HEAT TRANSFER DIVISION

The Heat Transfer Division's objective is to enhance the theory and application of heat transfer in equipment and thermodynamic processes in all fields of mechanical engineering and related technologies.

Summer 2013

Chairman's Message

Roy E. Hogan, Jr.

It is truly an exciting time for the Heat Transfer Division (HTD) and for ASME. Founded in 1938, the Heat Transfer Division is presently celebrating our 75th anniversary. The May 2013 issue of Mechanical Engineering Magazine includes a special 75th anniversary insert presenting a history of the Heat Transfer Division, an update on the activities of our three archival journals, an overview of federal research programs in thermal transport, and the plans for our 75th anniversary celebration at the upcoming Summer Heat Transfer Conference, July 14-19, in Minneapolis, MN. This meeting, organized in conjunction with the Advanced Energy Systems Division and the Solar Energy Division, will bring together three conferences: the ASME 2013 Summer Heat Transfer Conference, the ASME 7th International Conference on Energy Sustainability, and the ASME 11th Fuel Cell Science, Engineering, and Technology Conference. We appreciate the efforts of Drs. S.A. Sherif, Srinath V. Ekkad, and Frank A. Kulacki in organizing this conference for the HTD. Additional details on the Summer Heat Transfer Conference are discussed later in this newsletter (Page 3). Please plan on joining us at this conference. As part of our 75th anniversary, Dr. Webb Marner has written an interesting article on the history of the Heat Transfer Division that will be published in special issues of the Journal of Heat Transfer and the Journal of Thermal Science and Engineering Applications and was published in May 2013 issue of the ASME Mechanical Engineering Magazine.

As we enter the 21st century, there are many challenges facing the engineering profession. An ASME survey of engineers, conducted in 2011, identified some of the most important challenges. This study, "The State of Mechanical Engineering: Today and Beyond," identified alternative energy, bioengineering/biomedical, computers, electronics, energy, nanotechnology, and water as future cutting-edge

2013 Summer Newsletter
Patrick E. Hopkins
Media Editor
University of Virginia
To contribute to upcoming newsletters, please email: phopkins@virginia.edu

fields. Clearly, there are many opportunities for the heat transfer community in these areas. An overview of present research programs supported by the Department of Energy, National Science Foundation, and Department of Defense are also presented in the May 2013 issue of the Mechanical Engineering Magazine. The Heat Transfer Division strives to meet the challenges of disseminating timely technical information through a number of activities; these activities include organizing technical conferences, conducting workshops, and supporting three ASME technical journals.

In addition to our 2013 Summer Heat Transfer Conference and the IMECE, the HTD is active in international collaborations which includes participating in the 2013 ASME 11th International Conference on Nanochannels, Microchannels, and Minichannels in Sapporo, Japan; the 2013 ASME 4th International Micro/Nanoscale Heat and Mass Transfer Conference in Hong Kong, China; the 2013 11th Indian Society of Heat and Mass Transfer/ASME Heat and Mass Transfer Conference in Kharagpur, India; and the ASME/ATI/UTI Thermal Energy Systems: Production, Conservation, and Environment Conference in Palermo, Italy. We appreciate the leadership of Drs. Yoav Peles, Yogesh Jaluria, Sumanta Acharya, and Richard Goldstein, respectively, in organizing our participation in these conferences.

The Heat Transfer Division proudly sponsors three archival journals. Our oldest journal, the Journal of Heat Transfer (JHT), focuses on fundamental research in heat transfer. The Journal of Thermal Science and Engineering Applications (JTSEA) has a broader range of content that includes more applied thermal sciences and engineering topics. The Journal of Nanotechnology in Engineering and Medicine (JNEM) is focused on nanoscience, nanostructures, and nanomaterials applied to technologies in engineering, medical, and life science systems. We are fortunate to have Drs. Terry Simon, Michael Jensen, and Boris Khusid serving as editors for the JHT, JTSEA, and JNEM, respectively.

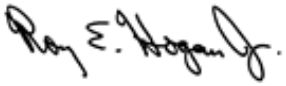
An important function of the HTD is recognizing the accomplishments of our membership. Our annual Heat Transfer Division Honors and Awards Luncheon was held at the 2012 IMECE in Houston. At this luncheon, the Heat Transfer Memorial Awards were presented to Dr. Chang H. Oh (Art), Dr. Javad Mostaghimi (Science), and Dr. Satish G. Kandlikar (General). The Bergles-Rohsenow Young Investigator Award was presented to Dr. Evelyn N. Wang. In addition to these Society awards, seventeen HTD members were recognized for their promotion to ASME Fellows. The 2012 Heat Transfer Division Best Paper Award was awarded for "Modeling Subcooled Flow Film Boiling in a Vertical Tube" by Meamer El Nakla, D.C. Groeneveld, and Shui-Chih Cheng; published in the Journal of Thermal Sciences and Engineering Applications, Vol. 2, No. 2, June 2010. Congratulations to these award recipients. The Journal of Heat Transfer recognized the 2012 Outstanding Reviewers; Sid Becker, Cesare Biserni, Tongbeum Kim, Lin-Hua Liu, Gregory J. Michna, and Qiang Zhang. The outstanding reviewers for the Journal of Thermal Science and Engineering Applications were Stephen A. Solovitz, Gongnan Xie, and Guang Xu. We thank all the reviewers for their exceptional service to the journals.

The vitality of the HTD is due to the committed participation of our members in the HTD activities; including organizing conferences and sessions, serving on division committees, and contributing to our journals as editors, reviewers, and authors. The technical committees, administrative committees, and technical journals are the heart and soul of the HTD. The activities of many of our technical committees are described in this newsletter (Page 10). If you are interested in a particular committee, please contact the specific committee chair. An effective partnership with the ASME staff is essential to our success. We appreciate the support of Ms. Erin Dolan, who is always helpful in our interactions with the Society. It takes the collective contributions from all of us for the HTD to be successful.

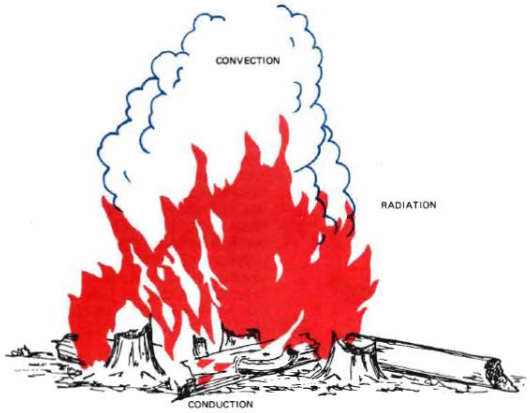
In this 75th year of our Division, we owe a great deal of thanks to the heat transfer pioneers and our colleagues who have created and sustained the Heat Transfer Division and our community. Our challenge and obligation is to continue to build on that foundation. With the continued support of our dedicated volunteers, I am optimistic that the Heat Transfer Division has a promising future for many years to come. I thank all of the volunteers for your service to the Heat Transfer Division and to the ASME.

The Heat Transfer Division welcomes the participation of new members. If you are interested in becoming involved in the Heat Transfer Division, please contact an Executive Committee member or a committee Chair. We always appreciate suggestions on how we can better serve our members and the greater heat transfer community.

Sincerely,



Roy E. Hogan, Jr.
2013 Heat Transfer Division Chair
Sandia National Laboratories



75th Anniversary of the ASME HTD and the 2013 SHTC

Frank A. Kulacki
75th Anniversary Steering Committee Chair
University of Minnesota

S. A. Sherif
2013 SHTC General Conference Chair
University of Florida

S.V. Ekkad
2013 SHTC Technical Program Chair
Virginia Polytechnic Institute & State University

The Heat Transfer Division (HTD) was founded in 1938. A celebration of the 50th Anniversary of the HTD was held in 1988 in Houston. The ASME Summer Heat Transfer Conference (SHTC) in 2013 will mark the 75th year of the HTD. Celebrations will take place at the Conference, which will be held in Minneapolis. This conference will bring together international researchers and engineers focusing on heat and mass transfer in a variety of applications. The objectives of the meeting are to provide a forum for presentation of state-of-the-art research and opportunities for technical interactions among participants. Several top heat transfer researchers have been invited to make keynote presentations. In addition, several panel sessions on cutting edge heat transfer topics are being conducted during the course of the conference. Symposia in honor of Profs. Goldstein, Bergles, Kaviany, and Spalding are being organized with invited speakers and presentations (more details beginning on Page 17). The conference will also host the Max Jakob lecture (Page 16) and the Donald Q. Kern Lecture. The conference and celebration will kick off with an NSF sponsored workshop on emergent trends in heat transfer engineering, research and education, described in detail below. This will be the largest gathering of heat transfer researchers in the past 2 decades. Come join and celebrate 75 years of heat transfer through ASME HTD. More information on the 2013 SHTC can be found at: http://www.asmeconferences.org/ht2013/

NSF Workshop at the 2013 SHTC
Emergent Trends in Heat Transfer Engineering, Research and Education
Sunday, July 14th, 8:30 AM – 2:30 PM
Minneapolis Hilton Hotel

All conference participants are invited to attend a workshop dedicated to shaping the future of the Heat Transfer Division and the heat transfer field. Emergent trends in engineering, research, and education in the field are the focal points of the conference. To create the context for recommendations, brief reports on the outcomes of the recent survey of the heat transfer community and the ASME Visio 2030 project will be presented. Round table discussions will follow around several key questions about our future and the future of the field including: What are the challenges in design and manufacturing of heat transfer equipment? What are the compelling scientific questions and barriers to answering them? What levels of fundamental knowledge are needed to achieve cost competitiveness in the commercial sphere? How should engineers who practice in the thermal science and engineering fields be educated for a lifetime of practice? How can the field respond to the National Academy of Engineering (NAE) Grand Challenges? Broad input on these and other questions will be sought from all who attend. Interactive roundtable discussions will explore issues, trends and alternative futures for heat transfer engineering, research and education. The workshop will be held on Sunday, July 14th at the conference hotel, 8:30 AM – 2:30 PM. There is no cost to attend this workshop, and registration is requested. A limited number of travel assistance grants are available for advanced graduate students to attend the workshop. Applications via letter and a letter of recommendation from the applicant's supervisor/adviser should be sent electronically to Dr. Frank Kulacki, Workshop Chair, kulacki@me.umn.edu.

Tour of Research Laboratories
Dept. of Mechanical Eng., University of Minnesota
Thursday, July 18th, 3:00 – 5:00 PM

Participants in the 2013 Summer Heat Transfer conference will have an opportunity to tour the research laboratories of the Department of Mechanical Engineering on Thursday, July 18th from 3:00 to 5:00 PM. Laboratories of the extensive thermal science and engineering program at Minnesota will be opened for guided tours. The Department's research covers all fields of heat transfer, fluid mechanics, gas turbine heat transfer, solar energy, plasma science and technology, bio-heat transfer, and particle technology. At the conclusion of the tour, the Department of Mechanical Engineering will host an informal reception for all who attend. Busses will leave the conference hotel and return after the tour and reception. Registration is requested. There is a small charge for transportation.

Past and Future Conferences

ASME 3rd Micro/Nanoscale Heat & Mass Transfer International Conference (MNHMT 2012)

Atlanta, GA

March 3 – 6, 2012

G. P. "Bud" Peterson and Zhuomin Zhang

The ASME 3rd Micro/Nanoscale Heat & Mass Transfer International Conference was held at the Georgia Institute of Technology in Atlanta, Georgia on March 3-6, with over 320 attendees from 20 countries. The conference was co-sponsored by the ASME Heat Transfer Division and the Georgia Institute of Technology. Partial support was provided by the National Science Foundation, the Office of Naval Research, and several industrial sponsors including Seagate, Praxair, General Nano Inc., and Teledyne Scientific Company.

This conference series is dedicated to Dr. Chang-Lin Tien (1935-2002), a world renowned scholar, a leader in higher education, and a close friend and colleague. Professor Tien's tremendous intellect and unique vision have continued to inspire researchers to expand the frontiers of micro/nanoscale heat and mass transfer. The first two conferences were held in Tainan (January 2008, chaired by "Bob" D. Y. Tzou) and Shanghai (December 2009, chaired by Ping Cheng).

There were three plenary addresses and six keynote speeches, over 250 oral presentations, and 40 poster presentations. The conference provided a forum for participants (over 200 professionals and 120 graduate students) to discuss state-of-the-art research and development, and to identify the research needs in this emerging field. Nearly 140 peer-reviewed technical papers are included in the proceedings CD. Selected papers will be published after review/revision in a forthcoming special issue of the *Journal of Heat Transfer*.

Furthermore, an NSF/ONR Workshop on Nano/Microscale Thermal Transport was held on Sunday (March 4) in conjunction with the conference with more than 70 attendees. The goal of the workshop was to identify the achievements to date and the challenges and barriers currently faced by the community in the area of nano/microscale transport centered around three major themes: phonon transport fundamentals, materials challenges in thermal management, and heat transfer in microchannels. Workshop presentations and summaries, as well as pertinent presentations, can be found from the following website:
http://www.me.gatech.edu/NSF_ONR_Workshop

2012 ASME International Mechanical Engineering Congress and Exposition (IMECE 2012)

Houston, TX

November 9 – 15, 2013

S. A. Sherif

The Heat Transfer Division (HTD) once again participated in the International Mechanical Engineering Congress and Exposition (IMECE), which was held in Houston, Texas, November 9-15, 2012. Heat Transfer papers were predominantly in Track 7 which was jointly sponsored by the Fluids Engineering Division (FED), although several other tracks such as Tracks 6 and 11 had significant numbers of Heat Transfer papers. In Track 7 alone there were 532 presentations that included 363 written papers. These numbers do not reflect numerous papers and presentations that were removed either before or after the conference for not satisfying one or more requirements. Track 6 was jointly sponsored with the Advanced Energy Systems Division (AESD) and had papers dealing with energy. Several of the topics in that track dealt with fire- and combustion-related issues. One of the topics in Track 11 was devoted to posters in heat transfer and fluids engineering. Like the rest of the Congress, posters in Track 11 were either presentation-only or were associated with written papers. All written papers were subject to two independent reviews before they were accepted or rejected. The overall number of papers in 2012 was a record among past ASME Congresses. Like Track 7, Track 11 was also jointly sponsored by both HTD and FED. Professor Francine Battaglia from Virginia Tech represented FED. The following is a list of topics in Track 7 dealing with Heat Transfer: Heat Transfer in Energy Systems, Theory and Fundamental Research in Heat Transfer, Advances in Heat Transfer Equipment, Panel on the Highlights of the 18th Symposium on Thermophysical Properties, Heat Transfer in Fire and Combustion, Nuclear Energy, Heat Transfer in Multiphase Systems, Heat Transfer in Gas Turbine Systems, Transport Phenomena in Materials Processing and Manufacturing, Heat Transfer in Electronic Equipment, Heat and Mass Transfer in Biotechnology, Heat Transfer under Extreme Conditions, Environmental Heat Transfer, Computational Heat Transfer, Heat Transfer Photogallery, Flow and Transport in Heterogeneous Porous Media, Energy Efficiency and Thermal Management of Buildings.

2013 ASME Summer Heat Transfer Conference (SHTC 2013)

Minneapolis, MN

July 14 – 19, 2013

S. A. Sherif

The ASME Summer Heat Transfer Conference (SHTC) in 2013 will mark the 75th year of the HTD. Celebrations will take place at the Conference, which will be held in Minneapolis. This will be the largest gathering of heat transfer researchers in the past two decades. More details about this conference and activities are discussed on Page 3 of this newsletter. In addition, more information on the 2013 SHTC can be found at:
http://www.asmeconferences.org/ht2013/

2013 ASME International Mechanical Engineering Congress and Exposition (IMECE 2013)

San Diego, CA

November 15 – 21, 2013

Roy E. Hogan, Jr.

Consider joining us at the annual ASME International Mechanical Engineering Congress & Exposition (IMECE), at the Manchester Grand Hyatt in San Diego, November 15-21, 2013. The IMECE is the flagship conference for the ASME and includes a wide breadth of interdisciplinary topics; i.e. aerospace, manufacturing, biomedical, biotechnology, dynamics and vibrations, energy, fluids, solid mechanics, micro/nano-systems, transportation, and systems and design. Student-focused opportunities include a Graduate Student Poster Session in Heat Transfer and Fluid Science and an NSF Student Competition. The overall theme for this interdisciplinary meeting is "Advanced Manufacturing." So far, the IMECE has approximately 3200 abstracts and over 2100 draft papers. Within the Heat Transfer and Thermal Engineering Track, there are approximately 400 abstracts with 300 papers under review.

In addition to the technical opportunities at IMECE, a highlight for the Heat Transfer Division is our annual Honors and Awards Luncheon where we recognize the accomplishments of our membership. Awards will be presented to the recipients of the Heat Transfer Memorial Awards, Bergles-Rohsenow Young Investigator Award, Best-paper Awards, and Fellow promotions. Members will also be recognized for their service to the Division; participation in the HTD committees, the Journal of Heat Transfer, the Journal of Thermal Sciences and Engineering Applications, and the Journal of Nanotechnology in Engineering and Medicine. The HTD Honors and Awards Luncheon will be held on Tuesday, November 19. Luncheon tickets are subsidized by the Division and can be purchased for $30 during the registration process. Please plan on joining us in celebrating the accomplishments of our colleagues. It's also a great opportunity to catch up with old friends. We look forward to seeing you there!

2013 4th Micro/Nanoscale Heat & Mass Transfer International Conference

Hong Kong, China

December 11 – 14, 2013

Yogesh Jaluria

The 4th ASME Micro/Nanoscale Heat & Mass Transfer International Conference (MNHMT-13) will be held at The University of Hong Kong, Hong Kong, on December 11-14, 2013. It is a follow-up conference to the first three conferences, which were held in Tainan (January 2008), Shanghai (December 2009) and Atlanta (2012), with over 300 attendees in each. This conference series is dedicated to Dr. Chang-Lin Tien (1935-2002), a world renowned scholar and a leader in higher education, whose intellect and unique vision have continued to inspire our efforts in expanding the frontiers of micro/nanoscale heat and mass transfer. The Conference is sponsored by the ASME Heat Transfer Division and organized by the Department of Mechanical Engineering of The University of Hong Kong.

Research and education on micro/nanoscale heat and mass transfer have advanced rapidly over the last two decades through many dedicated individuals and team efforts, with direct impact now extending into various fields in both science and engineering. The conference is intended to provide a forum for researchers, educators and practitioners around the world to exchange ideas on the state-of-the-art research and development and identify future research needs in this interdisciplinary emerging field. The conference will include keynote and invited presentations, contributed oral and poster presentations, as well as panel discussions on the current status and future opportunities. Authors of selected papers will be encouraged to submit manuscripts for consideration for inclusion in a special issue of ASME Journal of Heat Transfer. More information can be found at: http://www.asmeconferences.org/MNHMT2013/

22nd National and 11th ISHMT – ASME Heat and Mass Transfer Conference

Kharagpur, India

December 28 – 31, 2013

Sumanta Acharya

The 22nd National and 11th ISHMT-ASME Heat and Mass Transfer Conference is scheduled to be held during December 28-31, 2013 at the Indian Institute of Technology (IIT), Kharagpur, India. The conference aims at bringing together a number of leading experts from all over the world on to a common platform to discuss and share their vision on research in the frontier areas of heat and mass transfer. This conference provides a unique opportunity for exchanging innovative ideas and application experiences amongst researchers working in academia, research and development organizations and industries as well as to present and publish their research findings and to interact with experts. The conference will include plenary and keynote presentations in addition to contributed oral and poster presentations. A special issue of ASME Journal of Heat Transfer will publish selected papers that are considered meritorious after the conference. More information can be found at: http://ishmt2013iitkgp.in/

Several workshops are planned around the conference. These include: (a) Advanced Energy and Thermal Systems, Jan. 2-3, 2014, IIT-Delhi (b) Micro & Nanoscale Heat and Mass Transport, Dec. 23-24, 2013, IIT-Ropar (c) Multiphase Flow and Heat Transfer, Dec. 21-22, 2013, IIT-Mumbai and (d) Novel Combustion for Sustainable Energy, Jan. 2-4, 2014, IIT-Kanpur.

Journal Editors' Messages

Terry Simon
Editor. Journal of Heat Transfer
University of Minnesota

Michael Jensen
Editor, Journal of Thermal Science and Engineering Applications
Rensselaer Polytechnic Institute

Debjyoti Banerjee
HTD Editor, Journal of Nanotechnology in Engineering and Medicine
Texas A&M University

The Heat Transfer Division (HTD) now has three archival journals: The *Journal of Heat Transfer* (JHT), the *Journal of Thermal Science and Engineering Applications* (JTSEA), and the *Journal of Nanotechnology in Engineering and Medicine* (JNEM). The *Journal of Heat Transfer* disseminates information of archival value in the areas of heat and mass transfer. Contributions may consist of results from fundamental research that apply to thermal energy or mass transfer in all fields of mechanical engineering and related disciplines. The *Journal of Thermal Science and Engineering Applications* focuses on the dissemination of information of archival value in applied thermal sciences and engineering. The JHT and the JTSEA are complementary to one another. The *Journal of Nanotechnology in Engineering and Medicine* provides an interdisciplinary forum focused on conveying advancements in nanoscience and applications of nanostructures and nanomaterials to life sciences.

The publication of these issues would not be possible without the support and contributions of the HTD. In 2013, the HTD will celebrate the 75th Anniversary of the establishment of the Heat Transfer Division of the American Society of Mechanical Engineers. This event will be recognized in the dedicated June 2013 issues of the JHT and the JTSEA in which historical events of the Heat Transfer Division are reviewed and advances in heat transfer are discussed. These invited articles from specialists in the field demonstrate the diversity of activity within the heat transfer community.

Authors who contributed papers to the JTSEA Special Issue are: historical review, W. Marner; CFD methods for turbulent heat transfer D. Tafti; solar thermal collector design P.E. Phelan; multi-phase solidification P. Dutta; heat transfer in solar thermo-chemical applications W. Lipinski; internal cooling for turbine airfoils M.K. Chyu; heat transfer in fire modeling O.A. Ezekoye; helical swirl flow heat transfer enhancement R.M. Manglik and A.E. Bergles; gas turbine heat transfer J.C. Han; thermal energy storage for solar applications R. Pitchumani; and high flux, two phase thermal management I. Mudawar. The Associate Editor with responsibility for the Special Issue is Srinath Ekkad.

Authors who contributed papers to the JHT Special Issue are: historical review, W. Marner; heat transfer systems, I. Catton and E. Sparrow; porous media, A. Kuznetsov and D. Nield and S. V. Garimella; biological heat transfer, T. Ohara and J. C. Bischof; microchannel heat transfer, S. Kandlikar; microscale heat transfer, K. Goodson, Z. Zhang, T. Fisher, P. Norris and G. Chen; boiling, J. Chung and V. Dhir; manufacturing, Y. Jaluria; radiation, M. Modest; and electronics cooling, Y. Joshi. The Associate Editor with responsibility for the Special Issue is Leslie Phinney.

Webb Marner discusses the history of the two thermal science journals in his lead article of the Special Issue, as follows:

"ASME Journal of Heat Transfer (JHT)

Soon after the HTD was formed, the leadership started pushing for its own journal based on the steady increase in heat transfer papers being produced. After about 15 years, ASME announced in 1958 that the Transactions of the ASME would be split up into four different journals; however, none of the four was a heat transfer journal. But, thanks to some last minute heroic efforts by Scotty Kezios, the Journal of Heat Transfer (JHT) was added as a fifth transactions journal. So, the first issue of the Journal was published in February 1959 with 15 articles. Among the familiar authors of papers in the maiden issue were Eph Sparrow, Robert Siegel, Sol Levy, Ralph Greif, R. G. Deissler, and George Dusinberre. For the first three years J.J. Jacklitsch of the ASME staff served as Editor with Kezios as Consulting Editor. In 1963 the position of Senior Technical Editor was established (later changed to Technical Editor with an editorial board of Associate Editors in 1968). The JHT disseminates information of permanent interest in the areas of heat and mass transfer. Contributions may consist of results from fundamental research that apply to thermal energy or mass transfer in all fields of mechanical engineering and related disciplines. The journal is available in both print and electronic format, but within the next few years only the electronic format will be available. From the very beginning the Division established a rigorous peer review process, which remains to this day, and the contributions

of the reviewers in maintaining high standards is regularly acknowledged. Today, there is a general consensus that the ASME Journal of Heat Transfer is the world's premier journal in its field.

The past and current Editors of the Journal of Heat Transfer are listed in Table 1. The JHT Editors have all been academicians with a strong record of research and service; however, there has been participation by industry, national laboratories, and government through the Associate Editors. In 1988 there was a special fifth issue of Volume 110 of the JHT prepared as part of the Division's 50th anniversary with a total of 20 review articles on a range of topics. A number of hardbound copies of this edition were published as well those in the usual format. More recently, there have been several other special issues, i.e. Electronic Cooling (January 2005), Thermal Processing of Materials (2002), Gas Turbine Heat Transfer (May 2005), Boiling, Two-Phase Flow Heat Transfer, and Interfacial Phenomena (December 2006), Nano/Microscale Radiative Transfer (January 2007), Computational Heat Transfer (April 2007), Micro/Nanoscale Heat Transfer (April 2008),

Table 1. Editors of the Journal of Heat Transfer

1959-1962	J.J. Jacklitsch (with S.P. Kezios as consulting Editor)
1963-1969	S.P. Kezios
1970-1972	W.H. Giedt (R.A. Seban completed second year due to Giedt's illness)
1972-1980	E.M. Sparrow
1980-1984	K.T. Yang
1985-1989	G.M. Faeth
1990-1994	J.M. Howell
1995-1999	R. Viskanta
2000-2004	V.K. Dhir
2005-2010	Y. Jaluria
2010-Present	T. Simon

Micronanoscale Heat Transfer (March & April 2009), Recent Advances in Porous Media Transport (October 2009), Molecular-to-Large-Scale Heat Transfer with Multiphase Interfaces (December 2009), Radiative Heat Transfer (February 2010), Recent Advances in Microchannel Heat Transfer (April 2010), Heat and Mass Transfer in Biosystems (January 2011), Advanced Thermal Processing (March 2011), Thermal Issues in Emerging Technologies (March 2012), Heat Transfer in Nanochannels, Microchannels, and Minichannels (February 2012), Microscale Heat and Mass Transfer (May 2012). A careful review of this list of special issues clearly indicates the primary focus has been in the area of Micro- and Nanoscale heat transfer.

Another feature was introduced in the May 1997 issue of JHT: the Heat Transfer Photogallery. This section features photographs, many in beautiful color, illustrating a variety of heat transfer phenomena. This addition helps to visualize heat transfer and brings real meaning to the old term that "a picture is worth a thousand words." And, it might be added that "a color picture is probably worth at least two thousand words."

Since the 1980s, the JHT has moved from four issues per year, with a significant publishing delay because of a backlog of quality papers, to bi-monthly issues. Finally, submission pressures allowed the present monthly format. The Editors took the lead in coordinating a common symbol list among the major heat transfer journals, and many journals now allow authors to provide only a list of those symbols not on the common list. This approach resulted in a significant savings in pages over the years.

ASME Journal of Thermal Science and Engineering Applications (JTSEA)

This relatively new journal focuses on the dissemination of information of permanent interest in applied thermal sciences and engineering and is intended to be complementary to the JHT. Thus, the Journal directly addresses the concern of some HTD members who feel that the Journal of Heat Transfer has become "too theoretical." Contributions must have clear relevancy to an industry, an industrial process, or a device. While the processes and phenomena discussed may be complex, the results must have a relatively straightforward or feasible path to application. Subject areas can be as narrow as a particular phenomenon or device or as broad as a system. Papers are sought that have long-term relevance to specific applications including: original research of an applied nature; application of thermal sciences to processes or systems; technology reviews; and identification of research needs to solve industrial problems at all time and length scales. The founding Editor was Michael Jensen of Rensselaer Polytechnic Institute, a position he still holds. The Journal is published quarterly."

ASME Journal of Nanotechnology in Engineering and Medicine (JNEM)

HTD is a recent sponsor of this new journal since 2012. JNEM focuses on the dissemination of latest fundamental research activities in nanotechnology which are relevant for engineering and medicine applications. The purpose and scope is defined as: "The ASME Journal of Nanotechnology in Engineering and Medicine provides an interdisciplinary forum uniquely focused on conveying advancements in nanoscience and applications of nanostructures and nanomaterials to the creative conception, design, development, analysis, control and operation of devices and technologies in engineering, medical, and life science systems. High-quality contributions of three types are sought: original research reports addressing nanoscale phenomena, synthesis and analysis of nanomaterials and devices, and applications of these; reviews of emerging nanotechnology topics and

research needs to impact engineering and medicine; and opinions/views on the developments and potential applications of nanoscience, engineering and technology." Recognizing the growing popularity of nanotechnology topics in thermofluids research community - HTD (along with three other divisions of ASME) sponsors the activities of JNEM. Dr. James Klausner (Past Chair, HTD) was instrumental in initiating the participation of HTD in JNEM advisory board. The representatives nominated to the JNEM advisory board on behalf of HTD are Dr. Malissa Sarntinoranont (University of Florida) and Dr. Debjyoti Banerjee (Texas A&M University). To publicize the recent change in scope of JNEM with inclusion of topics relating to the thermofluids literature – a special issue on "Micro/Nano-Scale Transport Phenomena" is being published in Volume 3 Issues 3 and 4 (some of the papers are already available online while the print publications are in their due process). Close to 40 manuscripts were submitted for the special issue with an acceptance rate of ~40%. This reflects the depth of activities in thermofluids research community leveraging the advances in nanotechnology and nanoscience. For the special issue the guest editor is Dr. Debjyoti Banerjee (Texas A&M University) and Dr. Kunal Mitra (Florida Institute of Technology).

Several research topics that are at the confluence of thermofluids sciences and nanosciences (e.g., nanofluids, nanocoatings, etc.) have generated their fair share of controversies. The guest editorial for the special issue explored the underlying limitations in past research reports that were the potential sources of these controversies. The guest editorial for the special issue therefore provided guidance (in the spirit of the ASME motto – "setting the standard") on the due diligence required of investigators for reporting advances in these topics – with the intention of minimizing such controversies in the future.

Excerpts from the guest editorial for the special issue are provided as follows: "Before the advent of the ubiquitous term 'nanotechnology' in the scientific literature, study of microscale transport phenomena (e.g., boiling on microstructured surfaces) and nanoscale transport phenomena (e.g., combustion/surface catalysis, electrokinetic flows, slip flows, etc.) has been explored quite extensively in the thermal-fluids literature. Hence, the topics explored in this special issue can be misconstrued to be a mature area. Advances in numerical techniques, engineering, fabrication and metrology/testing capabilities in the realm of micro/nano-length scales have enabled the development of new frontiers in research and applications. Particularly, the application of micro/nanotechnology enabled metrology platforms in scientific investigations (such as scanning probe microscopies) has provided surprising fundamental insights into transport phenomena, especially in these small-scale regimes. The exploration of fundamental issues in micro/nanoscale transport has wide ranging implications—from energy systems (e.g., nanofluids for concentrated solar power and thermal energy storage) to thermal management (chip cooling) to manufacturing systems (nanolithography, nanosynthesis) to nanosensors (metamaterials, homeland security, biosecurity) to biotechnology/biomedical devices (autonomous microfluidics/multiphase flows, lab-on-chip, biochemical reactions, nanofluids for cancer therapy, ciliary transport, ligand–receptor interactions, etc.). The diversity of applications is also the genesis of a fair share of controversies (e.g., stability of nanobubbles, stability issues of nanofluids for thermophysical measurements, etc.). Hence, this special issue is dedicated to the publication of recent developments in simulations and experiments involving transport phenomena at small length scales. The motivation is to enhance the fundamental knowledge about these physical phenomena as they relate to the variety of applications in engineering and medicine. This special issue was inspired by the themes and topics covered in past ASME conferences…"

A pioneering feature of the special issue of JNEM on the recent "Micro/Nano-Scale Transport Phenomena" is the inclusion of opinion articles by visionaries in this topic. This includes the opinion article by Dr. Avram Bar-Cohen (DARPA, University of Maryland) on the challenges in developing thermal management platforms for the next generation devices/ systems with and overview of the existing and upcoming programs at DARPA to tackle these challenges. Several more opinion articles are in process and it is hoped that JNEM will set the standards within ASME journals (as well as for other journals) for opinion articles. The intent of publishing the opinion articles are to serve as vision statements for the research community and spell-out future directions from the perspectives of established researchers, practitioners with long-standing records in these topics (e.g., government research laboratories) and consumers of these research topics (e.g., program managers at research sponsoring organizations).

It is sincerely anticipated that the participation of HTD in JNEM will lead to enhanced and more broad-based audience (in engineering and medicine) of the authors and papers from the thermofluids community. The participation of the thermofluids community in JNEM is expected through the submission of high quality cutting-edge research papers, reviewers for these manuscripts and leadership in spear-heading additional special issues relating to contemporary research topics in thermofluids sciences. In this spirit – a special issue of JNEM is in process on "Design and Fabrication of Microscale and Nanoscale Devices for Applications in Energy, Environment, and Medicine"; with Lead Guest Editor: Dr. S. Prakash (Ohio State University), Co-Editor: Dr. S. Seal (University of Central Florida) and Co-Editor: Dr. D. Banerjee (Texas A&M University). Active participation of the HTD community is requested through submission of manuscripts and review of the submitted manuscripts to the upcoming special issues.

Technical Committee News

K-6: Heat Transfer in Energy Systems

Timothy S. Fisher
Chair, K-6
Purdue University

On July 1st, Kyle Daun will become chair of K-6 and Wojciech Lipinski will become Vice Chair.

K-8: Theory and Fundamentals of Heat Transfer

Leslie M. Phinney
Chair, K-8
Sandia National Laboratories

The K-8 Committee of the HTD continues to actively sponsor technical interactions at the Heat Transfer Conference and International Mechanical Engineering Congress & Exposition. This would not be possible without the efforts of our members. Deborah Pence, Oregon State University, and Patrick Hopkins, University of Virginia, led the K-8 organizational efforts for the 2012 Heat Transfer Conference in Rio Grande, Puerto Rico. At the 2012 HTC, K-8 sponsored 11 sessions on focusing on the Fundamentals of: Nanoscale Heat Transport, Phase Change Heat Transfer, Multiscale Modeling of Heat and Mass Transfer, and Thermal Management. Patrick Hopkins and John Duda both from the University of Virginia and Theodorian Borca-Tasciuc from Rensselaer Polytechnic Institute did a great job organizing K-8's activities for the 2012 ASME IMECE in Houston, Texas. At the 2012 IMECE, K-8 organized 21 sessions on the Fundamentals of: Instrumentation and Measurement Techniques, Nanoscale Heat Transport, Phase Change Heat Transfer, Natural Convection, Forced Convection, and Heat Conduction. K-8 also organized a panel on Significant Questions in Thermal Energy Storage and participated in the informational panel on the new K-9 Committee on Nanoscale Thermal Transport.

K-8 is busy finalizing sessions for the 2013 Summer Heat Transfer Conference as well as working on sessions for the 2013 ASME IMECE. A special symposium occurring at the 2013 SHTC is titled: Heat Transfer Physics: A Symposium in Honor of Massoud Kaviany's 65th Birthday. This symposium will bring together researchers from across the world to celebrate Professor Kaviany's contributions over the last 30 years to the heat transfer community, specifically in the areas of transport in porous media and heat transfer physics. Prof. Kaviany also a previous chair of K-8. The symposium will feature an address from Professor Kaviany, 16 invited talks, and 20 contributed talks. It is being organized by members of the K-8, K-13, and K-18 committees, with K-8 leading the effort. We look forward to seeing you in Minneapolis for the SHTC and San Diego for the IMECE this year. K-8 welcomes interested members to attend our meetings and become involved in planning and organizing future sessions and events.

K-9: Nanoscale Thermal Transport

Zhuomin Zhang
Chair, K-9
Georgia Institute of Technology

The K-9 Committee on Nanoscale Thermal Transport held its first committee meeting and an information panel at IMECE 2012, Houston, TX. With over 30 active members and still growing, K-9 committee aims at representing all fields of nanoscale thermal transport including theory, computation, and experiment; and membership from a broad professional audience including academia, industry, and national laboratories.

The K-9 Committee will actively interact with other K-Committees to coordinate the nanoscale activities within the Heat Transfer Division, focusing on organizing and co-organizing technical sessions at ASME conferences. Furthermore, the K-9 Committee will interact with the NanoEngineering Council and other divisions to coordinate society-wide activities.

K-10: Heat Transfer Equipment

Yaroslav Chudnovsky
Chair, K-10
Gas Technology Institute

The Heat Transfer Equipment Technical Committee (K-10) is the one of oldest and active committees of the ASME Heat Transfer Division. As the present Chair it is my pleasure to introduce our committee, which is a great forum for dissemination of the science and engineering of advanced heat exchanger technology across the wide spectrum of the industrial applications ranging from food and paper processing to oil refining and steelmaking. The members of K-10 technical committee represent a "melting pot" of the industrial, academic and governmental research engineering organizations. Historically the committee unites the heat transfer equipment and thermal process development leaders from Boeing Research, ExxonMobil Research Engineering, Gas Technology Institute, Argonne National Laboratory, Honeywell Aerospace, GE Power and Water, HTRI, Isotherm, National Research Council of Canada, Koch Heat Transfer, Praxiar Technology Center, National Institute of Standards and Technology, United Technologies Research Center, Idaho National Laboratory as well as a number of reputable engineering schools such as Penn State University, University of Cincinnati, Virginia Tech University, Rensselaer Polytechnic Institute, University of Maryland, University of Minnesota, Wichita State University, Embry-Riddle Aeronautical University, University of Texas and others. Most of the K-10 committee members are knowledgeable, experienced professionals in their respective field and strongly committed to disseminate their knowledge and expertise among the ASME membership as well as junior research and engineering community.

The K-10 committee provides technical programming and sponsors activities focusing on advanced areas in industrial heat transfer equipment research and development. The committee strives to disseminate technical information, enhance technology transfer, and support the interchange of ideas between industrial, governmental, and academic sectors. The major areas of the committee's interests include but not limited to:

- advanced heat transfer equipment concepts, design and materials;
- heat transfer enhancement and performance improvement of the process equipment;
- industrial energy efficiency and waste heat recovery;
- emergent problems in thermal management and energy conversion;
- heat transfer equipment for sustainable energy and water sources.

Between the face-to-face committee meetings the members communicate with each other individually or by groups via email and phone calls to raise, discuss and address the emergent issues on the committee's focus – by-laws revisions, conference program preparation, administrative logistics and membership attraction.

In July 2013 committee on Heat Transfer Equipment sponsors eight technical sessions and two panel discussions in the framework of the Summer Heat transfer Conference including the Symposium in Honor of Professor Arthur E. Bergles. Moreover, K-10 members are busy in preparation for the annual ASME Congress and Expo in San Diego, CA where the committee will be sponsoring five technical sessions and a traditional ANL/UT panel on the Thermal Management Challenges in Energy Conversion and Conservation. In the technical programming HTD K-10 committee closely cooperates with the PID committee on Heat Exchangers by co-sponsoring most of the relevant events.

Heat Transfer Division K-10 Technical Committee on Heat Transfer Equipment always welcomes new members from the industry, academia and government that are interested in Advanced Heat Transfer Equipment and could contribute their knowledge and experience towards to major ASME missions "to serve diverse global communities by advancing, disseminating and applying engineering knowledge for improving the quality of life and communicating the excitement of engineering".

K-14: Gas Turbine Heat Transfer Committee

Ting Wang
Chair, K-14
University of New Orleans

Ray Chupp finished his two-year term as K-14 Committee Chair on June 30, 2012. Ting Wang and Nirm Nirmalan started their terms on July 1, 2012 as Chair and Vice Chair, respectively. Four K-14 members, Jim Down, Cengiz Camci, Ardy Riahi, and Kenichiro Takeishi, were selected as associated editors for ASME Journal of Turbomachinery.

K-14 sponsored technical sessions in following conferences:

1. ASME Turbo Expo 2012 – Copenhagen, Denmark, June 11-15, 2012

- Point Contact Jim Downs reported that K14 sponsored 46 paper sessions and one 1 tutorial session, 311 abstracts received, 204 final papers accepted, 47 recommended for publication at ASME Journal of Turbomachinery. Each paper must be reviewed by three reviewers, preferably one from academia, one from industry, and one from government.
- 13 new member applications were approved. New members were congratulated.
- Out of 183 papers presented at ASME Turbo Expo 2011 three papers were selected for K-14 Committee Best Paper Award. Plaques were presented.
  (a) GT2011- 45894 "Coal Ash Deposition on Nozzle Guide Vanes: Part I - Experimental Characteristics of Four Coal Ash Types" by Nitin Padture, Andrew Gledhill, Brett Barker, Brian Casaday, Jeffrey Bons, Joshua Webb, Ohio State University
  (b) GT2011- 45977 "Aerodynamic and Aerothermal Investigation of The Flow Around an HPT Rotor Shroud: PIV Measurements"
  GT2011- 45979 "Aerodynamic And Aerothermal Investigation Of The Flow Around An HPT Rotor Shroud: Heat Transfer And Cooling Effectiveness" by Knut Lehmann, Vasudevan Kanjirakkad, Howard Hodson , University of Cambridge (These two papers are related, so only one award was given.)
  (c) GT2011-45310 "Experimental Measurements of Ingestion Through Turbine Rim Seals. Part 1: Externally-Induced Ingress" by Gary Lock, Carl Sangan, Oliver Pountney, Kunyuan Zhou, Mike Wilson, Michael Owen, University of Bath
- Two new ASME Fellows, **Charles Haldeman** and **Man Yeong Ha,** were recognized.
- K-14 Committee Meeting Attendants (Approximately 120 heads. Please count.)

2. 2012 ASME Summer Heat Transfer Conference –July 8-12, 2012, San Juan, Puerto Rico, USA

- K-14 Committee sponsored Track 7: Heat Transfer in Gas Turbine Systems
- Track Organizer Srinath Ekkad reported that 32 abstracts were received and ended with 17 papers being accepted in four sessions. The session organizers are Danesh Tafti, Lesley Wright, Eric Ruggiero, and Srinath Ekkad.

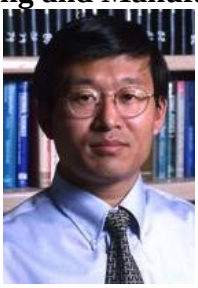
3. ASME IMECE 2012 – November 11-17, 2012, Houston, Texas, USA

- K-14 Committee sponsored Topic 7-22 Heat Transfer in Gas Turbine Systems
- Topic Organizer Ting Wang reported 27 abstracts were received and 12 final papers were accepted in three sessions.

The Warren M. Rohsenow Prize was awarded to Greg Natsui as the winner of this year's for presenting the following paper at the 2012 ASME Summer Heat Transfer Conference in Rio Grande, Puerto Rico. This award was presented at the Heat Transfer Division Luncheon on Tuesday, November 13 at IMECE 2012 in Houston.

HT2012-58131 "Experimental Evaluation of Large Spacing Compound Angle Full Coverage Fill Cooling Arrays: Adiabatic Film-Cooling Effectiveness" Authors:
Greg Natsui (presenter), Roberto Claretti, Jayanta Kapat (University of Central Florida)
Michael Crawford, Glenn Brown (Siemens Energy, Inc.),Ken Landis (Florida Turbine Technology)

K-15: Transport Phenomena in Materials Processing and Manufacturing



Yuwen Zhang
Chair, K-15
University of Missouri

The K-15 committee will sponsor an invited special session on Past, Present and Future of Transport Phenomena in Materials Processing and Manufacturing in the 2013 ASME Summer Heat Transfer Conference. Current trends and future research needs in thermal transport process in manufacturing, laser-assisted micro/nanofabrication, photovoltaic and semiconductor materials processing, and thermally activated chemical vapor deposition will be presented and discussed. The session will be chaired by Professor Milind Jog of the University of Cincinnati and Professor Wilson Chiu of the University of Connecticut. The confirmed speakers include Yogesh Jaluria of Rutgers University, Costas Grigoropoulos of University of California at Berkeley, Hemant Mungekar of Applied Materials, and Roop Mahajan of Virginia Tech.

K-16: Heat Transfer in Electronic Equipment

Samuel Graham
Chair, K-16 (incoming)
Georgia Institute of Technology

The K-16 Committee on Heat Transfer in Electronic Equipment would like to recognize the service of their outgoing Chair, Gamal Refai-Ahmed who has led the committee over the past two years. Along with EPPD, the K-16 Committee will honor his service with the Clock Award at ASME InterPack in San Francisco in July, 2013. The K-16 Committee welcomes Prof. S. B. Park (SUNY Binghamton) as its new Secretary while Samuel Graham (Georgia Tech) takes the role of Chair and Victor Chiriac (Qualcomm) takes the role of Vice Chair.

The K-16 Committee has been active in participating in several conferences and meetings. At IMECE in Houston in November 2012, also at ITHERM conference in May 2012 in San Diego. In addition, K-16 would like to acknowledge Prof. Jayathi Murthy (University of Texas-Austin) as the recipient of the 2012 Clock Award given to her at ASME IMECE in Houston. Amanie Abdelmessih (St. Martin University) and Mike Ohadi (University of Maryland) have led the committee's participation in the 2013 Heat Transfer Conference in Minneapolis in July 2013. K-16 is helping to organize Track 10. Currently, there are 7 sessions with 22 draft papers submitted. Projected activities at 2013 Heat Transfer Conference include: a) Celebration of the 75th Anniversary, b) NSF workshop 9 a.m. – 3 p.m. 'Emergent Trends in Heat Transfer Engineering,' open to all attendees, among others. Concurrently with the 2013 Heat Transfer Conference, K-6 is also helping to organize ASME InterPACK in San Francisco in July 2013. Here, Samuel Graham is co-organizing Track 8 on Thermal Management with Thomas Brunschwiler (IBM) and Fushinobu Kazuyoshi (Tokyo Institute of Technology). Currently, there are 63 papers spread over 15 sessions. Overall, K-16 and its members are looking forward to two great meetings this summer. K-16 will hold its summer committee meeting on Wednesday, July 17 at InterPACK in San Francisco.

K-17: Heat and Mass Transfer in Biotechnology

Ram Devireddy
Chair, K-17
Louisiana State University

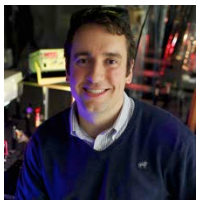
The HTD K-17 Committee (also known as the "Biotransport Committee" in the BED division of ASME) held their annual committee meeting at the scenic El Conquistador Resort, Fajardo, Puerto Rico as part of the 2012 Summer Bioengineering Conference (SBC). The committee unanimously approved the minutes of our meeting from 2011 SBC. We reported on the technical podium and poster sessions organized at the SBC in Fajardo, Puerto Rico and planned for the next year's meeting in Sunriver Resort, Sunriver, Oregon. The technical sessions, organized by our committee at the ASME Heat Transfer, Fluids Engineering, and Nanochannels, Microchannels and Minichannels joint conference (July 8-12, 2012, Fajardo, Puerto Rico) and at the ASME IMECE Winter Annual Meeting (Nov 9-15, 2012, Houston, Texas), were also discussed. An update was also provided to the committee on member research accomplishments and awards, member promotions and relocations. Further, there was interest expressed by the committee for holding a mini-symposium on "Nano-Thermal Medicine – Bench Top to Bed Side: Challenges and Opportunities" as part of the 75th anniversary celebrations of the HTD division at the 2013 ASME Summer Heat Transfer Conference, in Minneapolis, MN. This symposium organized by Dr. Bhowmick (University of Massachusetts), Dr. Han (Purdue) and Dr. Devireddy (Louisiana State University) will include 4 to 6 invited lectures/presentations (approximately 30 mins in duration plus 15 min Q&A) from researchers specializing in the following areas:

i) Nanoscale Heat Transfer (Measurement, Models and Applications) or Heat Transfer around Nanostructure in Biological Settings
ii) Quantitative Imaging and Diagnosis using Nanoparticles
iii) NanoMaterials in Bioengineering (Choice, Selection, Fabrication and Use thereof) or Synthesis of Functional Nanostructures
iv) Delivery of NanoBioMaterials (Selective Targeting, "turn-on" and "turn-off" switches) or Mass Transport of Nanoparticles for Diagnosis and Drug Delivery
v) Current Clinical Techniques in Nanothermal Medicine (Advantages and Limitations)

vi) Clinical/FDA/Translational Challenges (Regulatory Challenges)

And finally, the committee also discussed several ideas and other topics to further improve and expand the activities of our members at SBC and beyond. Specifically, the membership of the K-17 committee actively participated and organized to the ASME 2013 Nano-engineering for Medicine and Biology conference in Boston (http://www.asmeconferences.org/NEMB2013/). The membership is also exploring and open to opportunities to participate in international conferences, such as ICCHMT and jointly conduct conferences with JSME, KSME and BMES of China.

K-21: Heat Transfer Education Committee



Patrick E. Hopkins
Chair, K-21
University of Virginia

K-21 and HTD sponsored two poster sessions at the IMECE in Houston, TX. These two poster sessions, described below, will be offered annually at IMECE. These poster sessions are planned at the 2013 IMECE in San Diego. As per a new procedure with IMECE, **these K-21 sponsored poster sessions will be accepting abstracts for poster presentations only up until June 10th! Abstract submissions are handled through the IMECE website.**

1) Dewitt Poster Session for Undergraduate Research in Thermal/Fluid Sciences (Track 16-17): The ASME Heat Transfer Division's K-21 Heat Transfer Education Committee will sponsor a session highlighting student contributions in the broad area of heat transfer engineering, thermal/fluid sciences and thermal management. The session will consist of poster presentations of research conducted by Undergraduate Students. Topics should deal with a research or design contribution to the general area of heat transfer engineering. Appropriate for this session would be papers describing an analysis of an industrial thermal management problem, analysis of a fundamental heat transfer and fluid phenomena, studies intended to satisfy a particular thermal/fluid design need, or studies used for the optimization of an existing heat transfer process application. Only undergraduate students and recent graduates (within 18 months of the session) are eligible to submit and present posters. Partial travel reimbursement may be available.

2) The Graduate Student Poster Session in Heat Transfer and Fluid Sciences (Track 16-18): The ASME Heat Transfer Division's K-21 Heat Transfer Education Committee will sponsor this poster session to provide an opportunity for a student author (or coauthors) to present their research alongside other students in the field of heat transfer. The poster can be presented by a student that is already giving an oral presentation in a technical session, or this could be an opportunity for a student coauthor to give a presentation. For example, if an advisor is presenting in a technical session and you are a coauthor, the student is invited to present the same paper in this poster session. New submissions not presented otherwise are also welcome. The intention of this session is to promote the interaction, collaboration, and socialization of fellow students that are conducting research in the field of Heat Transfer. The criteria for participation in this poster session are that the poster presenter must have been a graduate or undergraduate student when the work was conducted. This is a valuable opportunity to further publicize your research and foster collaboration with other students from institutions around the world in the field of heat transfer.

K-21 Education Committee Open Membership!

The K-21 Education Committee is seeking new members to join ASME's mission in furthering Heat Transfer Education. Our committee is dedicated to further Education in Heat Transfer through ASME by creative opportunities such as unique conference organization, online outreach, industry collaborations, student discussions, and demonstrations and involvement at all levels of Education and Academia.

We are excited for participation from all interested parties in Academia, Industry, and Government. *We encourage Graduate Students to get involved with ASME conference planning and outreach by joining K-21!* Note that there are no committee membership restrictions with K-21, and you can still be an active member of K-21 and another K-committee.

For more information about K-21 membership and involvement, please contact:

K-21 Contact and Chair:
Patrick E. Hopkins
Dept. of Mechanical and Aerospace Engineering
University of Virginia
Phone: 434-982-6005
phopkins@virginia.edu

Committee Chairs and Contacts

EXECUTIVE COMMITTEE

Chair
Roy E. Hogan, Jr., Ph.D, PE
Sandia National Laboratories
Thermal and Fluid Processes Department
P. O. Box 5800, MS-0836
Albuquerque, NM 87185-0836
(505) 845-9585
rehogan@sandia.gov

Vice-Chair
S. A. Sherif, Ph.D.
University of Florida
PO Box 116300
232 MAE Bldg B
Gainesville, FL 32611
(352) 392-7821
sasherif@ufl.edu

Treasurer
Yaroslav Chudnovsky, Ph.D.
Gas Technology Institute
1700 S Mt Prospect Rd
Des Plaines, IL 60018-1800
(847) 768-0536
chudnovskyy@asme.org

Member-at-Large
Yong X. Tao, Ph.D.
University of North Texas
1155 Union Circle #311098
Denton, TX 76203-5017
(940) 369-8801
yong.tao@unt.edu

Secretary
Sumanta Acharya, Ph.D.
Louisiana State University
Rm 1419B Patrick Taylor Bldg
Baton Rouge, LA 70803-0001
(703) 292-7494
acharya@tigers.LSU.edu

Past Chair
James F. Klausner, Ph.D.
University of Florida
P.O. Box 116300
Gainesville, FL 32611
(352) 392-3506
klaus@ufl.edu

ASME Staff
Erin Dolan
Program Manager – Technical Units
Two Park Avenue
New York, NY 10016
(212) 591-7123
DolanE@asme.org

TECHNICAL COMMITTEE CHAIRS

K-2 Long Range Directions and Issues in Heat Transfer
Pamela Norris, Ph.D. (7/15)
University of Virginia
Thornton Hall, Room A110
122 Engineer's Way
Charlottesville, VA 22904
(434) 924-6295
pamela@virginia.edu

K-6 Heat Transfer in Energy Systems
Timothy S. Fisher, Ph.D. (7/13)
Purdue University
Birck Nano Tech Lab
1205 W States Street
West Lafayette, IN 47907-2057
(765) 494-5627
tsfisher@purdue.edu

K-7 Thermophysical Properties
Heng Ban, Ph.D., PE (7/15)
Utah State University
Mech and Aerospace Engrg
4130 Old Main Hill
Logan, UT 84332
(435) 797-2098
heng.ban@usu.edu

K-8 Theory and Fundamental Research
Leslie M. Phinney, Ph.D. (7/15)
Sandia National Laboratories
P.O. Box 5800, MS 0346
Albuquerque, NM 87185-0346
(505) 845-8484
lmphinn@sandia.gov

K-9 Nanoscale Thermal Transport
Zhuomin Zhang, Ph.D. (7/15)
Georgia Institute of Technology
Woodruff School of Mech. Eng.
Atlanta, GA 30332-0405
(404) 385-4225
zhuomin.zhang@me.gatech.edu

K-10 Heat Transfer Equipment
Yaroslav Chudnovsky , Ph.D. (7/13)
Gas Technology Institute
1700 S Mt Prospect Road
Des Plaines, IL 60018-1800
(847) 768-0536
yaroslav.chudnovsky@gastechnology.org

K-11 Fire and Combustion
Alexander L. Brown, Ph.D. (7/13)
Sandia National Laboratories
Fire & Aerosol Science Dept.
P.O. Box 5800, MS 1135
Albuquerque, NM 87185-1135
(505) 844-1008
albrown@sandia.gov

K-12 Aerospace Heat Transfer
Erol Ulucakli, Ph.D. (6/14)
Lafayette College
Dept. of Mechanical Engineering
Easton, PA, 18042
(610) 330-5444
ulucakli@lafayette.edu

K-13 Heat Transfer in Multiphase Systems
Ali Siahpush. Ph.D. (7/13)
University of Idaho – Idaho Falls
Center for Advanced Energy Studies C208
Idaho Falls, ID 83401
(208) 533-8129
siahpush.ali@gmail.com

K-14 Gas Turbine Heat Transfer
Ting Wang, Ph.D. (7/15)
University of New Orleans
Energy Conversion and Conservation Center
2000 Lakeshore Dr.
New Orleans, LA 70148-0001
(504) 280-7183
twang@uno.edu

K-15 Transport Phenomena in Manufacturing and Materials Processing
Yuwen Zhang, Ph.D. (7/14)
University of Missouri
Dept. of Mech. and Aero. Eng.
Columbia, MO 65211
(573) 884-6936
zhangyu@missouri.edu

K-16 Heat Transfer in Electronic Equipment
Sam Graham, Ph.D. (7/16)
Georgia Institute of Technology
Woodruff School of Mech. Eng.
Atlanta, GA 30332-0405
(404) 894-2264
sgraham@gatech.edu

K-17 Heat and Mass Transfer in Biotechnology
Ram Devireddy, Ph.D. (7/13)
Louisiana State University
Dept. of Mechanical Engineering
Baton Rouge, LA 70803
(225) 578-5891
devireddy@me.lsu.edu

K-18 Heat Transfer under Extreme Conditions
Zhixiong Guo, Ph.D. (7/15)
Rutgers University
98 Brett Road
Piscataway, NJ 08854-8058
(848) 445-2024
guo@jove.rutgers.edu

K-19 Environmental Heat Transfer
Sandra Boetcher, Ph.D. (7/13)
Embry-Riddle Aeronautical University
600 S. Clyde Morris Blvd
Daytona Beach, FL 32114
(386) 226-7442
sandra.boetcher@erau.edu

K-20 Computational Heat Transfer
Kevin J. Dowding, Ph.D. (7/15)
Sandia National Laboratories
V&V, UQ, Credibility Processes
P.O. Box 5800, MS-0386
Albuquerque, NM 87185-0386
(505) 844-9699
kjdowdi@sandia.gov

K-21 Education
Patrick Hopkins, Ph.D. (7/14)
University of Virginia
122 Engineer's Way, Room 331
Charlottesville, VA 22904-4746
(434) 982-6005
phopkins@virginia.edu

K-22 Committee on Visualization of Heat Transfer
Chang Kyoung ("CK") Choi, Ph.D. (7/15)
Michigan Tech., MEEM
832 R. L. Smith Building
1400 Townsend Drive
Houghton, MI 49931
(906) 487-1463
cchoi@mtu.edu

JOURNAL OF HEAT TRANSFER

Terry Simon, Ph.D.
University of Minnesota
Mechanical Engineering Department
111 Church St. S.E.
Minneapolis, MN 55455
(612) 625-5831
tsimon@me.umn.edu

JOURNAL OF THERMAL SCIENCE AND ENGINEERING APPLICATIONS

Michael K. Jensen, Ph.D.
Rensselaer Polytechnic Institute
Department of Mechanical Aerospace and Nuclear Engineering
Troy, NY 12180-3590
(518) 276-2843
jensem@rpi.edu

JOURNAL OF NANOTECHNOLOGY IN ENGINEERING AND MEDICINE

Debjyoti Banerjee, Ph.D.
Texas A&M University
Department of Mechanical Eng.
College Station, TX 77843
(979) 845-4500
dbanerjee@tamu.edu

HONORS AND AWARDS COMMITTEE (K-3)

Van P. Carey, Ph.D. (7/14)
University of California
Mech Engineering Department
6123 Etcheverry Hall
Berkeley, CA 94720-1740
(510) 642-7177
vcarey@me.berkeley.edu

MAX JAKOB MEMORIAL AWARD COMMITTEE

Prof. Kenneth J. Bell
Oklahoma State University
School of Chemical Engineering
Stillwater, OK 74078
(405) 744-5280
kjbell@okstate.edu

2012 Honors and Awards

Honors and Awards presented at the 2012 IMECE HTD Awards Luncheon
Awards presented by Dr. S.A. Sherif, Vice Chair of the HTD Executive Committee

Heat Transfer Memorial Award (Art) for Dr. Chang H. Oh

Heat Transfer Memorial Award (Science) for Dr. Javad Mostaghimi

Heat Transfer Memorial Award (General) for Dr. Satish G. Kandlikar

Bergles-Rohsenow Young Investigator Award for Dr. Evelyn N. Wang

Award recipients Drs. Chang H. Oh, Evelyn Wang, Javad Mostaghimi, and Satish Kandlikar

ASME Fellow Dr. Jayathi Y. Murthy

Retiring 201-2012 HTD Chair Dr. James F. Klausner

Retiring HTD Media Editor Dr. Yong X. Tao

Retiring K-8 Chair Dr. Van P. Carey

Retiring K-20 Chair Dr. N.K. Anand

Retiring Journal of Heat Transfer Associate Editor Dr. Pamela M. Norris

Journal of Heat Transfer Outstanding Reviewer Dr. Gregory J Michna

2012 Max Jakob Memorial Award & SHTC 2013 Lecture

2012 Max Jakob Memorial Award

Dr. Wataru Nakayama
Research Advisor
ThermTech International
Nakagun, Kanagawa, Japan

Award Lecture: "Heat in Computers: A Note on Applied Heat Transfer for Information Technology"

Wednesday, July 17
5:40-7:00 PM
Hilton Minneapolis

The Max Jakob Memorial Award is bestowed in recognition of eminent achievement of distinguished service in the area of Heat Transfer. Made annually, without regard to society affiliation or nationality, the Award consists of a bronze plaque, an honorarium of $1,000.00 and reimbursement for travel expenses up to $1,000.00 to accept the award.

The Award was established in 1961 by the ASME Heat Transfer Division in honor of Max Jakob, a pioneer in the science of heat transmission, commemorating his outstanding contributions as a research worker, educator and author. In 1962, AICHE joined in the Award, which is administered by the Max Jakob Memorial Award Committee, a Board of seven, three from each Society, and the Past Chair.

The lecture will be preceded by a reception serving wine and cheese. This event is open to all registrants for the conference.

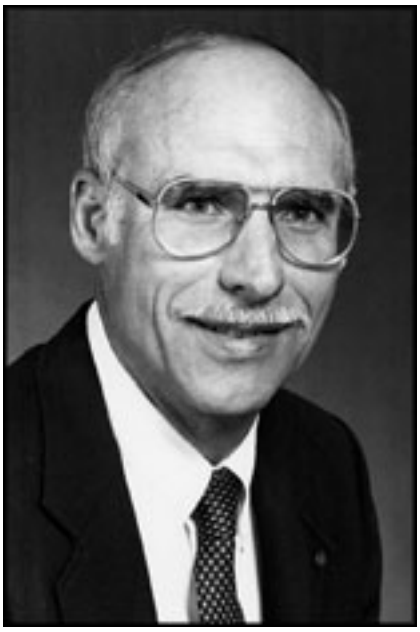
ASME
SETTING THE STANDARD

2013 ASME Summer Heat Transfer Conference

Minneapolis, MN, USA
July 14-19, 2013

A Symposium in Honor of Professor Arthur E. Bergles

About the Symposium and Professor Bergles:



Sponsored by the ASME Heat Transfer Division this symposium at the **2013 Summer Heat Transfer Conference** is in honor of Professor Arthur S. Bergles distinguished career.

Professor Arthur E. Bergles is a Glenn L. Martin Institute Professor of Engineering at University of Maryland. He also holds an Emeritus appointment at RPI and is a Senior Lecturer at MIT. A. E. Bergles has served as a Research Professor in the Department of Mechanical Engineering at the University of Maryland since 1999. Following the completion of his Ph.D., he served on the M.I.T. staff and faculty from 1962-1969, including positions as Associate Professor of Mechanical Engineering, Chairman of the Engineering Projects Laboratory, and Associate Director of the Heat Transfer Laboratory. He subsequently joined Georgia Tech as Professor of Mechanical Engineering. He was Professor and Chairman of Mechanical Engineering at Iowa State University from 1972-1983, and continued there as Professor-in-Charge of the Heat Transfer Laboratory until 1986. He then became the Clark and Crossan Professor of Engineering and Director of the Heat Transfer Laboratory at Rensselaer. He serves on the editorial boards of 18 Thermal Science journals. He was Dean of Engineering at RPI from 1989-1992. He has published over 500 papers, books, and reports. He was the 1990-1991 President of ASME. He is an ASME Honorary Member and a Fellow of ASEE, AAAS, AIChE, and ASHRAE. Among his other recognitions are the Heat Transfer Memorial Award of ASME, Lamme Medal of ASEE, Royal Academy of Engineering (UK), National Academy of Sciences (Italy), the ASME Max Jakob Memorial Award of AIChE and ASME, Donald Q. Kern Award of AIChE, and National Academy of Engineering.

Technical Sessions:

This Symposium is organized in honor of Professor Arthur E. Bergles, Honorary Member of ASME and a long-standing contributor to its technical, professional development, and mentoring activities. As part of the 75th Anniversary Celebrations of the Heat Transfer Division, technical contributions will include presentations on current research (experimental and theoretical or computational), as well as state-of-the-art reviews, in the broad areas of enhanced heat transfer (covering all techniques and modes of heat transfer), enhancement applications in power, process, and chemical industries, fundamental issues in boiling and condensation (with particular emphasis on energy and water purification or desalination systems), compact and ultra-small heat exchangers, general issues in energy conservation and water consumption, and any other allied work that deals with heat transfer (with or without enhancement) applications in energy-water consumption. Besides the submitted papers and presentations, this symposium will also provide a forum for selective invited presentations.

Symposium and Session Organizers:

Raj M. Manglik, University of Cincinnati, raj.manglik@uc.edu
Michael K. Jensen, Rensselaer Polytechnic Institute, jensemrpi.edu
T. S. Ravigururajan, Wichita State University, ts.ravi@wichita.edu
Avram Bar-Cohen, DARPA-MTO, abc@darpa.mil

2013 ASME Summer Heat Transfer Conference

Minneapolis, MN, USA
July 14-19, 2013

A Symposium in Honor of Professor Richard J. Goldstein

About the Symposium and Professor Goldstein:

Sponsored by the ASME Heat Transfer Division this symposium at the **2013 Summer Heat Transfer Conference** is in honor of Professor Richard Goldstein's distinguished career.

Professor Richard J. Goldstein, Regents' Professor at the University of Minnesota, is world renowned for his fundamental work in experimental fluid mechanics and heat transfer. His work on the topics of film cooling, wall jets and optical flow measurements has transformed the field. During his five decades at Minnesota, he has been recognized with the ASME Heat Transfer Memorial Award (1978), National Academy of Engineering membership (1985), the AIChE/ASME Max Jakob Memorial Award (1990) and the ASME Medal (2006), the highest award ASME bestows. Prof. Goldstein is a fellow of APS, ASEE, the Royal Academy of Engineering, and an honorary member of ASME. He served as ASME president from 1996-1997.

Technical Sessions:

- **Film Cooling, Impingement Cooling**
  - Effect of Uncertainty in Blowing Ratio on Film Cooling Effectiveness
  - Influence of Coolant Density on Turbine Blade Tip Film Cooling
  - Heat Transfer in Narrow Radially Outward Channels with and without Rotation
  - Optimization of Single Row Jet Impingement Array by Varying Flow Rates

- **Natural Convection, Heat Transfer Enhancement**
  - Closed-Loop Thermosyphon using Microencapsulated Phase-Change Material
  - Scalable MHD Solver for High Rayleigh Number Thermal Convection in Rotating Systems
  - Transient Free Convection over a Thin Vertical Disk with Joule Heating
  - Optimization of Thermal Systems to Enhance Output and Reduce Environmental Effect

Invited Speakers:

- Ronald S. Bunker, GE Global Research
  Film Cooling-How Has the Technology Progressed Over the Last 40 Years
  Ronald J. Adrian, Arizona State University
  Turbulent Eddies and the Mechanisms for Heat Transfer from Solid Surfaces

Symposium and Session Organizers:

Ronald Adrian, Arizona State University,jradrian@asu.edu
Amy Fleischer, Villanova University, amy.fleischer@villanova.edu
Thomas Kuehn, University of Minnesota, kuehn001@umn.edu
Frank Kulacki, University of Minnesota, kulacki@me.umn.edu
James Ramsey, University of Minnesota, jwramsey@me.umn.edu
John Shadid, Sandia National Laboratory, jnshadi@sandia.gov
Vinod Srinivason, GE Global Research, vinods@me.umn.edu

ASME
SETTING THE STANDARD

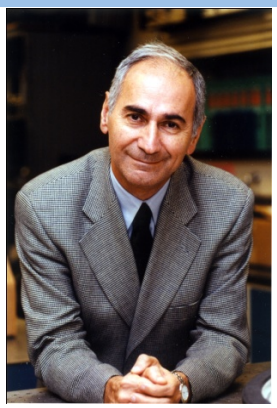
2013 ASME Summer Heat Transfer Conference

Minneapolis, MN, USA
July 14-19, 2013

Heat Transfer Physics: A Symposium in Honor of Professor Massoud Kaviany's 65th Birthday

Track 3, Topic 3-1

About the Symposium and Professor Kaviany:



Sponsored by ASME Heat Transfer Division's Theory and Fundamental Research (K8), Heat Transfer in Multiphase Systems (K13), and Heat Transfer Under Extreme Conditions (K18) technical committees, this symposium at the **2013 Summer Heat Transfer Conference** is in honor of Professor Massoud Kaviany's 65th birthday.

He is with the Department of Mechanical Engineering and also the Applied Physics Program, University of Michigan, where he has been since 1986. His interest is in heat transfer education and research. He has authored *Principles of Heat Transfer in Porous Media* (1995, Springer) *Principles of Convective Heat Transfer* (2001, Springer) *Principles of Heat Transfer* (2001, Wiley), *Heat Transfer Physics* (2008, Cambridge), and *Essentials of Heat Transfer* (2011, Cambridge), and has authored over 130 journal articles with his students. He was Chair of the ASME Committee on Theory and Fundamental Research in Heat Transfer (1995-1998), is an ASME (1992) and APS Fellow (2011), and recipient of University of Michigan *Engineering 2003* Education Excellence Award, 2002 ASME Heat Transfer Memorial Award, and 2010 ASME Harry Potter Gold Medal.

ASME SHTC 2013: Track 3, Topic 3-1: Heat Transfer Physics: A Symposium in Honor of Professor Massoud Kaviany's 65th Birthday

Technical Sessions:

- Heat Transfer Physics: An Overview and Fluid Particle Transport
- Heat Transfer Physics: Thermal Interfacial Transport
- Heat Transfer Physics: Thermoelectrics and phonon transport
- Heat Transfer Physics: Phonon Transport in Organic Materials and New Challenges
- Heat Transfer Physics: Multiscale Transport and Fuel Cells
- Heat Transfer Physics: Modeling and Simulation Methods
- Heat Transfer Physics: Thermal Radiation
- Heat Transfer Physics: Lasers and Photovoltaics
- Heat Transfer Physics: Convection and Multiphase Transport

Symposium and Session Organizers:

Hua Bao, Shanghai Jiao Tong University, UM-SJTU Joint Institute, Phone: +86-21-34206765 ext 3021, Email: hua.bao@sjtu.edu.cn
Paddy Chan, University of Hong Kong, Phone: 852-28592634, Email: pklc@hku.hk
Jae Dong Chung, Sejong University, Phone:+82-2-3408-3776, Email: jdchung@sejong.ac.kr
Baoling Huang, Hong Kong University of Science and Technology, Phone: 852-23587181, Email: mebhuang@ust.hk
Katsunori Hanamura, Tokyo Institute of Technology, Phone: +81-3-5734-3705, Email: hanamura@mech.titech.ac.jp
Charn-Jung Kim, Seoul National University, Phone: +82-10-9948-1662, Email: kimcj@snu.ac.kr
Jedo Kim, Pukyong National University, Phone: +82-51-629-6131, Email: jedokim@pknu.ac.kr
Alan McGaughey, Carnegie Mellon University, Phone: 412-268-9605, Email: mcgaughey@cmu.edu
Amir Oliveira, Universidade Federal de Santa Catarina, Phone: +55-048-3721-9390, Email: amir.oliveira@ufsc.br
Chanwoo Park, University of Nevada-Reno, Phone: 775-682-6301, Email: chanwoo@unr.edu
Xiulin Ruan, Purdue University, Phone: 765-494-5721, Email: ruan@purdue.edu
Melik Sahraoui, Tunisia Polytechnic School, Phone: +216-97-143-772, Email: melik.sahraoui@ept.rnu.tn
Yong Tao, University of North Texas, Phone: 940-565-2400, Email: yong.tao@unt.edu

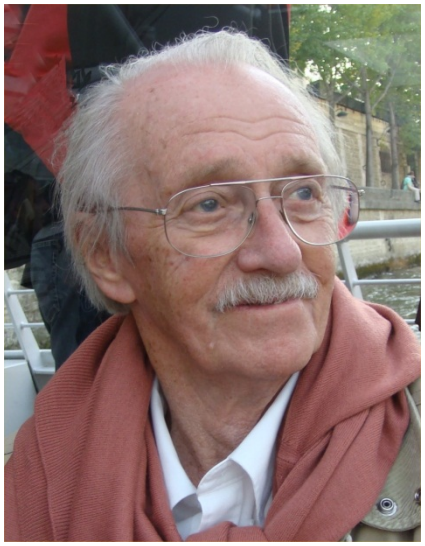
ASME
SETTING THE STANDARD

2013 ASME Summer Heat Transfer Conference

Minneapolis, MN, USA
July 14-19, 2013

A Symposium in Honor of Professor D. Brian Spalding

About the Symposium and Professor Spalding:



Sponsored by the ASME Heat Transfer Division this symposium at the **2013 Summer Heat Transfer Conference** is in honor of Professor D. Brian Spalding's distinguished career.

Professor Brian Spalding FRS, FREng, Managing Director, Concentration Heat & Momentum (CHAM) Limited, Emeritus Professor, Imperial College London, is known, internationally, as a founding father of Computational Fluid Dynamics (CFD), for the creation of turbulence models, for work on Heat Transfer and Combustion and for creating (with colleagues) the first commercially available general-purpose CFD computer code, PHOENICS, which set an example that many have followed. Brian's career started at Cambridge University in 1951. He was invited to join Imperial College in 1954, as Reader in Applied Heat, and became the College's first Professor of Heat Transfer. He stayed at IC for over thirty years, retiring in 1988. He founded CHAM in 1969 to enable industry to benefit from the results of CFD research carried out by him and his associates.

He has received awards including: Huw Edwards Prize, Physics Institute (2011); Luikov Prize (2010); Franklin Institute Medal (2010); Global Energy Prize (2009); Dr-Ing E.h.Friedrich Alexander University Erlangen-Nurnberg (1997); Luikov Medal ICHMT (1986); Bernard Lewis Medal (1982); Medaille d'Or Institute Francais de l'Energie (1980); AIChE/ASME Max Jakob Award (1978); James Clayton Prize Institution Mechanical Engineers (1970). He is a Fellow of the Royal Society of London, Royal Academy of Engineering, Institute of Mechanical Engineers, Engineering Institute, Institute of Chemical Engineers and Energy Institute. He is a Member of ASME, Royal Institution, Combustion Institute, AIAA, British Flame Research Foundation, British Heat Transfer Society, Russian Academy of Sciences; Siberian Branch Russian Academy of Sciences; Ukrainian National Academy of Sciences; and Royal Norwegian Society of Sciences & Letters. In his 90th year he continues to work at CHAM full-time; and at present sees no prospect of, or necessity for, a second retirement.

Technical Sessions"

- General Topics on Numerical Methods
- Computational Heat and Mass Transfer
- Computational Combustion
- Computational Multiphase Flow
- Industrial Applications of CHT

Symposium and Session Organizers:

Akshai Runchai, CFD Virtual Reality Institute, Dharamsala, India
Pratap Vanka, University of Illinois at Urbana-Champaign

Passing the Torch

Dr. Dilip Ballal

Dr. Dilip Ballal was an internationally renowned fuels and combustion researcher who directed the Hans von Ohain Fuels and Combustion Center at the University of Dayton (UD). He also served as division head for energy and environmental engineering at UD Research Institute (UDRI). His distinguished 40-year career included experience in fuels, gas-turbine combustion, emissions and related research in academia and industry. He was the author of several hundred papers, co-authored several book chapters on fuels and combustion, and was the lead author of a graduate level fuels and combustion hardcover.

In 1999, was named the University's first Hans von Ohain Distinguished Professor. During his nearly 30-year career at UDRI, Ballal helped garner more than $150 million in Air Force funding for research and development in synthetic, alternative and blended fuels as well as technologies to improve combustion and thermal management and reduce emissions. Under his leadership, research activities in fuels and combustion grew extensively, enabling the creation of the energy and environmental engineering division at the Research Institute in 2003. Ballal enjoyed international renown as a leading fuels researcher. In 2011 he received the American Society of Mechanical Engineers (ASME) R. Tom Sawyer Award, the organization's highest international award in gas-turbine technology. In 2010 he was named the first Pratt & Whitney Distinguished Chair (Visiting) Professor in Gas Turbine Engineering at the Indian Institute of Science in Bangalore. He was a senior vice president for the ASME Institutes Sector Board, a member of the board of directors of the ASME-International Gas Turbine Institute, the International Combustion Institute (Central States Section) and NASA combustion research and development committee. He also served as editor-chief of ASME's *Journal of Engineering for Gas Turbines and Power*.

In his spare time, Dr. Ballal was an avid photographer, audiophile, and a world traveler. He enjoyed exploration and traveled to base camp 2 at Everest and, over the years, to several other mountain peaks. He shared of love of music with his wife Shubhangi, a love of cameras with his daughter Deepti, and a love of cars with his son Rahul. He lived a rich life, full of great experiences at work and at home. His work legacy lives on through the Annual Dilip R. Ballal Early Career Award kindly funded by ASME and IGTI (first awarded at IGTI's TurboExpo June 2013). His life legacy lives on through his wife, kids, daughter-in-law (Sonia), and his two grandchildren (Shyla & Sameena). He will be missed, but his contributions to his field and love for his family will remain ever-present.