Conference Program

ASTFE
American Society of
Thermal and Fluids Engineers

2nd Thermal and Fluids Engineering Conference
4th International Workshop on Heat Transfer

April 2–5, 2017, Las Vegas, NV, USA

www.astfe.org/tfec2017/

Preface

On behalf of the conference committee, welcome to the **2nd Thermal and Fluids Engineering Conference (TFEC)** and **4th International Workshop on Heat Transfer (IWHT)**. We are pleased to have you join us at the Rio Hotel and Casino in Las Vegas. The conference is hosted by the American Society of Thermal and Fluids Engineering (ASTFE), with the first conference held in New York City in 2015. There are over 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.

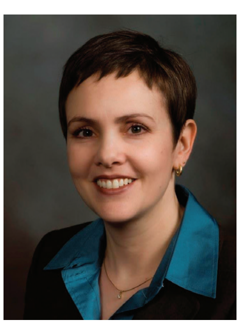
To kick-off the conference, there are a few workshops for those who want to broaden their knowledge in technical areas. A three-day workshop entitled "Introduction to Finite Element, Boundary Element, and Meshless Methods," is offered as a certified course. A one-day Measurement Uncertainty Workshop is offered on Sunday and a special hands-on session using COMSOL, a commercial multi-physics program will be held on Monday. Monday through Wednesday morning will begin with our distinguished plenary speakers, and a special plenary luncheon will be held on Tuesday. Monday and Tuesday also include widely recognized keynote speakers (see Page 5 for more details about the plenary and keynote presentations). Another highlight of the conference is the Technology, Entrepreneurship, Communications (TEC) Talks, which have been organized as a single session on Tuesday afternoon. A presentation by NSF is also included regarding research topics and funding opportunities.

A goal of the conference is to provide opportunities for participants to interact with colleagues and world-renown experts in the fields of thermal and fluids engineering, along with activities and discussions regarding new research directions. We encourage you to enhance your involvement in ASTFE by becoming a member and help in our future conferences and events. A meeting will be held on Monday afternoon for organizers and the closing ceremony on Wednesday will provide opportunities for you to become involved and provide feedback. It is volunteers such as yourselves that can help direct the future of ASTFE.

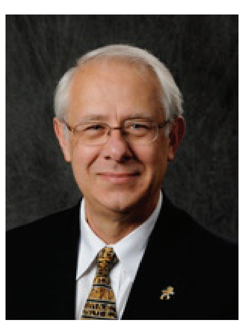
The ASTFE Board of Directors and organizing committees, thank you for your participation in this exciting conference. Special appreciation goes to Yelena Shafeyeva, Anna Berlinova, and other Begell House staff, for their support and dedication, and to the staff and students from UNLV for their assistance to make this program a success. We also wish to thank our conference sponsors: Begell House Inc. Publishers, COMSOL Inc., Yota Enterprise and CRC Press Taylor & Francis Group for their contributions to make this conference possible. 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 by traveling to the meeting and sharing their work.

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

Yours sincerely,

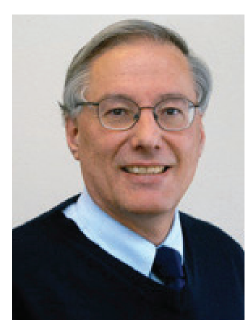


Francine Battaglia
2017 Conference Chair



Darrell Pepper
2017 Conference Co-Chair

Ahmad Fakheri
2017 TFEC Technical Program Chair



Terry Simon
2017 IWHT Technical Program Chair

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.

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.

Officers Pages

OFFICERS

Yogesh Jaluria, President

Kenneth Bell, Senior Vice President

Francine Battaglia, Vice President – Treasurer

Yaroslav Chudnovsky, Vice President – Secretary/Programs

Anna Berlinova, Managing Director

ADVISORY BOARD

John Lloyd, Chairman

Gang Chen

Michael Jensen

Jinkook Lee

James Liburdy

Stathis Michaelides

Pamela Norris

MEMBERS AT LARGE

Sumanta Acharya

Arun Muley

S.A. Sherif

Yong Tao

Wayne Strasser

Michael Plesniak

PUBLISHER

Begell House, Inc.
Yelena Shafeyeva

TFEC / IWHT Conference Committees

TFEC CONFERENCE COMMITTEE

Francine Battaglia
Conference Chair

Darrell W. Pepper
Conference Co-Chair

Ahmad Fakheri
Technical Program Chair

S.A. Sherif
Technical Program Co-Chair

IWHT CONFERENCE COMMITTEE

Terry Simon
Technical Program Co-Chair

Qiuwang Wang
Technical Program Co-Chair

Yi-Tung Chen
Technical Program Co-Chair

TFEC Plenary Speakers

SVANTE LITTMARCK

Affiliation: Co-founder and CEO of the COMSOL Group and the President and CEO of COMSOL, Inc.

Title: Multiphysics Simulations are More Powerful, and Much Less Complicated, than Ever Before

ABSTRACT: This talk will describe the process of creating useful "off the shelf" Multiphysics simulation software and demonstrate the latest achievements.

We will discuss the strengths and weaknesses of numerical simulations of physics phenomena in general and we will demonstrate what state-of-the art Multiphysics software can do today for the researcher specialist – and for someone with application expertise but with no or little expertise in numerical solver settings.

BIOGRAPHY: Dr. h.c. Svante Littmarck is cofounder and CEO of the COMSOL Group and the president and CEO of COMSOL, Inc. The company was founded in 1986 in Stockholm, Sweden, when Littmarck was a student of Professor Germund Dahlquist at the Department of Numerical Analysis and Computer Science at KTH Royal Institute of Technology. In 1998, Littmarck and his colleagues introduced the COMSOL Multiphysics® simulation software environment for solving coupled or multiphysics phenomena. In 2004, Svante Littmarck received an honorary doctorate degree at KTH Royal Institute of Technology in Stockholm, Sweden. Today, COMSOL employs more than 460 people in 21 offices worldwide.

PAT MULROY

Affiliation: Retired and Former Head of Southern Nevada Water Authority

Title: Reinventing Water Management in the 21St Century

ABSTRACT: The 21st century will be defined by the convergence of two factors: a rapidly changing climate and a population explosion. To feed the 9 billion people who will inhabit this planet by 2050 the World Economic Forum has estimated 50-60% more food needs to be produced by 2030 and that energy production will require 80 percent more water than it consumes today. Increased agricultural and energy demands increase the demands for water globally.

At the same time, the pressures on U.S. urban hydrological systems are mounting. Urban economies are growing as people increasingly move to cities for jobs and aging water and wastewater systems are suffering under the strain of decades of deferred maintenance and necessary upgrades. Whether it is due to a catastrophic weather event never before experienced or whether it is withstanding the slow-moving devastation of a decadal drought long ignored infrastructure will not be able to withstand the strain. Even as communities struggle to adapt, certain policy, regulatory and governance issues are emerging that must be addressed.

Issues have long engulfed intractable subjects such as water rights, regulations enacted pursuant to the Safe Drinking Water Act, the Clean Water Act and the Endangered Species Act and the governance structure within which urban utility departments find themselves. As many in this country discuss at length adaptation options these subjects are usually ignored because they are politically difficult. Today as we reimagine the water space it would be foolhardy to not address the issues that contributed greatly in creating the challenges we face today. This discussion will address these uncomfortable issues delineating the resulting problems and possible solutions.

BIOGRAPHY: Pat Mulroy serves as a Non-resident Senior Fellow for Climate Adaptation and Environmental Policy for The Brookings Institution and also as a Practitioner in Residence for the Saltman Center for Conflict Resolution at the UNLV William S. Boyd School of Law. She also holds a faculty position at the Desert Research Institute, where she serves as the Maki Distinguished Faculty Associate. Mulroy also serves on the Wynn Resorts Ltd Board of Directors.

Between 1989 and early 2014, Pat Mulroy served as General Manager of both the Las Vegas Valley Water District and the Southern Nevada Water Authority (SNWA). Mulroy was a principal architect of the SNWA, helping to guide Southern Nevada through one of the worst droughts in the history of the Colorado River.

At UNLV's Boyd School of Law and DRI, Mulroy's focus is on helping communities in water-stressed areas throughout both the American Southwest and the world develop strategies to address increased water resource volatility and identify solutions that balance the needs of all stakeholders.

TFEC Keynote Speaker

ASHWANI K. GUPTA

Affiliation: Distinguished University Professor, Department of Mechanical Engineering, University of Maryland

Title: Sustainable Clean Energy Production in a Carbon Constrained World

ABSTRACT: It is now well recognized that carbon dioxide is a greenhouse gas that provides direct contributions to global warming of our plant. Although there are other contributors to global warming but the share of CO2 is significant. Most of the CO2 is produced from the combustion of fossil fuels and our use of fossil fuels has been increasing due to increased activity and population. The carbon during the combustion process is converted to CO2 with the subsequent release of thermal energy. In the USA most of the electricity is produced from fossil fuels, with coal being the highest. The demand for electricity continues to grow in the developed countries with significant more in some of the developing countries. This has resulted in dramatic increase in global ambient concentrations of CO2. Significant efforts are being pursued to curtail the emission of CO2 or capture and store it in order to maintain the ambient concentrations to some acceptable levels. This talk will focus on energy sustainability with view to global climate change and reduce emission of greenhouse gases to the environment. The emphasis will be on sustainability issues, with due considerations to efficiency and fuel use in different energy usage sectors. Carbon emissions continue to increase through the increase use of fossil fuels. Clean energy harvesting from various kinds of feedstocks is a challenge but recent research and development efforts show a novel fuel reforming path that can be used in a wide variety of industries extending from commercial to aerospace application. Fuels of different physical and chemical properties are available that may not be suitable for all applications. Gasification and pyrolysis are important steps to reform the fuel properties so that they can be used in the current energy conversion systems for various energy and power use with due consideration to environmental impact. Sample gasification results from a laboratory scale reactor and its effect on syngas yield and syngas characteristics will be provided using different waste materials.

BIOGRAPHY: 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 University of Derby, UK. He is a Fellow of AIAA, ASME, SAE, AAAS and RAeS. 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, and University of Maryland President Kirwan award and College of engineering research award. He has published over 700 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.

IWHT Plenary Speakers

EVELYN N. WANG

Affiliation: Associate Professor of Mechanical Engineering, Gail E. Kendall Professor, MIT

Title: From Nanoscale Surface Engineering to Macroscale Thermal Energy Systems

ABSTRACT: Nanoengineered surfaces and materials have exciting, untapped potential to improve macroscale thermal energy systems. In particular, nanostructures on these surfaces can be harnessed to achieve superhydrophilicity and superhydrophobicity, as well as to control liquid spreading, droplet wetting, and bubble dynamics. In this talk, I discuss our recent work that harnesses novel surface designs to control and manipulate phase-change processes. In condensation, we elucidate the importance of structure geometry on droplet morphology, as well as growth and departure dynamics. In addition, we demonstrate ≈30% higher heat transfer coefficients compared to that on state-of-the-art dropwise condensing surfaces using functionalized copper oxide nanostructures.

In boiling, we rapidly and reversibly turn nucleate boiling "on and off" and thus alter heat transfer performance up to an order of magnitude through molecular manipulation of the boiling surface. Finally, in flow boiling, we show that microstructures can increase flow stability and enhance heat dissipation capability via capillary wicking. These studies provide key insights into the complex physical processes underlying fluid-structure interactions for heat transfer enhancement and also offer a path to achieving increased efficiency in next generation energy systems.

BIOGRAPHY: Evelyn N. Wang is an Associate Professor, the Gail E. Kendall Professor, in the Mechanical Engineering Department at MIT. She is the Associate Director of the Solid State Solar Thermal Energy Conversion (S3TEC) Center and an Associate Director of the Microsystems Technology Laboratory (MTL) at MIT. She received her BS from MIT in 2000 and MS and PhD from Stanford University in 2001 and 2006, respectively. From 2006-2007, she was a postdoctoral researcher at Bell Laboratories. Her research interests include fundamental studies of micro/nanoscale heat and mass transport and the development of efficient thermal management, thermal storage, and solar thermal energy conversion systems. Her work has been honored with several awards including the 2012 ASME Bergles-Rohsenow Young Investigator Award and the 2016 ASME EPPD Women Engineer Award. She is an ASME Fellow.

IWHT Plenary Speakers

WEN-QUAN TAO

Affiliation: Key Laboratory of Thermo-Fluid Science & Engineering of MOE, School of Energy & Power Engineering, Xi'an Jiaotong University

Title: Some Recent Advances in Computational Heat Transfer & Fluid Flow

ABSTRACT: In recent decades computational heat transfer and fluid flow have experienced tremendous developments in both numerical methods and applications. In this plenary keynote speech a brief summary will be presented for the achievements obtained by researchers in our Key Laboratory. It includes following four parts.

Part 1: Incompressible fluid flow and heat transfer by FVM—Advances from scheme to algorithm

In literature it is usually considered that the accuracy and stability are a pair of contradiction for the discretization scheme of the convective term: schemes with absolute stability are of low order of accuracy while higher order schemes are conditionally stable. We have proposed a general numerical method to construct accurate and absolutely stable schemes. This general construction method will be described and numerical examples are provided. Considering the coupling between pressure and velocity the SIMPLE-like algorithm is probably the most dominated algorithm adopted world widely for numerically solving incompressible flow. However, its semi-implicit character has never been completely overcome since its proposal in 1972. We have proposed a new algorithm call CLEAR and later its improvement IDEAL which can completely discard the semi-implicit feature and can significantly accelerate convergence speed with good robustness. Comparison with existing algorithms in literatures are presented to show its advantages.

Part 2: Interface Capturing method of two-phase flow—From VOF and Level Set to VOSET

VOF and Level Set are probably the two most widely adopted methods for capturing interface of two-phase flow. VOF can guarantee mass conservation, while surface curvature can not be determined accurately. Level Set can accurately predict surface curvature while it can not guarantee mass conservation. The combination of the two is a naturally further development and has been done by several authors. In the existing combined methods the two partial differential equations for the two dependent variables, volume of fluid and the level set function, are both numerically solved. We have proposed a new combined method, VOSET, where only the partial differential equation of volume of fluid is numerically solved while the Level Set function is determined by a geometrical method, leading to an appreciable saving of computational effort. The ratios of density and viscosity of liquid over vapor can be as large as 1000. Examples of 2D and 3D cases are provided.

Part 3: Complicated single and two-phase problem by LBM—from flows in microchannels and porous media to electroosmotic non-Newtonian fluid flow and highly compressible flow

LBM is regarded as a mesoscale numerical method which can connect FVM upward and molecular dynamics simulation downward. In addition it can simulate both single-phase flow and phase change heat transfer of boiling and condensation without artificially setting some embryos for boiling or condensation. Numerical treatments of its boundary conditions in order to simulate micro fluid flow has been invented, and methods for solving highly compressible fluid flow with adjustable ratio of specific heat and Prandtl number have been successfully proposed. A LB scheme has developed for electroosmotic non-Newtonian fluid flow, and complicated coupled mechanisms between non-Newtonian fluid flow and electrical potential distributions have been revealed. In addition, both boiling of pure liquid and vapor condensation with non-condensable gases are simulated. For effective thermal conductivity prediction, a multiple-relaxation-time lattice Boltzmann model with an off-diagonal collision matrix has been adopted to predict the effective thermal conductivities of anisotropic heterogeneous materials with anisotropic components.

Part 4: Multiscale fluid flow and heat transfer simulation—from multiscale system t multiscale process

Multiscale simulation is a new development trend of numerical simulation, where several order variation occurs either in geometrical scale or in time scale or both. Two typical examples are the cooling process in a data center and the transport process in a PEMFC. From the point of numerical solution two kinds of multiscale problems are defined: Multiscale system where flows at different scales are governed by the same equations as it occurs in data center, and multiscale process for which different governing equations should be adopted for different regions as this happens in the PEMFC. For multiscale system a top-to-down method is adopted to solve the temperature of a small welding point in a large printed board with thousands of such welding points. For the multiscale process numerical solutions in different regions should be matched at their interfaces. Two operators are proposed: compression operator and reconstructed operator, which transfers information form less number solutions to large number of solutions. Reconstruction operators for coupling FVM and LBM have been successfully developed and applied in several examples of multiscale problems.

Finally some conclusions are presented.

BIOGRAPHY: Wen-Quan Tao is a Professor of Heat Transfer at Xi'an Jiaotong University, Xi'an, China. He graduated from Xi'an Jiaotong University in 1962 and received his graduate Diploma in 1966. From 1980 to 1982 he worked with Professor E.M.Sparrow as a visiting scholar at the Heat Transfer Laboratory of University of Minnesota. His recent research interests include heat transfer enhancement, advanced numerical methods in fluid flow and heat transfer, multiscale simulations, heat transfer in micro- and nano-configurations and applications of solar energy.

IWHT Keynote Speakers

JOHN C CHAI

Affiliation: Department of Engineering and Technology, School of Computing and Engineering, University of Huddersfield

Title: An Integrated Thermodynamics-Transport Model for Asphaltene Deposition in Pipelines and Wellbores

ABSTRACT: Depositions in pipes are encountered in many industrial applications. These include, but are not limited to, fouling in pipelines and heat exchangers, deposits in the form of hydrate, asphaltene or wax in oil and gas pipelines, wellbores and processing facilities. These processes usually take place in the presence of multiphase flow environment. For example, asphaltene deposition in multiphase (oil-water-gas-sand), hydrate deposition in (gas-water-sand) flows and foulings in heat exchangers.

Comprehensive understanding of the deposition processes is important to control or prevent such processes. Numerical models capable of incorporating physics important to these processes are crucial to understanding and with time possibly accurately predict some of these processes. The complications in the modeling of these processes include, but are not limited to, large length-to-diameter ratio of the flow passages, the presences of moving (fluid-fluid, fluid-gas, fluid-solid and gas-solid) interfaces and the associated equations of state.

In this talk, we present our work on the modeling of asphaltene deposition in very long pipelines. Due to the large length-to-diameter ratio full computational fluid dynamics (CFD) simulations are impractical and most of the time impossible. We present our simplified approach to model this very challenging multiscale problem. Multiscale spanning asphaltene precipitation of nanometers, asphaltene aggregation to micrometers, deposition thickness of millimeters, pipe diameter of centimeters and the pipe length of kilometers. Though the span of the physical dimension is large, the physical processes still occurs in the continuum regime. Coupling of our approach to equation of state is also presented.

We will present validation of our approach using simple test cases with known analytical solutions, with available experimental data and also with available field data showing the upscaling of our approach to pipe length of 15,000 ft with a pipe diameter of 2.75 in.

BIOGRAPHY: John Chai is currently a Professor at the University of Huddersfield, UK. He is an Editorial Board member of Computational Thermal Sciences, Associate Editor of the ASME Journal of Thermal Science and Engineering and Heat Transfer Engineering. He is an elected Fellow of ASME (American Society of Mechanical Engineers). Prior to UK, he held faculty positions in United Arab Emirates (UAE), Singapore and Tennessee, USA.

He received his B.S. (with First-Class Honors) in Mechanical Engineering from the University of Windsor, Canada and his M.S. in Mechanical Engineering from the University of Wisconsin-Milwaukee. In 1994 he graduated from the University of Minnesota with a Ph.D. in Mechanical Engineering where he worked under the supervision of Prof. Suhas V. Patankar.

He has published over 90 journal articles, over 100 conference articles and contributed a chapter to the second edition of the Handbook of Numerical Heat Transfer. According to Google Scholar, his works have been cited over 3200 times and his H-index is 27. He has worked on over US$5M in funded research projects in USA, Singapore and UAE.

His research interests are in the development of numerical techniques for complex multiphysics transport phenomena encountered in multi-phase flows and fluid-structure interactions. Applications include, but are not limited to, digital (droplet-based) microfluidics, wet chemical etching, renewable energy, asphaltene (cholesterol) depositions and numerical methods for oil and gas industry.

HYUNG HEE CHO

Affiliation: Yonsei University

Title: Thermal Design of Cooling Systems in Advanced Gas Turbine Blades

ABSTRACT: The higher performance of gas turbine engine is obtained by increasing the turbine inlet temperature. Hot components of advanced gas turbine engine such as combustor, vanes and blades are exposed to extremely high operating temperature over their allowable melting temperature. Therefore, cooling technologies are necessary to design hot components of advanced gas turbine engine. Various cooling technologies, such as rib turbulated cooling, impinging jet cooling and film cooling, have been developed and applied to gas turbine hot components operated under high temperature environment. However, cooling technologies induce large temperature gradient on hot components; it could induce thermal stress which is one of the leading causes of failure in turbine hot components. Moreover, the turbine parts become vulnerable to the thermal stress under high temperature operating condition due to the weakened strength of material. Therefore, thermal stress of hot components is one of the key factors for development of gas turbine engines to assure their performance and secure operation. This presentation introduces thermal design for heat transfer enhancements

of cooling technologies in turbine hot components. Cooling technologies of hot components include from a single cooling element to combination of multiple cooling elements based on experimental results studied in the laboratory. Local distribution of thermal load on hot components is also introduced to consider the proper cooling technique locally.

BIOGRAPHY: Hyung Hee Cho is a Professor at the Department of Mechanical Engineering, Yonsei University, Seoul, Korea. His research interests include heat transfer and fluid flow to solve thermal problems for various hot components, such as gas turbines and rocket nozzles. Prof. Cho received Ph.D degree in mechanical engineering from the University of Minnesota in 1992. Since 1995, he has been with the Department of Mechanical Engineering, Yonsei University, Seoul, Korea, where he is currently a full professor in the Department of Mechanical Engineering and a Yonsei underwood distinguished professor. Prof. Cho is a fellow of the American Society of Mechanical Engineers, a scientific council member of the International Centre for Heat and Mass Transfer, and a senior member of the National Academy of Engineering of Korea. He is also Vice President for Research Affairs at Yonsei University and President-elect of Korean Society of Mechanical Engineers.

JIANG PEIXUE

Affiliation: Professor of Tsinghua University, Beijing, China

Title: Convection Heat Transfer of Fluids at Super-Critical Pressures in Tubes or Porous Structures

ABSTRACT: Super-critical pressures fluids are more and more used in thermal power equipments, advanced nuclear reactors, solar-thermal power stations, aerospace and enhanced geothermal system (EGS). The knowledge on convection heat transfer of fluids at super-critical pressures is essential for the development of the technologies. This keynote speech will introduce convection heat transfer of fluids at super-critical pressures in straight small/mini/micro tubes, serpentine tube, fractures and porous media.

The influence of multiple factors including the buoyancy, flow acceleration, centrifugal force, roughness and particle diameter on convection heat transfer was studied. It was found that for vertical mini tube the buoyancy is the dominant factor affecting convection heat transfer rather than the flow acceleration even in cases with relatively high inlet Reynolds number when the heat flux was high, and the local wall temperatures vary in a complex and nonlinear form with deterioration and recovery of the heat transfer observed in upward flows but not in downward flows. However, for the vertical micro tube the buoyancy effect on the heat transfer could be neglected, while the flow acceleration was the main factor that leads to the abnormal local wall temperature distribution at high heat fluxes. The effects of the flow acceleration due to heating and pressure drop on the heat transfer are in similar magnitude in micron scale channels. The influence of centrifugal and buoyancy forces on heat transfer in mini serpentine tube were studied. The heat transfer for upward flow generally performed better than downward flows at high heat fluxes due to the effect of buoyancy on centrifugal force. The average heat transfer coefficient increases with rotation rate, and 3 times of static condition at 1500rpm. The convection heat transfer of CO2 mixed with lubricating oil is worse than the convection heat transfer of pure CO2.

Experimental study was carried on to evaluate the internal convection heat transfer of CO2 at supercritical pressures in fractures and sintered porous media. The experimental test section was designed with confining pressure to prevent the fluid from flowing through the gap between the sample and holder wall. The effect of thermophysical properties and buoyancy force on the internal heat transfer coefficient were analyzed. Nusselt number correlations were developed.

BIOGRAPHY: Professor Jiang is now Director of Institute of Engineering Thermophysics in Department of Thermal Engineering of Tsinghua University, Director of Key Laboratory for Thermal Science and Power Engineering of Ministry of Education, Director of Beijing Key Laboratory of CO2 Utilization and Reduction Technology. He is a Council Member of the Chinese Society of Engineering Thermophysics, Vice Chairman of the Chinese Heat and Mass Transfer Society, Member of Department of Energy and Transportation in Science and Technology Committee of the Ministry of Education, and an advisory editorial board member of Experimental Heat Transfer, and Heat Transfer–Asia Research, an editor of Frontiers in Energy, and Petroleum, etc.

He obtained his bachelor's at Tsinghua University in 1986 and his Ph.D. at the Moscow Power Engineering Institute in 1991. In 1991 he was appointed assistant professor and in 1993 associate professor at Tsinghua University. In 1997 he became a full professor at Tsinghua University. From 1998 to 1999, he was a visiting scholar in the School of Engineering, the University of Manchester.

Professor Jiang is the recipient of the National Science Fund for Distinguished Young Scholars from the National Natural Science Foundation of China, the 8th Beijing Youth Science & Technology Award, Chang Jiang Scholar of Ministry of Education, Candidate of the New-Century National Talented Persons Plan, the leader of the Science Fund for Creative Research Groups from the National Natural Science Foundation of China

Prof. Jiang has conducted fundamental research on convection heat transfer in porous media and enhanced heat transfer, convection heat transfer of fluids at Super-Critical Pressures, transpiration cooling and film cooling, thermal transport in micro/nano-scale structures and spray cooling, migration and heat mass transfer of super-critical CO2 in porous media under conditions of geological storage and oil/shale gas recovery, Enhanced Geothermal System (EGS). He has won the National Natural Science Award second prize.

Professor Jiang is currently leading the projects such as Study of fundamental problems of thermal transport (Science Fund for Creative Research Groups of Natural Science Foundation of China), Study on fluid flow and heat and mass transfer mechanism of fluids at supercritical pressures under multi-factors effect conditions (the Key Project Fund from the National Natural Science Foundation of China), Study of key basic scientific issues for the low energy consumption capture of CO2 and its sequestration and utilization (the National Key Research and Development Plan).

IWHT Keynote Speakers

ZHIXIONG GUO

Affiliation: Professor of Mechanical and Aerospace Engineering at Rutgers University-New Brunswick, NJ, USA

Title: Radiation Transport Applied to Energy, Biomedicine, Micro/Nano Fabrication and Sensing

ABSTRACT: Light has a dual nature – wave and particle properties. Maxwell's wave theory builds the foundation of optics and can be applied to describe evanescent phenomenon and near-field radiation enhancement in nanotechnology. Radiation transport in particle form is governed by radiation transfer equation and is an important mode of heat transfer in thermal and energy systems. In this lecture, some cutting-edge research and developments on both the aspects of radiation transport from large-scale to nanoscale will be introduced. Focus will be placed on examination and explanation of computational errors, conservation of scattered energy and angle, treatment of light speed, as well as practical applications to solar renewable energy harvesting, USP laser tissue processing, nanofabrication, nanoscale sensing and on-chip dynamic temperature monitoring.

BIOGRAPHY: Dr. Guo is a Professor of Mechanical and Aerospace Engineering at Rutgers University-New Brunswick, NJ. He graduated with highest honor in Engineering Physics from Tsinghua University. Following the completion of his Ph.D. in Mechanical Engineering at Polytechnic University (now NYU-Tandon School of Engineering), Brooklyn, NY, he joined the faculty at Rutgers in 2001. He is a recognized expert in heat transfer, with notable expertise in radiation transport. He explores the extremes of very small length, time, and strength scales in the fundamental study of thermal energy transport and laser applications. He is also interested in research addressing large-scale industrial applications. He received research funds from the NSF, NASA/NJSGC, USDA, ASEE/DOD, MTF, NIH, NJ Nanotechnology Consortium, Charles and Johanna Busch Memorial Funds, NNSFC, JSPS, and other sources. He has supervised a number of graduate students and postdoctoral/visiting scholars. Two of his former Ph.D. graduates received the Outstanding Graduate Student Award from Rutgers School of Engineering. Dr. Guo has also received a teaching award from Rutgers Vice President Office for Undergraduate Education. He is the author/co-author of over 200 archival journal and conference papers. Dr. Guo is a Managing Editor for journal Heat Transfer Research, an Associate Editor for Journal of Heat Transfer, and an editorial board member for journal Applied Thermal Engineering. He is a Fellow of ASME, and served as Technical Committee Chair for ASME HTD, Technical Program Chair and Conference General Co-Chair in several international conferences.

XIAOBING LUO

Affiliation: School of Energy and Power Engineering, Huazhong University of Science and Technology, Wuhan, China

Title: Heat and Fluid Flow in LED Packaging and Applications

ABSTRACT: Light-emitting diodes (LEDs), due to their extraordinary characteristics, are widely used in our daily lives. Usually, LED chips must be packaged into modules and further assembled into products for application. In LED products, both light and heat are generated from LED chips and then transmitted or conducted through many packaging materials and interfaces. Meanwhile, part of the transmitted light converts into heat as well along the light propagation; in return, the accumulation of heat will lead to the degradation of light output. The accumulated heat negatively influences the reliability and longevity of LEDs, and thus thermal management is critical in LED packaging and applications. On the other hand, in LED packaging processes, many fluid flow problems exist, such as phosphor coating, silicone injection, and solder reflow. Among them, phosphor coating is the most important process, it concerns light convertion, propagation and intensity distribution. In this presentation, we will report the key heat and mass transfer issues in LED packaging. The fundentalmental studies on these issues and their applications will be discussed. These results and methods can be extended to other electronic packaging applications.

BIOGRAPHY: Xiaobing Luo received Ph. D. degree in 2002 from Tsinghua University, Beijing, China. From 2002 to 2005, he was with Samsung Electronics, Seoul, Korea, as a Senior Engineer. Now he is the Professor in Huazhong University of Science and Technology in Wuhan city of China.

He has published 183 papers as the first or corresponding author. Among them 89 papers are peer-reviewed international journal papers. He obtained 26 granted invention patents in USA and China as the first inventor. He has published three English book chapters in Wiley and Springer. He also coauthored the first-ever English LED packaging book through John Wiley Press.

Papers by him and his students have won IEEE Best Paper Award for 4 times, including IEEE CPMT Best paper Award, IEEE Cisco Best Paper Award, IEEE Philips/NXP Best Paper Award. Prof. Luo was elected to serve as Associate Editors for IEEE Transactions on Components, Packaging, Manufacturing Technologies (2013-), ASME Journal of Electronic Packaging (2015-).

He has won 2016 IEEE/CPMT Exceptional Technical Achievement Award, 2016 Second-Grade National Award of Technology Invention in China.

TEC Talk Speakers

SVANTE LITTMARCK

Affiliation: Co-founder and CEO of the COMSOL Group and the President and CEO of COMSOL, Inc.

Title: Building Multiphysics Apps for Users in the Real World

ABSTRACT: The COMSOL Multiphysics Application Builder brings R&D experts' simulation models to a much broader audience. We demonstrate how and why this is important for the future.

BIOGRAPHY: Dr. h.c. Svante Littmarck is cofounder and CEO of the COMSOL Group and the president and CEO of COMSOL, Inc. The company was founded in 1986 in Stockholm, Sweden, when Littmarck was a student of Professor Germund Dahlquist at the Department of Numerical Analysis and Computer Science at KTH Royal Institute of Technology. In 1998, Littmarck and his colleagues introduced the COMSOL Multiphysics® simulation software environment for solving coupled or multiphysics phenomena. In 2004, Svante Littmarck received an honorary doctorate degree at KTH Royal Institute of Technology in Stockholm, Sweden. Today, COMSOL employs more than 460 people in 21 offices worldwide.

WILLIAM WOREK

Affiliation: Executive Director EFCREO, Texas A&M University

Title: Challenges in Comfort Cooling: Separating Sensible and Latent Loads - Material Constraints and New Opportunities

ABSTRACT: As buildings have become more energy efficient and tighter and as Net Zero Energy Buildings are designed and implemented, the latent cooling load has increased and improved performing heating systems are desired. This presentation will present the status of current technologies and the efforts to improve performance and the capacity per unit volume (i.e., minimization of footprint) of heating and cooling systems. Conventional heating systems have limited efficiencies, many times less than one. Likewise, thermally-activated cooling/dehumidification systems also have relatively poor efficiencies. New developments are showing that performance can be significantly improved. Some of these new technologies will be highlighted for discussion.

BIOGRAPHY: Professor Worek is in the Department of Mechanical Engineering and is the Executive Director of the Eagle Ford Center for Research Education and Outreach (EFCREO) at Texas A&M – Kingsville. He has been involved, over the last 35 years, in the development of desiccant materials for cooling systems applications, modeling of sorption processes, experimental testing of desiccant material performance and the use of desiccant processes in the design of cooling and dehumidification systems. He holds three patents on sorption system design improvements and has published extensively in archival journals and has given numerous lectures on the subject.

PAT MULROY

Affiliation: Retired and Former Head of Southern Nevada Water Authority

Title: Reinventing Water Management in the 21st Century

ABSTRACT: The 21st century will be defined by the convergence of two factors: a rapidly changing climate and a population explosion. To feed the 9 billion people who will inhabit this planet by 2050 the World Economic Forum has estimated 50-60% more food needs to be produced by 2030 and that energy production will require 80 percent more water than it consumes today. Increased agricultural and energy demands increase the demands for water globally.

At the same time, the pressures on U.S. urban hydrological systems are mounting. Urban economies are growing as people increasingly move to cities for jobs and aging water and wastewater systems are suffering under the strain of decades of deferred maintenance and necessary upgrades. Whether it is due to a catastrophic weather event never before experienced or whether it is withstanding the slow-moving devastation of a decadal drought long ignored infrastructure will not be able to withstand the strain. Even as communities struggle to adapt, certain policy, regulatory and governance issues are emerging that must be addressed.

Issues have long engulfed intractable subjects such as water rights, regulations enacted pursuant to the Safe Drinking Water Act, the Clean Water Act and the Endangered Species Act and the governance structure within which urban utility departments find themselves. As many in this country discuss at length adaptation options these subjects are usually ignored because they are politically difficult. Today as we reimagine the water space it would be foolhardy to not address the issues that contributed greatly in creating the challenges we face today. This discussion will address these uncomfortable issues delineating the resulting problems and possible solutions.

BIOGRAPHY: Pat Mulroy serves as a Non-resident Senior Fellow for Climate Adaptation and Environmental Policy for The Brookings Institution and also as a Practitioner in Residence for the Saltman Center for Conflict Resolution at the UNLV William S. Boyd School of Law. She also holds a faculty position at the Desert Research Institute, where she serves as the Maki Distinguished Faculty Associate. Mulroy also serves on the Wynn Resorts Ltd Board of Directors.

Between 1989 and early 2014, Pat Mulroy served as General Manager of both the Las Vegas Valley Water District and the Southern Nevada Water Authority (SNWA). Mulroy was a principal architect of the SNWA, helping to guide Southern Nevada through one of the worst droughts in the history of the Colorado River.

At UNLV's Boyd School of Law and DRI, Mulroy's focus is on helping communities in water-stressed areas throughout both the American Southwest and the world develop strategies to address increased water resource volatility and identify solutions that balance the needs of all stakeholders.

TEC Talk Speakers

JOSEPH LOMBARDO

Affiliation: Executive Director, National Supercomputing Institute & Dedicated Research Network University of Nevada

Title: Leveraging High Performance Computing for Alzheimer's Research and Beyond

ABSTRACT: Alzheimer's Disease continues to cause tremendous familial, social, and economic burdens to modern society. Despite substantial progress, existing treatment approaches are limited – so new therapeutic approaches are desperately needed. The National Supercomputing Institute currently collaborates with clinical researchers to compare the genomes of Alzheimer's patient with normal patients. Specifically, our researchers need to enhance the statistical power of analyses due to the addition of hundreds of new patients to the study. The challenge is dealing with the massive genomics data sets and the need for a major leap in computational performance.

BIOGRAPHY: Joseph Lombardo is currently serving as Executive Director of the National Supercomputing Institute located at UNLV. He has served as a PI and administrative lead on numerous federal awards and contracts over a 20 year tenure. Currently, he serves as the data core PI on a 5 year NIH award entitled "Center for Neurodegeneration and Translational Neuroscience" in collaboration with the Cleveland Clinic. Joseph has been a consultant to private industry, academia and government laboratories with an expertise in computational modeling, parallel computing, data management and data visualization. Joseph has published numerous technical papers and reports, and is co-author of three textbooks. He has served as an expert witness for the United States Senate Committee on Commerce, Science, and Transportation in the area of High Performance Computing as it relates to and supports academic research. A fundamental objective of his research is to demonstrate a wide variety of nationally important applications that support primary government interests, including health care, education, scientific research, and the improvement of U.S. business competitiveness.

LESLIE PHINNEY

Affiliation: Sandia National Laboratory

Title: Sustaining an Engineering Career

Leslie Phinney is a Principal Member of Technical Staff at Sandia National Laboratories in Albuquerque, New Mexico. She has an M.S. and Ph.D. in Mechanical Engineering from UC Berkeley and a B.S. in Aerospace Engineering from UT Austin. She is a Fellow of ASME. Dr. Phinney will provide her perspective on sustaining an engineering career based on personal experiences as well as research on the retention of engineers in the workforce and reasons why they leave the profession. She will provide suggestions for improving the environment for working engineers.

Sandia National Laboratories is a multi-mission laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

DANIEL SEAGLEMAN

Affiliation: Department of Mechanical Engineering, Michigan State University

Title: Predicting The Future is not Really Getting Easier

ABSTRACT: One would expect that engineering and physics – where we think that we know what the correct rules (equations) are – would be fields ripe for enhancement of predictive capability through the huge increases in computational power seen in the last two decades. Indeed, this promise has been achieved in some areas, though there is reason for disappointment in others.

In this talk I focus on one category of problems where a case can be made that we may never significantly exceed current capabilities; that field being the prediction of probabilities of extremely rare events associated with complex engineering systems.

In talking about the probability of rare events, we find ourselves thinking in terms of generalized loads on the system and corresponding generalized strengths to withstand those loads and the statistics behind those loads and strengths. In this perspective, we find three perhaps insurmountable elements of the problem:

- Only modest amounts of data are ever available for development of probabilistic models for problem parameters. Where we desire to predict the probabilities of rare events, we are reliant on knowledge about tails of the distributions of the relevant parameters. That information just does not exist. This issue is illustrated through considerations of distinct but plausible parameter probability distributions.
- Two additional, intertwined issues have to do with model selection and model verification. Because ultra-rare events necessary involve extremely unusual, but unpredicted circumstances it is impossible to verify the relevant physical and statistical models.
- In the absence of verification, we find ourselves having to put great faith in the presumed model forms. Sometimes this concern is set aside because the given models are based on "first principles. A few skeptical observations can be made about the concept of first principles in this context.

Finally, suggestions are made about how one might discuss the probabilities of high-stakes rare events without actually knowing what those probabilities are.

BIOGRAPHY: Dan Segalman earned his PhD in Engineering Mechanics form the University of Wisconsin in 1978. He worked in the automobile and petroleum industries before coming to Sandia National Laboratories in 1986, where he has worked in a variety of topics including nonlinear vibrations, dynamics, and uncertainty quantification. While at Sandia, Dan served two years on loan to the Air Force Office of Scientific Research as a Program manager and one year on loan to the National Nuclear Security Administration as a technical advisor. He served four years as a member of the Air Force's Scientific Advisory Board. Dan achieved the rank of Distinguished Member of Technical Staff before retiring from Sandia in 2014. He is now a Professor of Mechanical Engineering at Michigan State University. Dan is a past Vice President and a Fellow of the American Society of Mechanical Engineers.

JOSÉ L. LAGE

Affiliation: Professor, Department of Mechanical Engineering Southern Methodist University. Director, Thermal Transport Processes Program National Science Foundation

Title: Recent Past and Future of the NSF Thermal Transport Processes Program

ABSTRACT: US Congress' mandate to fund technology development is evident in the yearly budget evolution of some NSF divisions of the engineering directorate. This evolution transforms itself in an extra burden and a paradigm shift for academia, particularly engineering. It becomes imperative now for the research community to either counter or adapt to this evolution, particularly in view of the original reasons for creating the NSF and the main objectives of the academic enterprise. Propositions for helping the community guide this evolution in the realm of the Thermal Transport Processes (TTP) program of the NSF, and their relation to the future of the TTP community itself will be presented, including details of the new TTP program description and relevance, the emphasis on engineering (e.g., nano), the review panel composition, and the support for meetings and workshops. Finally, information on budget, recent funding allocations and opportunities by the program, together with details on the new NASA/CASIS joint program, the possibility of "open" submission window, and the identification of three ingredients for strengthening proposals, are also discussed.

BIOGRAPHY: A Professor of Mechanical Engineering (ME) at Southern Methodist University (SMU), where he began his career in 1991, Prof. Lage is currently on leave at the National Science Foundation where he is the Director of the Thermal Transport Processes (TTP) program. Among his current responsibilities is the identification of emerging frontiers of multidisciplinary activities and innovative research, the development of strategic plans for targeted investments in research and education, and the coordination and collaboration with other Federal agencies and organizations to ensure investments are made in a diverse, rich mix of bold, cutting-edge projects.

A Texas Professional Engineer, Lage has accumulated over 200 peer reviewed publications, including journal articles and book chapters. He has conducted interdisciplinary collaborative research, both at the national and international levels, in partnership with several colleagues in academia and industries, and with funding from several agencies, including the NSF, DOE, and NIST. He has pioneered the use of fractional calculus in fluid mechanics and micro-scale heat transfer, with direct application to thin film characterization. He has designed, built and tested a new (patented) cold plate for phased-array radar systems, now used in the USAF F-35 joint strike fighter. His original work on the implications of blood flow in alveolar respiration has led to the discovery of a new, more efficient form of forced convection by particulates termed "sweeping convection". He has also coined the term "porous-continuum" to highlight the differences between experimental (measured) and analytical (predicted) quantities used in analytical models. His current h-index is 33 on Google Scholar, with over 3,500 citations.

He has created, got funded and directed for over six years a FIPSE-CAPES bi-lateral, multi-university consortium in Manufacturing and Global Security. He has served as the Associate Chair of the SMU/ME Dep for three years, and more recently has been elected and served as the President of the SMU Faculty Senate when he led the highest faculty representation body in the university. Lage has been elected an Honorary Member of Pi Tau Sigma and a Fellow of the ASME, and served twice as an Associate Editor of the ASME JOURNAL OF HEAT TRANSFER, among other journals. He is the recipient of several awards, including the Sigma Xi for Outstanding Research, the ASEE for Outstanding Teaching, the ASME-NTS Engineer of the Year Award for "Outstanding Achievements in Mechanical Engineering", the SAE Ralph R. Teetor Educational Award for "Significant Contributions to Teaching, Research and Student Development", and the SMU Golden Mustang Award for "Sustained High Achievement as both a Teacher and Scholar". He has been a Visiting Professor of the Swiss Federal Institute of Engineering (ETH-Zurich), and of the Federal University of Technology Parana (UTF-PR-Brazil). In 2014 he was elected member of the Scientific Council of the International Centre for Heat and Mass Transfer.

3-Day Certified Course

March 31-April 2, 2017

RIO CASINO AND RESORT, LAS VEGAS, NV
www.astfe.org/courses/febemm/

Introduction to Finite Element, Boundary Element, and Meshless Methods

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

DESCRIPTION

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.

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 OUTLINE

Overview

Day 1: The Finite Element Method

Day 2: The Boundary Element Method

Day 3: The Meshless Method

COURSE INSTRUCTORS

Dr. Darrell W. Pepper
The University of Nevada Las Vegas,
Las Vegas, NV

Dr. Alain Kassab
The University of Central Florida,
Orlando, FL

Dr. Eduardo Divo
Embry-Riddle Aeronautical University,
Daytona Beach, FL

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/febemm/

6-Hour Course

April 2nd, 2017, 9am-4pm

RIO HOTEL, CONVENTION CENTER, LAS VEGAS, NV
www.astfe.org/courses/muq/

Measurement Uncertainty Workshop

DESCRIPTION

This 6-hour course will provide an introduction and references for further study on measurement uncertainty. Several hands-on examples will be performed during the course with participants using their own computer. The course will be based upon traditional uncertainty analysis with correlated uncertainties, but will go beyond current textbooks on several topics including independent sampling and limitations of current methodology.

OBJECTIVES

– Introduction to Measurement Error and Uncertainty

– Uncertainty of a Single Variable

– Propagation of Uncertainty Using Taylor Series and Monte Carlo Methods

– A Priori Uncertainty Quantification for Experiment Planning

– A Posteriori Uncertainty Quantification

WHO SHOULD ATTEND

The course is appropriate for anyone who has an undergraduate understanding of measurements. The information presented will be relevant to anyone interested in a better understanding of the distinctions between uncertainty and error, or random and bias error sources. We will discuss how to interpret uncertainty information and move beyond uncertainty procedures. A broader class of error sources will be discussed than in a typical treatment (e.g. uncertainty stemming from material property data), as well as correlation between error sources.

INSTRUCTORS

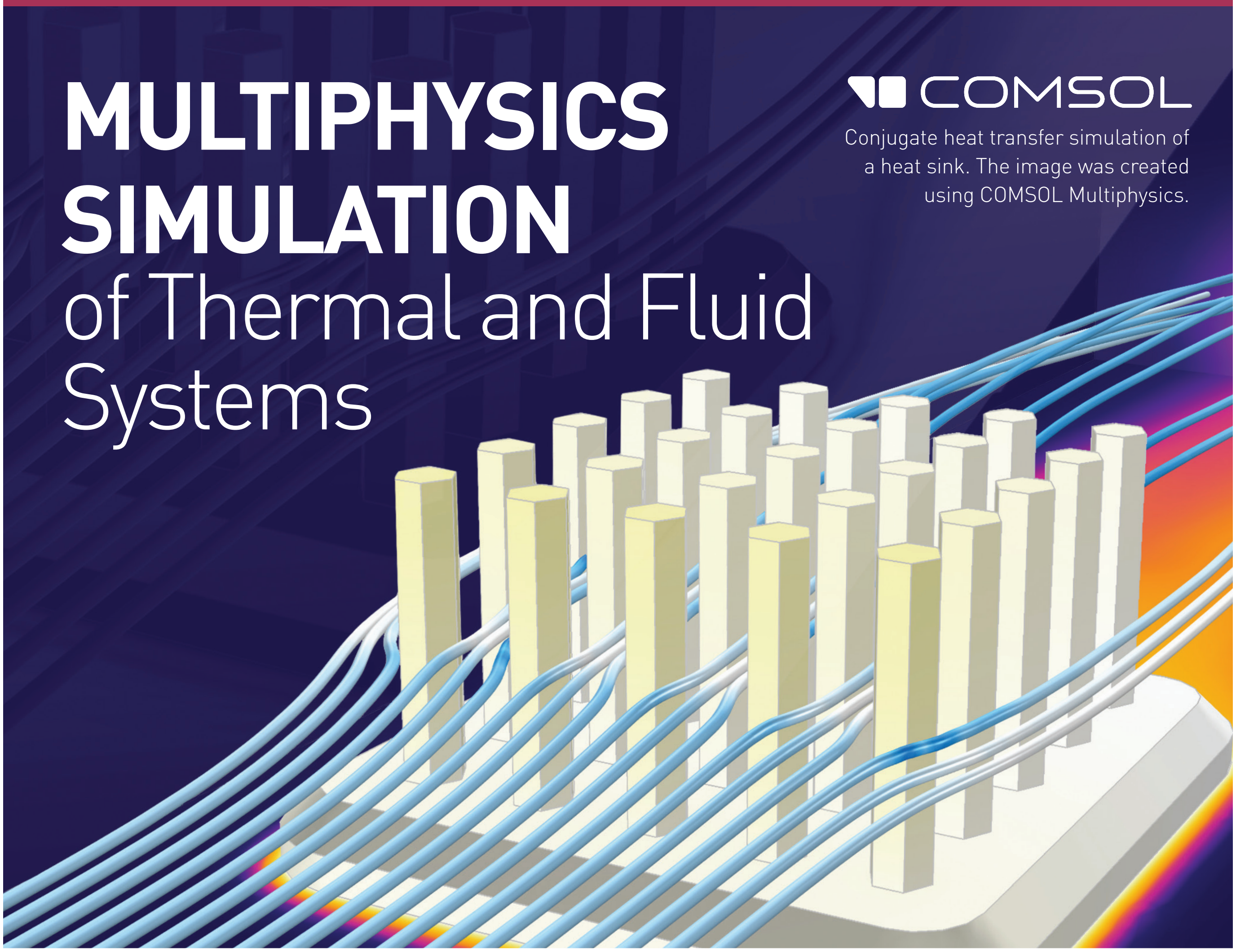
Professor Barton Smith
Utah State University

Dr. Douglas Neal
LaVision Inc.

COMSOL 1.5 Hours Free Course

April 3rd, 2017

RIO CASINO AND RESORT, LAS VEGAS, NV
www.astfe.org/courses/comsol/



Engineers and scientists are turning to the accuracy of multiphysics modeling software to optimize their designs and for deeper understanding of processes involving fluid flow and heat transfer. The ability to simulate conjugate heat transfer together with other physics is being used for applications such as:

- **Heat exchangers**
- **Thermoelectric cooling**
- **Bioheating**
- **Laser heating**
- **Thermal lensing**
- **Electronic cooling**
- **Induction heating**
- **RF heating**

This minicourse introduces you to multiphysics simulation using COMSOL Multiphysics® software. The design of a heat sink is used to demonstrate step-by-step how to model conjugate heat transfer.

David Kan

David Kan is COMSOL's vice president of sales for the southwestern region of the US. He set up the Los Angeles branch office of COMSOL in 2001 and received a PhD in applied mathematics from UCLA in 1999.

ASTFE
American Society of Thermal and Fluids Engineers

NSU
NOVA SOUTHEASTERN UNIVERSITY

3rd Thermal and Fluids Engineering Conference (TFEC)

CALL FOR PAPERS

The 2018 American Society of Thermal and Fluids Engineers (ASTFE) Conference will be held March 4–7, 2018 at the Nova Southeastern University in Ft. Lauderdale, FL. ASTFE is the premier international society by and for professionals within the thermal and fluids science and engineering community. The 2018 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:**

- Aerospace Applications
- Combustion, Fire and Fuels
- Education
- Energy and Sustainability
- Experimental Methods/Tools in Thermal-Fluid Systems
- Materials and Manufacturing
- Multiphase Phenomena
- Plasma Physics and Engineering
- Biosystems
- Computational Methods/Tools in Thermal-Fluid Systems
- Energy-Water-Food Nexus
- Industrial and Commercial Processes
- Micro- and Nano-Scale Processes
- Natural and Built Environments
- Transportation

Authors will have options to present their research work either in an extended abstract (maximum of 4 pages) or full-length paper. The conference proceedings will contain both peer-reviewed extended abstracts and papers, and will be distributed in a digital form. Authors will also have the option to submit their conference papers to a technical journal of their choice after the conference.

SUBMIT YOUR ABSTRACT BY JUNE 16, 2017 TO:
http://submission.astfe.org

Please check www.astfe.org/tfec2018/ regularly for conference updates or contact us at info@astfe.org for further inquiries.

June 16, 2017
Abstracts Due

July 14, 2017
Notification of Abstract Accept/Decline

September 15, 2017
Draft Paper Extended Abstract Due

October 27, 2017
Draft Paper/Extended Abstract Reviews Completed

November 10, 2017
Authors Notified of Paper/Abstract Status

December 15, 2017
Revised Manuscript Due

January 12, 2018
Final Paper/Extended Abstract Due

ORGANIZATION COMMITTEE

Conference Chair: Dr. Yong Tao
Nova Southeastern University
(ytao@nova.edu)

Conference Co-Chair: Dr. James Klausner
Michigan State University
(jfk@msu.edu)

ASTFE
American Society of Thermal and Fluids Engineers

167 Madison Ave, Suite 501
New York, NY 10016, USA
info@astfe.org

Telephone: +1 212 288 9200
Fax: +1 212 427 0300
www.astfe.org

Registration Information

TIME AND LOCATION

Registration will be at the following hours:

Sunday April 2nd, 2017	Monday April 3rd, 2017	Tuesday April 4th, 2017
10:00 AM – 5:00 PM	8:00 AM – 5:00 PM	8:00 AM – 5:00 PM
Tropical/Palma rooms	Tropical/Palma rooms	Tropical/Palma rooms

Upcoming Conferences of Interest to the Thermal and Fluids Engineering Communities

2017

The 7th International Symposium on Advances in Computational Heat Transfer (CHT-17)

Napoli, Italy

May 28, 2017 – June 2, 2017

13th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics

Portorž, Slovenia

July 17–19, 2017

24th National and 2nd International ISHMT-ASTFE Heat and Mass Transfer Conference (IHMTC-2017)

BITS-Pilani, Hyderabad Campus, Telangana, India

December 27–30, 2017

2018

The 16th International Heat Transfer Conference

Chinese National Convention Center, Beijing, China

August 10–15, 2018

ASTFE
American Society of Thermal and Fluids Engineers

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

begell
begell house inc publishers

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