



The International Information Center for Multiphase Flow

# NEWSLETTER

No.26 May 2006

The Japanese Society for Multiphase Flow



## Report of the International Conference on Jets, Wakes and Separated Flows (ICJWSF-2005) October 5-8, 2005, Mie, Japan

by Toshihiko Shakouchi

The International Conference on Jets, wakes and Separated Flows, the ICJWSF-2005, was held on October 5-8, 2005 at Toba Hotel International, Tobashi, Mie, Japan.

This conference was originally prompted by the earlier successes of the symposiums and forums held at the past JSME (Japan Society of Mechanical Engineers) and JSMF (Japanese Society for Mechanical Engineers) meetings, and the 3<sup>rd</sup> and 4<sup>th</sup> ASME and JSME Joint Fluids Engineering Conferences, which were held in San Francisco in 1999 and in Honolulu in 2003. Moreover, over the past three years we have had research group meetings about the "Fundamentals of Jet Flows and Advanced Applications" at the JSME, FED (Fluid Engineering Division). This conference was sponsored by the JSME, JSMF, Mie University and other societies.

It goes without saying that free and wall bounded shear flows, particularly jets, wakes and separated flows are not only interesting but are also very important

research subjects in the field of fluid mechanics and engineering. This is because they look like simple flows but include every important essence of fluid mechanics, for example, free and wall boundary layers, turbulent shear flows, eddy and large vortex structures, as well as possessing stability and control. Recently, there has been a particular interest in the coherent vortex structures of jets, wakes, and separated flows, and their control using various passive and active methods in order to improve the efficiency of momentum, heat and mass transfer, mixing, and diffusion in the various fields of industry, energy, and the environment.

We had invited 7 prominent speakers to give following keynote lectures and have received 117 excellent papers in total.

Keynote Lectures:

1. Measurements of Fine Scale Turbulence Properties in Wakes Flows

Prof. F. Durst (Erlangen University, Germany)

### To Join ICeM:

Everybody, who is interested in "multiphase flow", can be a member of ICeM. You are welcome to join ICeM. Please contact one of the following to register as an ICeM member.

#### Chairman(Editor):

Prof. Tomoji Takamasa  
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2. On Active Control of Separation from Bluff Bodies  
Prof. I. Wygnanski (The Univ. of Arizona, USA)
3. A Perspective on Combining RANS and LES for Computing Complex Flows and Heat Transfer  
Prof. K. Hanyalic (Delf Univ. of Technology, the Netherlands)
4. Aeroacoustics of Turbulent Jets: Flow Structure, Noise Sources, and Control  
Prof. E. Gutmark (Univ. of Cincinnati, USA)
5. Toward Smart Control of Turbulent Jet Mixing and Combustion  
Prof. N. Kasagi (The Univ. of Tokyo, Japan)
6. Research Works on Jets in Japan  
Prof. K. Toyoda (Hokkaido Institute of Technology, Japan)
7. Recent Progress on Monotone Integrated Large Eddy Simulation of free Jets  
Dr. F. F. Grinstein (Los Alamos National Lab., USA)

About 200 persons were presented from 17 countries of Australia, Canada, China, France, Germany,

Greek, Italy, Korea, Malaysia, the Netherlands, Pakistan, Russia, Singapore, Taiwan, the United Kingdom, USA, and Japan.

The results of this conference has been brought together in the Proceedings and CD-ROM, and some selected papers are going to publish as the special issues of "Jets, Wakes and Separated Flows" of the JSME International Journal in October, 2006.

Based on successes of this conference, it was decided that "The 2<sup>nd</sup> International Conference on Jets, Wakes and Separated Flows" are going to be held in 2008 at Berlin, Germany.

Prof. Toshihiko Shakouchi,  
Chairperson of ICJWSF-2005  
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**The JSMF Annual Meeting 2006** will be held at Ishikawa, Kanazawa Institute of Technology on 4th-6th August, 2006. During the Meeting,, **the 25th Multiphase Flow Symposium** will be held 5th.

**Fifth International Symposium on Advanced Fluid Information (AFI-2005)  
-IFS-JAXA Joint Symposium-  
On Aerospace Science/Rarefied Gas/Plasma, and Biofluid Science/ Engineering  
December 8-9, 2005, Institute of Fluid Science, Tohoku University,  
Katahira 2-1-1, Aoba-ku, Sendai, Japan**

by Kenichi Nanbu

The term "Advanced Fluid Information" (AFI) was created by the Institute of Fluid Science with the intention of signifying a paradigm shift in fluid dynamics research (experimental, numerical, or theoretical) such as a full use of distributed or vector computational technologies.

The fifth AFI (AFI-2005) was held in Institute of Fluid Science, Tohoku University, Sendai, Japan (December 8-9, 2005). This AFI was held in collaboration with JAXA (Japan Aerospace Exploration Agency) since IFS and JAXA came to the global agreement to promote researches on aerospace sciences in 2005.

In this AFI-2005, latest works on the scope of Aerospace Science/Rarefied Gas/Plasma, and Biofluid Science/ Engineering were presented and discussed in the oral or poster sessions. Also, some fruits of the IFS supercomputer system that was renewed on this October were introduced.

The first session OS1 focuses on the topic of Aerospace Science/Rarefied Gas/Plasma Science. We have invited one plenary speakers and six invited speakers in the session.

Plenary Lecture:

Prof. Mikhail S. Ivanov (Rus. Acad. Sci.)

Title: "High-Altitude Aerothermodynamics of Space Vehicles"

Invited Speakers:

1. Prof. Alexey Rebrov (Rus. Acad. Sci.)  
Title: "Gas Jet Deposition of Thin Polymer Films and Polymer Nanoparticles"
2. Dr. Takuji Kurotaki (JAXA)  
Title: "Numerical Simulation of Subsonic Flow with High Accuracy and Resolution"
3. Prof. Kenichi Nanbu (IFS, Tohoku Univ.)  
Title: "Particle Modeling of Plasmas and Gases in Materials Processing"
4. Prof. Tomohide Niimi (Nagoya Univ.)  
Title: "Optical Diagnostic Methods for High Knudsen Number Flows"
5. Dr. Masato Sakurai (JAXA)  
Title: "Fluid Experiments under Microgravity Conditions"
6. Prof. Shigeru Obayashi (IFS, Tohoku Univ.)  
Title: "Multi-Objective Design Exploration for Multidisciplinary Design Optimization Problems"

The second session OS2 focuses on the topic of Biofluid Science/ Engineering.

We have invited one plenary speakers and five invited speakers.

Plenary Lecture:

Prof. Daniel A. Ruefenacht (Geneva University Hospital)

Title: "Integration of Biomedical Information for the Management of Cerebral Aneurysms: @neurIST"

Invited Speakers:

1. Prof. Bastien Chopard (University of Geneva)  
Title: "Comparison of Various Stent Performance Metrics: a Lattice Boltzmann Approach"
2. Prof. Tong-Miin Liou (National Tsing Hua University)  
Title: "Numerical and Experimental Studies on Pulsatile Flow in Angled Aneurysms Anchored on a Curved Parent Vessel"
3. Dr. Ryutaro Himeno (RIKEN)  
Title: "Computational Biomechanical Project and Voxel Human Model at RIKEN"
4. Prof. Toshiyuki Hayase (IFS, Tohoku Univ.)  
Title: "Transdisciplinary Methodology Integrating Measurement and Simulation in Application of Complex Biomedical Flows"
5. Prof. Makoto Ohta (IFS, Tohoku Univ.)  
Title: "Development of Fundamental Technologies with Use of in-vitro and in-silico Models for Endovascular Treatments"

The poster session was organized by a combination of short presentations and discussions with posters. All participants gather in one room. Every participant can attend all short presentations and can discuss directory to the posters of one's interest.

Planned every organized and poster sessions were resulted in a great success. These sessions also showed the broad and vivid activities of AFI to the overseas participants.

Prof. Kenichi Nanbu,

(Chairperson of AFI2005)

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**Report on 18th National & 7th ISHMT-ASME HMTc 2006  
January 4-6, 2006, IIT Guwahati, India**

by Masaru Ishizuka

I attended, as one of the coordinating scientists for Japan, China and South-East Asian countries, the 18th National and 7th ISHMT-ASME Heat and Mass Transfer Conference which was held at IIT Guwahati, INDIA, during 4-6 January 2006.

The ISHMT organized the first National Heat and Mass Transfer Conference at the Indian Institute of Technology Madras in 1971 and subsequently the conference has been held once in every two years at different places across the country. Since 1994, ISHMT and the American Society of Mechanical Engineers (ASME) have been jointly organizing this conference. The 18th National & 7th ISHMT-ASME Heat and Mass Transfer Conference will be held at the Indian Institute of Technology Guwahati.

This is the first visit to India and also to the conference. This conference was a very big one, which had more than 500 leading researchers from academia, R&D organizations and industries from 20 different countries. A total of 365 research papers, including 2 plenary and 17 keynote papers, covering almost all areas of heat and mass transfer would be presented during the conference. And before the conference, two pre-conference programs (A Professional Development Course on Fundamentals of Fuel Cell Components and Systems and An International Workshop on Treatment of Thermal Radiation in Heat Transfer Problems, January 2-3, 2006, IIT Guwahati) also were held.

I was very surprised and happy to see many familiar Indian-Americans, who were born in India and now live in USA. I had seen most of them in the conference held in USA before. They are very active, therefore, it would not be an exaggeration to say that they underpin the development achieved by the heat and mass transfer fields in USA. Meanwhile, I felt lonely because only two people from Japan were there including me.

Another person was Professor S. Maruyama for Tohoku University who gave the keynote lecture on "Radiative heat transfer in nano to mega-scale systems". However, to my regret, I could not listen to his lecture. While the conference committee had reserved various hotels for our participants of the conference and transports were available from the hotels to the conference venue and back, the bus for our staying hotel was unpunctual and was often more than an hour late.

During the trip to India, the biggest benefit was for me to experience a big difference of the toilet system between Japan and India.

By Masaru Ishizuka, Professor Dr.-Eng.  
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**An Announcement from Editor**

The JSMF gives internet-service for ICMF members.

You can read updated ICeM NEWSLETTER by visiting JSMF homepage

<http://www.jsmf.gr.jp/index-en.htm>

## Future Meetings

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

### **Eurotherm Seminar 78 “Computational Thermal Radiation in Participating Media II”**

Poitiers, France, April 5-7, 2006  
Dr. Denis Lemonnier, Heat Transfer Laboratory,  
ENSMA, Poitiers, France  
LET- ENSMA, BP. 40109  
86961 Futuroscope Chasseneuil, France  
Tel.: +33 5 49 49 81 16  
Fax: +33 5 49 49 81 01  
E-mail: euro78@ensma.fr  
<http://www.euro78.ensma.fr/>

P. O. Box 6000, Verstal Parkway East  
Binghamton, NY 13902-6000 USA  
Phone: 607-777-6880  
E-mail: bahgat@binghamton.edu  
<http://www.itherm.org/>

### **ANS Annual Meeting**

Reno, NV, June 4-8, 2006  
Dr. Joseph Parrish, Energy Northwest  
Dr. Louis E. Pardi, Washington Group International,  
Inc.  
<http://www.ans.org/meetings/index.cgi?c=n>

### **The Fifth World Congress on Particle Technology**

Orlando, Florida, USA, April 23-27, 2006  
Prof. George E. Klinzing  
University of Pittsburgh  
Tel: (+1) 412-624-0784  
E-mail: confchair@wcpt5.org  
<http://www.wcpt5.org/>

### **Second International Conference on Transport Phenomena in Micro and Nanodevices**

Il Ciocco Hotel and Conference Center, Barga, Italy,  
June 11-15, 2006  
Prof. Mohamed Gad-el-Hak  
Department of Mechanical Engineering  
Virginia Commonwealth University  
Richmond, VA 23284-3015, U.S.A.  
Tel: 1-804-828-3576  
Fax: 1-804-827-7030  
E-mail: gadelhak@vcu.edu  
<http://engconfintl.org/6at.html>

### **6th International Conference on Boiling Heat Transfer VI**

Spoletto, Italy, May 7-12, 2006  
Dr. Gian Piero Celata,  
ENEA Casaccia, Institute of Thermal Fluid Dynamics,  
Via Anguillarese 301, 00060 Santa Maria di Galeria,  
Rome, Italy,  
Tel.: +39 06 3048 3905  
Fax: +39 06 3048 3026  
E-mail: celata@casaccia.enea.it  
<http://www.engconfintl.org/6ak.html>

### **13th International Symposium on “Applications of Laser Techniques to Fluid Mechanics”**

Lisbon, Portugal, June 26-29, 2006  
Prof. R. J. Adrian, Arizona State University, USA  
Prof. D. F. G. Durão, Universidade Lusíada, Portugal  
Prof. K. Hishida, Keio University, Japan  
Prof. A. L. Moreira, Instituto Superior Técnico,  
Portugal  
Prof. C. Tropea, Technical University of Darmstadt,  
Germany  
E-mail: llaser@dem.ist.utl.pt  
<http://in3.dem.ist.utl.pt/lxaser2006/>

### **ASME ATI Conference**

Milan Italy, May 14-17, 2006  
ATI, Sez. Lombardia  
Tel: +39.02.78.49.89  
Fax: +39.76.00.94.42  
E-mail: atilombardia@atilombardia.overweb.it  
<http://www.asmeati2006.it>

### **4th International Energy Conversion Engineering Conference (IECEC 2006)**

San Diego, California, USA, June 26-29, 2006  
Dr. Robert J Pinkerton  
[http://www.aiaa.org/  
content.cfm?pageid=230&lumeetingid=1309](http://www.aiaa.org/content.cfm?pageid=230&lumeetingid=1309)

### **The Eleventh Asian Congress of Fluid Mechanics (11ACFM)**

Kuala Lumpur, Malaysia, May 22-25, 2006  
Prof. C. S. Ow  
E-mail: acfm@iem.org.my  
<http://11acfm.mmu.edu.my/>

### **14th International Conference on Nuclear Engineering (ICONE14)**

Miami, Florida, USA, July 17-20, 2006  
Dr. Randall Roe, Burns and Roe, U.S.  
Prof. Michael Corradini, University of Wisconsin,  
U.S.  
Prof. Yasuo Koizumi, Kogakuin University, Japan  
Dr. Dieter Matzner, PBMR Pty, Republic of South

### **ITherm 2006**

San Diego, CA, USA, May 30 - June 2, 2006  
Prof. Bahgat G. Sammakia  
Director, Integrated Electronics Engineering Center  
State University of New York at Binghamton

Africa

<http://www.conferencetoolbox.org/ICONE14/>

**Sixteenth Symposium on Thermophysical Properties**

Boulder, CO, USA, July 30 - August 4, 2006  
Prof. Dan Friend  
Physical and Chemical Properties Division, 838.08  
National Institute of Standards and Technology  
325 Broadway  
Boulder, CO 80303 U.S.A.  
Fax: 303-497-5224  
Prof. Andreas Mandelis  
Department of Mechanical Engineering  
University of Toronto  
5 King's College Road  
Toronto, Ontario M5S 3G8 Canada  
E-mail: [symp16@nist.gov](mailto:symp16@nist.gov)  
<http://symp16.boulder.nist.gov/>

**International Heat Transfer Conference (IHTC-13)**

Sydney, NSW, Australia, August 13-18, 2006  
Prof. Graham de Vahl Davis  
School of Mechanical and Manufacturing Engineering  
The University of New South Wales  
Sydney, NSW, Australia 2052  
Tel: +61 2 9385 4099  
Fax: +61 2 9963 1222  
E-mail: [ihtc-13@unsw.edu.au](mailto:ihtc-13@unsw.edu.au)  
<http://ihtc-13.mech.unsw.edu.au/>

**The 5th International Conference for Conveying and Handling of Particulate Solids (CHoPS-05)**

Hilton Hotel, Sorrento, Italy, August 27-31, 2006  
Prof. Paolo Massacci, University of Rome  
Tel: +39-06-44585-605  
Fax: +39-06-44585-618  
E-mail: [paolo.massacci@uniroma1.it](mailto:paolo.massacci@uniroma1.it)  
<http://www.ortra.com/solids/>

**10th International Congress on Liquid Atomization and Spray Systems (ICLASS-2006)**

Kyoto, Japan, August 27 - September 1, 2006  
Prof. H. Gen Fujimoto, Doshisha Univ., Japan  
E-mail: [iclass06@mail.doshisha.ac.jp](mailto:iclass06@mail.doshisha.ac.jp)  
<http://comb.doshisha.ac.jp/iclass2006/>

**17th International Symposium on Transport Phenomena (ISTP-17)**

Toyama International Conference Center, Toyama, Japan, September 4-8, 2006  
Prof. Masaru Ishizuka, Toyama Prefectural University  
Department of Mechanical Systems Engineering  
E-mail: [ishizuka@pu-toyama.ac.jp](mailto:ishizuka@pu-toyama.ac.jp)  
E-mail: [istp17@pac.ne.jp](mailto:istp17@pac.ne.jp)  
<http://www.pac.ne.jp/istp17/>

**12th International Symposium on Flow Visualization**

Gottingen, Germany, September 10-14, 2006  
Dr. Jürgen Kompenhans  
Dr. Andreas Schröder  
German Aerospace Center (DLR)  
Institute of Aerodynamics and Flow Technology  
Göttingen, Germany  
E-mail: [Isfv2006@dlr.de](mailto:Isfv2006@dlr.de)  
<http://www.isfv.org/>

**IUTAM Symposium 2006 NAGOYA, "Computational Physics and New Perspectives in Turbulence"**

Integrated Building in Nagoya University, Nagoya, Japan, September 11-14, 2006  
Prof. Y. Kaneda, Nagoya Univ.  
E-mail: [iutam-nagoya@fluid.cse.nagoya-u.ac.jp](mailto:iutam-nagoya@fluid.cse.nagoya-u.ac.jp)  
<http://www.fluid.cse.nagoya-u.ac.jp/%7Ekaneda-lab/iutam2006/>

**The 8th International Heat Pipe Symposium Kumamoto University, Kumamoto, Japan,**

September 24-27, 2006  
Prof. Hideaki Imura  
Department of Mechanical Engineering and Materials Science,  
Faculty of Engineering, Kumamoto University  
2-39-1 Kurokami, Kumamoto, 860-8555  
Tel & Fax: (+81)-96-342-3752  
E-mail: [imura@gpo.kumamoto-u.ac.jp](mailto:imura@gpo.kumamoto-u.ac.jp)  
<http://www.mech.kumamoto-u.ac.jp/8ihps/>

**5th International Symposium on Turbulence, Heat and Mass Transfer**

Dubrovnik, Croatia, September 25-29, 2006  
Prof. K. Hanjalic, Chairman  
Department of Multi-scale Physics  
Delft University of Technology  
Lorentzweg 1, 2628 CJ Delft, The Netherlands  
Tel: +31 15 278 1735 and +49 6151 16 6280  
Fax: +31 15 278 1204 and +49 6151 16 4754  
E-mail: [hanjalic@ws.tn.tudelft.nl](mailto:hanjalic@ws.tn.tudelft.nl)  
<http://130.83.243.201/thmt-06/announce.html>

**International Workshop on Process Intensification in Fluid and Particle Engineering (IWPI2006)**

Kobe University Centennial Hall, Kobe, Japan, October 15-18, 2006  
Prof. Yushi Hirata, Osaka University, Japan  
Prof. Hiromoto Usui, Kobe University, Japan  
<http://www2.kobe-u.ac.jp/~iwpi/>

**ASME International Mechanical Engineering Congress and Exposition**

Chicago, Illinois, November 5-10, 2006



Dr. Said Jahanmir  
MiTi Heart Corporation  
E-mail: [sjahanmir@mitiheart.com](mailto:sjahanmir@mitiheart.com)  
<http://www.asmeconferences.org/Congress06>

**ANS Winter Meeting and Nuclear Technology Expo**

Albuquerque, NM, November 12-16, 2006  
Dr. Robert W. Kuckuck (Los Alamos National Laboratory)  
Dr. Thomas O. Hunter (Sandia National Laboratory)  
<http://www.ans.org/meetings/index.cgi?c=n>

**Fifth International Conference on Computational Fluid Dynamics in the Process Industries**

Melbourne, Australia, December 13-15, 2006  
Dr. M P Schwarz  
CSIRO Division of Minerals  
Box 312  
Clayton South Vic 3169  
Australia  
Tel: +61 3 9545 8500  
Fax: +61 3 9562 8919  
E-mail: [cfid@minerals.csiro.au](mailto:cfid@minerals.csiro.au)  
<http://www.cfd.com.au/cfdconf/>

**3rd BSME - ASME International Conference on Thermal Engineering**

Dhaka, Bangladesh, December 20-22, 2006  
Prof. M. H. Khan  
Prof. A.K.M. Sadrul Islam  
Dept of Mechanical and Chemical Engineering Islamic University of Technology  
Board Bazar, Gazipur-1704, Bangladesh  
E-mail: [sadrul@iut-dhaka.edu](mailto:sadrul@iut-dhaka.edu), [sadrul@me.buet.ac.bd](mailto:sadrul@me.buet.ac.bd)  
[http://www.iutoic-dhaka.edu/bsme\\_asme\\_ict2006/](http://www.iutoic-dhaka.edu/bsme_asme_ict2006/)

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**International Conference on Multiphase Flow (ICMF Leipzig 2007)**

Leipzig, Germany, July 9-13 2007  
Prof. Dr.-Ing. Martin Sommerfeld  
Martin-Luther-Universität Halle-Wittenberg  
Fachbereich Ingenieurwissenschaften  
Institut für Verfahrenstechnik  
Lehrstuhl Mechanische Verfahrenstechnik  
D-06099 Halle (Saale), Germany  
Tel: +49-(0)3461-462879  
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<http://www.icmf2007.org>

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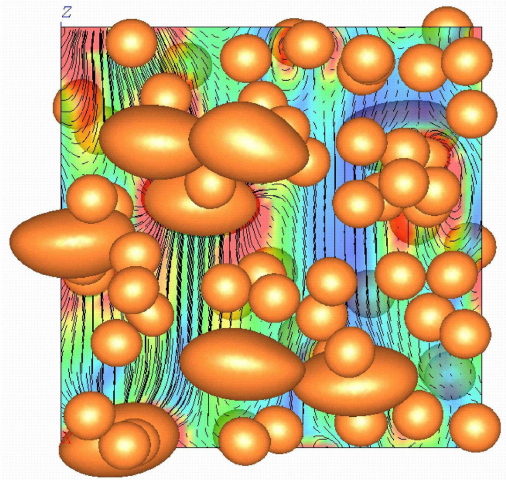
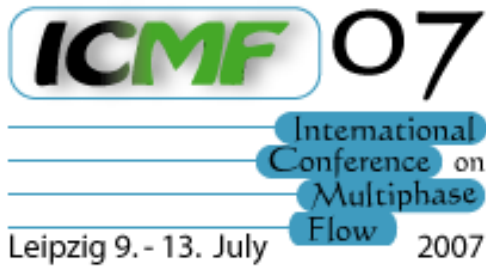
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**WWW : homepage** <http://www.jsmf.gr.jp/index.htm>



Conference Centre Leipzig  
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[www.icmf2007.org](http://www.icmf2007.org)

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**Co-Chair:** Prof. Dr.-Ing. Cameron Tropea  
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Prof. H. Nirschl, Universität Karlsruhe  
Prof. P. Walzel, Universität Dortmund  
Prof. H.-J. Warnecke, Universität Paderborn  
Prof. F.-P. Weiß, Forschungszentrum Rossendorf e.V.  
Prof. K.-E. Wirth, Universität Erlangen-Nürnberg

**Schedule:**

Deadline for abstracts:	15. November 2006
Notification of acceptance:	31. January 2007
Deadline for full paper:	31. March 2007
Early registration until:	31. March 2007

**Conference Location**

The conference will be held at the Conference Centre (CCL) in Leipzig, Germany which is located within the area of the new trade fair center. The CCL can be easily reached from the central station of Leipzig by S-Bahn or Tram within about 20 min. All the major hotels are within walking distance from the central station.





## History of the Conference

The International Conference on Multiphase Flow (ICMF) first was held in TSUKUBA, Japan in 1991 and the second ICMF took place in KYOTO, Japan in 1995. During this conference it was decided to establish an International Governing Board which takes care about the major aspects of the conference and decides about the future locations. Due to the great importance of the field it was furthermore decided to hold the conference every three years successively in Asia including Australia, Europe including Africa, Russia and the Near East and America. Hence, ICMF 98 was held in LYON, France; ICMF 2001 in NEW ORLEANS, USA and ICMF 2004 in YOKOHAMA, Japan. In Yokohama the Governing Board decided to have the ICMF 2007 in LEIPZIG, Germany.

## Governing Board Members

Dr. Gian Piero Celata, ENEA, Casaccia, Italy  
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 Prof. Andrea Prosperetti, John Hopkins University, USA

Prof. Michael Reeks, University of Newcastle, UK  
 Prof. Akio Tomiyama, Kobe University, Japan  
 Prof. Gretar Tryggvasson (Vice Chair), Worcester Polytechnic Institute, USA  
 Prof. Theo Theofanous, University of California, USA  
 Prof. Lixing Zhou, Tsinghua University, China

## Scope of the Conference

The conference will be devoted to all aspects of Multiphase Flow. Researchers from all over the world should gather in order to introduce their recent advances in the field and thereby promote the exchange of new ideas, results and techniques. The conference should be a key event in Multiphase Flow and support the advancement of science in this very important field. The major research areas relevant for the conference are:

- Elementary processes for particles, droplets, bubbles and nano-particles (dispersed Multiphase Flows)
- Interaction phenomena in dense dispersed multiphase flows (collision, agglomeration, coalescence)
- Discontinuous multiphase flows (annular, slug, wavy and stratified flows, flow pattern regimes and instabilities)
- Multiphase flows with phase change (boiling, evaporation and condensation, reactive flows)
- Numerical methods for multiphase flows (Euler/Euler, Euler/Lagrange, DNS, LES, VOF, interface tracking, population balance, molecular modelling)
- Instrumentation for multiphase flow analysis (holography, tomography, LDA, PDA, imaging techniques)
- Applications (chemical engineering, biotechnology, nuclear engineering, combustion, automotive, nano-technology, life science, environment)

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