

The International Information Center for Multiphase Flow

**NEWSLETTER**

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**ICeM**

The Japan Society of Multiphase Flow

**Report on the 1st Pacific Symposium on Flow Visualization and Image Processing****February 23-26, 1997, Honolulu, Hawaii, U.S.A.**

by S. Mochizuki

The First Pacific Symposium on Flow Visualization and Image Processing (PSFVIP-1) was held on 23-26 February 1997 in Honolulu, the capital of the beautiful-islands state of Hawaii, U.S.A. The meeting was the first in a series of Pacific Symposia in Flow Visualization and Image Processing to be held biennially under the auspices of the Pacific Center of Thermal-Fluids Engineering. The objective of the Symposium was to provide a forum for communication and information exchange in the fields of both flow visualization and image processing over the entire range of disciplines.

Papers describing current research on flow visualization and image processing from principles to applications were solicited. After review process, 127 papers were accepted to present at the symposium. They were classified into the categories of combustion, complicated flows, external flows, flow instability, heat transfer visualization, high-speed flows, image processing, internal flows, multiphase flows, numerical flow visualization, optical methods, PIV/PTV, supersonic flows and surface flow phenomena. Also three keynote lectures were presented by three internationally well-known distinguished scholars in the field of flow visualization and image processing, Professors T. Asanuma, K. C. Cheng and G. M. Carlomagno. All the papers were published in a two-volume book entitled Flow Visualization and Image Processing 1997 (ISBN 0-9652469-1-4 and 0-9652469-2-2).

As one of the features of this symposium, a short (1-day) course on Optical Method in Flow Visualization was offered on February 23 preceding symposium sessions. The course was intended for engineers, scientists and researchers in industry, academia and government who wanted to acquire a working knowledge of the widely-used optical methods of visualizing flows. The course lecturers were Professors W. Merzkirch and Wen-Jei Yang who had been organizing and teaching an intensive 3-day course on Flow-Visualization Techniques for thirteen years at the University of Michigan, U. S. A.

Practically, flow visualization and image processing technique has the broad application not only to the field of science and technology but also to life and nature on earth and even to phenomena occurring all over the universe. Therefore, a lot of studies in these fields are done and there is a strong need from engineers and scientists to have opportunities to exchange information and ideas. This is the background which made this symposium very successful with more than 140 participants.

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**To Join ICeM:**

Everybody, who has an interest in "multiphase flow", can become a member of ICeM. ICeM welcomes his/her joining. Please contact either of the following to register in ICeM.

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**Report on International Symposium on Measuring Techniques for Multiphase Flows  
April 10-13, 1995, Nanjing, China**

by Shimin Wang

The "International Symposium on Measuring Techniques for Multiphase Flows" which was jointly organized by the Chinese Society for Measurement, Southeast University of China and Automation research institute of Ministry of Metallurgical Industry, China, was held at the campus of Southeast University, Nanjing 210096, China on April 10-13, 1995. Twenty-nine well-known scientists were invited to act as the members of International Scientific Committee. More than 85 scientists and engineers from 10 countries, including UK, Germany, Switzerland USA, Japan, Russian, Korea, Israel, Greece and China attended the symposium. Five invited lectures at the plenary session with the topics as:

- Professor Gantang Chen "Particle Kinetics in Gas-Solid Flow System"
- Professor C. T. Crowe "Numerical Models for Turbulent Two-Phase Flow"
- Professor M. Sommerferld "Advanced Phase-Doppler Anemometry to Characterize Two-Phase Flows"
- Professor Z. L. Wei "Frequency Shift Behind an Oscillating Bluff Body in a Wake Flow"
- Professor Anatoly P. Nefedov "Probe and Optical Methods for diagnostics of High-Temperature Two-Phase Flows"

There are 68 technical papers presented in 12 sessions during the symposium. All invited and contributed papers were included in the proceedings entitled

"Modern Measuring Techniques for Multiphase Flows", which was published by the Southeast University Press, China. It covers the following measurement technique areas for multiphase flows.

- Probe and Sensor
- Droplet and Particle Characterization
- Tomography, Holography, Imaging and Visualization
- Numerical Model and Signals Analysis
- Velocity Measurement and Flowmeter
- Doppler Velocimetry
- Application

At the evening of April 12, 1995, a round table discussion with the major subject of the further activities on the Measurement Techniques for Multiphase Flows was held. It is anticipated that next international meeting on the Measurement Techniques for Multiphase Flows will be held in China in 1998. A technical tour of visiting the Thermoenergy Engineering Research Institute, Southeast University was conducted during the symposium.

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**Report on The Ninth International Symposium on Transport Phenomena (ISTP-9)  
in Thermal-Fluids Engineering  
June 25-28, 1996, Singapore**

by S. H. Winoto

The Ninth International Symposium on Transport Phenomena (ISTP-9) in Thermal-Fluids Engineering was successfully organized by the Department of Mechanical and Production Engineering, The National University of Singapore and sponsored by Pacific Center of Thermal-Fluids Engineering (PCTFE). It was held from 25 to 28 June 1996 at the Mandarin Singapore, and attended by about 230 participants from 25 countries.

Since its inception by PCTFE, this series of multi-disciplinary symposia has become one of the leading engineering conferences in the international calendar. The 1st ISTP was held in Honolulu, 1985 (Rotating Machinery); the 2nd in Tokyo, 1987 (Turbulent Flows); the 3rd in Taipei, 1988 (Thermal Control); the 4th in Sydney, 1991 (Heat and Mass Transfer); the 5th in Beijing, 1992 (Heat Transfer); the 6th in Seoul, 1993 (Thermal Engineering); the 7th in Acapulco, 1994 (Transport Phenomena in Manufacturing Processes) and the 8th in San Francisco, 1995 (Combustion). The theme of the ISTP-9 was Thermal-Fluids Engineering, in recognition of the promising future of this discipline in the Asia Pacific region.

8 keynote papers and more than 210 general papers representing a broad spectrum of fundamental and applied research areas were presented at the symposium, and contained in two volumes of its proceedings. Amongst the topics covered were flow measurements and visualization, computational fluid dynamics, drag reduction, turbulence, bluff body flows, multi-phase flows, biofluid mechanics, heat transfer enhancements, heat exchangers, cooling of electronic equipment, thermal processes and systems, combustion processes and turbomachines. There were about 20 Multi-phase Flow papers presented, including a keynote paper by Prof. F. Mayinger. All papers presented at ISTP-9 will be consid-

ered for publication in one of the following journals: Journal of Flow Visualization and Image Processing, International Journal of Rotating Machinery or International Journal of Transport Phenomena.

The distinguished keynote speakers and their respective topics were Prof. C-M Ho of UCLA-Los Angeles, USA, "Micro-Electro-Mechanical-Systems (MEMS) - An Innovative Approach to Control Transport Phenomena"; Prof. R J Goldstein of University of Minnesota, USA, "Flow and Mass Transfer performance in Short Pin-Fin Channels with Different Fin Shapes"; Prof. N Kasagi of the University of Tokyo, Japan, "Contribution of Direct Numerical Simulation Databases to Fundamental Research of Turbulent Transport Phenomena"; Prof. F Mayinger of Technische Universitat Munchen, Germany, "Transient Phenomena and Non-Equilibrium in Two-Phase Flow with Phase Change"; Prof. W Merzkirch of Universitat Gesamthochschule Essen, Germany, "Potential and Limitations of Quantitative Flow Visualization"; Prof. K Suzuki of Kyoto University, Japan, "Flow Modification and Heat Transfer Enhancement with Vortices"; Prof. R Viskanta of Purdue University, USA, "Convective and Radiative Heat Transfer in Flame Impingement Heating", and Dr R C Chu of IBM Corporation, USA, "Recent Development of Cooling Technology and Thermal Designs for Leading-Edge Electronic Products".

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**To Members**

For forthcoming data bank on Multiphase Flow Research/Researchers, ICeM would like to have your personal data. Please write your name, address, research field and a list of papers etc. to the Editor.

ICeM would also be very grateful to receive recent reprints, along with up to five keywords per paper.

ICeM welcomes research articles on multiphase flow or articles on personalities in the field for inclusion in the future Newsletters. It would be very helpful if the manuscripts are sent by E-mail or diskettes are attached to the manuscript submitted.

**Report on the XIXth International Congress of Theoretical and Applied Mechanics**

**August 25-31, 1996, Kyoto, Japan**

by Arie Biesheuvel

ICTAM Kyoto 1996 was organized under the auspices of the International Union of Theoretical and Applied Mechanics. More than 800 papers were presented on various aspects of solid and fluid mechanics. Here we report on contributions in the field of *Bubble Dynamics and Cavitation*.

*Rising bubbles.* It is generally believed that the formulation of the equations of motion of bubbly fluids requires a better understanding of the behaviour of single bubbles and of the hydrodynamic interaction between just a few bubbles. S.Takagi/Y.Matsumoto (Tokyo) and J.Magnaudet/A.Blanco (Toulouse) reported on numerical solutions of the axisymmetric Navier-Stokes equations for single deformable bubbles rising under the action of gravity at Reynolds numbers up to 200 and Weber numbers up to 15. Excellent agreement is found with experimental results. Growing shape oscillations, propagating from the front to the rear, are observed in the regime in which in experiments the bubbles perform a zigzag or spiralling motion. The tentative conclusion is that these oscillations trigger the periodic detachment of part of the closed vortex at the rear of the bubble, thereby leading to unsteady bubble motion. G.Tryggvasson (Ann Arbor) gave an impressive overview of simulation results, obtained with his front-tracking method, of the motion of interacting deformable droplets and bubbles, and showed how the method could be used to evaluate effective properties of bubbly fluids. It seems that full 3D-simulation of motion at high Reynolds numbers is still limited to rather low numbers of bubbles, but by positioning the bubbles in suitably chosen periodic boxes approximate results for high bubble volume concentrations may be obtained. H.F.Bulthuis (Twente) presented work based on this approach. He found the remarkable result that as the volume concentration increases the mean viscous drag on the bubbles first becomes *less*; only above a concentration of about % the drag begins to rise, as is familiar from experiments.

*Bubbles and turbulence* A subject which is expected to attract much attention in the near future is the interaction between bubbles and turbulence. Three presentations at this congress were concerned with the response of bubbles on turbulence. P.D.M.Spelt/A.Biesheuvel (Twente) summarized analytical and numerical results (with turbulence generated by kinematic simulation) on the motion of single bubbles, showing for instance that already low levels of turbulence lead to a significant decrease in the mean rise velocity. They also described how hydrodynamic in-

teractions between bubbles increases the relative dispersion due to turbulence in the direction of rise, but decreases that dispersion in a horizontal plane. R.Perkins et al. (Lyon) reported on experiments and simulations of the motion of particles and bubbles in a turbulent boundary layer flow (generated numerically with the method of proper orthogonal decomposition). From the simulations it appears that through the *combined* action of

lift forces and inertia forces the bubbles gather on the boundaries of vortical regions of the flow. The experiments indicate that whether the bubbles remain trapped at the wall, in the boundary layer flow, or are expelled from it, depends strongly on the bubble size. A detailed comparison between experiments and simulations should lead to a better understanding of the processes that govern the bubble behaviour in turbulence. F.Risso/J.Fabre (Toulouse) described experiments under micro-gravity conditions on the break-up of bubbles in isotropic turbulence. It appears that about twenty times higher turbulence levels are needed to break-up the bubbles than in experiments on ground level. The authors attribute this to the fact that, for the bubble size that was investigated, the equilibrium shape in normal conditions is already a deformed one, as compared to the spherical shape that is found under micro-gravity conditions.

*Sound propagation* M.J.Buckingham (San Diego) described how knowledge of the mechanisms by which bubbles are created and produce sounds at the sea-surface can be employed to study air-sea surface interaction, and how information on the acoustical properties of the bubbly upper-layer of the ocean can be used to analyse the 'acoustic signature' of submerged objects or the bottom of the ocean. A numerical study of the collective oscillations of a cloud of bubbles in a very viscous fluid, and the sound thereby produced, was presented by M.Ichihara/Y.Matsumoto (Tokyo); the sound signature compared well with some typical recordings of oscillations in magma chambers.

*Cavitation-single bubbles* The mechanisms by which cavitating flows cause damage and produce sound remains an active field of research. Both C.Dickopp/J.Ballman (Aachen) and J.R.Blake et al. (Birmingham) reported on numerical simulations of the interaction of vapour cavities with solid surfaces. The first authors (who use a finite-element method to solve the compressible flow equations) attempt to fully resolve the behaviour of the bubble-interior and the elastic/plastic wall; only results for the initial

stages of the implosion were yet available. The group from Birmingham were able to study the jet penetration processes in greater detail using a boundary integral technique. It appears that the peak pressure at the wall is actually produced *after* the jet hits the wall, when the liquid rushes in again to compress the remains of the imploded cavity. H. Takahira et al. (Osaka/Kyoto) described a method by which a micro-bubble could be trapped and positioned through optical forces; the technique has great potential for studies of acoustic cavitation.

*Cavitation-bubble clouds* The collective behaviour of cavitating bubble clouds was addressed in three papers. V.K. Kedrinskii presented experimental and numerical studies of the impulsive loading of structures submerged in liquids with tiny vapour cavities; examples included the disintegration of kidney stones and the explosion of fuel containers. Finally, two interesting papers by van Wijngaarden et al. (Twente) and Brennen et al. (Pasadena) were concerned with sheet cavitation and the formation and collapse of cavity clusters. The group from Twente gave experimental and numerical evidence for the existence of a cycle in which a sheet cavity is formed near the leading edge of a hydrofoil and subsequently grows towards the trailing edge, during this process a re-entering jet is formed which moves up front and breaks off a vapour bubble cloud that collapses downstream;

the cycle then begins again. Experiments indicate a characteristic Strouhal number for this process, which can be used, together with basic knowledge on the sound emission of bubble clouds, to devise scaling rules for sound production by cavitating hydrofoils. The group from CalTech gave further numerically obtained evidence that as a cloud of vapour bubbles collapses an inwards propagating shock wave develops and that geometrical focussing of this shock may lead to very intense pressure pulses. These events could be recognized in experimental recordings of the pressure disturbances at the hydrofoil. The recordings also showed a new phenomenon: high pressure peaks of short duration which seem to be associated with the passage past the pressure transducers of structures within the detached bubbly sheet.

It is a pleasure to end this report by congratulating T. Tatsumi and E. Watanabe, Chairman and Secretary General of the local executive committee, with the superb organization of the congress.

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### Report on 5th IEA Heat Pump Conference September 22-25, 1996, Toronto, Canada

Beginning on 22 September 1996, some 250 participants, from 25 countries, gathered at the Sheraton Centre hotel in the heart of Toronto city, for the "5th International Energy Agency Conference on Heat Pumping Technologies". Eight oral sessions were held over a four-day period under the conference theme: "Heat Pumping Towards the Next Century: Applications and Markets".

Some 40 oral papers were presented and are summarized further in this issue of the *IEA Heat Pump Centre Newsletter*. In addition, a large number of poster papers were presented, many of which are compiled in the conference proceedings. This article summarizes the keynote addresses of the opening session and the concluding discussion of the closing session.

This conference was the 5th in a series of triennial conferences organized under the auspices of the IEA Heat Pump Programme. But it was the first to use the term "heat pumping".

Heat pumping has come to mean all technologies, regardless of the application, for pumping heat from a source at one temperature, to a sink at a higher temperature. It thus encompasses all air

conditioning applications including space heating, space cooling and dehumidification. It also includes heat pump water heaters and industrial heat pumps, plus all types of refrigeration equipment.

The organizers of this conference were thus able to select papers on a broader range of technologies than their predecessors. Nonetheless, many of the papers focused on heat pumps - equipment for the provision of heating by means of the refrigeration cycle. This includes heating-only equipment, and equipment that provides both heating and cooling.

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**Report on Sixth International Conference on Hydraulic Engineering Software  
(HYDROSOFT 96)**

**September 10-12, 1996, Penang, Malaysia**

by Paula Doughty-Young

The sixth International Conference on Hydraulic Engineering Software (HYDROSOFT 96) was held in Penang, Malaysia from 10 to 12 September 1996. The conference was attended by approximately 60 delegates from 26 countries with a high number of delegates from both Japan and Greece.

After the opening, the keynote paper entitled 'Application of modelling techniques in a groundwater nitrate pollution problem' was presented by Professor Latinopoulos from Aristotle University of Thessaloniki, Greece followed by the remaining papers in the first session.

During the three days of the conference, papers were presented on a variety of topics including: hydrology and hazard assessment, water quality and aquifer modelling, hydraulic networks and irrigation, open channel flow, hydrodynamic modelling, coastal dynamics and estuaries, wave propagation, numerical modelling, GIS and advanced software.

Delegates and their partners attended a welcome reception on the first evening which was held around the pool area of the hotel complex. A conference dinner was arranged for Wednesday evening in a local restaurant offering a choice of Malaysian food and typical Malay dancing.

The next conference in the series will take place in 1998 at a venue to be announced.

Further information on the next conference

will be available from:

Wessex Institute of Technology  
Ashurst Lodge  
Ashurst  
Southampton  
SO40 7AA

Telephone: 44 (0) 1703 293223  
Fax: 44 (0) 1703 292853  
E-Mail: wit@wessex.ac.uk

The proceedings of HYDROSOFT 96 are available in book form from:

Computational Mechanics Publications  
Ashurst Lodge  
Ashurst  
Southampton  
SO40 7AA

Telephone: 44 (0) 1703 293223  
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The book (ISBN: 1853124052) consists of 534 pages and is priced at 162.00 pounds sterling / \$243.00.

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**To Corresponding Members**

Please address information on multiphase flow researches and researchers to the Editor. Also, please invite colleagues working on multiphase flow in your country to join ICeM.

**All Correspondence Concerning**

News items of general interest to ICeM members, notice of future meetings and conferences, personal news items, new books, etc. should be addressed to the editor or to regional corresponding members. It will be very helpful if any manuscripts proposed for publication are sent by E-mail or if diskettes are also attached to the manuscripts.

**Report on Pool Boiling Heat Transfer 2 - EUROTHERM Seminar 48**  
**September 18-20, Paderborn, Germany**

by Paul Kaupmann

The second EUROTHERM Seminar on Pool Boiling Heat Transfer to take place at Paderborn, Germany, during September 1996 was organized by the Thermodynamics and Heat Transfer Section of Paderborn University (Laboratorium für Wärme- und Kältetechnik, Universität -GH- Paderborn). The scientific scope of the Seminar was the presentation of new results from experimental and theoretical research on pool boiling heat transfer. The Seminar is an event of the EUROTHERM Seminar series established by the EUROTHERM Committee in 1986. The series has become a popular forum for high-level scientific and technical exchange of ideas in a wide range of specialist topics. The primary aim of the seminars is to stimulate discussion and improve liaisons between specialist groups in the field of thermal sciences.

More than 60 experts from 11 countries participated in the Seminar to present and discuss results of recent scientific research in pool boiling heat transfer. The topics included:

- Influence of the heating wall and bubble formation (11 papers)
- Enhanced pool boiling heat transfer (6 " )
- Convective effects in pool boiling (5 " )
- Boiling of mixtures (3 " )

- Boiling in an electric field and under microgravity (5 " )
- Transient phenomena in boiling (5 " )
- Film boiling (3 " )

The seminar provided ample opportunities for the exchange of ideas among the participants during the lectures, discussions and the various social events that were offered.

The Proceedings are available from  
Edizioni ETS  
P.za Torricelli, 4  
I-56126 Pisa, Italy  
ISBN: 88-7741-993-8

Selected papers will soon be published in a special issue of the International Journal of Refrigeration.

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Information on The Japan Society of Multiphase Flow (JSMF) and on The International Information Center for Multiphase Flow (ICeM) available on:

JSMF: <http://www.ijjnet.or.jp/JSMF>

ICeM: <http://www.kz.tsukuba.ac.jp/~monji/> (tentative)

## Report on 14th European Conference on Thermophysical Properties

September 16-19, 1996, Lyon, France

by Jean-François Sacadura

The 14th European Conference on Thermophysical Properties was held in Lyon-Villeurbanne, France, 16 to 19 September 1996.

The 14th ECTP in part of a Conference series initiated in 1968 in Baden-Baden, Germany, as a European effort to collect expertise and to present the latest research in the area of measurement and theoretical predictions of thermophysical properties of materials - solids and fluids - which are of technical and industrial interest.

Since 1990 the Conference is run over a three year cycle allowing a coordination with the American and Asian thermophysical conferences. Therefore, every year somewhere in the world, a wider thermophysical conference is held under the management of one of the three organizations. This means that the thermophysical conferences have a global perspective, not limited by geography : over 350 participants came ECTP 14 from more than 40 countries all around world. This clearly shows that the thermophysical community is now worldwide networked.

The number of papers presented at ECTP 14 and the variety of subjects addressed indicate the richness and the strength of the research work of this community. Out of more than 470 abstracts submitted, 410 communications have been accepted for presentation at the conference.

- 21 oral sessions including a total of 99 communications on the following topics :  
radiative properties, alternative refrigerants, prediction of thermophysical properties and reference materials, heat capacity and calorimetric devices, ceramics and glasses, metals and alloys, phase equilibria, thermal diffusivity and periodic methods, viscosity, thermophysical properties of metals, semi and superconductors, thermal conductivity, transport properties, food and biological material properties, thermal diffusivity and flash methods, phase equilibria, polymers, thermal conductivity, materials under particular conditions, parameter identification, thermal expansion, acoustic properties.
- 6 poster sessions including a total of 150 works grouped into the following topics :  
Prediction of Thermophysical Properties and Reference Materials - Parameter Identification.  
Radiative Properties - Ceramics and Glasses - Metals and Alloys.  
Thermal Conductivity - Thermophysical Properties of Metals, Semi- and Superconductors - Transport Properties.  
Food and Biological Material Properties - Heat Capacity and Calorimetric Devices - Viscosity - Polymers - Acoustic Properties - Thermal Ex-

pansion.

Materials under Particular Conditions - Thermal Diffusivity and Periodic Methods - Thermal Diffusivity and Flash Methods.

Phase Equilibria - Alternative Refrigerants.

- 8 keynote lectures were delivered by internationally known speakers on the following topics :  
Thermal Radiation Characteristics of Real Surface of Solid Materials in Natural / Industrial Environments.

Microscopic Approach of Thermo-optical Properties.

Surface Temperature Measurements.

Thermophysical Properties of Organic Liquids and Polymers over Wide Ranges of Pressures and Temperatures.

Thermophysical Properties of Liquid Metals and Graphite Diamond Production under Fast Heating.

Thermophysical Properties of Nonelectrolyte Solutions.

Methods for Experimental Design and Parameter Identification.

Physical Properties of Food at Elevated Temperatures - Experimental Measurement and Prediction.

- 3 workshops were organized : Reference Materials, Alternative Refrigerants, Photothermal Methods.

In addition special attention was paid to scientific equipment presentation through a specific oral session and an exhibition held over the four conference days.

A ceremony took place to remember two eminent thermophysicists recently died: Professors François Cabannes and Luigi Crovini. In memoriam speeches were delivered by Drs. François Gervais and Francesco Righini, respectively.

The European Thermophysics Award aimed to honour a scientist for his outstanding contribution to the field of thermophysical properties was presented for the 5th time.

The recipient is Dr. Hans E. Schmidt, from Karlsruhe, Germany, one of the founding members of the ECTP.

The ECTP International Scientific Committee has decided that the next conference in the series, ECTP 15, will take place in Würzburg, Germany, in 1999, under the chair of Professor Jochen Fricke, University of Würzburg.

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## Report on the International Conference on Nuclear Containment

September 23-25, 1996, Cambridge, UK

by Francesco Oriolo

The International Conference on Nuclear Containment, organised by the Institution of Nuclear Engineers (INE), was held at the Robinson College of Cambridge University (UK), September 23rd-25th, 1996. The event was sponsored by the Institution of Electrical Engineers, the British Nuclear Energy Society and co-sponsored by the European Nuclear Society. Dr. L.M.C. Dutton (NNC Ltd) was the conference Chairman. Attendance from 14 countries totalled about 100 participants, with 40 from outside UK. Sizeable contingents from Belgium, France, Germany, Italy and Spain with representative from Canada, Finland, Japan, Sweden, Switzerland and USA. The Congress was developed in a warm hospitality following the Cambridge tradition, to favour the exchange of up-to-date scientific experience. The social program included the very interesting visit to the Sizewell B Plant, the last generation UK PWR, and the visit to Cambridge and its surroundings for the guests. Prof. P.J. Grant, INE President, opened the Conference with a welcoming address illustrating the principal aims of the INE, which are promotion and advancement of Nuclear Engineering and allied branches of science and engineering.

**First Plenary Session** - On opening the first plenary session, Dr. Dutton remarked that the choice of the four papers in this session was to obtain an overview of the arguments discussed in the Conference, providing an international perspective on containment licensing, research and development.

This short overview will be focused only on this first session for space reasons, even if the other sessions have had a relevant scientific value for the high quality of the presented papers.

The first paper was presented by Mr. I.J. McNair of HM Nuclear Installation Inspectorate (NII, UK) and titled "A Regulatory View of Nuclear Containment on UK Licensed Sites". This paper draws an excellent overview of the role of containment in protecting against potential radiological and related hazard and describes the factors which influence the NII's assessment of containment safety cases. In doing so, the Authors recognise that there is still a degree of uncertainty about much of the input to containment safety cases, and so they seek focused research to improve their understanding of containment structural limits.

The second paper, "Regulatory Aspects of Nuclear Containment in Spain", was presented by Mr. F. Robledo of Consejo de Seguridad Nuclear (Spain). This paper address the more relevant aspects of regulatory process in Spain, pay-

ing special attention to those aspects related to the containment building, and the legal foundations of the regulatory process. This legal framework, necessary for the differences between the German and American regulations, provides a common position in the regulatory requirements on the Spanish plants in case of design basis accidents (DBA). Besides Mr. Robledo provides a picture of the regulatory process for severe accident in Spain, which is still under elaboration.

The third paper, "EU Research in the Field of Containment Integrity against Severe Accidents Performed as Cost-Shared Projects" was presented by Dr. G. Van Goethen of European Commission (DG XII, Science, Research & Development). This was an excellent summary based on the Reactor Safety program of European Union (EU). This program was organised as a Reinforced Concerted Action (RCA 1992-95) covering research activities based on joint experimental and analytical programme in the area of severe accident phenomena, both for existing and next generation Light Water Reactor (LWRs). The total founding was shared between Community (ECU 13 million) and 20 European Organisations (ECU 49 million), coming from 9 out of 15 member countries of the EU and from some East-European countries. In particular, this presentation shows the objective and the achievements of the specific CONT project, that is the assessment of the mechanical and thermal containment response for different accident scenarios, including the examination of mitigation systems for ex-vessel molten corium retention, hydrogen risk reduction and containment cooling.

The last paper of this first plenary session, "Structural Performance of AGR Prestressed Concrete Pressure Vessel at Elevated Temperature", was by Dr. J.O. Oyinloye, (Electrowatt Engineering Services Ltd). The paper described the derivation of material, design and thermal-hydraulic data required to assess the structural behaviour of prestressed concrete pressure vessels (PCPV) used in Advanced Gas Reactors (AGR) at elevated temperature. In particular, data on the high-temperature proprieties of different concrete mixes were used to compare the structural behaviours of PCPVs. The thermal-structural assessment shows that the PCPV will retain its overall structural integrity when concrete temperature reaches 400°C (650°C in a future work) at about 2 days. This has been confirmed by localised assessments of most vulnerable penetrations.

**Other Sessions** - About 40 papers, presented in

oral sessions and poster sessions, are published as Conference Proceedings. The scientific quality of papers, reviewed by international and qualified referees, was very high. These sessions were an opportunity to have an up-to-date overview of the international containment research, in particular about the assessment of the response of both existing and new containment design during normal operations and in accident situations, including the effect of advanced passive systems. The subdivision of papers in the different sessions is in the following, also illustrating the different containment items addressed:

- Sessions 2&3 Containment Design (15 papers)
- Session 4 Modelling of Containment Behaviour (4 papers)
- Session 5 Containment Cooling (5 papers)
- Session 6 Accident Management&Leakage (3 papers)
- Session 7 Hydrogen (5 papers)

#### Sessions 8&9 Level 2 Analysis (9 papers)

This Conference provided a forum for the presentation of current developments in all aspects of containment design, evaluation and operation to further improve the nuclear plant safety. In the future, the main problem open to be investigated is the scaling factor of the experimental facility used for the hydrogen distribution behaviour and for the verification of the proposed mitigative devices, based on passive mechanisms.

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### A Note from the Editor

Members, who have paid the membership fee but did not send their Biographical Questionnaire, please send the Questionnaire to the Editor as soon as possible.

Members, who have sent the Biographical Questionnaire but did not pay the membership fee, should pay the fee to ICeM.

The annual membership fee is ¥3,500 (Japanese yen) (¥1,500 for members of the Japan Society of Multiphase Flow (JSMF) ); the fee for 3 years(1997-1999) is ¥10,000.

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- ICeM will send the membership card and the receipt of membership fee for those who pays the fee.
- The ICeM Newsletter is published twice a year and the next issue will be published in October 1997.
- Space may be bought in the Newsletter for advertisements. Please contact the Editor for details and rates.
- Any questions/comments are also welcome.

**Report on 5th International Conference on Multiphase Flow in Industrial Plants  
September 26-27, 1996, Amalfi, Italy**

by Snamprogetti S.p.A.

The 5th International Conference on Multiphase Flow in Industrial Plants held in Amalfi (Italy), September 26-27 1996, has been organized by the Multiphase Fluid Mechanics Section of ANIMP (Italian Association of Industrial Engineers and Contractors) in cooperation with AIDIC (Italian Association of Chemical Engineers) and the Chemical and Food Engineering Department of the University of Salerno.

The Conference provided 41 papers of good scientific interest: 9 papers were prepared by non Italian authors. The number of attendants increased with respect to last Conference event, dated 1994. The international character of the Conference has been confirmed by the participation of highly qualified experts and authors as:

- Profs. Duo, Boerefijn, Lim, Arteaga, Ghadiri from the University of Surrey (UK)
- Dr. Williams from Shell International, Amsterdam (NL)
- Dr. J.S. Duffield, from J.R.C. European Commission
- Prof. Tardos from CUNY, New York (USA)
- Prof. Godfrey from University of Bradford (U.K.)
- Prof. Banerjee from University of California, Santa Barbara, CA (USA)
- Dr. Hayati from Borax Europe Ltd, Guildford (U.K)
- Profs. Delamarche, Gorgels, Grootveld, Scarlett from Delft University of Technology (NL).

The objectives of the Conference were to bring together the multiphase fluids science community. The researchers, designers, experimentalists, modellers and numerical analysts in this area had the opportunity to meet for high level scientific and technical interchange of ideas, to stimu-

late discussion and liaisons between specialist groups, to exchange their expertise and experiences to further incite their research activities.

The session has been opened by Reg Davies from Central Research and Development Experimental Station of du Pont de Nemours (USA), who overwied the Main Aspects and Advances in Particle Characterization Techniques for Multiphase Systems.

These are topics covered during Conference technical sessions:

- Transport and pumping systems;
- Stabilization and transport of emulsions;
- Generation of multiphase systems;
- Multiphase mass transfer operations;
- Mixing and separation systems;
- Measurement and control of flow parameters.

Special focus was given to the stabilization and transport of oil-in-water dispersions, introduced by E. Borgarello (Eniricerche, Italy), who presented Fundamentals and Applications of the Use of Dispersions for the Transportation of Heavy Oils in Water.

The scientific work of various attendants produced satisfactory results, giving rise for new development on the field of multiphase systems.

Conference Proceedings in English are available at ANIMP, Via Spalato 11/2, 20124 Milano (Italy). Ph: +39-2-6070242, Fax: +39-2-6070245.

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**Report on The Fourth International Symposium on Heat Transfer  
October 7-11, 1996, Beijing, China**

by X. F. Peng

The Fourth International Symposium on Heat Transfer at Beijing held at Tsinghua University in Beijing, China, October 7-11, 1996, included four plenary sessions, nine keynote lectures and over 100 general papers presented at 17 technical sessions. The symposium also included a forum on research exchange and international cooperation to encourage scientific cooperation and effective research coordination to meet the challenge of the 21st Century. This symposium was attended by people from research institutes, universities and various industries from twenty-one countries. It was a successful symposium with international participation.

The nine symposium keynote lectures provided a thorough assessment of the state-of-the-art on research in various fields. The current "hot topics" that were addressed gave insights into heat transfer phenomena in numerous advanced technologies. Topics included microscale heat transfer, cryopreservation of living organs, interfacial heat and mass transfer in microgravity, heat transfer in the Czochralski crystal growth process, bursting and heat transfer in turbulent boundary layers, flow boiling of refrigerant binary mixtures, fluid mechanics and heat transfer mechanisms in reciprocating flow, and some fundamental aspects of heat transfer from tubes in crossflow. A key project in China connected with the research and effective utilization of nuclear energy was also discussed. All of these topics are important to the development of new advanced technology.

General papers provided new understanding, improved experimental data and improved methods of prediction in many areas. Conduction heat transfer in composite and metallic materials was discussed for systems with and without phase change. Various convective flow phenomena were discussed for both steady and transient, single- and two-phase flows including natural, mixed and forced convection flows and for systems utilizing jet impingement or falling liquid films. Various aspects of flow condensation and boiling were considered with special emphasis on various aspects of CHF, especially with non-

uniform heat flux distributions such as encountered in nuclear reactor safety. Thermal radiation and combustion was analyzed for systems including furnaces and pool fires. Heat transfer in various practical complex configurations was also analyzed including heat transfer in porous media analyzed using non-Darcian models. Numerous different microscale transport problems were considered including systems with Marangoni interfacial effects, thermocapillary flow in thin liquid layers, and the performance of micro-thermosyphons. Several innovative mechanisms were presented for enhancing heat transfer in heat exchangers and heat pipes. The application of combined heat and mass transfer processes in material processing, crystal growth and ice formation were also considered. Energy transport processes were analyzed for various types of energy systems, including biological waste water treatment, contamination detection, air-conditioning, and power plant air heaters. The broad range of papers presented at the Fourth International Symposium on Heat Transfer in Beijing proved interesting and useful to a wide range of people from various disciplines within the heat transfer community.

The tremendous amount of excellent, high quality original research in this symposium will have an impact on heat transfer developments worldwide for years to come. The interesting and open discussions that accompanied the many paper presentations were a very important part of the symposium. The exchange of ideas not only promoted the understanding of the physical laws in heat transfer in special topics but also served to build up personal friendships in the international heat transfer community.

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**Report on 12th International Conference on MHD Electrical Power Generation**

**October 15-18, 1996, Yokohama, Japan**

by S. Shioda and Yoshihiro Okuno

The 12th International Conference on MHD Electrical Power Generation was held at Yokohama, Japan in Oct. 15-18, 1996. The objective of the conference is to provide significant results achieved since the last conference held in Beijing, 1992, covering wide range of engineering and scientific fields related to MHD (Magnetohydrodynamic) power generation and its applications. The international conference on MHD has a long history over the last thirty four years. During the period, significant amount of progress and achievements have been reported both scientifically and technologically, such as, achievement of sufficient enthalpy extraction ratios 10-35 %, demonstration of long duration test over 1000 hrs, successful geophysical application of pulsed MHD generator, good agreement between numerical simulations and experiments, establishment of thermodynamical system of power trains and superconducting magnets, etc.

The 12th international conference was organized by Tokyo Institute of Technology, under the leadership of ILG-MHD(the International Liaison Group on MHD) Inc., in co-operation with SEAM (USA), IVTAN (Russia), IEE of China, CNR (Italy), Consorzio (Italy) and the Japanese MHD Society, the Institute of Electrical Engineers of Japan and the Japan Society of Mechanical Engineers.

	Attendant	Paper
China	11	9
Italy	4	10
Japan	>100	58
Korea	1	--
Netherlands	1	--
Poland	2	3
Russia	15	31
Ukraine	--	5
USA	5	5
Total	~150	121

The conference consisted of plenary, oral and poster sessions. In the plenary sessions, reviews of topics related to MHD technology were presented. In the oral and poster sessions, results of studies were reported by each author of the paper. This combination provided a good communication, particularly for young scientists and students. A wide range of topics related to MHD

technology was given in the conference. Among them, several items which seem to be important for the future of MHD are pointed out as follows.

(1) It is reported that experiments of coal fired open cycle MHD power generation is and will be continued in China. It must be recognized that open cycle MHD has the highest possible efficiency (50% or more) and lowest environmental impact among advanced coal fired electrical power plants presently developed.

(2) Achievement of enthalpy extraction ratio higher than 30 % and adiabatic efficiency 50 % are reported in closed cycle MHD (ICD) experiments with thermal input 0.5 - 3MW. Now it is required that experiments with thermal input of 10 MWt must be conducted in order to demonstrate 60 - 70 % adiabatic efficiency. Also test of continuous operation with a closed loop is required to show technical feasibility of the ICD power plant.

(3) Studies on pulsed MHD generators and its application to geophysical sounding are conducted under the international cooperation.

(4) New concepts and new applications using MHD generators and MHD accelerators are proposed. Among them, the system of zero stack emission open cycle MHD power generation are important from the future global environmental point of view. It has the possible efficiency of 45% which can be compared to 30 - 35 % of gas turbine combined cycle. Application of closed cycle MHD (ICD) to nuclear fusion reactor is attractive for efficient conversion of heat from fusion reactors to electricity.

(5) It is stressed in the conference that attentions should be paid to the areas of space and material processing to which MHD technology is applicable. In this sense, T-layer MHD generators with plasma clots are interest for space and other applications.

The next 13th International Conference will be held in China, 1999.

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**Report on 1996 Chinese National Symposium on Combustion  
October 28-November 2, 1996, Wuhan, China**

by Lixing Zhou

The 1997 Chinese National Symposium on Combustion, sponsored by the Chinese Section of the Combustion Institute and the Chinese Society of Thermal science (Engineering Thermophysics), was held in Huazhong University of Science and Technology, Wuhan, China in October 28-November 2, 1996. There are 75 papers presented in the symposium proceedings and nearly 80 participants attended this symposium.

One of the main topics discussed at the symposium is the numerical modeling of gas-particle flows and combustion. New models and numerical methods, such as modeling of flows behind a bluff body using the lattice-gas-Boltzmann method, full two-fluid models of turbulent reacting gas-particle flows for simulating pulverized-coal and liquid-spray combustion, pdf transport equation model of methane-air turbulent combustion, two-phase second-order moment model

and different versions of modified k-epsilon models for simulating strongly swirling turbulent gas-particle flows, a multi-delta-pdf model of turbulent combustion, were discussed.

Other topics discussed at this symposium are: combustion behavior of coal/char particles; combustion technology for burning pulverized coal and coal-water slurry, circulating fluidized-bed and other-kind fluidized-bed combustors; formation and reduction of pollutant emission during coal combustion; liquid-spray combustion in internal combustion engines and gas-turbine combustors; combustion measurements.

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**Report on 1996 ASME International Mechanical Engineering Congress and Exposition  
November 17-22, 1996, Atlanta, Georgia USA**

by C. T. Crowe

This meeting was sponsored by the ASME Fluids Engineering Div. and K-15 Committee of the Heat Transfer Division. The purpose of the meeting was to provide a forum for the cross fertilization of ideas between materials processing and thermal fluid systems. The presentations were divided into four sessions: spray-coating technologies, spray casting technologies, melt processing and supporting subsystems. Dr. Masato Ikegawa of Hitachi, Japan, gave the invited address on fluid flow and heat transfer problems in semiconductor manufacturing.

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## Report on International Conference on Heat Transfer with Change of Phase "HEAT'96"

December 8-10, 1996, Kielce, Poland

by Artur S.Bartosik

The conference was organized by the Chair of Thermodynamics and Fluid Mechanics of the Kielce University of Technology under the scientific supervision of the Committee of Thermodynamics and Combustion of the Polish Academy of Sciences.

The conference was held at the luxurious Educational and Recreational Centre of the Polish Petroleum Company (CPN) in Machocice, near the city of Kielce.

The purpose of the conference was to provide an opportunity for specialists, particularly from Poland and Central Europe, to exchange ideas and present recent achievements to their colleagues from all over the world.

Sixty scientists from Poland, the United States, France, Israel, Macedonia, Ukraine, Germany and Slovakia participated in the conference. Thirty nine papers were delivered including eleven keynote lectures. The papers dealt both with experimental and theoretical aspects in the following fields: two-phase flow with heat transfer, boiling and condensation, melting, solidification and sublimation, multiphase flow. All papers were published in Scientific Papers of the Kielce University of Technology, Ser. Mechanics, vol. 61 (1996).

Each session of the meeting began with the presentation of keynote lecture, given by the leading specialists:

- \* A.Bergles, Rensselaer Polytechnic Institute (USA) - Enhancement of Phase-Change Heat Transfer.
- \* Z.Bilicki, Institute of Fluid-Flow Machinery (Poland) - The Effect of Thermodynamic Nonequilibrium on Flashing Flow.
- \* B.Donevski, University "St. Clement Ohridski" (Macedonia) - Examination of Predicted and Experimental Data of Void Fraction in Subcooled Flow Boiling.
- \* G.Hetsroni, Technion - Israel Institute of Technology (Israel) - Structural Features of Temperature Field on the Wall in a Turbulent Boundary Layer (with A.Mosyak, R.Rozenblit, L.P.Yarin and G.Ziskind).
- \* D.Hollingsworth, University of Houston (USA) - Applications of Liquid Crystal Thermography to Boiling Heat Transfer (with J.L.Hay and N.E.Dalrymple).
- \* J.Madejski, Committee of Thermodynamics and Combustion-PASci. (Poland) - Equilibrium and Non-Equilibrium in Processes of Heat Transfer with Change of Phase.

\* J.Mikielewicz, Institute of Fluid-Flow Machinery (Poland) - Modelling of Wavy Liquid Film Flow (with D.Mikielewicz).

\* M.Podowski, Rensselaer Polytechnic Institute (USA) - Mechanistic Modeling of Multidimensional Two-Phase Flow and Heat Transfer.

\* G.Smirnov, Odessa State Academy of Refrigeration (Ukraine) - Boiling in Capillary-Porous Structures (with B.A.Afanasiev and M.E.Poniewski, Poland).

\* J.Stasiek, Technical University of Gdańsk (Poland) - The Use of Thermochromic Liquid Crystals and Digital Image Processing in Heat Transfer and Multi-Phase Flow (with P.Dominiczak and Wierzbowski).

\* L.Witte, University of Houston (USA) - Two-Phase Heat Transfer in Microgravity (with L.B.Fare).

The closing session was devoted to the evaluation of the meeting and defining future plans. The participants highly praised the organization of the conference and its professional content. They expressed a need for holding such meetings regularly with greater participation of European scientists. The organizers truly believe that the conference initiated a series of scientific contacts contributing to the further development of international cooperation in the field of multiphase heat transfer. Our goal is to continue the idea of such a conference through the involvement of our foreign guests in organizing and scientific committees of the next meetings.

Mieczyslaw E. Poniewski - Head of the Organizing Committee.

Artur S. Bartosik - Scientific Secretary.

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## Report on Sixth Australasian Heat and Mass Transfer Conference

December 9-12, 1996, Sydney, Australia

by Chakravarti V. Madhusudana

The conference ran for three and a half days. It was held in honour of Graham de Vahl Davis, a leading international figure in the field of heat transfer. There were more than 70 participants from within Australia and Overseas.

The keynote speeches were:

1. Unnatural Natural Convection by Graham de Vahl Davis
2. Transport Phenomena in Highly turbulent Flames by Franz Mayinger
3. The Drying of Timber Boards by Roger Keey
4. Heat and Mass Transfer in Turbulent Combustion by Robert Bilger
5. The Fluid Mechanics of Natural Ventilation by Paul Linden
6. Thermal Contact Conductance of Coatings and Films by Leroy Fletcher

In addition, sixty five technical papers were presented. Each of these papers had been reviewed by two independent referees before being accepted for presentation. Topics included:

- Combustion
- Experimental Heat Transfer
- Heat and Mass Transfer in Drying
- Two Phase Flow
- Solar Heat Transfer

- Heat Transfer in Engines
- Convection
- Heat Transfer in Manufacturing
- Turbulence
- Heat Transfer in Fires
- Conduction
- Joint Thermal Conductance
- Environmental Heat Transfer
- Heat Exchangers

The conference proceedings will be published later this year by Begell House of New York. The conference chairman and secretary were, respectively, John Reizes and Chakravarti Madhusudana. Further information may be obtained from the secretary on email: madhu@cfm.mech.unsw.edu.au, or Fax: +61 2 9663 1222.

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## Report on the Fifth Asian Conference on Fluidized-Bed and Three-Phase Reactors

December 16-20, 1996, Hsitou, Taiwan

by L. P. Leu

Beginning in Tokyo in 1988, this conference is the fifth of a series. The Fifth Asian Conference on Fluidized-Bed and Three-Phase Reactors was held on December 16 -20, 1996 in Hsitou, Taiwan. There are 117 participants who came from Indonesia, Korea, Japan, Singapore, Taiwan, U. S. A., and Czech Republic attending the conference.

The conference consisted of eight sessions, respectively on; a) Fundamentals of Gas/Solids System; b) High Velocity Fluidization; c) Heat Transfer and Combustion; d) Emission Control; e) Applications of Gas/Solids System; f) Fundamentals of Liquid/Solids, Gas/Liquid and Gas/Liquid/Solids Systems; g) Heat and Mass Transfer; h) Bioreactor and Application. A total of 74 papers including oral and poster presentation was presented during the technical

sessions. All the papers presented were published as the proceedings.

The Sixth Asian Conference on Fluidized-Bed and Three-Phase Reactors will be held in Cheju Do Island on Dec. 1998.

Further information on the Fifth Asian Conference on Fluidized and Three-Phase Reactors can be obtained by

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**Report on GVC-Working Group "Multiphase Flow" of the German Society of  
Chemical Engineering (GVC) within the Verein Deutscher Ingenieure (VDI)  
February 26-27, 1997, Würzburg, Germany**

by D. Mewes

The GVC-Working Group Meetings are unofficial conferences of the mechanical and chemical engineers mostly experts from the chemical industry and the universities but also engineers from other companies with many kinds of chemical or biochemical related production units. The meeting takes place once a year and is by personal invitation. This meeting was on February, 26th and 27th, 1997, in Würzburg. 32 papers presented the latest results from actual projects in research, development, construction and production. The results was discussed within this group of experts. The presentations were divided into five groups each of them scheduled for half a day: bubble column reactors, gas-liquid flow, particles in gases and liquids, numerical computation, measurement technology.

L. Gui, R. Lindken, W. Merzkirch, T. Wagner: Measurement of velocity in multiphase flow using particle-image-velocimetry

M. Piesche, M. Bierdel, U. Janoske: Fluid dynamic instabilities within the shearing gap of dynamic cross flow filters

J. Nagel, O. Molerus, K.-E. Wirth: Studying a new method for handling very small particles and producing thin layers on the example of powder varnishing using liquid nitrogen

C. Riehle: Mobility - a size for characterization of disperse systems

T. Schiewe, K.-E. Wirth: Fluid mechanic characterization of the feeding device of a downer-reactor

B. Hirschberg, J. Werther: Mechanisms of mixing and separation of particles with different size and density in fluidized beds

G. Gneipel, P. N. Tuong: Shock and friction losses in a radial rotary pump for pumping heterogeneous disperse liquid-solid mixtures with large particles

G.E.A. Meier: Gas dynamics in multiphase flow with phase changes

J. Huhn, M. Wein: Critical mass flow and thermodynamic non equilibrium during fast expansion of a initial sub-cooled liquid

R. Diener, L. Friedel, K. Kiesbauer: Measurement of the mass flow rate within a control valve during two-phase flow

R. Eggers, A. Schmoll: Generation of liquid sprays under high pressure conditions

C. Schneider: Studies of the fluid dynamics of foam

M. Hartnagel, T. Seeger, A. Leipertz: Measurement of the oxygen concentration in multiphase flow using laser spectroscopy

L. Ebner, O. Reichel, I. Müller: A innovative method to provide maximum oxygen-supply for lakes

M. Schlüter, M. Hainke, N. Rübiger: Bubbles swarms in two-phase and three-phase flow

R. Praetor, B. Wunderlich, H. J. Kecke: Influence of bubbles on the flow-field, interaction of liquid and gaseous phase

M. Özkurt, M. H. Pahl: Influence of the shape of bubbles and the mass transport on bubble motion at the example of CO<sub>2</sub> and N<sub>2</sub> bubbles

M. Hainke, N. Rübiger: Minimal value of the velocity of the driving liquid stream and the void fraction of the circulating gas in a three-phase loop reactor

W. Cherdron, H. Sauter: Examination of invasive bubble detectors in the single bubble flow regime

T. Schröder, P. Walzel: Design of rotation sprayers considering the outlet geometry

M. Nädler, A. Tokarz, D. Mewes: The influence of emulsion formation on the flow of non miscible liquids in horizontal pipes

M. Creutz, D. Mewes: From the model formation up to the numeric calculation of multiphase flow fields

M. Sommerfeld, G. Kohnen, A. Mai: Numerical optimization of the spray coating of solid particles

A. Lapin, A. Lübbert: Progress in the simulation of bubble-column reactors

A. Rinne, R. Loth: Influence of directional resistance factors and virtual mass forces on the simulation of two-phase flow parameters

M. Jenne, M. Reuss: Influence of the k-ε model on the simulation of the flow in a mixing vessel

G. Kohnen, M. Sommerfeld: Numerical calculation of turbulent two-phase flow with regard to the influence of the disperse phase on the turbulence

M. J. Bouma, F. U. den Hartog, A. A. C. M. Beenackers: Modeling of the gas phase in gas-liquid contactors from the homogeneous up to the heterogeneous regime

R. Bonitz, G. Grabbert: Improved models for calculating the flooding of packed beds

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## Future Meetings

Listings include Conference Name, Place, Date and Contact.

### **INFUB, 4th European Conference on Industrial Furnaces and Boilers**

Porto, PORTUGAL, April 1-4, 1997  
Prof. A. Reis, Fax: +351 2 973 0746

Krasnokazarmennaya 17A, Moscow 111250  
RUSSIA, Fax: +7 095 362 55 90  
Dr. G.P. Celata, Tel.: +39 6 3048 3905  
Fax: +39 6 3048 3026  
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### **Control of Particulate Processes IV**

Delft, THE NETHERLANDS, April 6-9, 1997  
Engineering Foundation Conferences, 345 East  
47th Street New York, NY 10017, Fax: +1-212-  
705-7411, E-mail: engfnd@aol.com  
Chairs: Prof. B. Scarlett, Delft University of  
Technology The Netherlands

### **CFD 97, Fifth Annual Conference of the CFD Society of Canada**

British Columbia, CANADA, May 25-27, 1997  
CFD 97 Conference Secretariat, Department of  
Mechanical Engineering, University of Victoria,  
P.O. Box 3055 MS 8895, Victoria, B.C. V8W  
3P6, Tel: (604) 721-6034, Fax: (604) 721-6051  
E-mail: cfd97@me.uvic.ca

### **Frontiers in Industrial Process Tomography - II**

Delft, THE NETHERLANDS, April 9-12, 1997  
Prof. Brian S. Hoyle, Department of Electronic  
and Electrical Engineering The University,  
Leeds, LS2 9JT, United Kingdom, Tel: +44-113-  
233-2056, Fax: +44-113-233-2032  
E-mail: b.s.hoyle@leeds.ac.uk

### **Imaging Technology: Techniques and Civil Engineering Applications**

Davos, SWITZERLAND, May 25-30, 1997  
Dr. Sue McNeil, Carnegie Mellon University  
Tel: +1-412-268-5675, Fax: +1-412-268-7813  
Email: mcneil@ce.cmu.edu

### **NUTHOS-5, Fifth International Topical Meeting on Nuclear Thermal Hydraulics, Operations, and Safety**

Beijing, CHINA, April 14-18, 1997  
Dr. Jason Chao, Technical Program Co-Chair,  
EPRI, 3412 Hillview Avenue, Palo Alto, CA  
94304, USA, Tel: +1 415 855 8901, Fax: +1 415  
855 1026, E-mail: JCHAO@MSM.EPRI.COM

### **The Second Israel Conference for Conveying and Handling of Particulate Solids**

Jerusalem, ISRAEL, May 26-28 1997  
Dr. Haim Kalman, Department of Mechanical  
Engineering, Ben-Gurion University of the  
Negev, P.O.Box 653, Beer Sheva, 84105, IS-  
RAEL; Tel: +972-7-472105, Fax: +972-7-  
472990, E-mail: kalman@menix.bgu.ac.il

### **Powders and Grains 1997 Third International Conference on Micromechanics of Granular Media**

Duke University, Durham, NC, USA, May 18-  
22, 1997  
Prof. Robert BEHRINGER, Department of  
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NC 27708-0305, USA  
Fax: (919) 660-2525, E-mail: bob@phy.duke.edu

### **CHT-97, International Symposium on Advances in Computational Heat Transfer**

Cesme, TURKEY, May 26-30, 1997  
Prof. G. de Vahl Davis, Fax: +1 2 663 1222  
E-mail: g.devahldavis@unsw.edu.au

### **2nd International Conference on Convective Flow and Pool Boiling**

Irsee, GERMANY, May 18-23, 1997  
Prof. F. Mayinger, Fax: +49 89 289 16218  
E-mail: may@thermo-a.mw.tu-muenchen.de  
Dr. G.P. Celata, Tel.: +39 6 3048 3905  
Fax: +39 6 3048 3026  
E-mail: celata@casaccia.enea.it  
Engineering Foundation Conferences, 345 E.  
47th Street New York, NY 10017, Fax: +1-212-  
705-7441, E-mail: engfnd@aol.com

### **Fifth International Conference on Nuclear Engineering**

Nice, FRANCE, May 26-30, 1997  
Pierre Lecocq, Senior VP and Technical Man-  
ager, EDF France, c/o French Nuclear Energy  
Society (SFEN), 69-73, rue Dutot, F-75015,  
Paris, FRANCE  
Dr. J. Costa, E-mail: costa@ntp.ce.fr  
Tel: +33.1.4419.6220, Fax: +33.1.4419.6222

### **International Symposium on the Physics of Heat Transfer in Boiling and Condensation**

Moscow, RUSSIA, May 21-24, 1997  
Prof. A.I. Leontiev, Chairman  
Dr. N.V. Medvetskaya, Scientific Secretary  
National Committee for Heat and Mass Trans-  
fer, Russian Academy of Sciences, IVT RAN,

### **8th International Stirling Engine Conference and Exhibition**

Ancona, ITALY, May 27-30, 1997  
Prof. C.M. Bartolini, Tel: +39 71 220 4772  
Fax: +39 71 280 4239

### **ARS '97, 2nd International Topical Meeting on Advanced Reactor Safety**

Orlando, FL, USA, June 1-4, 1997  
Prof. F. Oriolo, Tel: +39 50 585252, Fax: +39  
50 585265, E-mail: oriolo@ccii.unipi.it  
Dr. R.P. Taleyarkhan, Fax: +1 423 574 0740  
E-mail: zrt@cosmail1.ornl.gov

**4th World Conference on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics**

Brussels, BELGIUM, June 2-6, 1997  
 Prof. M.Giot, Tel +32-10-472200, Fax +32-10-452692, E-mail giot@term.ucl.ac.be  
 Dr. G.P. Celata, C.R. Casaccia ENEA  
 Heat Transfer Unit Head, Via Anguillarese, 301  
 00060 S.M. di Galeria, Rome, Italy  
 Tel.: +39 6 3048 3905, Fax: +39 6 3048 3026,  
 E-mail: celata@casaccia.enea.it

**Chemical Reaction Engineering VI: Chemical Reactor Engineering for Sustainable Processes and Products**

Banff, Alberta, CANADA, June 8-13, 1997  
 Prof. H. de Lasa, Chemical Reactor Engineering Centre, Department of Chemical and Biochemical Engineering, The University of Western Ontario, London, Ontario N6A 5B9, CANADA  
 Fax: +1-519-661-3498  
 E-mail: hdeLasa@charon.engga.uwo.ca

**2nd International Symposium on Turbulence, Heat and Mass Transfer**

Delft, THE NETHERLANDS, June 9-12, 1997  
 Prof. K. Hanjalic, Fax: +31 15 278 1204, E-mail: hanjalic@duttwta.tn.tudelft.nl  
 Dr. T.W.J. Peeters, Fax: +31 15 278 1204  
 E-mail: tim@duttwta.tn.tudelft.nl

**ITEEC 97, 3rd International Thermal Energy & Environment Congress**

Marrakesh, MAROQUE, June 9-12, 1997  
 Prof. A. Mir, Fax: +1 212 8 22 78 24/22 72 60  
 • **New Technologies Symposium**  
 Prof. V. Naso, Tel: +39 6 487 4839, Fax: +39 6 487 4838

• **Natural Convection Symposium**

Prof. J.K. Platten, Fax: +32 65 37 35 10

• **Thermal Buildings Symposium**

Prof. F. Haghghat, Fax: +1 514 848 7965

• **Fluidized Beds Symposium**

Prof. J Chaouki, Fax: +1 514 340 4159

• **Heat Pumps Symposium**

Dr. J. Labidi, Fax: +1 514 340 4159

• **Environment symposium**

Dr. M. Mansour, Fax: +49 89 3187 3371

**ISHTEEC '97, International Symposium on Heat Transfer Enhancement and Energy Conservation**

Guangzhou, CHINA, June 16-19, 1997  
 Prof. F. Mayinger, Fax: +49 89 289 16218  
 E-mail: may@thermo-a.mw.tu-muenchen.de  
 Prof. S.P. Wang, Fax: +86 20 5511616, E-mail: cespwang@scut.edu.cn

**8th International Conference Multiphase 97 How deep? How far? How soon?**

Cannes, FRANCE, June 18-20, 1997  
 Mrs Catherine Cox, Conference Organiser, BHR Group Limited, Cranfield, Bedfordshire MK43 0AJ, UK

Fax: +44-(0)1234 750074  
 E-mail: ccox@conf.bhrgroup.co.uk

**34th SEAM, Symposium on Engineering Aspects of Magneto hydrodynamics**

Mississippi State, MS, USA, June 18-20, 1997  
 Prof. Robert L. Cook, DIAL, P.O. Box MM, Mississippi State, MS 39762  
 Tel: +1-601-325-2105, Fax: +1-601-325-8465  
 E-mail: dial.msstate.edu  
 www: http://www.mssate.edu - select RESEARCH

**1997 ASME FED Summer Meeting**

Vancouver, Canada, June 22-26, 1997

• **7th International Symposium on Gas-Particle Flows**

Prof. D. Stock, Symposium Chair, Mech. Dept., Washington State Univ., Pullman WA 99164-2920, USA, TEL +1-509-335-3223, E-mail stock@mme.wsu.edu

Prof. Y. Tsuji, Faculty of Engineering, Osaka Univ., Suita, Osaka 565, Japan, Tel & Fax +81-6-879-7315, E-mail tsuji@mupf.meim.eng.osaka-u.ac.jp

• **6th International Symposium on Liquid-Solid Flows**

Dr. M. C. Roco, Symposium Chair, National Science Foundation, Engineering Directorate, Suite 525, 4201 Wilson Blvd., Arlington, VA 22230, Tel: +1-703-306-1371, Fax: +1-703-306 0319

• **6th International Symposium on Gas-Liquid Two-Phase Flows**

Dr. Timothy J. O'Hern, Sandia National Labs Engineering Sciences Center, MS 0826, Dept. 9111, Albuquerque, NM 87185-0826, USA  
 Tel: +1-505-844-9061, Fax: +1-505-844-8251  
 E-mail: tjohern@sandia.gov

Prof. Jean Bataille, L.M.F.A., Ecole de Lyon 69131 Ecully cedex, France  
 Tel: +33-72-18-61-56, Fax: +33-78-64-71-45  
 E-mail: bataille@mecaflu.ec-lyon.fr

• **Multiphase Flow Education**

Prof. K. Ravindra, Aerospace & Mechanical Engrg. Dept., Parks College of St. Louis Univ., Cahokia, IL 62206

Tel: +1-618-337-7575, Fax: +1-618-332-6802

E-mail: ravindra@pxa.slu.edu

• **Cavitation and Multiphase Flow**

Prof. Joseph Katz, Mechanical Engineering Dept., Johns Hopkins Univ., 118 Latrobe Hall, Baltimore, MD 21218

Tel: +1-410-516-5470, Fax: +1-410-516-7254

E-mail: katz@polaris.me.jhu.edu

• **Multiphase Flow - Work in Progress**

Prof. Andrea Prosperetti, Mechanical Engineering Dept., 122 Latrobe Hall, Johns Hopkins Univ., Baltimore, MD 21218, Tel: +1-410-516-8584, E-mail: prosper@titan.me.jhu.edu

• **Fluid Measurements & Instrumentation**

Prof. Gerald L. Morrison, Mechanical Engineering Dept., Texas A&M Univ., College Station, TX 77843-3123

Tel: +1-409-845-5414, Fax: +1-409-845-3081

E-mail: gmorrison@mengr.tamu.edu

• **Advances in Numerical Modeling of Free Surface and Interface Fluid Dynamics**

Prof. Peter E. Raad, Mechanical Engineering Dept. Southern Methodist Univ., 3160 SMU Boulevard, Dallas, TX 75205  
Tel: +1-214-768-3043, Fax: +1-214-768-1473  
E-mail: peter@seas.smu.edu

**Compact Heat Exchangers for the Process Industries**

Snowbird, Utah, USA, June 22-27, 1997  
Prof. Ramesh K. Shah, Department of Mechanical Engineering, University of Kentucky, Lexington, KY 40506-0108, USA  
Tel: +1-606-257-6043, Fax: +1-606-257-3304  
E-mail: shah@engr.uky.edu

**Energy-Related Process Integration Technologies-EUROTHERM Seminar 52**

Manchester, UK, June 26-27, 1997  
Prof. B. Linnhoff, Fax: +44 161 236 7439

**Mechanics of Granular Materials for the Joint ASME/ASCE/SES Summer '97 Meeting**  
Northwestern University, USA, June 29 - July 2, 1997

Prof. Wing Kam Liu, Northwestern University, Department of Mechanical Engineering, 2145 Sheridan Rd., Evanston, IL 60208-3111  
Fax: +1-708-491-3915  
E-mail: McNU97@nwu.edu, www: <http://www.mech.nwu.edu/McNU97>

**JSME Centennial Grand Congress - Toward the New Century -**

Tokyo, JAPAN, July, 1997  
Mr. M. Takahashi, Tel +81-3-5360-3508  
Fax +81-3-5360-3500

**Fourth International Conference on Technologies and Combustion for a Clean Environment**

Lisbon, PORTUGAL, July 7-10, 1997  
Prof. M.G.Carvalho, Mechanical Engineering Department, Instituto Superior Tecnico, Av. Rovisco Pais, 1096 Lisbon Codex, PORTUGAL  
Tel: +351-1-841 73 72 / 841 71 62  
Fax: +351-1-847 55 45 / 726 26 33  
www: <http://navier.ist.utl.pt/cleanair/>

**ISAC '97 High Performance Computing on Multiphase Flows**

Tokyo, JAPAN, July 18-19, 1997  
Prof. Y.Matsumoto, Dept. Mech. Eng., The University of Tokyo, Hongo, Bunkyo-ku, Tokyo 113, JAPAN, Fax: +81-3-3818-0835, E-mail: ymats@mech.t.u-tokyo.ac.jp

**International Conference on Fluid and Thermal Energy Conversion '97**

Yogyakarta, INDONESIA, July 21-24, 1997  
Dr. A. Suwono, Thermodynamics Research Laboratory, Inter University Center for Engi-

neering Sciences, Bandung Institute of Technology, Jalan Tamansari 126, Bandung 40132, INDONESIA, Tel: (62.22)250-2342, Fax: (62.22)250-1926, E-mail: thermo@ibm.net

**International Symposium on Radiative Transfer**

Kusadasi, TURKEY, July 21-25, 1997  
Prof. M.P. Menguc, Fax: +1 606 257 3304  
E-mail: menguc@engr.uky.edu  
www: <http://www.ewl.uky.edu/~enguc/rad.html>

**Tenth International Conference on Numerical Methods for Thermal Problems**

Swansea, UK, July 21-25, 1997  
Prof. R.W.Lewis, Institute for Numerical Methods in Engineering University of Wales Swansea, Singleton Park, Swansea, SA2 8pp, UK  
Tel: +44 1792 295256, Fax: +44 1792 295705  
E-mail: Thermal.Conference@swansea.ac.uk  
www: <http://www.swan.ac.uk/civeng/thermal/>

**The 2nd Pacific Rim Conference on Rheology**

Melbourne, AUSTRALIA, July 27-31, 1997  
Conference Secretary, PRCR2, Department of Chemical Engineering, The University of Melbourne, Parkville Victoria, AUSTRALIA 3052, Tel: +61 3 9344 7440, Fax: +61 3 9344 4153, E-mail: prcr2@unimelb.edu.au  
www: <http://gondwana.ecr.mu.oz.au/~chemeng/conference.html>  
Chair: David Boger

**3rd International Thermal Energy Congress**

Kitakyushu, JAPAN, July 28 - August 1, 1997  
Ms H. Okabe, Congress Secretary/ 3rd ITEC, AINEC Co., Ltd., 2408 Hyatt Residential Suites Fukuoka 2, 1-3-70 Momochihama, Sawaraku, Fukuoka, 814 JAPAN  
Tel: +81-92-852-1575, Fax: +81-92-845-5135  
E-mail: ainec@jms09.jeton.or.jp

**Tenth International Conference on Numerical Methods for Laminar and Turbulent Flow**

Swansea, UK, July 28 - August 1, 1997  
Prof. C.Taylor, Institute for Numerical Methods in Engineering, University of Wales Swansea, Singleton Park, Swansea, SA2 8PP, UK  
Tel: +44 1792 295256, Fax: +44 1792 295705  
E-mail: Flow.Conference@swansea.ac.uk  
www: <http://www.swan.ac.uk/civeng/flow/>

**Thermal Spray Processing of Nanoscale Materials**

Davos, SWITZERLAND, August 3-8, 1997  
Prof. Enrique J. Lavernia, Department of Chemical Engineering and Materials Science, Department of Mechanical and Space Engineering, University of California at Irvine  
Tel: +1-714-824-8714, Fax: +1-714-824-2262

**1997 National Heat Transfer Conference**

Baltimore, MARYLAND, August 10-12, 1997

Prof. G. Kojasoy, College of Engineering & Applied Science, Department of Mechanical Engineering, University of Wisconsin, Milwaukee, P.O. Box 784, Milwaukee, WI 53201  
Tel: +1-414-229-5639, Fax: +1-414-229-6958  
E-mail: kojasoy@csd.uwm.edu

**Improving the Practice of Pollution Prevention and Accident Prevention**

Crested Butte, CO, USA, August 17-22, 1997  
Dr. Robert B. Pojasek, Cambridge Environmental Inc., 58 Charles Street, Cambridge, MA 02141  
Tel: +1-617-225-0812, Fax: +1-617-225-0813  
E-mail: rpojasek@sprynet.com

**ICLASS-97, 7th International Conference on Liquid Atomization and Spray Systems**

Seoul, KOREA, August 18-22, 1997  
The Secretariat of ICLASS-97, c/o INTERCOM Convention Services, Inc. 4Fl., Jisung Bldg., 645-20 Yoksam 1-dong, Kangnam-gu, Seoul 135-081, KOREA  
Tel: +82 2 3453 2937, Fax: +82 2 3452 7292  
E-mail: intercom@soback.kornet.nm.kr

**4th International Conference on Moving Boundaries 97, Computational Modelling of Free and Moving Boundary Problems**

Ghent, BELGIUM, August 27-29, 1997  
Ms. Sue Owen, Conference Secretariat, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK  
Tel: +44 (0) 1703 293223, Fax: +44 (0) 1703 292853, E-mail: sue@wessex.witcmi.ac.uk

**The Second International Aerospace Congress**

Moscow, RUSSIA, August 31 - September 5, 1997  
Prof. M.R. Liberzon, 27, Petrovka street, Moscow, 103767 RUSSIA

**Fifth Triennial International Symposium on Fluid Control, Measurement and Visualization**

Hayama, JAPAN, September 1-4, 1997  
FLUCOME Desk, Kinki Nippon Tourist, 7th fl. Takakyu Bldg., 19 Kanda Matsunaga-cho, Chiyoda-ku, Tokyo 101, JAPAN  
Tel: +81-3-3253-6131, Fax: +81-3-3255-7128

**Eleventh Symposium on Turbulent Shear Flows**

Grenoble, FRANCE, September 8-11, 1997  
Prof. F.W.Schmidt, Secretary, Turbulent Shear Flows, Department of Mechanical Engineering The Pennsylvania State University, University Park, PA 16802 USA  
Tel: +1-814-865-2072, Fax: +1-814-863-4848

**World Tribology Congress**

Londra, UK, September 8-12, 1997  
J. Brown, Fax: +44 171 222 9881

**Heat Transfer in Single Phase Flow 5 - EUROTHERM Seminar 55**

Athens, GREECE, September 9-10, 1997  
Prof. K.D. Papailiou, Fax: +30 1 772 1658

**3rd European Fluid Mechanics Conference (Particular Session on: Multi-Phase Flows)**

Goettingen, GERMANY, September 15-18, 1997  
Prof. Dr. G.E.A. Meier, Institut fuer Stroemungsmechanik, DLR, Bunsenstrasse 10, D-37073 Goettingen, Germany; Tel: +49-551 709 2177; Fax: +49-551 709 2889

**NATO - Advanced Study Institute - Physics of Dry Granular Media -**

Stuttgart, GERMANY, September 15-26, 1997  
Institute for Computer Applications 1, Ms Marlies Parsons - NATO ASI 1997, Pfaffenwaldring 27, 70569 Stuttgart, GERMANY, Fax: +49 711 / 685 3658  
E-mail: cargese97@ical.uni-stuttgart.de

**5th UK National Conference on Heat Transfer**

London, UK, September 17-18, 1997  
Miss Anne Lomax, Fax: +44 1788 577182  
E-mail: alomax@icheme.org.uk

**11th ISAM Biennial Congress**

Sendai, JAPAN, September 23-26, 1997  
Prof. T.Takishima, First Department of Internal Medicine, Tohoku University School of Medicine, 1-1 Seiryomachi, Aoba-ku, Sendai 980-77 -JAPAN  
Tel: +81-22-717-7153, +81-22-717-7154  
Fax: +81-22-717-7156  
E-mail: isam@intl.med.tohoku.ac.jp, www: <http://www-intl.med.tohoku.ac.jp/isam/index.html>

**Thermal Management of Electronic Systems 3 -EUROTHERM Seminar 58**

Nantes, FRANCE, September 24-26, 1997  
Prof. J.P. Bardon, Fax: +33 40 68 31 41

**NURETH-8, Eighth International Topical Meeting on Nuclear Reactor Thermal-Hydraulics**

Kyoto, JAPAN, September 30 - October 4, 1997  
Dr. A. Takizawa, Nuclear Power R&D Center, the Tokyo Electric Power Co., Egasaki-cho 4-1, Tsurumi, Yokohama, Kanagawa 230, JAPAN, Tel: +81-45-585-8946, Fax: +81-45-585-8958, E-mail: nureth-8@rd.tepco.co.jp

**1997 International Symposium on Multiphase Flow**

Beijing, CHINA, October 5-7, 1997  
Prof. M.C.Ge, ISMF '97-Beijing, Chinese Society of Engineering Thermophysics, P.O.Box 2706, Beijing 100080, CHINA, Tel: 8610-6257-3330-516  
Fax: +8610-6257-5913

E-mail: GMC@etpservers.etp.ac.cn

**The Fifth Asian International Conference on Fluid Machinery**

Seoul, KOREA, October 5-8, 1997

Prof. Jung Yul Yoo, Department of Mechanical Engineering, Seoul National University, Seoul 151-742, KOREA, Tel: +82-2-880-7112, Fax: +82-2-883-0179, E-mail: jyyoo@plaza.snu.ac.kr

**Summerschool on Multiphase Flow (Hochschulkurs Mehrphasenströmungen)**

University Hannover, GERMANY, October 6-9, 1997

Dipl.-Ing. K. Grotjahn, Prof. Dr.-Ing. D. Mewes, Institut für Verfahrenstechnik, Universität Hannover, Callinstraße 36, D-30167 Hannover, GERMANY, Fax: +49-511-762-3031  
E-mail: gro@c36.uni-hannover.de

**Advanced Concepts and Techniques in Thermal Modelling 2 - EUROTHERM Seminar 53**

Mons, BELGIUM, October 8-10, 1997  
Prof. J. Henriette, Fax: +32 65 37 44 00  
E-mail: euro53@stecsci.fpms.ac.be

**Prevention of Damages in Power Plants III VDI-GET Conference, Braunschweig, GERMANY, October 8, 1997**

VDI Gesellschaft Energietechnik, Postfach 10 11 39, D-40002 Düsseldorf  
Fax: +49 211 6214-161

**International Symposium on Multiphase Fluid, Non-Newtonian Fluid and Physico-Chemical Fluid Flows '97 Beijing**

Beijing, CHINA, October 9-11, 1997  
Prof. Lixing Zhou, Department of Engineering Mechanics, Tsinghua University, Beijing 100084, CHINA, Fax: (+86-10)62785569  
E-mail: zhoulx@mail.tsinghua.edu.cn

**The Third international Conference on Fluid Dynamic Measurement and Its Applications**

Beijing, CHINA, October 14-17, 1997  
Prof. SHEN Xiong, Department of Engineering Mechanics, Tsinghua University, Beijing 100084, CHINA  
Fax: +86-10-62595569

**The Impact of Mineral Impurities in Solid Fuel Combustion**

Kona, HAWAII, November 2-7, 1997  
Engineering Foundation Conferences, 345 East 47th Street, NEW YORK, N.Y. 10017  
Tel: +1-212-705-7836, Fax: +1-212-705-7441  
E-mail: engfnd@aol.com, www: http://www.engfnd.org/engfnd  
Chair: T.F. Wall, CRC for Black Coal Utilization, Department of Chemical Engineering, University of Newcastle, Callaghan NSW2308, AUSTRALIA  
E-mail: cgtfw@cc.newcastle.edu.au

**International Symposium on Liquid-Liquid Two-Phase Flow and Transport Phenomena**

Antalya, TURKEY, November 3-7, 1997  
Dr. Faruk Arinc, ICHMT Secretary General, Mechanical Engineering Department, Middle East Technical University 06531 Ankara, TURKEY  
Tel: +90-312-210 5214 & 1429, Fax: +90-312-210 1331 & 1266, E-mail: arinc@metu.edu.tr, www: http://www.metu.edu.tr/~wwwichmt  
Prof. D.M. Maron, Fax: +972 3 502 6510  
E-mail: barad\_r@milk.cteh.ac.il

**AIChE 1997 Annual Meeting**

Los Angeles, USA, November 16-21, 1997  
(Proposals due: April 1, 1997)  
Dr. Dianne Dorland, E-mail: LA97@d.umn.edu

**ASME International Mechanical Engineering Congress & Exposition**

Dallas, Texas, USA, November 16-21, 1997  
• **Symposium on Dispersed Flow in Combustion, Incineration and Propulsion Systems**  
Prof. D.E. Nikitopoulos, Mechanical Eng. Dept. Louisiana State Univ., Baton Rouge, LA 70803  
Tel: +1-504-388-5903, Fax: +1-504-388-5924  
E-mail: meniki@me.lsu.edu

• **4th International Symposium on Fluid-Structure Interaction, Aeroelasticity, Flow-Induced Vibration & Noise**

Prof. Michael P. Paidoussis, Department of Mechanical Engineering McGill University, 817 Sherbrooke Street West, Montreal, QC, Canada H3A 2K6  
Tel: +1-514-398-6294, Fax: +1-514-398-7365  
E-mail: maryf@mecheng.lan.mcgill.ca

**IMP'97 - Modelling of Design and Fluid-Flow Machinery**

Gdansk, POLAND, November 18-21, 1997  
Maria Baginska, Institute of Fluid-Flow Machinery, ul. Gen. J. Fiszer 14, PL-80 952 Gdansk, POLAND, Fax: +48 58 41 61 44  
E-mail: maja@ziutok.imp.pg.gda.pl

**The Sixth Western Pacific Regional Acoustics Conference**

Kowloon, HONG KONG, November 19-21, 1997  
Dr. S. K. Tang, Department of Building Services Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, HONG KONG  
Tel: (852) 27665855, Fax: (852) 27746146  
E-mail: besktang@polyu.edu.hk

**The Tenth International Symposium on Transport Phenomena in Thermal Science and Process Engineering**

Kyoto, JAPAN, November 30 - December 3, 1997  
Prof. K. Suzuki, ISTEP-10 Secretariat, Department of Mechanical Engineering, Kyoto University, Kyoto 606-01, JAPAN  
Tel: +81-75-753-5250, Fax: +81-75-753-5851  
E-mail: ksuzuki@htrans.mech.kyoto-u.ac.jp

**Compact Fired Heating Systems - EURO THERM Seminar 54**

Louvain, BELGIUM, December 11-12, 1997  
Prof. E. Van den Bulck, Fax: +32 163 22985

**Fifth International Congress on Sound and Vibration**

South Australia, AUSTRALIA, December 15-18, 1997

Prof. Colin Hansen, Congress Secretariat, Fifth International Congress on Sound and Vibration, Department of Mechanical Engineering, University of Adelaide, 5005, AUSTRALIA  
Tel: +61 8 303 5460, Fax: +61 8 303 4367  
E-mail: icsv5@mecheng.adelaide.edu.au

**SFAIF-98, Space Technology & Applications International Forum**

Albuquerque, NM, USA, February 15-19, 1997  
Prof. Mary J. Bragg, Fax: +1-505-277-4950

E-mail: mjbragg@unm.edu

**A.2nd Conference on Future Space and Earth Science Mission**

Dr. Peter Ulrich, Fax: +1 202 358 3096

E-mail: peter.ulrich@hq.nasa.gov

**B.2nd Conference on Applications of Thermophysics in Microgravity**

Dr. Rodney Herring, Fax: +1 514 926 4766

Email: rodney@space.gc.ca

**C.3rd Conference on Commercial Development of Space**

Dr. Raymond P. Whitten, Fax: +1 202 358-2886

E-mail: rwhitten@osat.hq.nasa.gov

**D.3rd Conference on Next Generation Launch Systems**

Dr. Jess Sponable, Fax: +1 505 846 8930

E-mail: sponablj@plk.af.mil

**F.15th Symposium on Space Nuclear Power and Propulsion and Synergistic Technologies**

Dr. Michael G. Houts, Fax: +1 505 665 3167

E-mail: houts@lanl.gov

**Microscale Heat Transfer - EURO THERM Seminar 57**

Poitiers, FRANCE, February 1998

Prof. J.B. Saulnier, Fax: +33 49 49 81 01

**Heat Transfer in Radiating and Combusting Systems 3 - EURO THERM Seminar 56**

Athens, GREECE, April 1-3, 1998

Dr. E. Kakaras, Fax: +30 1 380 1712

**Gaviation 98 - 3rd International Symposium on Cavitation**

Grenoble, FRANCE, April 1998

J.M. Michel, LEGI/IMG, BP 53, F-38041

Grenoble Cedex 9

Fax: +33 0476 82 52 71

**EUROMECH Colloquium 376 - Waves in Two-phase Flows**

Istanbul, TURKEY, April 1998

C.F. Delale, Dept. Mech. Engineering, Istanbul

University, Avcilar Kampusu, 34850 Avcilar, Istanbul, TURKEY

E-mail: delale@yunus.mam.tubitak.gov.tr

**Fluidization IX**

Durango, USA, May 17-22 1998

Engineering Foundation Conferences, 345 E. 47th Street New York, NY 10017

Tel: +1-212-705-7836, Fax: +1-212-705-7441

E-mail: engfnd@aol.com, www: http://

www.engfnd.org/engfnd

Chair: Dr. L.S.Fan, Department of Chemical Engineering at The Ohio State University, E-mail: FAN.1@OSU.EDU

**ICMF '98-Lyon, 3rd International Conference on Multiphase Flow**

Lyon, FRANCE, June 8-12, 1998

(Abstracts due: July 15, 1997)

Prof. J. Bataille, Laboratoire de Mécanique des

Fluides et d' Acoustique, Ecole Centrale de

Lyon, BP 163, 69131 ECULLY cedex, France

Tel:+33 72 18 61 56, Fax:+33 78 64 71 45

E-mail: bataille@athena.mecaflu.ec-lyon.fr

www: http://www.mecaflu.ec-lyon.fr/ICMF98/

**1998 ASME Fluids Engineering Division Summer Meeting**

Washington, DC, USA, June 21-26, 1998

(Abstracts due: July 18, 1997)

Prf. C.T. Crowe, Washington State University, USA, Fax: 509-335-4662

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**Heat Exchangers for Sustainable Development**

Lisbon, PORTUGAL, June 22-25, 1998

Prof. M.G. Carvalho, Fax: +351 1 847 5545/726 2633

**Heat and Mass Transfer, and Thermodynamics of Inverse Cycle Machines - EURO THERM Seminar 59**

Nancy, FRANCE, July, 1998

Prof. M. Feidt, Fax: +33 83 59 55 51

**World Congress on Particle Technology 3 • Tird International Particle Technology Forum(Third IPTF)**

The Brighton Centre, ENGLAND, July 6-9, 1998

IChemE, Davis Building 165-189 Railway Terrace Rugby, CV21 3HQ, ENGLAND

Tel: +44-(0)1788-578214, Fax: +44-(0)1788-577182, E-mail: j.morgan@icheme.org.uk

www: http://icheme.chemeng.ed.ac.uk/wcpt.htm

Chairman: Prof. M.C.Roco, National Science Foundation, 4201 Wilson Blvd., Suite 525

Arlington, VA 22230, U.S.

Tel: 703 306 1371, Fax: 703 306 0319

E-mail: mroco@nsf.gov

**Ninth International Symposium on Application of Laser Techniques to Fluid Mechanics**

Lisbon, PORTUGAL, July 13-16, 1998  
(Abstracts due: December 19, 1997)  
Prof. Manuel V. Heitor, Dept. of Mechanical Engineering Instituto Superior Tecnico, Av. Rovisco Pais, 1096 LISBOA CODEX PORTUGAL, Tel: 351-841 73 79, Fax: 351-849 61 56  
E-mail: mheitor@termcomb.ist.utl.pt  
www: <http://gep.ist.utl.pt/Fluid-Laser-Symp>.

**11th International Heat Transfer Conference**  
Seoul, KOREA, August 23-28, 1998  
Prof. S.T.Ro, Tel +82-2-880-7111  
Fax +82-2-883-0179

**Second International Symposium on Measuring Techniques for Multiphase Flows**  
Beijing, CHINA, August 31-September 1, 1998  
(Abstracts due: August, 1997)  
Prof. Xu Yiqian, Thermoenergy Engineering Research Institute, Southeast University, Nanjing 210096, CHINA  
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**9th European Symposium on Comminution**  
Albi, FRANCE, September 8-10, 1998  
(Abstracts due: May 15, 1997)  
PROGEP Comminution 98, Florence Foucaud 18 Chemin de la Loge, 31078 Toulouse Cedex 4, FRANCE, Tel: +33 (0)5 62 25 23 80, Fax: +33 (0)5 62 25 23 18, E-mail: [Progep@ensigct.fr](mailto:Progep@ensigct.fr)  
www: <http://www.enstimac.fr/manif/comminution98>

**EFMC-3, 3rd European Fluid Mechanics Conference**  
Göttingen, GERMANY, September 15-18, 1998  
G.E.A. Meier, DLR Institut für Strömungsmechanik, Bunsenstr. 10, D-37073 Göttingen  
E-mail: [efmc97@msfd1.dnet.gwdg.de](mailto:efmc97@msfd1.dnet.gwdg.de)

**Energy-Related Process Integration Technologies - EUROTHERM Seminar 52**  
Manchester, UK, 1998  
Prof. B. Linnhoff, Fax: +44 161 236 7439

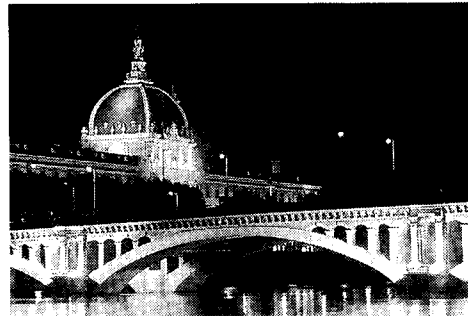
**2nd International Symposium on Two-Phase Flow Modelling and Experimentation**  
Pisa, ITALY, May 23-25, 1999  
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**Integral Methods in Science and Engineering 2000**  
Alberta, CANADA, June 12-15, 2000  
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# ICMF'98

THIRD INTERNATIONAL CONFERENCE  
ON MULTIPHASE FLOW 98

Lyon, France, June 8 - 12, 1998  
Palais des Congrès de Lyon



EUROPE <http://www.mecaflu.ec-lyon.fr/ICMF98/>  
USA <http://amy.me.tufts.edu/ICMF98>  
JAPAN <http://www.ijnet.or.jp/icmf98/>  
<http://www.ijnet.or.jp/JSMF/icmf98/>  
<http://www.ijnet.or.jp/JSMF/links.htm>



## Guideline for Applications

### Opportunities for Postdoctoral Researchers Fiscal Year 1997

Power Reactor and Nuclear Development Corporation (PNC), Japan

PNC offers the opportunity to researchers with unlimited originality to open up the new world of science and technology in the next century.

1. Number to be admitted  
Approximately six

2. Research system  
PNC will provide an independent environment where young, creative researchers can pour their originality into leading, basic, or fundamental research. Postdoctoral researchers are encouraged to make extensive use of the facilities provided by PNC. All researchers will receive advice and support from research fellows in their relevant sections or departments.

3. Research field  
Research fields include R & D on advanced power reactors, basic fields related to nuclear fuel recycling and R & D on radioactive waste geological disposal and geoscience study and other related fields to PNC.  
(For further information please see the attached "Examples of Research Themes" or ask R & D Planning Section, PNC: Tel +81-3-3586-3311 Ext. 2431.)

4. Qualifications  
Interested applicants must possess a doctorate (or expect to receive a doctorate), or have the equivalent research ability, and be aged less than thirty-five years old at the time of application. Applicants should be sound in health, self-motivating, and able to conduct research independently.

5. Commencement date of contract  
October 1, 1997 (scheduled)

6. Conditions  
Remuneration: Approximately ¥500,000 a month (including social insurance and tax).  
Research allowance: Up to a maximum of ¥1.58 million per annum.

Other allowances: Commuting allowances, residence allowances, etc. are provided separately.

Researchers are allowed to study at other research institutions for periods of up to two months per a year during the assignments in PNC if this should promote the effectiveness of their researches.

7. Length of research period  
In principle, three years or less. Contracts will be renewed according to the results of assess-

ments conducted on an annual basis.

8. Documents to be submitted / Method of application

- Application form specified by PNC
- Graduation certificates, certificates of completed courses of study (e.g. bachelor's, master's and doctor's courses).
- Certificates of results (e.g. bachelor's, master's and doctor's courses).
- Letter of recommendation (from universities, etc.).

Applications must be received at PNC by Friday June 6, 1997.

9. Screening schedule

- (1) Receipt of applications: From April to the beginning of June
- (2) Inspection of submitted documents: From the middle of June to the end of June
- (3) Notification of applicants successfully passing initial screening: End of June
- (4) Interviews / Health examination: Beginning of July
- (5) Notification of successful applicants: Middle of July
- (6) Signing of contracts: End of September

10. Address for inquiries

Mr. Kawahara or Mr. Kameda  
Technical Cooperation Office  
Technology Management Division, PNC  
1-9-13, Akasaka, Minato-ku, Tokyo 107, Japan  
Tel: +81-3-3586-3311 (Extensions 2370, 2371),  
+81-3-3586-3709 (Direct line available at night)  
Fax: +81-3-3583-6387  
E-mail: daigaku @pnc. go. jp

-----  
Examples of Research Themes

- R & D on advanced power reactors
- 1. Research on high temperature structural systems
  - (A) Sodium technology
    - 1) Thermohydraulics
    - 2) Monitoring / Measurement technology
- 2. Research on safety
  - (A) Improvement of core safety
    - 1) Research on fuel safety
    - 2) Research on core disruptive accidents
    - 3) Research on passive safety features
    - 4) Research on FBR safety test reactors
  - (B) Improvement of plant safety
    - 1) Research on coolant safety
    - 2) Research on source terms and containment safety assessments

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**Summerschool on Multiphase Flow  
(Hochschulkurs Mehrphasenströmungen)  
October 6-9, 1997, University Hannover, GERMANY**

by Dipl.-Ing. Kathrin Grotjahn

The advanced training course in multiphase flow measurement, analysis and design of chemical, nuclear and other energy converting processes will be held in Hannover, Germany, for the fifth time. It is attended by process engineers, chemists and physics from different industries mostly related to nuclear and conventional power stations, construction offices and production sides. The lectures are held by Prof. Mewes (Hannover), Prof. Mayinger (München) and their research assistants as well as by specialists from the industry. During the four days course the fundamentals of multiphase flows in pipelines and different kinds of large volume equipment are taught. New tomographic and other measurement methods for stationary and transient flows of gases and liquids are explained together with latest results of experimental and numerical work on multiphase flows in pipelines, bubble columns and special equipment of the chemical, biochemical and nuclear industry. Examples of transient flows in trickle bed reactors, structured packings, bubble columns and pipes are given.

Some items of the program are:

- Multiphase flow in horizontal pipe lines: Two- and three phase flows, flow patterns, pressure drops and emulsification,
- Dispersion of gases in liquids,
- Flows of two immiscible liquids,
- Fluidynamic instabilities, slug flow and intermitted flow,
- Fluidynamic modelling of bubble columns,
- Dynamic simulation of multiphase flows in volumetric complex chemical equipment,
- Visualisation of multiphase flows by methods, holographic and interferometric methods, by methods using fluorescence
- Instrumentation for multiphase flow measurement,
- Tomographic methods for multiphase flows: Measurement by integral or by local methods with different time scales, Technical applications for the pressure relief of chemical reactors, multiphase flow in the upper plenum of PWR and maldistribution in packed columns operated in co- and countercurrent flow.

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PRELIMINARY  
ANNOUNCEMENT  
IMSE 2000

*INTEGRAL METHODS IN SCIENCE  
AND ENGINEERING 2000*

**BANFF CONFERENCE CENTRE  
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JUNE 12 - 15, 2000**

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THE DEPARTMENT OF MECHANICAL ENGINEERING  
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**ISMTMF**

FIRST ANNOUNCEMENT AND CALL FOR PAPERS

**SECOND INTERNATIONAL SYMPOSIUM ON MEASURING TECHNIQUES FOR MULTIPHASE FLOWS**

August 31 - September 1, 1998  
Beijing China



**ORGANIZED BY**

- \* THE CHINESE SOCIETY FOR MEASUREMENT
- \* TSINGHUA UNIVERSITY, CHINA
- \* AUTOMATION RESEARCH INSTITUTE OF MINISTRY OF METALLURGICAL INDUSTRY OF CHINA
- \* THE PRODUCTION WELL LOGGING INSTITUTE, DAQING PETROLEUM ADMINISTRATION

**SPONSORED BY**

- \* NATIONAL NATURAL SCIENCE FOUNDATION OF CHINA

**OBJECTIVES AND SCOPE**

The first International Symposium on Measurement

Techniques for Multiphase Flows (ISMTMF) was held in Nanjing, China in 1995. More than 90 participants from 11 countries joined the conference and presented 73 papers covering both theoretical and applied topics on the measurement technology for multiphase flows. It was assessed a great success by all the participants. The major subjects of the further activities on the measurement techniques for multiphase flows were discussed during the conference. It was anticipated that the next international conference on the measurement techniques for multiphase flows would be held in Beijing, China in two or three years.

The Second International Symposium on Measurement Techniques for Multiphase Flows (ISMTMF) will be held in Aug. 30 - Sep. 1st, 1998 in Tsinghua University, Beijing, China. The objective of the ISM TMF '98 is to exchange information among participants, particularly between scientists and engineers working in fundamental research areas and those who engaged in technology development. The symposium will reflect the current international situation of measurement techniques for multiphase flows.

**For further information please contact with**

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**TOPICS**

General areas of interest are measurement techniques for

**multiphase flows:**

- \* New ideas and theories elucidate the newly developed multiphase flow meters and calibration facilities
- \* Measurement system design and experimental research
- \* Novel sensors, probes and instrumentation
- \* Non - intrusive measuring techniques
- \* Flow visualization and flow imaging techniques
- \* Signal and data processing
- \* Fundamental of multiphase flow measuring devices
- \* Industrial Application

**LANGUAGE**

English Only

**PAPER SUBMISSION**

Three copies of 500 words abstract should be sent to Organizing Committee of ISM TMF '98

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**SCHEDULE**

August, 1997 Deadline of Abstract (s) Submission  
October, 1997 Notification of abstract acceptance  
April, 1998 Deadline of Full Paper (s) Submission

**TECHNICAL VISITS AND SIGHTSEEING TOURS**

The technical visits and sightseeing tours including the post - Conference tour in China are being planned. Detailed information will be included in the second announcement.

## OBJECTIVES OF THE SYMPOSIUM

*The European Symposium on Comminution was organized for the first time in 1962 and the previous Symposium was held in Stockholm in 1994.*

The purpose of the Symposium is to provide a forum for the presentation and discussion of recent developments in science and technology relating to Comminution and Classification.

Comminution and Classification of all kinds of materials will be considered, i.e. minerals, metals, coal, chemicals, biological materials, pharmaceuticals, food, agricultural products, ceramics, pigments, fillers, etc...

Papers are welcome on equipment and process developments, as well as applied research and basic research.

An exhibition of equipment, books, instruments and control systems will be organized in conjunction with the Symposium.



### Some of the areas to be covered in the Symposium will be

- Fundamentals and micro-processes including fracture physics, particle breakage, material characteristics related to comminution, particle motion, classification and stressing in mills, local energy distributions...
- Mechanical activation and mecano-chemical reactions
- Classification in wet and dry systems of fine and coarse particles
- Modeling and simulation
- Machine design and practical experience
- Control and instrumentation
- Operation of comminution circuits and systems
- Wear in crushers and mills

### THE SYMPOSIUM

#### is supported by

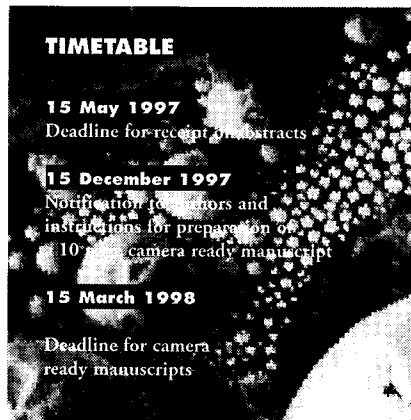
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**Comminution**

**8 - 10 september 1998**  
**Albi - France**



## SESSIONS

Papers will be presented in plenary and in parallel sessions.

All papers will be included in the conference preprints available at registration.

After the conference papers will be reviewed and published in a special volume of the journal *Powder Technology* and as a hardcover book.

## REQUIREMENTS FOR ABSTRACTS

Persons wishing to submit a paper should provide **three copies** of an abstract of at least 300 words giving as complete as possible a description of the work including the objectives, the claims made and the expected results. These abstracts should be submitted together with the attached application by mail, fax or electronic mail to the Symposium Secretariat **before 15 May 1997.**

### PROGEP

#### Comminution 98

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**NINTH INTERNATIONAL SYMPOSIUM ON APPLICATIONS OF LASER TECHNIQUE IN FLUID MECHANICS**

16, 19, 23 Lisbon, Portugal



The 9th International Symposium will run in parallel with the Lisbon World Exhibition, EXPO 98, and arrangements will be made to provide special visits to the participants of the Symposium

**ABSTRACTS**

Paper selection will be based upon extended abstracts of not less than 500 words, which should be typed double space and state the purpose, results and conclusions of the work with supporting figures as appropriate. Four copies of the abstract should be submitted to:

**LADOAN - 9**  
 c/o Prof. Manuel V. Heitor  
 Dept. of Mechanical Engineering  
 Instituto Superior Técnico  
 Av. Rovisco Pais  
 1096 LISBOA CODEX PORTUGAL  
 Telf. 351-841 73 79  
 Fax: 351-849 61 56  
 E-mail: mheitor@feamcomb.ist.utp.pt

<http://gep.ist.utp.pt/Fluid-Laser-Symp.>

**DEADLINES**

Final date for receipt of abstracts

**December 19, 1997**

Authors informed concerning acceptance

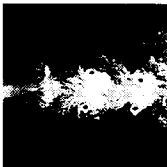
**March 6, 1998**

Final date for receipt camera-ready manuscripts

**May 22, 1998**



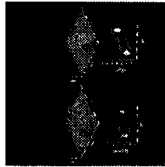
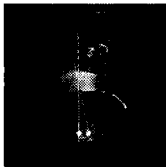
**INSTITUTO SUPERIOR TÉCNICO**



Approximately 40 formal sessions are planned. The format will involve presentations and structured discussions.

Contributed papers are welcome in the following areas:

- Turbulent flows
- Unsteady flows
- Hydrodynamic and aerodynamic flows
- Reacting flows
- Two phase flows and related instrumentation
- Particle sizing
- Developments of instrumentation for laser anemometry
- Whole field velocimetry
- Optical methods for temperature, density, concentration
- Imaging methods for scalar fields



Workshops in specialist topics may be arranged (to be discussed in formal discussions).

Possible topics will include:

- Wall and local heat and mass flux
- Surface measurements of pressure and temperature
- Emissions from Engines and Turbines
- Comparison of techniques for improved understanding

