
9:30am	12884	Enhanced heat transfer for low-temperature baseboard heating	Heat Transfer Enhancement IV	Fifth Avenue	Ahmad Fakheri	Chun Hsun Kao
	12888	Numerical investigation of forced convection thermal management of high power electronics on a rotary platform				Ilker Tari
	12893	On the modeling of a spray impingement onto a hot surface				Andre' Silva
	13192	Numerical study of forced convection heat transfer over circular and oval tube banks using rectangular winglet vortex generations				Mohammad Refatul Islam
	12887	Dewar configuration as an approach to maximizing the cooling of heat loads in two-temperature Dewars				Narcrisha Norman
	13364	Experimental study on heat transfer performance of Al2O3-water nanofluid in spray cooling system				Hongbo Xu
9:30am	12700	Wall effects on subcooled boiling-induced vibration phenomena of a single heater rod	Multiphase and Phase Change Phenomena III	Lexington	Steve Cai Chang Choi (Co-Chair)	Kenji Takano
	12773	Observation of coalescence behaviors of nucleation bubbles near a preexisting bubble on the wall in subcooled flow boiling in an annular channel				Tomoaki Kunugi
	12657	Investigation of bubble frequency in slug flow regime for flow boiling in a single round uniformly heated micro-channel				Amen Younes
	12815	Effects of cross-section geometry on the thermal performance of a pulsating heat pipe				Jungseok Lee
	12776	Investigation of wall surface temperature evaluation procedure during subcooled nucleate boiling in non-empirical boiling and condensation model				Yasuo Ose
	12694	Wetting behavior of propane drops on solid materials				Thomas Grab
9:30am	12747	Nano-resonator with variable material properties	Micro and Nanoscale Conduction	Fashion	Hakan Erturk, Zhuomin Zhang (Co-Chair)	Hamdy Youssef
	12804	Research on the in-plane thermal diffusivity of aluminum coated steel substrates				Boyu Zheng
	12823	Molecular dynamics study of the thermal conductivity of a hexagonal boron nitride-water nanofluid				Tolga Akiner
	12765	Thermal conductivity of single ployethylene chain dependence on length, temperature and mechanical strain using molecular dynamics simulations				Zhichun Liu
	12777	Phonon mean free path and thermal conductivity relation for gallium nitride				Nazli Donmezer

			Session Title	Room	Session Chair	Presenter
11:00am - 11:15am		**Break**				
11:30am - 1:30pm		**Thermal Fluids Engineering Awards Luncheon**		**Vermilion restaurant (480 Lexington Ave, New York, NY 10017)**		
2:00pm - 3:00pm		**Plenary Lecture: "Simulating Fire Effects in Large Buildings" by Dr. Howard Baum**		**Ballroom, Lobby**		
3:00pm - 3:30pm		**Refreshment Break**		**2nd Floor Foyer**		
3:30pm	12897	Development and demonstration of a hybrid heat transfer device	Fundamentals in Heat, Mass and Momentum Transfer IV	Vanderbilt	Keith Walters Yi Zheng (Co-Chair)	Steve Cai
	12925	Optimal fin thickness and spacing in fully-developed flow accounting for non-uniform heat transfer coefficient				Georgios Karamanis
	12987	Experimental investigation of carbon dioxide dry-ice assisted jet impingement cooling performance				Jaeseon Lee
	12993	Flux-limited relativistic heat and mass transfer				Juan Ramos
	12994	Film drawing of liquid semi-crystalline polymers				Juan Ramos
	12822	Increasing exergetic efficiency through convective heat transfer enhancement in a finned reciprocating compressor				Mahbod Heidari
3:30pm	12687	Numerical investigation of the local heat transfer behaviour to single and multiple jet impingement over an electronic component	Heat Transfer Enhancement V	East End	Raj Manglik	Pullarao Muvvala
	12690	Numerical study on the improvement of flow distribution uniformity among parallel microchannels				Cyril Pistoresi
	12693	Flowing and wetting behavior of falling liquid films in inclined and internal structured tubes				Simon Eichinger
	12696	A numerical and experimental study of optimal distribution of discrete heat sources under natural and forced convection				Shankar Durgam
	13010	An experimental study of free convection heat transfer on triangular fins in order to optimize the arrangement of fins				Hamid Goshayeshi
	12832	Numerical study of heat transfer and fly ash deposition characteristics for two kinds of H-type finend tubes				Fei-Long Wang
3:30pm	13638	State estimation with the auxiliary sampling importance resampling particle filter for the radiofrequency hyperthermia therapy of cancer	Thermal Sciences in Biomedicine and Biofluids	Fifth Avenue	Yogesh Jaluria	Helcio Orlande
	13764	A comparison of particle filter algorithms applied to the temperature fields estimation in hyperthermia phantoms				Helcio Orlande
	13017	Examining mucin type and morphology effects on mammalian mucus mechanical and microstructural properties				Keisha Walters
	13147	Thermal radiation effect on inclined arterial blood flow through a non-Darcian porous medium with magnetic field				Bhupendra Sharma
	13153	Mathematical modeling of magneto-blood flow and heat transfer through porous medium with variable viscosity				Madhu Sharma
	13157	Targeting of curcumin loaded Iron oxide nanoparticles during magnetic drug targeting: An in vitro study				Mohammed Asfer
3:30pm	12791	Stator heat transfer prediction of disk-type electrical machines	Computational Methods and Tools in Thermal Fluids Sciences IV	Sutton	Francine Battaglia Wayne Strasser (Co-Chair)	Alireza Rasekh
	12846	Simulation of arterial flow with moving indentation: An immersed boundary approach				Somnath Roy
	12848	Simulation of wind turbine flow using the actuator line method in NEK5000				Murphy O'Dea
	13294	Adjoint method for transport of heat and particles in internal automotive flows				Sinisa Krajnovic
	13004	Numerical simulation of heat transfer and fluid flow in fuel rod sub-channels of pressurized water reactor (PWR)				Sarkar Rashid
	12737	Numerical modeling of the discharged heat water effect on the aquatic environment from thermal power plant				Alibek Issakhov
3:30pm	12858	Numerical study of colloidal droplet impingement on a porous substrate	Multiphase and Phase Change Phenomena IV	Broadway	Steve Cai Chang Choi (Co-Chair)	Ronghui Ma
	12795	Investigation of subcooled flow boiling heat transfer at pressures at 1 - 3 bar				Masahiro Kawaji
	12806	Visualization experiment for heat pipe vaporator of nanoparticle-laden mesh wick charged with water, methanol, or acetone				Shwin-Chung Wong
	12864	Numerical study of particle density on buoyancy-driven two phase flow				Ronghui Ma
	12909	Thermal decomposition of ethanol by film boiling				C Thomas Avedisian
	12873	Capillary resistance and flow pattern change of pulsating heat pipe				Wei Qu
	12838	CFD simulation of velocity and void fraction distribution of two-phase flows (air-water) in vertical helical coils				Rouhollah Moosavi

			Session Title	Room	Session Chair	Presenter
3:30pm	12576	Hydrodynamics and heat transfer of micro-scale surface flows induced by triangulated droplet stream impingement array	Micro- and Nanofluidics and Phase Change	Lexington	Dong Liu	Jorge Alvarado
	12579	Motion of bubbles and particles in drying paint layers due to surface tension-driven flows				Nazli Saranjam
	12825	Water-evaporation characteristics of a nano-patterned transparent film fabricated by UV nanoimprint				Shin-ichi Satake
	12955	Enhanced modelling and investigation of micro-droplet formation in immiscible fluids at a T-junction				Tilak Chandratilleke
	13185	Characterization of evaporation and rapid boiling of thin liquid film from an energy point of view: A molecular dynamics study				Sheikh Mohammad Shavik
3:30pm	12935	Advanced statistical analysis of the collision of wall jet with a boundary layer	Aerospace Applications II	Fashion	David Pratt	Andre' Silva
	13011	Investigation of dynamic hybrid RANS-LES modeling for compressible turbulent flows				Keith Walters
	13511	The performance of gas turbine engines at minimum entropy generation				Yousef Haseli
	13143	An experiment study on the steam jet condensation with different type of nozzles				Quanbin Zhao
	13205	Investigations on the effect of variable angle ramp diffuser in ramjet engine				David Jebamani
3:30pm	12880	Convective-radiative fin of irregular profile with multiple nonlinearities by the collocation spectral method	Engineering Equipment and Processes II	Riverside	Ahmad Fakheri	Jing Ma
	12905	Co-current loop thermosyphon with active working fluid management: Application for water recovery in flue gas				Tao He
	13029	Investigation of heat pipe cooling of LI-ION batteries				Upendra Rohatgi
	13213	Efficiency of mixture separation on a structured packing - New ideas and approaches				Aleksandr Pavlenko
	12929	Passive residual heat removal system for WWER with the thermosiphon heatexchange equipment				Igor Sviridenko
	13016	Effect of liquid nitrogen cooling on rock cracking and its prospect in fracturing				Zhongwei Huang
5:00pm - 5:15pm		**Break**				
5:00pm - 6:30pm		**Exhibition and Networking**		**2nd Floor Foyer**		
WEDNESDAY - AUGUST 12, 2015						
8:00am - 9:00am		**Plenary Lecture: "Modeling Thermal and Fluids Problems Arising in Industry" by Dr. John Abbott**		**Vanderbilt**		
9:00am - 9:30am		**Coffee Break**		**2nd Floor Foyer**		
9:30am	12853	Fluctuation-induced radiative heat transfer and Van der Waals force for spherical shapes	Fundamentals in Heat, Mass and Momentum Transfer V	East End	Keith Walters Yi Zheng (Co-Chair)	Yi Zheng
	12863	A numerical study of natural convective heat transfer from horizontal isothermal heated elements of complex shape				Patrick H Oosthuizen
	12865	Numerical study of the effect of vent size on natural convective heat transfer from a square horizontal isothermal heated surface surrounded by a protective cover				Patrick H Oosthuizen
	12878	Sheared stably stratified turbulence and large-scale waves in a lid driven cavity				Nimrod Cohen
	12849	Assumptions in linear stability theories of double diffusive finger convection: When are they invalid?				Faria Rehman
9:30am	12824	Dynamic contact angle measurement on a surface with nanoparticles coating for boiling crisis model improvement	Heat Transfer Enhancement VI	Fifth Avenue	David Pratt	Yu. A. Kuzma-Kichta
	12827	Enhanced melting for latent heat storage				Gennady Ziskind
	12809	Performance analysis of a novel heat transfer surface used in industrial heat recovery process				Wenjing DU
	13229	Unsteady heat transfer enhancement in a rectangular duct using pulsatile flow				Nahmkeon Hur
	13179	Visualizaiton and evaporator resistance measurement in a two-phase thermosyphon with a boiling surface covered with a porous metal foam				Wei Wang
	13236	Effects of initial conditions on oscillatory flow in an oscillating heat pipe				Yuwen Zhang

			Session Title	Room	Session Chair	Presenter
9:30am	13156	Flow boiling of water in a hydrophobic coated small diameter tube	Multiphase and Phase Change Phenomena V	Broadway	Sumanta Acharya Chang Choi (Co-Chair)	Arcot R Balakrishnan
	13174	Transient behavior of droplet growth and heat transfer characteristics during dropwise condensation process on SAM coated hydrophobic surface				Jae Bin Lee
	12912	Inward melting and freezing of additive-enhanced phase change materials in small diameter cylinders				Matthew McCarthy
	12918	Evaporation cooling for vaccine delivery using aluminum hierarchically porous structures				Seongchul Jun
	12922	Heat transfer analysis of solid particles during melting and sedimentation in a liquid pool				Hamidreza Shabgard
	13187	Analytical solution of heat transfer of a liquid plug flowing in a tube with uniform wall temperature				Hongbin Ma
	13199	Simulation and experimental study of phase-isolation in a vertical pipe using a static centrifugal device				Shuai Wang
9:30am	12901	An analysis of prior information in Bayesian tomographic reconstruction	Computational Methods and Tools in Thermal Fluids Sciences V	Vanderbilt	Kevin Dowding	Samuel Grauer
	12908	Reduced order modeling of a data center with multi-parameters in a 3D approach				Cheng-Xian Lin
	12927	Numerical analysis and optimization of a complex geometry, high-temperature heat pipe				Mahboobe Mahdavi
	12933	Analysis of a heat pipe-assisted high temperature latent heat energy storage system using a three-dimensional model				Saeed Tiari
	12941	Comparison of finite element and finite volume analysis for rough surfaces using mapped domains				Ashley Emery
	12771	RANS simulations and turbulence models for single-round, annular and coaxial free jets				Essam Wahba
9:30am	12907	Modeling of a heat pump based on the Vuilleumier thermodynamic cycle	Energy Conversion Systems II	Lexington	Jon Longtin, Ronggui Yang (Co-Chair)	Hanfei Chen
	12914	Computational models for study of time dependent performance of hybrid PV/T air systems				Cheng-Xian Lin
	12936	Spectral collocation discrete-ordinates method for 1D and 2D atmospheric solar radiative transfer				Zhixiong Guo
	13495	Evaporative cooling and data acquisition system for data centers				Kai Zheng
	12921	Unsteady evaporative cooling in a vacuum of sprayed droplets deposited on a flat surface				Eric Golliher
	12961	Experimental studies on the electrochemical evolution of oxygen bubble from an artificial nucleation cavity				Babu Radhakrishnan
9:30am		1. Jorge Alvarado - Effects of High Frequency Droplet Train Impingement on Spreading-Splashing Transition, Film Hydrodynamics and Heat Transfer	Heat Transfer Photo Gallery I	Sutton	Chang Kyoung Choi	
		2. Jungho Lee - Visualization of Terrain-induced Slugging in W-shaped Pipeline				
		3. Jorge Alvarado - Effects of High Frequency Droplet Train Impingement on Crown Propagation Dynamics and Heat Transfer				
		4. Dion Antao - Dynamics of the Evaporating Liquid-Vapor Interface in Micropillar Arrays				
		5. Jungho Lee - Boiling Visualization of Two Adjacent Impinging Jets on Hot Steel Plate				
		6. SH Lee - Frosting Characteristics on Hydrophilic and Superhydrophobic Copper Surfaces				
		7. Fang Yuan - Flow Visualization of Submerged Steam Jet in Subcooled Water				
		8. Chang Kyoung Choi - Neutron Imging of cryogenic liquid hydrogen				
		9. SH Lee - High speed imaging of impinging droplets				
9:30am	12739	Excitation pulse width research on the peak diffusing method for thermal diffusivity measurement	Thermodynamics and Thermophysical Properties	Riverside	Matthew Jones Brian Iverson (Co-Chair)	Huilong Dong
	12855	Calculation of emissivity and near-field radiative heat transfer for multi-layered structures				Yi Zheng
	12932	Sustainable working fluids for ejector technology systems				Olexiy Buyadgie
	12976	Numerical simulation on modulation characteristics of high pressure and high temperature jet				Xianzhi Song
	13061	An accurate temperature measurement method by using feedback of pressure to temperature of heat pipe				Zhihu Xue
	13155	Effect of Rayleigh numbers on characteristics of double diffusive finger convection in variety of fluid systems like stellar & planetary interiors, magma chambers & oceans				Faria Rehman
	12889	Experimental measurement on radiative extinction properties of ceramic foam at high temperature				Shun-De Zhang

			Session Title	Room	Session Chair	Presenter
9:30am	13069	Air-cooled power plant condensers at water-cooled performance levels - Is it possible?	Fundamentals in Heat, Mass and Momentum Transfer VI	Fashion	SA Sherif	Srinivas Garimella
	12820	Pressure and velocity fields reconstruction from temperature data in natural convection flows				Nikolay Vinnichenko
	12968	The influence of temperature on the impact characteristics of supercritical CO2 jet				Haizhu Wang
	12681	Overview of NSF-EPRI collaboratively funded advanced dry cooling projects				Jessica Shi
	12826	Effect of corrugated tubes on heat exchangers using numerical simulations				José A. Almendros-Ibáñez
	13652	Nonlinear Eigenfunction expansions for the solution of non-linear diffusion problems				Renato M. Cotta
11:00am - 11:15am		**Break**				
11:15am - 12:15pm		**Plenary Lecture: "Thermal Transport in Selected Food Processing Operations" by Prof. Mukund Karwe**		**Vanderbilt**		
12:15pm - 1:15pm		**Lunch**				
1:15pm	12653	Effective thermal conductivity of a porous copper foam saturated with eicosane	Heat Transfer Enhancement VII	East End	Ahmad Fakheri	John Crepeau
	12834	Experimental investigation of copper-water heat pipes operation at mid-Level temperature range for aerospace and industrial applications				Roger Riehl
	12836	Thermal performance comparison between water-copper and water-stainless steel heat pipes designed for industrial application				Roger Riehl
	12882	Cooling capacity increase of CPU liquid cooling systems using hBN nanofluids				Hakan Erturk
	12613	Effect of jet shape on the heat transfer in trailing edge model				Unal Uysal
1:15pm	13160	DES and URANS downstream of a heated backward facing step	Computational Methods and Tools in Thermal Fluids Sciences VI	Vanderbilt	Jun Zhou	Sebastian Ruck
	13177	Fluid flow and heat transfer calculations in a matrix of surface-mounted cubes				Basara Branislav
	13234	Thermal comfort and air quality analysis of a ventilated cavity with a mixture of Air-CO2: A single or multiple air outlets				Miguel Angel Gijón Rivera
	13235	Mass balance in velocity Dirichlet boundary conditions for lattice Boltzmann method				Yuwen Zhang
	13244	Study of fluid flows, thermal absorption and dissipation in KLCC				Zambri Harun
1:15pm	12911	Crossflow mixed convection heat transfer for horizontal tube banks	Thermal Fluids in Industrial Applications	Lexington	Olexiy Buyadgie	Christy Laird
	12942	Diffusion is ubiquitous: A volume decomposition application for 3D printing				Sibel Tari
	12977	Numerical simulation of a disks-type induction pump on rotating permanent magnets				Ekaterina Koroteeva
	13227	Feasibility study of an innovative naturally air cooled condenser				Ahmad Fakheri
	12875	Modeling of heat transfer and fluid flow in fusion welding				Jun Zhou
	12954	Experiment on rock-erosion features with combined swirling and round jet of supercritical carbon dioxide under the ambient pressure condition				Shouceng Tian
1:15pm	12934	Experimental analysis of energy storage devices using phase change materials integrated with a milk storage system	Multiphase and Phase Change Phenomena VI	Broadway	Matthew McCarthy	Ilker Tari
	12946	Numerical study of nano-enhanced PCMs: Are they worth it?				Dominic Groulx
	12947	Thermal modeling of tablets: Temperature management using phase change materials				Dominic Groulx
	12953	Exploring the "nano-fin effect" in pool boiling enhancement using temperature nano-sensor arrays				Debjyoti Banerjee
	12945	Visualization of dropwise condensation using surface plasmon resonance (SPR) reflectance microscopy				Vinaykumar Konduru
	13232	An experimental study on frost deposition on cryogenic surfaces				Yuwan Dong

			Session Title	Room	Session Chair	Presenter
1:15pm		1. Mitch Blanc - Visualization of the Cavity Effect Present for Origami-Inspired Surfaces With IR Imaging	Heat Transfer Photo Gallery II	Sutton	Chang Kyoung Choi	
		2. Nimrod Cohen - Visualization of Mean Velocity and Temperature Fields in a Lid-Driven Cavity Flow With Stable Stratification				
		3. Miguel Angel Goni Rodrigo - Thermal Wave Imaging of Microelectronics				
		4. Yojiro Ishino - 3D Printing of Instantaneous Trubulent Flame Shapes, Experimentally Captured by 3D Computer Tomography and Multi-Directional Schlieren Photography				
		5. Mohamed Ali - New Natural Eco-Friendly Insulating Material				
		6. Scott Thompson - Electromagnetic Induction Via Pulsating Ferro-Nanofluid				
		7. Pierre Belleoud - Highly Turbulent Natural Convection				
		8. Hongbin Ma - Innovative Nanostructured Wicks for Heat Pipes				
		9. Elbara Ziade - Thermal Mapping of Thickness Dependent Thermal Conductivity of GaN				
1:15pm	12861	Numerical study of turbulent gas flow and CO2 absorption in porous packing materials	Transport Phenomena in Porous Media II	Riverside	Ehsan Languri	Ronghui Ma
	12869	Analysis of dissolved gas in the application of liquid piston gas compression				Longzhong Huang
	13198	Continuum radiative heat transfer modeling in multi-component anisotropic media in the limit of geometrical optics				Sophia Haussener
	12969	Effects of radiative heating rate and particle size on thermal transport in a porous CO2 sorbent particle				Wojciech Lipinski
	12931	Evaluation of physical properties of porous material by non-destructive electrical methods				Abderrahmene Merioua
	13159	Investigating of ZnO nanoparticles effect on steam assisted gravity drainage (SAGD) process in heavy oil reservoir				Mohammad Reza Ehsani
1:15pm	12774	Thermodynamic modeling and parametric study of microscale organic rankine cycle (ORC) system using modified Gouy-Stodola equation	Energy Conversion Systems III	Fashion	Kay Park Ronggui Yang (Co-Chair)	Surendra Singh Kachhwaha
	12787	Numerical investigation of a stand-alone solar hydrogen energy system: Effects of PEFC degradation				Ilker Tari
	12886	Investigation of core-shell nanofluids for enhanced solar absorption and thermal storage				Hakan Erturk
	13027	Near-field enhanced thermionic energy conversion				Mohammad Ghashami
	12574	Study and modeling of heat transfer and energy performance in a PV/T hybrid collector with double passage of air				Mohamed El Amine Slimani
1:15pm	12828	Experimental investigation of asphaltene deposition in vertical mini- and micro-channels	Micro- and Nano Channels and Nanofluids	Fifth Avenue	Dong Liu Yuwen Zhang (Co-Chair)	Afshin Goharzadeh
	13014	Magnetic nanoparticle morphologies: Developing ferrofluids for pulsating flows				Keisha Walters
	12847	Preperation and thermal conductivity of water based hBN nanofluids				Hakan Erturk
	12866	Thermal and hydrodynamic analysis of nanofluids at low concentrations in a microchannel heat sink				Eyüphan Manay
	12870	Convective heat transfer of nanofluids in a concentric circular tube				Eyüphan Manay
	12930	Effect of thermocapillary stress on slip length for Poiseuille flow over parallel ridges				Marc Hodes
	13145	Numerical study for compressible gas flow in micro-channel				Joanna Dib
2:45pm - 3:00pm		**BREAK**				
3:00pm		**TFESC CLOSING CEREMONY**		**Vanderbilt**		

Registration Information

TIME AND LOCATION

Registration will be at the following hours:

Sunday – August 9, 2015:	Monday – August 10, 2015:	Tuesday – August 11, 2015:
10:00 AM – 5:00 PM	8:00 AM – 5:00 PM	8:00 AM – 5:00 PM
Palm Room – Lobby Level	Second Floor Foyer	Second Floor Foyer

A map of the Second Floor meeting rooms will be available on the spot, and included in each conference bag provided.

Upcoming Conferences of Interest to the Thermal and Fluids Engineering Communities

2015

The 10th International Symposium on Numerical Analysis of Fluid Flow and Heat Transfer – Numerical Fluids 2015
September 23 – 29, 2015, Rhodes, Greece

23rd National and 1st International The Indian Society for Heat and Mass Transfer (ISHMT) and American Society of Thermal and Fluids Engineers (ASTFE) Conference
December 17 – 20, 2015, Trivandrum, Kerala, India

2016

The Pacific Rim Thermal Engineering Conference
March 13 – 17, 2016, Wairoloa Beach Marriott Resort & Spa, Hawaii's Big Island, USA

ASME Summer Heat Transfer Conference (SHTC) / Summer Fluids Engineering Conference (SFEC) / International Conference on Nanochannels, Microchannels and Minichannels (ICNMM) – Also 90th anniversary of FED
July 10 – 14, 2016, Hyatt Regency Washington D.C.

2017

ASTFE Thermal and Fluids Engineering Summer Conference with International Center of Heat and Mass Transfer (ICHMT)
March – April, 2017, Las Vegas, USA

ASME Summer Fluids Engineering Conference (SFEC) – No co-organizers
Date: TBD, Location: TBD

ASME Summer Heat Transfer Conference (SHTC) with INTERPACK / International Conference on Nanochannels, Microchannels and Minichannels (ICNMM)
Date: TBD, Location: TBD