ISSN 2188-2142

The International Information Center for Multiphase Flow

NEWSLETTER

No. 41, March 2014

The Japanese Society for Multiphase Flow

In Memory of Dr. Novak Zuber*

by Mamoru Ishii

Dr. Novak Zuber (December 4, 1922 - October 3, 2013) was one of the most important scientists in developing the field of two-phase flow and boiling heat transfer. He was a guiding light in the newly developing field of nuclear thermal-hydraulics. His influence on the development of analysis capability for nuclear reactor accidents is acknowledged around the world. He had an unlimited passion and love for science and engineering and an energy that influenced the people around him and changed their way of life. His interests were not limited to nuclear thermal-hydraulics but extended to the general engineering field, scaling, evolution and history, particularly that of central Asia, Europe and the Balkans.

I had the privilege of being his first Ph.D. student at New York University. Since several memorial articles for Novak Zuber are already appearing in the publications of other scientific societies, I would like to take this opportunity to remember Professor Zuber as one of his former students.

Professor Zuber had a turbulent youth due to World War II and the subsequent communist revolution in Yugoslavia. In spite of this, he was educated in an elite secondary school and began study at the University of Rome in Italy. He was fluent in Serbian, English, Russian, Italian and French. To avoid the aftermath of the war, he began working as a seaman and later jumped ship to enter the United States. He began his study in mechanical engineering at UCLA, where he obtained his B.S., M.S. and Ph.D. During his time at UCLA the Immigration Office finally caught up to him, but because of his outstanding research record he was able to become a U.S. Citizen thanks to special efforts by UCLA and the U.S. Congress.

His Ph.D. thesis became a widely known treatise on boiling heat transfer, and he eventually received the first Heat Transfer Memorial Award from the American Society of Mechanical Engineers (ASME) for this work. From 1960 to 1967 he worked at General Electric, where he performed a variety of research including such significant work as the development of the drift-flux model. The drift-flux model and the graphical methodology for developing the necessary constitutive relations from experimental

data provided the first reliable, mechanistic model for calculating the void fraction in a boiling system, even under transient conditions. The development of this model marked a significant change in the general approach to two-phase flow analysis from one based largely on empirical correlations to a mechanistic approach based on physical principles.

From 1967 to 1969 he was a professor of Mechanical Engineering at New York University. I was very fortunate to receive a recommendation to be his first research assistant from the chair of the graduate committee at NYU. At my interview for the position he spoke about density wave instability for about 30 minutes in very rapid English, then suddenly stopped and asked me "Do you like it?" I had no idea what he was talking about, and I told him so. He smiled, then gave me about 30 reports and papers and told me to come back in two weeks. At my second interview, I was able to ask some questions and luckily was hired. This was my introduction to the two-phase flow instability problem that became the topic for my Ph.D. Thesis. He was a considerate and kind teacher and was my tutor during my study in two-phase flow before he offered the first two-phase flow course at NYU. This allowed me to personally learn about his logical and systematic approach to science.

When Novak Zuber offered the first formal graduate course on two-phase flow, I was shocked to see how strict a teacher he was. Initially, several assistant professors and postdocs audited the course in addition to the graduate students. He asked many questions directly to the students, and when we were not able to answer we got into a lot of trouble. Many students were advised to drop the course. Soon almost 1/3 of the students and all of the assistant professors and postdocs had withdrawn from the course. The second two-phase flow course was even more difficult, because only five students remained. We all tried not to make eye contact with him to avoid being asked direct questions. Many years later, I think that these courses were actually very good at training us to handle difficult questions with little preparation. Since then I have often seen him asking very difficult questions at international conferences. I was reminded of these courses, and was grateful that the experience helped me in these instances.

I also found that it was not necessary to answer every question directly. Novak liked honesty and a quick wit, and you could occasionally use that to escape embarrassing situations. During my oral qualifying exam in front of six or so professors, Novak asked me to derive an area-averaged two-phase flow equation. At first I was shocked, as this derivation would require many pages of lengthy mathematics. I began the first several steps of the derivation, but became increasing frustrated with the situation. I turned around, looked at Novak and asked "Why did you ask this question? You know that I have done it before and can do it again, but it simply takes too long!" He laughed loudly and told me that I did not need to do it.

In 1969 he accepted a Chair position at Georgia Tech, and I followed him to Atlanta. At that time Gunol Kocamustafaogullari (later Kojasoy) asked me to introduce him to Novak and was also hired as a research assistant. Soon after we moved to Atlanta, Jean-Marc Delhaye of Grenoble Nuclear Research Center joined us as a visiting scientist. The four of us became the core of Novak Zuber's laboratory at Georgia Tech. We worked very closely and had almost daily discussions on our two-phase flow research. At this time we had a critical mass for efficient research. We often went to lunch together, followed by visits to the university book store. It was then that I found out about Novak's tremendous knowledge of, and passion for, world history. He was particularly interested in the history of Eastern Europe and Central Asia, especially the Turkish and Mongol Empires. From these discussions with him, I was motivated to expand my horizons and began to read history books that he had recommended. In this way, Novak had a great influence on the people around him. We learned not only about two-phase flow and science, but also to expand our interest in history and civilization. At the time of his death Novak left over 7000 books on topics including science and engineering, history and civilization, and I am happy to hear that his alma mater, UCLA, will establish the Two-Phase Flow and Heat Transfer Library to honor his legacy.

Our research group was soon joined by Pradip Saha, Yoo Kim, Denis Liles, Ken William and others. Novak was a professor of mechanical engineering only from 1967 to 1974, but he was an outstanding

educator who had a strong influence on the field of two-phase flow analysis through his students and his students' students. At Georgia Tech we were most concerned with developing the correct field equations for two-phase flows and the interfacial jump conditions. Jean-Marc worked on developing the interfacial jump conditions, while Gunol studied the area-averaged two-fluid model as his Ph.D. thesis topic. I was interested in the time-averaged two-fluid model. When Jean-Marc returned to Grenoble, he invited me there to continue my work on the two-fluid model. The mathematically rigorous two-fluid model used in today's computational tools can be traced to Novak Zuber and his research group at Georgia Tech, which we had the privilege of being a part of.

In 1974 Novak left Georgia Tech and joined the Atomic Energy Commission. Soon after this, the AEC was divided into the Nuclear Regulatory Commission (NRC) and the Energy Research and Development Administration (later the Department of Energy, DOE). When I returned from Grenoble I began to work at Argonne National Laboratory, while at the NRC Dr. L.S. Tong was assembling a group of truly impressive experts on two-phase flow and boiling heat transfer including Novak, Y.Y. Hsu and S. Fabic.

Soon the NRC embarked on the development of advanced safety analysis codes for LOCAs, as the existing codes at that time were not capable. Novak led the development of several NRC codes including TRAC-B, TRAC-P, RELAP5 and RAMONA. Later TRAC and RELAP5 became the best-estimate codes that changed the handling of LOCAs in licensing procedures. At that time the NRC had a very large international "2D-3D Program" with Japan and some European countries. Novak had tremendous influence on these large experimental programs as well as the analysis methods. The NRC then set up the Advisory Committee for Advanced Code Development, which included top minds from the fields of applied mathematics, continuum mechanics, two phase flow, heat transfer and numerical methods. It was a reflection of Novak's very rational approach to problem-solving based on physical principles and rigorous mathematical treatments.

I worked with Novak on several topics from 1974 until his retirement in 1991, including the development of constitutive relations for the two-fluid model such as the drag force and interfacial area concentration. One of our most significant accomplishments was the development of a rational integral scaling method for thermal-hydraulic systems and severe accident analysis. Novak played a key role at the NRC in developing the Code Scaling, Applicability and Uncertainty (CSAU) methodology that led to the revision of Appendix K of 10 CFR 50.46 for LOCA analysis to permit the applicant to use best estimate analysis with quantification of uncertainty in the licensing process.

Even after his retirement from NRC, Novak remained very active in nuclear thermal-hydraulics. His influence affected all of the research that we performed for NRC. He was always very straightforward, scientific and rational and was quick to note any weakness in analysis or modeling.

Novak Zuber made many significant contributions in the area of two-phase flow and boiling heat transfer, and published over 100 technical papers. He was also a true leader in the field of nuclear thermal-hydraulics and had widespread impact on the development of nuclear safety research. From him, we learned that honesty and integrity in research are of supreme importance. He attained many awards and honors from various scientific societies and from NRC, however he was also a gifted teacher and colleague and a wonderful friend to many of us. It was a privilege to know him personally, and to work with him. He will be remembered as a person who had a positive impact on our lives and many others. It is very sad to lose a friend like Novak, however we also celebrate his contributions to the field of two-phase flow, his other accomplishments, and his friendship.

* This article is reprinted from Japanese Journal of Multiphase Flow, Vol.27, No.4, 2013.

11th International Conference on Nanochannels, Microchannels, and Minichannels June 16-19, 2013, Sapporo, Japan

ASME 11th International Conference on *ICNMM* 2013

by Takemi Chikahisa

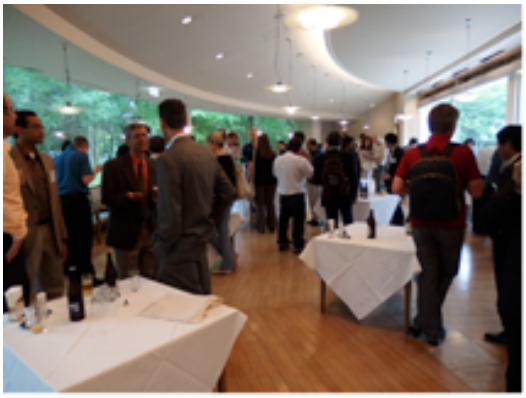
The Eleventh International Conference on Nanochannels, Microchannels, and Minichannels (*ICNMM*) was successfully held in June 16-19, 2013 at Hokkaido University in Sapporo, Japan. This conference is sponsored by the Fluids Engineering and Heat Transfer Technical Divisions of the American Society of Mechanical Engineers (*ASME*). The conference was first launched in 2003, and it has been held every year to provide a platform to exchange information in this emerging area encompassing micro thermal systems, *MEMS*, microfluidics, bio-medical and many other frontier research disciplines. This year the organizers decided to consolidate the tracks and selected thirteen focused topics ranging from single phase flow to chemical reactions as shown in list below.

The conference chair was Professor Yoav Peles of Rensselaer Polytechnic Institute. The co-chairs were Professor Daniel Attinger (Iowa State University) and Professor Vinod Narayanan (Oregon State University), and the conference local chairs were Professor Takemi Chikahisa (Hokkaido University) and Professor Yas Takata (Kyushu University). Over 160 scholars and researchers from 23 countries participated in the conference. The technical program includes 150 papers in 13 parallel technical sessions. The plenary lectures were given by three honorable keynote speakers; Professor Koichi Hishida (Keio University), Professor Peter Stephan (Technische Universität Darmstadt), and Professor Masahiro Kawaji (University of Toronto).

The session topics and the corresponding number of papers are listed below:

✧	Single Phase Gas Flow	9
✧	Single Phase Liquid Flow	6
✧	Two-Phase Flow	16
✧	Boiling and Condensation	16
✧	Electronics Cooling	7
✧	Electrokinetic Flow	5
✧	Fuel Cells	15
✧	Thin Film, Interfacial Phenomena, and Surface Tension Driven Flows	5
✧	Nano and Micro-Structures for Heat Transfer Enhancement	13
✧	Biomedical and Lab-on-a-Chip	15
✧	Measurements and Instrumentation	10
✧	Modeling and Simulation	26
✧	Mixing and Chemical Reactions	7

The conference began with an opening reception for all the attendees near the university campus. It was hosted by the Dean of Engineering of Hokkaido University. The conference banquet was hosted in Keio Plaza Hotel. The conference ended with a friendly farewell reception in the campus. The next *ICNMM 2014* conference will be held at the Hyatt Regency McCormick Place in Chicago, IL, on August 3-7 in 2014.



Prof. Takemi Chikahisa
Graduate School of Engineering
Hokkaido University, Japan
E-mail: takemi@eng.hokudai.ac.jp

21st International Conference on Nuclear Engineering (ICONE21) Conference Report July 29-August 2, Chengdu, China

by Akihiro Matsuda

The 21st International Conference on Nuclear Engineering (ICONE21) was held in Chengdu, China from the 29th of July to the 2nd of August. Over 1,300 participants attended the conference. About 910 oral presentations(about 100 presentations from Japan), 61 panel presentations were made in the following 17 tracks: Track 1 Plant Operations, Maintenance, Engineering, Modifications, Life Cycle and Balance of Plant, Track 2 Nuclear Fuel and Materials, Track 3 Plant Systems, Construction, Structures and Components, Track 4 Radiation Protection and Nuclear Technology Applications, Track 5 Next Generation Reactors and Advanced Reactors, Track 6 Nuclear Safety and Security, Track 7 Codes, Standards, Licensing and Regulatory Issues, Track 8 Fuel Cycle, Radioactive Waste Management and Decommissioning, Track 9 Thermal Hydraulics, Track 10 Computational Fluid Dynamics (CFD) and Coupled Codes, Track 11 Reactor Physics and Transport Theory, Track 12 Nuclear Education, Public Acceptance and Related Issues, Track 13 Instrumentation & Controls (I&C), Track 14 Fusion Engineering, Track 15 Beyond Design Basis Events, Track 16 Student Paper Competition, Track 17 Panel Session. The conference was mainly organized by the Chinese Nuclear Society, the American Society of Mechnical Engineers and the Japan Society of Mechnical Engineers in cooperation with the

International Atomic Energy Agency and the Chengdu Municipal Government. The conference sponsors were CNNC Jianzhong Nuclear Fuel Co., CNNC Southwestern Institute of Physics, Shanghai Nuclear Engineering Research and Design Institue, Candu Energy Inc., AREVA, Westinghouse, EDF and Studsvik.

The conference covered a wide range of research fields in nuclear engineering, so it is difficult to report on all aspects. I would like to present Track 17, Pannel Session, because I was one of the co-chairs for this track. It consisted of the following 10 pannel sessions: 17-1 Small Modular Reactors, 17-2 Nuclear Waste Management, 17-3 New NPP Designs & Passive Systems, 17-4 Next Generation NPPs, 17-5 Standards & Codes, V & V, 17-6 Fukushima Daiichi Accident Issues, 17-7 Variety of Severe Accident Management, 17-8 Nuclear Industry Initiatives, 17-9 Inland NPPs: Experience & Outlook and 17-10 Nuclear Engineering Education. For each session, 5 to 9 panelists presented and disscussed technical issues in front of an audience. All of the panel session presentations were very impressive and included many technical suggestions. In particular, Track 17-6 Fukushima Daiichi Accident Issues and Track 17-7 Variety of Severe Accident Management were very impressive to me.

It was announced that the next conference, ICONE22, will be held in Prague, which is the capital and largest city of the Czech Republic, in July of 2014. ICONE21 was a successful event, and I believe that ICONE22 will also be an excellent conference.

Akihiro Matsuda
University of Tsukuba
a_matsuda@kz.tsukuba.ac.jp

View of Chengdu city

Conference banquet

9th UK-Japan Seminar on Multi-Phase Flows 2013
September 16-18, 2013, Brunel University London, UK
http://dea.brunel.ac.uk/smpf13/

by Tassos G. Karayiannis and Yuichi Murai

The 9th UK-Japan Seminar on Multiphase Flows was held at Brunel University London, UK on the 16th-18th of September 2013. The present two-country seminar was chaired by Professor Tassos Karayiannis, Brunel University and co-chaired by Professor Yuichi Murai, Hokkaido University. The seminar was supported by Brunel University. This followed eight successful meetings in Japan and UK as seen below:

Nottingham, UK, Chaired by Professors Serizawa and Azzopardi (1995)

Kyoto, Japan, Chaired by Professors Serizawa and Azzopardi (1997)

London, UK, Chaired by Professors Issa and

Serizawa (1999)
Bury St Edmunds, UK, Chaired by Professors Hishida and Issa (2001)
Surrey, UK, Chaired by Professors Hagiwara and Smith (2003)
Osaka, Japan, Chaired by Professors Ozawa and B. Azzopardi (2005)
Nottingham, UK, Chaired by Professors Azzopardi and Ozawa (2007)
Sapporo, Japan, Chaired by Professors Murai and Azzopardi (2010)

This is a very select gathering of experts in multiphase systems for a very intensive and informative meeting. The success of the seminars is clearly evident by the continuous and regular meetings since the inaugural event in Nottingham in 1995. The main purpose of the meetings is to facilitate research at the highest calibre that could benefit both the academic and the industrial communities of Japan and the UK. New Japan-UK collaborations and spin off projects resulted from the past discussions and seminars. The year 2013 was the 400th anniversary of British-Japan relations since the arrival of the very first British ship at Nagasaki, Japan in 1613. This was one of motivations to hold this seminar in London, 2013.

The main focus of the seminar is on two-phase flows and covers research from the micro to the macro scales. An in-depth understanding of the fundamental issues involving the prevailing flow patterns and heat transfer mechanisms is essential for appropriate industrial applications. Other areas of two-phase systems including pool boiling and enhancement methods were included. Twenty five topics were presented and discussed by the UK participants and fourteen topics by the Japanese participants. In addition, the chairs invited Professors S. Kandlikar from the USA and A. Luke from Germany to talk about their work on flow boiling in microchannels and on the influence of microstructure on phase change phenomena bringing the total number of presentation to forty one.

The thirty minute sessions over the three day period allowed a detailed presentation by the

Participants in front of the bronze statue of Victorian engineer Isambard Kingdom Brunel

participants and useful discussion. The topics covered by these presentations included boiling heat transfer in micro-scale systems, theory for bubble dynamics and microbubble characteristics and molecular science of phase change. Research work was also presented on the thermal-hydraulics of coolants, gas-liquid interfacial kinematics, turbulent two-phase flow dynamics, drag reduction using two-phase flows, numerical approaches for complex interfacial physics, nonlinearity of particulate flows, droplet atomization, optical and thermo-chemical coupling phenomena. Recent work on instrumentation and measurement for multiphase flows was also presented. Professor G. Hewitt presented a special lecture on the exceptional contribution of Professor David Kenning (Oxford, Brunel) “Always on the Boil: An appreciation of the work of David Kenning”.

Prof. Tassos G. Karayiannis
E-mail: tassos.karayiannis@brunel.ac.uk
Prof. Yuichi Murai
E-mail: murai@eng.hokudai.ac.jp

The 12th International Conference on Fluid Control, Measurements and Visualization, November 18-23, 2013, Nara, Japan

by Shusaku Harada

The 12th International Conference on Fluid Control, Measurements and Visualization (FLUCOME 2013) was held in Nara city, Japan from November 18 to 23, 2013. The conference was conducted by organizing committee chaired by Prof. Kagawa (Tokyo Inst. Tech.) and was supported by the Visualization Society of Japan (VSJ) as a main sponsor, JSPS, SICE, JSME as technical co-sponsors and many companies as exhibition sponsors.

As introduced in invited talk by Prof. Nakayama, this conference has a history of 30 years. The first conference was held in Japan in 1985 and then it has taken place in many countries in Europe, Asia and North America. The main theme of FLUCOME 2013 is "Contribution of fluid control, measurement and visualization to sustainable society". Many researchers from 22 countries (Asia, Europe, Russia, USA, Arab, etc.) participated in the conference and discussed issues on fluid control and measurement.

Nara is located in the center of Japan and is close to both Kyoto and Osaka. There are many historical places and structures in Nara city since it was the capital of Japan until the 8th century. The conference venue is Nara prefecture new public hall located in Nara park. As can be seen in Photo 1, the over 1000 wild deer roams freely in the park. This is because Nara citizens traditionally consider deer as sacred one. The conference participants came to the venue enjoying the communication with deer every morning.

The conference was consist of 19 organized sessions (Measurement technique, Numerical simulation, Oil hydraulics, Drag reduction, Multiphase flow, Robotics and mechatronics, etc.), 4 memorial sessions and 3 invited talks. The invited talk was held in Noh theatre (classical Japanese musical theatre). Prof. Umezu (Waseda Univ), Prof.

Photo 1: Nara prefecture new public hall

Photo 2: Invited talk in Noh theatre

Nakayama (Tokai Univ.) and Prof. Bideaux (INSA Lyon) gave interesting talks in the Noh stage (Photo 2).

In FLUCOME 2013, the largest number of people participated in the history of the conference. The participants could exchange views on fluid control, and share information on recent development on measurement and visualization techniques. In break time, some people walked around the neighborhood and enjoyed sightseeing of old temples and the giant statue of Buddha.

During the conference, we had some opportunities to develop friendships with other researchers. The welcome party was held in Nara national museum on the first day and the banquet was held in Nara hotel last night of the conference. In the banquet, the participants enjoyed "mizugei" (Japanese traditional magic show using water).

FLUCOME 2013 was successfully completed by cooperation with many persons. Next FLUCOME will be held in 2015.

Assoc. Prof. Shusaku Harada
Session organizer of OS Multiphase Flow
Hokkaido University, Japan
E-mail: harada@eng.hokudai.ac.jp

8th International Symposium on Measurement Techniques for Multiphase Flow December 13-15, 2013, Guangzhou, P.R. China

By Yingna Zheng

The 8th International Symposium on Measurement Techniques for Multiphase Flows (ISMTMF'2013) was successfully held in Guangzhou, P.R. China, December 13-15, 2013. This conference was organized by Guangdong University of Technology, and co-organized by Southeast University, University of Shanghai for Science and Technology, Tianjin University, Zhejiang University, Institute of Mechanics, Chinese Academy of Sciences, Beihang University, and North China Electric Power University, P.R. China. Over 120 scholars and delegates from P.R. China, UK, Japan, and Norway

Fig.1 A Photo of ISMTMF'2013 Group

participated in the conference at Guangdong University of Technology. The participants discussed in depth around the conference's topic of "the research development and technique progressing of measurement techniques for multiphase flows under the condition of modern industry and current social development". This event series have allowed scientists and engineers in universities, industries and other fields from all over the world to share and exchange the measurement techniques for multiphase flows.

The International Symposium on Measurement Techniques for Multiphase Flow was sponsored by the Chinese Society for Measurement Techniques on Multiphase Flow, and co-sponsored by the Japanese Society for Multiphase Flow and the National Natural Science Foundation of China. The conference aims at providing an academic exchange platform to scholars, academics and engineers from different countries that engage in measurement techniques for multiphase flows, and promoting the development of these techniques. This is the 8th events, following the successful ISMTMF events held previously in Nanjing, P.R. China (1995); Beijing, P.R. China (1998); Fukui, Japan (2001); Hangzhou, P.R. China (2004); Macau, P.R. China (2006); Okinawa, Japan (2008) and Tianjin, P.R. China (2011), respectively. With the symposiums were held, the level of research on measurement techniques for multiphase flows has been developed and improved rapidly. This year's technical program includes 81 papers from more than 5 different countries. 16 parallel technical sessions were organized following six invited plenary lectures which were given by six honorable keynote speakers.

- ✧ Prof. Gérard Gouesbet (Coria Institute, INSA Rouen, France): Laser-based optical measurement techniques of discrete particles: a review
- ✧ Prof. Huihe Qiu (The Hong Kong University of Science and Technology, P.R. China): Recent Developments on Measurement Techniques for Interfacial Dynamics in Mini/Micro Multiphase Systems
- ✧ Prof. Shigeo Hosokawa (Kobe University, Japan): Photobleaching Molecular Tagging Velocimetry and Its Application to Bubbly Flows
- ✧ Prof. Mi Wang (University of Leeds, UK): Status of tomography-assisted multiphase flow metering
- ✧ Prof. Jidong Lu (South China University of Technology , P.R. China): Experimental study on the spectral characteristics of LIBS for direct

Fig.2 A Photo of ISMTMF'2013 Opening Ceremony

Fig.3 A Photo of ISMTMF'2013 Plenary Session

Fig.4 A Photo of ISMTMF'2013 Parallel Session

analysis of coal particle flow
- ✧ Prof. Don McGlinchey (Glasgow Caledonian University, UK): The Development And Performance Of A Solids Mass Flow Meter For Pneumatic Conveying Applications

The major topics of the conference include:
- ✧ Fundamentals of Multiphase Flow Measurement
- ✧ Novel Sensors and Measurement Methods of Multiphase Systems
- ✧ Information Technology for Multiphase Flow
- ✧ Process Tomography and Flow Visualization
- ✧ Intelligent Instruments and Monitoring Systems
- ✧ Optical, Non-intrusive and Other Advanced Measurement Techniques
- ✧ Characterization and Measurement of Multiphase Nanometer Flow
- ✧ Measurement of High Temperature Multiphase Flow
- ✧ Industrial Trials of Multiphase Flowmetering Techniques
- ✧ Environmental Monitoring
- ✧ Measurement of Bio-fluids
- ✧ Other Fields on the Measurement of Multiphase Flow

The success of the conference will promote the development of measurement techniques for multiphase flows immensely. The next conference (9th International Symposium on Measurement Techniques for Multiphase Flows) will be held in Hokkaido University, Japan, in 2015.

Prof. Yingna Zheng
School of Information Engineering,
Guangdong University of Technology, P.R. China
E-mail: zhengyn@gdut.edu

Future Meetings

Following list includes Conference Name, Place, Date and Contact.

Computational Engineering and Science for Safety and Environmental Problems (COMPSAFE 2014)
Sendai, Japan, April 13 - 16, 2014
http://www.compsafe2014.org/

2014 the 3rd International Conference on Fluid Dynamics and Thermodynamics Technologies (FDTT 2014)
Antalya, Turkey, April 21 - 23, 2014
Chair: Dr. Mahir Dursun (Gazi University)
Tel: 86-28-86527868
E-mail: fdtt@iacsit.org
http://www.fdtt.org/

The 5th International Conference on Heat Transfer and Fluid Flow in Microscale (HTFFM-V)
Marseille, France, April 22 - 26, 2014
Chair: Prof. Lounes Tadrist (Aix Marseille University)
Co-Chair: Prof. Irina Graur (Aix Marseille University)
E-mail: contact@htffm-v.fr
http://www.htffm-v.fr

7th World Congress on Particle Technology (WCPT-7)
Beijing, China, May 19 - 22, 2014
Chinese Society of Particuology
Chair: Prof. Jinghai Li (Chinese Academy of Science)
Co-Chair:
Prof. Junji Cao (Chinese Academy of Science)
Prof. Yunfa Chen (Chinese Academy of Science)
Pfor. Yulong Ding (Chinese Academy of Science)
Prof. Qingshan Zhu (Chinese Academy of Science)
Tel: 86-10-62647657
E-mail: wcpt7@home.ipe.ac.cn
http://www.wcpt7.org/

International Conference on Energy Systems Engineering and Technology (ICESET 2014)
New York, USA, June 5 - 6, 2014
http://www.waset.org/conferences/2014/newyork/iceset/

11th AIAA/ASME Joint Thermophysics and Heat Transfer Conference
Atlanta, Georgia, June 16 - 20, 2014
https://www.aiaa.org/EventDetail.aspx?id=18644

2014 ANS Annual Meeting
Reno, NV, June 15 - 19, 2014
Grand Sierra Resort
Chair: Prof. John J. Grossenbacher (Idaho National

Laboratory)
http://www.new.ans.org/meetings/c_1

The 16th International Symposium on Flow Visualization (ISFV16)
Okinawa, Japan, June 24 - 28, 2014
Chair: Prof. Koji Okamoto (The University of Tokyo)
E-mail: info@isfv.org
http://www.isfv.org

Eurotherm Seminar 101 - Transport Phenomena in Multiphase Systems
Krakow, Poland , June 30 - July 3, 2014
http://www.heat2014.agh.edu.pl

10th International conference on Advances in Fluid Mechanics
A Coruña, Spain, July 1-3, 2014
Chairs:
Prof. C. A Brebbia (Wessex Institute of Technology)
Prof. S. Hernandez (University of A Coruña)
Prof. M. Rahman (Dalhousie University, Canada)
E-mail: imoreno@wessex.ac.uk
http://www.wessex.ac.uk/14-conferences/afm-2014.html

Heat Transfer 2014
A Coruña, Spain, July 2 - 4, 2014
Chair:
Prof. B. Sunden (Lund University of Technology)
Pfor. C. A. Brebbia (Wessex Institute of Technology)
Tel/Fax: 44-238-029-3223/44-238-029-2853
E-mail: imoreno@wexxex.ac.jp
http://www.wessex.ac.uk/heat2014

17th International Symposium on Applications of Laser Techniques to Fluid Mechanics
Lison, Portugal, July 7 - 10, 2014

22nd International Conference on Nuclear Engineering (ICONE22)
Prague, Czech Republid, July 7 - 11, 2014
http://www.asmeconferences.org/icone22/

10th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT2014)
Orlando, USA, July 14 - 16, 2014
Chair: Prof. J. P. Mayer (University of Pretoria)
http://edas.info/web/hefat2014/home.html

4th Joint US-European Fluids Engineering Summer Meeting / 12th International Conference on Nanochannels, Microchannels, and Minichannels / 14th International Symposium on Gas-Particle Flows - Dedicated to the Memory of Professor Clayton T. Crowe
Chicago, USA, August 3 - 7, 2014
http://www.asmeconferences.org/FEDSM2014/

15th International Heat Transfer Conference (IHTC-15)
Kyoto, Japan, August 10 - 15, 2014
Chair:
N. Kasagi, Japan Sci. & Tech. Agency
Vice Chair:
H. Yoshida, Kyoto University
S. Maruyama, Tohoku University
E-mail: info@ihtc-15.org
http://www.ihtc-15.org

4th Micro and Nano Flows Conference
London, UK, September 7 - 10, 2014
E-mail: mnf-2014@ucl.ac.uk
http://www.mnf2014.com/

2nd Frontiers in Computational Physics Conference : Energy Sciences
Zurich, Switzerland, September 8 - 11, 2014
Chair: Prof. P. Koumoutsakos (ETH Zurich)
http://www.frontiersincomputationalphysics.com

5th International Workshop on Process Tomography (IWPT5)
Jeju Island, South Korea, September 16 - 18, 2014
E-mail: iwpt5@jejunu.ac.kr
http://iwpt5.org/jeju2014/main/main.php

13th International Conference Multiphase Flow in Industrial Plant
Sestri Levante, Italy, September 17 - 19, 2014
http://www.animp.it/mfip2014/index.html

9th International Conference on Two-Phase Systems for Space and Ground Applications
Baltimore, MD, USA, September 22 - 26, 2014
Chair: Prof. J. Kim (UMD)
E-mail: ittw2014@gmail.com
http://ittw2014.umd.edu

9th International Symposium on Numerical Analysis of Fluid Flow and Heat Transfer - Numerical Fluids Symposium 2014
Rhodes, Greece, September 22 - 28, 2014
http://www.icnaam.org/nafluids

2nd International Symposium on Multiscale Multiphase Process Engineering (MMPE)
Hamburg, Germany, September 24 - 27, 2014
Chair: Prof. M. Schluter (Hamburg University of Technology)
http://www.processnet.org/MMPE14.html

The 4th Asian Conference on Innovative Energy and Environmental Chemical Engineering (ASCON-IEEChE)
Yeosu, Korea, November 9 - 12, 2014
Chair: Prof. Yong Kang (Chungnam National University)
E-mail: choijhoo@konkuk.ac.kr
http://www.ascon-ieeche2014.org

2014 ANS Winter Meeting and Nuclear Technology Expo
Anaheim, CA, USA, November 9 - 13, 2014
Disney Resort & Hotel
Chair: Prof. Ed Halpin (PG&E)
http://www.new.ans.org/meetings/c_1

ASME 2014 International Mechanical Engineering Congress & Exposition (IMECE 2014)
Montreal, Canada, November 14 - 20, 2014
https://www.asmeconferences.org/Congress2014/

9th Korea-Japan Symposium Nuclear Thermal Hydraulics and Safety (NTHAS9)
Buyeo, Korea, November 16 - 19, 2014
Chair: Dr. Chul-Hwa Song (KAERI)
http://www.nthas9.org/

10th International Topical Meeting on Nuclear Thermal Hydraulics, Operation and Safety (NUTHOS-10)
Okinawa, Japan, December 14 - 18, 2014
http://www.nuthos10.org

---------- 2015 ----------

9th ECI Conference on Boiling and Condensation Heat Transfer
Boulder, CO, USA, April 26 - May 1, 2015
Chair: Prof. J. Kim (UMD)

The 23rd International Conference on Nuclear Engineering(ICONE23)
Chiba, Japan, May 17 - 20, 2015

12th International Conference on Power Engineering 2015(ICOPE 2015)
Yokohama, Japan, November 30 - December 3, 2015
Chair: Prof.M.Osakabe (Tokyo Univ. Marine Science and Tech.)

Corresponding Members

AUSTRALIA	
Hubert Chanson	University of Queensland
Jiyuan Tu	RMIT University
Aibing Yu	University of New South Wales
AUSTRIA	
Stefan Pirker	Johannes Kepler University
BRAZIL	
Gherhardt Ribatski	Universidade de São Paulo
Oscar M. H. Rodriguez	Universidade de São Paulo
CANADA	
Jos Derksen	University of Alberta
Jovica Riznic	Canadian Nuclear Safety Commission
CHINA	
Xu Cheng	Shanghai Jiao Tong University
Liejin Guo	Xi'an Jiaotong University
Jinghai Li	Chinese Academy of Sciences
Lixing Zhou	Tsinghua University
CZECH REPUBLIC	
Jiři Drahoš	Academy of Science of the Czech Republic
FRANCE	
Alain Cartellier	LEGI, CNRS and University Grenoble Alpes
Catherine Colin	IMFT, University of Toulouse, CNRS
Michel Lance	École Centrale de Lyon
Jacques Magnaudet	IMFT, University of Toulouse, CNRS
Olivier Simonin	IMFT, University of Toulouse, CNRS
Anne Tanière	LEMTA, Nancy University
Stéphane Zaleski	University Pierre et Marie Curie
GERMANY	
Dirk Lucas	HZDR
Michael Schlüter	TU Hamburg-Harburg
Martin Sommerfeld	Martin-Luther-Universität Halle-Wittenberg
Peter Stephan	Darmstadt University of Technology
Markus Uhlmann	Karlsruhe Institute of Technology
GREECE	
Vasilis Bontozoglou	University of Thessaly
INDIA	
Gargi Das	Indian Institute of Technology Kharagpur
ISRAEL	
Neima Brauner	Tel Aviv University
Yehuda Taitel	Tel Aviv University
ITALY	
Gian Piero Celata	ENEA
Paolo di Marco	University of Pisa
Alfredo Soldati	Università di Udine
KOREA	
Moo Hwan Kim	KINS
Sang Yong Lee	KAIST
Chul-Hwa Song	KAERI
NETHERLAND	
J.A.M. (Hans) Kuipers	Eindhoven University of Technology
Robert Mudde	Delft University of Technology
NORWAY	
Ole Nydal	NTNU
RUSSIA	
Sergey V. Alekseenko	Novosibirsk State University
SLOVENIA	
Iztok Žun	University of Ljubljana
SPAIN	
Carlos Martinez-Bazan	University of Jaén
SWEDEN	
Henryk Anglart	Royal Institute of Technology
SWITZERLAND	
Horst-Michael Prasser	ETH Zürich
John R. Thome	EPFL
TAIWAN	
Chih-Chen Chen	National Tsing Hua University
TURKEY	
Can Fuat Delale	Isik University
UK	
Panagiota Angeli	University College London
Barry Azzopardi	University of Nottingham
Tassos G. Karayiannis	Brunel University
Omar K. Matar	Imperial College London
Mike Reeks	Newcastle University
USA	
Steven L. Ceccio	University of Michigan
Jennifer Sinclair Curtis	University of Florida
Vijay K. Dhir	University of California, Los Angeles
John K. Eaton	Stanford University
Rodney O. Fox	Iowa State University
Dimitri Gidaspow	Illinois Institute of Technology
Yassin A. Hassan	Texas A & M University
Takashi Hibiki	Purdue University
Melany Hunt	California Institute of Technology
Satish Kandlikar	Rochester Institute of Technology
Masahiro Kawaji	City College of Newyork City
Jungho Kim	University of Maryland
Ellen K. Longmire	University of Minnesota
Efstathios E. (Stathis) Michaelides	Texas Christian University
Michael Podowski	Rensselaer Polytechnic Institute
Gretar Tryggvason	University of Notre Dame