



The International Information Center for Multiphase Flow

# NEWSLETTER

No.6  
April 1996

The Japan Society of Multiphase Flow

## THE MULTIPHASE FLOW INTERNATIONAL PRIZE

Recognizes an individual's significant scientific/technical contributions to the field of multiphase flow research, as well as outstanding leadership in promoting scholarship, research, development and education in this field. The Prize will be announced in March 1997, and the awardee will be invited to deliver a keynote lecture at the International Conference of Multiphase Flow (ICMF'98) in Lyon (France) in June 8-12, 1998.

### Selection criteria:

- Scientific originality and degree of generality (60%)
- Scientific/technological relevance (30%)
- Synergism resulted from international and/or industry collaborations (10%)

A manuscript to be submitted to the International Journal of Multiphase Flow is required.

Sponsor: IEA of Japan, Co. and ICMF'98

Nominations Deadline: November 1, 1996

Prize: A plaque, a certificate and a cash award, to be presented at the ICMF'98

## THE YOUNG SCIENTIST MULTIPHASE FLOW BREAKTHROUGH AWARD

Recognizes an individual's significant scientific/technical breakthrough(s) in the field of multiphase flow research, made by a researcher younger than 40 years at the date of the Award pre-

sentation. The Award will be announced in March 1997, and the awardee will be invited to deliver a keynote lecture at the International Conference of Multiphase Flow (ICMF'98) in Lyon (France) in June 8-12, 1998.

### Selection criteria

- Scientific originality and degree of generality of the breakthrough (50%)
- Scientific/technological relevance (25%)
- Overall professional performance, including the quality of PhD thesis, journal publications, education in multiphase flow, professional society activities (25%)

A manuscript to be submitted to the International Journal of Multiphase Flow is required.

Sponsor: Eastman Kodak Co. and ICMF'98

Nominations Deadline: November 1, 1996

Award: A plaque, a certificate and a cash award, to be presented at the ICMF'98

### The International Multiphase Flow Award Committee

Prof. M.C. Roco, Head  
Prof. M. Bohnet (Germany),  
Dr. G.-P. Celata (Italy),  
Dr. J.-M. Delhaye (France),  
Prof. D. Joseph (USA),  
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Prof. T. Theofanous (USA),  
Dr. A. Tsuge (Japan),  
Prof. Y. Tsuji (Japan),  
and Prof. L. Zhou (China), Members

### 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.

#### Chairman(Editor):

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### Call for Nominations

Nomination Form to the International Multiphase Flow Award Committee for:

THE MULTIPHASE FLOW INTERNATIONAL PRIZE  
or  
THE YOUNG SCIENTIST MULTIPHASE FLOW BREAKTHROUGH AWARD

#### Background Data

Name of the Award  
Name of the Nominee  
Present Position  
University Education (institution, degree, year)  
Positions Held (institution and location, position held, dates)  
Membership in Professional Organizations  
Honors  
Sponsor's Name and Address

Citation (no more than thirty words, that reflect specific accomplishments)

Qualifications (identification and evaluation of the accomplishments on maximum 2 double spaced pages; list of selected references published by the nominee; refer to the award's selection criteria; a resume may be included)

Supporting Letters (up to three letters to be attached to the nomination; the Award Committee members may not write supporting letters)

For nominations write to: The International Multiphase Flow Award Committee,  
Prof. M.C. Roco  
National Science Foundation, 4201 Wilson Blvd., Suite525, Arlington, VA 22230, USA  
TEL +1-703-306-1371; FAX +1-703-306-0319.

#### 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) (¥1,000 for members of the Japan Society of Multiphase Flow (JSMF)).

Please send your remittance to the Editor in one of the following ways.

- 1) *International Postal Remittance Service*
- 2) *Postal Giro Account*  
Account Number: 00370-2-17483  
Name of the Account: ICeM
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- 4) *Checks drawn by Hanil Bank in Korea are also acceptable (to G. Matsui).*  
\*Personal checks are not acceptable.

- 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 1996.
- Space may be bought in the Newsletter for advertisements. Please contact the Editor for details and rates.
- Any questions/comments are also welcome.

## **International scale organization in multiphase flow field**

NY, and Rome, Italy for discussion of a proposal of the Japan Society of Multiphase Flow (JSMF) last year(1995) by the request of JSMF. JSMF's proposal was to establish an international organization which will make the decisions on the future locations and hosts of International Conference on Multiphase Flow (ICMF) to develop it. Many constructive opinions were expressed in the meetings by attendees. Based on these opinions, JSMF updated the proposal. Prof. Ayukawa, President of JSMF, sent all attendees the following letter. This letter shows the progress of the matter.

February 1, 1996

Dear Colleague,

I wish to thank you for attending the meetings held after the Second International Conference on Multiphase Flow (2nd ICMF) in Hilton Head, USA; Saratoga-Springs, USA; and Rome, Italy. Discussions at these meetings, which were organized by the Japan Society of Multiphase Flow (JSMF) centered around the future of the ICMF beyond the 3rd ICMF.

JSMF has set up a Working Group (WG) under JSMF's International Exchange Committee (chairman: Prof. Y. Matsumoto, The University of Tokyo) to deliberate on the growth of the ICMF, based on the thoughts mentioned below.

Our ideas are summarized as follows:

The 1st and 2nd International Conferences on Multiphase Flow (ICMF) succeeded in gathering many researchers from around the world, and promoted the exchange of results between various fields such as gas-liquid flow, gas-solid flow, and solid-liquid flow. These interactions advance the establishment of "Multiphase Flow" as an integrated science and engineering discipline.

To continue to promote the development of research on multiphase flows along the successful line established by the preceding conferences, the objective for the ICMF should be to become the most established conference in this field, maintaining standards of high quality, and developing its potential to promote the science and technology of multiphase flow through integration of various fields. Since there are many researchers in multiphase flow who have not participated in previous ICMF's, the ICMF must develop in such a way as to attract their interest and participation. The need and opportunity for creating an International Society on Multiphase Flow should be considered after careful deliberation on the growth of the ICMF.

In order to achieve this objective, JSMF and I wish to emphasize the importance of a successful 3rd ICMF. In cooperation with Professor Bataille, the conference organizer, we intend to contact researchers in the field of Multiphase Flow to increase the number of participants at future ICMF's.

Many opinions and proposals were offered at the meetings to the draft of "Setting up an Assembly" which was proposed by the representatives of the JSMF Working Group: Prof. Y. Tsuji at Hilton Head and Rome and by Prof. A. Serizawa at Saratoga-Springs. Again, I thank those who offered their opinions and proposals at the meetings.

After synthesizing the opinions and proposals offered at the three meetings, JSMF would like to offer the following proposal to the researchers concerned:

1. As suggested by Professor G. Hewitt, a "Working Party" should be established to consider ways to achieve the objective of continued growth of the ICMF.
2. The selection of members of the Working Party will be entrusted to three persons (Prof. J. Bataille from Europe, Prof. C.T. Crowe from the U.S. and Prof. Y. Tsuji from Japan).

I believe that deliberations on the growth of ICMF should be entrusted to the Working Party, and its discussion should not be constrained by any previous proposals offered at the three meetings.

I hope our proposal meets with your agreement.

Please contact Professor Y. Tsuji, the coordinator of the JSMF Working Group, if you have any comments.

Yours sincerely,



Kyoza Ayukawa  
President of the Japan Society of Multiphase Flow

## Gas-Liquid Two-Phase Flow Research in Canada

by M. Kawaji

Canadian researchers in many Universities, government laboratories and various companies are engaged in a broad range of multiphase flow research activities that are of interest to oil/gas, chemical, nuclear and other industries. This article describes some of the current research activities in Canada known to the author specifically in the area of gas-liquid two-phase flow.

UNIVERSITY OF TORONTO - Both fundamental and application oriented research projects are conducted using air/water, air/kerosene, freon, and steam/water two-phase flow loops in the author's laboratory. The fundamental structures of horizontal annular flow, stratified wavy flow, horizontal and vertical slug flows, and countercurrent annular flow have been investigated using a flow visualization technique called Photochromic Dye Activation method [UT-1 - UT-6]. For example, recent results have clearly indicated the existence of organized motion or vortices under wavy interfaces in stratified flow and falling liquid films, that can explain the enhancement of interfacial and wall-to-liquid heat and mass transfer rates in such flows [UT-7].

Other industrially important two-phase flow problems studied are the gas-liquid phase and flow rate distributions in compact heat exchangers used for automobile air conditioning [UT-8], steam/water two-phase flow in large-diameter pipes [UT-9] and large centrifugal pumps used in nuclear power plants [UT-10]. The latter two projects were conducted in collaboration with the Ontario Hydro Technologies (OHT) in Toronto using the Pump Test Facility and were supported by Canadian, Japanese, and American nuclear industries. These large-scale, high-pressure steam/water experiments were conducted to better understand the geometry and scale effects on multi-dimensional gas/liquid two-phase flow in industrial scale flow channels. Two-phase flow characteristics in tube bundles under cross-flow conditions and two-phase flow induced vibration of tube bundles have also been investigated by the author's group in collaboration with OHT. Two-phase flow characteristics such as void fraction and pressure drop have been well characterized in air/water and boiling freon flows [UT-11 - UT-13]. More recently, two-phase flow regimes in tube bundles have been identified objectively based on the local void fraction fluctuation characteristics, and the two-phase damping

of tubes in both cross and parallel flows has been found to be directly related to the void fraction fluctuations [UT-14, UT-15].

McMASTER UNIVERSITY - Countercurrent flooding phenomena in complex pipe geometries similar to CANDU reactor's feeder pipes have been recently investigated by Prof. M. Shoukri's group [MU-1]. His research group has also conducted experimental studies on the two-phase flow characteristics of refrigerant (R-134A) and the use of orifice and turbine flow meters to measure the refrigerant mass flow rate [MU-2 - MU-4]. Other research projects currently underway in his laboratory are: phase separation in piping junctions, flow regimes and local void fraction distribution in large diameter vertical pipes, flow induced vibrations in liquid-vapour cross flow over tube bundles (conducted by Professors D. Weaver and R. Judd). The diabatic two-phase flow studies include interfacial phenomena in subcooled flow boiling, convective flow boiling in narrow channels (with Prof. R. Judd), rewetting of hot vertical tubes by falling liquid film in the presence of rising non-condensable gases, EHD enhancement of convective boiling heat transfer (with Prof. J.S. Chang).

Professor J.S. Chang's research group has been conducting studies on the application of neutron radiography for void fraction measurement [MU-5] and has compared the results with those of a high-speed X-ray tomography method developed in Japan [MU-6]. Two-phase flow in a horizontal pipe with a rod bundle has been studied in connection with the Primary Heat Transport System characteristics of CANDU nuclear reactors [MU-7]. In addition, two-phase flow characteristics and condensation enhancement by steam pulsation in a reflux condenser have been investigated [MU-8, MU-9].

Professor M.H.I. Baird is conducting studies on gas-liquid flow behaviour in a 15 cm diameter reciprocating plate column. The plates are doughnut shaped with a close fit to the wall, and internal diameter 7 cm. When the plates are reciprocated in water, periodic vortices are formed at the plate, and these tend to increase the gas holdup, which is a function of gas flow rate and energy dissipation rate per unit volume [MU-10].

UNIVERSITY OF NEW BRUNSWICK - A neutron scattering technique has been used to measure void fraction in thick-walled tubes by

Prof. E.M.A. Hussain's research group [UNB-1]. A fast neutron scattering system has been developed to measure void fraction in boiling water flows in pipes with 22 mm I.D. (wall thickness = 3 mm) and 127 mm O.D. (with a 7-mm wall thickness). In addition, a device for measuring the void fraction in a channel containing a seven-element rod bundle has also been developed. In all of these systems, isotopic sources of modest radioactivity have been used, enabling the design of well-shielded and portable devices.

UNIVERSITY OF BRITISH COLUMBIA - Professor J.R. Grace has been conducting research on the analogy between flow regime transitions in gas-liquid and gas-solid two phase flows [UBC-1]. In collaboration with Professor N. Epstein, Prof. Grace's group is also studying the flow regimes and their transitions in three-phase (gas-liquid-solid) flows, in particular at higher gas superficial velocities than covered in previous work. As part of this project, and in particular to ground the criteria for distinguishing flow regimes, extensive measurements of hydrodynamic properties and flow regimes have been made in gas-liquid two-phase flows. These results will be presented later this year at a chemical engineering conference.

Professor D. Fraser is working on modelling of critical two-phase flow, and experimental and analytical studies of heat transfer and two-phase flow involving alternative refrigerants including single component and multi-component systems. His group has also started a project on supercritical water oxidation to investigate heat transfer and fouling of heat exchangers (due to salt deposition) in a scaled facility. The working fluids include water, brine solutions and a sludge representative of pulp mill effluents. His group is also investigating with Prof. M. Salcudean, the bubble growth dynamics during subcooled boiling in a vertical test section.

UNIVERSITY OF SASKATCHEWAN - Professor K. Rezkallah is conducting research in three major areas. To improve heat transfer in a run-around heat-recovery system, a two-phase flow coupling fluid is used between the exhaust and supply air exchangers. The result is a much higher heat transfer coefficient in the heat exchangers yielding a significant improvement in the system overall thermal effectiveness [US-1, US-2]. The work has also resulted in a U.S. patent No.5,441,103: "Two-Phase Flow Heat Exchange." In the second project, two-phase flow experiments are conducted under reduced

gravity for application to thermal transport systems and material processing in space. Experimental data for flow regimes, pressure drop, gas void-fraction and heat transfer coefficients were gathered under microgravity during several KC-135 flights. A flow regime map and correlations and models for the predictions of local and average heat transfer coefficients were also published [US-3 - US-8].

The third area is the numerical modeling of gas-liquid bubbly flow under normal and microgravity conditions. The first project in this area involves the analysis and tracking of the moving interface using a Volume of Fluid (VOF) technique. Numerical simulation of the onset of bubbly flow at microgravity conditions, and the progression of the bubble growth and deformation are done using a supercomputer. Another project involves the numerical simulation of phase velocities, gas-void distribution, and turbulence dissipation in bubbly flow at earth gravity and microgravity conditions [US-9, US-10].

UNIVERSITY OF MANITOBA - Most of the research in the area of multiphase flow at the University of Manitoba is carried out jointly by Professors G.E. Sims, S.J. Ormiston and H.M. Soliman. The individual projects are as follows.

- Analytical and experimental determination of the flow-regime boundaries during condensation of pure vapors in horizontal and inclined tubes [UM-1].
- Numerical prediction of fluid flow and heat transfer during film condensation on plates in the presence of noncondensable gases [UM-2].
- Heat transfer and hydrodynamics in two-phase, two-component (gas-liquid) flow in a vertical tube, involving the measurement of heat transfer coefficients, pressure drop and void fraction in a wide range of flow regimes [UM-3].
- Phase redistribution and pressure drop during gas-liquid flow at tee junctions. The effects of branch diameter and fluid properties are investigated for different inlet conditions and split ratios. Experimental and analytical studies are being pursued [UM-4].
- Two-phase discharge through single and multiple branches from stratified regions. Different branch configurations are currently being tested. The phenomena of interest include the onsets of gas and liquid entrainment, mass flow rates and quality of discharge [UM-5, UM-6].

ECOLE POLYTECHNIQUE MONTREAL - Professor C. Guy is conducting two-phase and multi-phase reactor research, involving mainly

hydrodynamics and mass transfer in bubble columns [EP-1], airlifts and three-phase fluidized bed [EP-2]. His latest contributions are the application of a new convective model to describe the gas phase flow in bubble columns [EP-3], and the application of a radioactive particle tracking technique (with Prof. J. Chaouki) for the characterization of the hydrodynamics of the solid phase in three-phase fluidization [EP-4].

**ATOMIC ENERGY OF CANADA, LTD.** - At the Whiteshell Laboratories in Manitoba, two-phase flow and heat transfer studies are conducted in connection with CANDU reactor design and safety. The main test facility, RD-14M, is an 11 MW, full elevation, scaled model of a CANDU heat transport system, including a simulated core, full height steam generators and coolant pumps. The facility operates at pressures/temperatures up to 10 MPa and 310 C. Experiments are conducted by Dr. P. Ingham and others to study the thermalhydraulic behaviour of a CANDU reactor during LOCA's, forced and natural circulation cooling, flow stability and other topics [AE-1, AE-2].

Dr. S.R. Mulpuru and M. Hogeveen Ungurian are conducting an experimental study on the flashing water jets and generation of water droplets that may carry dissolved fission products into the containment building during postulated accidents. High-enthalpy water is discharged through small nozzles of different sizes and geometries, and a Phase Doppler anemometer is used to measure the droplet sizes and velocities [AE-3].

Dr. J. Kowalski and others are conducting experimental studies on boiling heat transfer on the finned elements and two-phase (gas-liquid) header injection tests. Boiling heat transfer rates are measured in a vertical, concentric-annulus test section consisting of an outer glass tube and an electrically heated cylinder with longitudinal, rectangular fins. The onset of nucleate boiling (ONB) and significant void (OSV) on finned surfaces was investigated for high subcooling and high flow conditions [AE-4 - AE-6]. Analytical and experimental studies were also performed to determine CHF and measure void fraction using a gamma densitometry technique [AE-7, AE-8]. For the header injection tests, the Large-Scale Header (LASH) facility at Stern Laboratories Inc. (SL) in Hamilton, Ontario is used to investigate the two-phase flow behaviour in CANDU headers under postulated accident conditions. The facility consists of two horizontal headers (inlet and outlet) connected by thirty feeders. Ex-

periments are performed by injecting a two-phase, steam-liquid water mixture into the inlet header at pressures between 1 and 5 MPa to study the flow and phase distributions within the inlet and outlet headers, and the thirty connecting feeders. Another Header/Feeder facility located at Whiteshell is constructed of clear acrylic, which allows for the visual observation of two-phase flow during air/water injection experiments at near atmospheric pressures.

At Whiteshell, other test facilities are also available to study or test characterize the thermalhydraulic behaviour of CANDU reactor components such as the end fitting, orifices and turbine flow meters under steam-water flow conditions. The Waterhammer Facility is used to study cold waterhammer in 50 mm piping by collapsing one or more vapour pockets (voids) at the top of the facility (the facility is about 20 m high) at room temperature. Various void sizes and vapour pocket pressures (subatmospheric) are examined. New and improved two-phase flow instruments are developed for void fraction measurements at high temperatures and pressures (300 C and 10MPa). Optical fibre probes, a variety of conductivity probe arrays, multi-beam gamma-densitometers, and neutron scatterometry are being investigated. Recently, efforts have been made to improve the durability and rangeability of turbine flow meters. Most of the work, with the exception of boiling heat transfer on finned surfaces, was funded by the CANDU Owners' Group through the Safety Thermalhydraulics Working Party.

At the Chalk River Laboratories in Ontario, Dr. S. Yin and others are involved in the measurement and analysis of CHF, post-dryout and pressure drop in special subchannels in connection with the CANDU reactor core thermalhydraulics research. Working fluids cover water and Freons (R-12, R-22 in earlier years, presently only R134a) over a wide range of operating conditions. Other research projects are as follows.

- Advanced CANDU fuel bundle CHF and pressure drop experiment in Freon 134a covering radial flux profiles significantly different from the standard CANDU natural uranium radial profile.
- Two-phase flow maldistribution experiment in inlet headers of shell-and-tube process heat exchangers for the purpose of optimizing the header geometry design.
- High velocity and high heat flux flow boiling experiment and modelling in tubular channels for fusion reactor design applications.

- Development of user-friendly heat transfer packages involving all regimes for engineering design and basic research purposes.
- Experiments on and analysis of heat transfer and CHF enhancement in tube and bundle geometries (Dr. R. Sollychin)

ALBERTA RESEARCH COUNCIL - Many of the past and current research projects in the area of two-phase flow are related to the oil/gas industry and Dr. D.M. Nguyen, Dr. P. Toma and their colleagues are involved in the following investigations.

- gas lifting of oil wells using a novel "one-level" injection technology which has been successfully tested in the laboratory and in field tests,
- use of gamma densitometry for phase identification and metering,
- studies on countercurrent vapor-condensate flow in porous media with applications to steam stimulation of heavy oil reservoir-gravity drainage from horizontal wells,
- gas (combustion)-liquid flow in porous media during in-situ combustion processes,
- multi-phase pumping of gas-oil-water producing wells using progressive cavity pumps, and
- development of liquid film distributors for evaporators used in industrial water purification systems.

ONTARIO HYDRO TECHNOLOGIES - In addition to the collaborative work with the University of Toronto described earlier, Dr. A.M.C. Chan is conducting condensation induced waterhammer tests in order to accurately measure waterhammer transients in simple pipe geometries and to produce benchmark data for the validation of the current advanced thermalhydraulic and stress analysis methodologies. In the OHT Waterhammer Test Facility, a large number of test data have been acquired using a 5.6 m long vertical test pipe (2" or 4" in diameter) under various initial and boundary conditions.

Two-phase pressure drop has been measured across a full size secondary steam separator of the CANDU 600 reactor design in a simulated main steam-line rupture event in a PWR or PHWR. The OHT High Pressure/Temperature Test Loop, rated at 13.8 MPa and 316 C, was blown down from 4.8 MPa (260 C) to atmospheric pressure, and pressure, temperature, void fraction and two-phase mass fluxes were measured both upstream and downstream of the test section. Depending on the discharge flow rate which was controlled by a valve, qualities be-

tween 5-25% were obtained at the inlet to the test section. The performance of large and small centrifugal pumps is studied under off-normal operating conditions with detailed local flow parameter measurements including void and flow distributions and two-phase mass fluxes at the pump suction [OH-1, OH-2]. Two pumps with impeller diameters of 77 cm and 33.4 cm have been already tested and the third with a 17.6 cm diameter impeller will be tested in 1996.

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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.

## Report on 3rd International Symposium on Coal Combustion and International Symposium on Mathematical Modeling of Turbulent Flows

by Lixing Zhou

- Third International Symposium on Coal Combustion, Tsinghua University, Beijing, China, September 18-21, 1995.

This Symposium is the continuation of the First and Second Symposiums held at the same place in 1987 and 1991 respectively. Three invited papers and 80 session papers were presented from the following 15 countries:

Australia, Canada, China, Finland, France, Germany, Holland, Japan, Korea, Portugal, Russia, Sweden, Switherland, the United Kingdom and the United States. Fundamentals and numerical modeling of gas-particle flows and coal combustion and their application in pulverized-coal burners and furnaces and fluidized-bed combustors, also related technologies were discussed. The proceedings of this symposium was published by the Science Press, Beijing.

- International Symposium on Mathematical Modeling of Turbulent Flows, The University of Tokyo, Tokyo, Japan, December 18-20, 1995.

12 invited papers, 35 oral session papers and 22 poster session papers were presented by the participants from the following 8 countries:

China, France, Germany, Holland, Japan, Korea, Turkey and the United States. New turbulence models, validation of existing turbulence models, application of turbulence models, direct numerical simulation, modeling of turbulent multiphase flows and compressible flows were discussed.

In developing new turbulence models, a multi-scale Reynolds stress equation model, improved modeling of dissipation term, diffusion term and nonlinear modeling of pressure-strain term for this model, a two-scale k-e model, a third-order nonlinear k-e model, a modified k-e model accounting for near-wall effect, k-e model with modified dissipation term in the e-equation, and k-e model with a fourth-order tensor viscosity are proposed.

In validating existing models, it has been shown that the nonlinear multiscale k-e model is better than the standard k-e model in predicting confined swirling co-axial jet flows, and the direct numerical simulation of annular flows is compared with that using the Reynolds stress equation model for validating different terms in the RS model.

In modeling multi-phase flows, a k-e-PDF model is proposed and used for simulating sudden-expansion gas-particle flows, giving better results in simulating nonisotropic turbulence than other existing two-phase turbulence models, for example, the k-e- $\Delta p$  model and k-e-kp model. Modeling of gasparticle flows with glass beads using the standard and two-scale k-e models and its comparison with LDV measurements shows reduction of gas turbulent kinetic energy when adding particles.

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### WWW Server Information for ICMF'98

"On-line information about the 3rd International Conference On Multiphase Flow to be held in LYON, France from June 8 to June 12, 1998(ICMF'98)" can be directly obtained from the WEB Site which has been recently created.

Its address is

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

The information contained in this document will be regularly updated.

If you have any special question to ask about the organization of the conference, you may contact via e.mail at the following address:

Prof. Jean Bataille, Laboratoire de Mécanique des Fluides, et d'Acoustique  
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## Report on the International Symposium on Two-Phase Flow Modelling and Experimentation October 9-11, 1995, Rome, Italy

by Gian Piero Celata

The International Symposium on Two-Phase Flow Modelling and Experimentation, organized by the Assembly of World Conferences on Experimental, and by the ENEA Centre of Thermal-Fluid Dynamics, was held in Rome from 9 to 11 October 1995.

A total of 173 papers plus 6 invited lectures have been presented in three parallel sessions, well attended by the over 220 participants coming from more than 30 countries, providing a clear indication of how well the world-wide scientific community is networked. Papers presented covered a wide spectrum of two-phase flow systems, spanning from the experimental investigation of complex fundamental aspects of two-phase flow to practical and industrial applications, from modelling to numerical analysis, testifying the continued vitality and vigour of two-phase flow research work. The Symposium was aimed to create a forum for a close cooperation between experimentalists and modellers. Advancements in the knowledge of two-phase flow phenomena necessitates a close working relationship among experimentalists, modellers and numerical analysts in order to produce the maximum synergism. Computation may provide the direction for the conduct of efficient experimentation, while experimentation is necessary to verify complex computational codes and for complex situation for which no reasonably accurate numerical analysis is possible, and as a basis for modelling of phenomena. Quite interesting the six invited lectures, summarized in this report.

Y. Murao (JAERI) showed present difficulties of two-phase flow modelling in best estimate thermal hydraulics codes. Problems are mainly due to the difficulty in extrapolating current experimental information to actual conditions (artificial test conditions as well as boundary and initial conditions, limitations in the sensors, assumptions in data analysis, etc.). S. Banerjee (University of California at Santa Barbara) provided information about the structure and the transport processes in the turbulent behaviour of gas-liquid free interfaces. Phenomena are strictly depending on interface shear conditions and on wave presence, and are of interest also for their implications in environmental problems. H. Lemonnier (CEA/CEN Grenoble) reviewed the recent measurement techniques for local analysis in multiphase flow. Nuclear Magnetic Resonance (NMR) allows to get information on the flow structure, such as the velocity distributions

of each phase (when each phase can be excited separately, as is the case of freon-water mixtures), on flow pattern transitions, on the turbulence of both the phases. As a forthcoming issue, pulsed NMR technique may also provide information about spatial velocity distributions and phase fraction in three-phase systems. Void fraction and flow pattern of two-phase flow regimes may be also investigated with success using the Electric Impedance Tomography technique based on multi-probe devices.

F. Mayinger (Technical University of Munich) outlined the importance of optical (non intrusive) techniques, such as holographic interferometry and high-speed cinematography (coupled to modern image processing systems), in the comprehension of two-phase flow phenomenology. As an example, holographic interferometry can give useful information on the heat transfer at the phase interface, i.e. for bubble condensing in a subcooled liquid or for bubbles coming out from thermal boundary layers in evaporating systems. J.R. Thome (Swiss Federal Institute of Technology of Lausanne) reviewed flow boiling problems in horizontal tubes. He evidenced the lackings in current design methods, such as the boiling suppression factor, the two-phase convective multiplier, the prediction of stratified flow, thermal-fluid dynamic non-equilibrium, providing indications on the areas still requiring further research actions.

G.F. Hewitt (Imperial College of Science, Technology & Medicine of London) provided a survey of multiphase flow problems encountered in hydrocarbons production either on-shore or off-shore. In these cases the multiphase flow may be made by water, air, sand and petroleum, presenting typical characteristics which cannot be deduced by the two-phase flow systems knowledge. The 173 papers presented at the Symposium dealt with a wide spectrum of two-phase flow topics, either for boiling and condensing systems or for adiabatic (gas-liquid) systems: modelling, fundamental equations and closure laws, interfacial and film flow phenomena, turbulence, jets, bubbly flow, pressure drop, instrumentation and measurement techniques, critical heat flux, flow pattern and structure, phase separation, heat transfer enhancement, nuclear reactor safety, combustion. The wideness of treated topics and their deepening level both experimentally and theoretically, the large and qualified participation (most of participants were from foreign countries) conveys the Symposium the role

of reference international meeting on two-phase flow systems, with special emphasis on modelling, experimentation and their mutual interaction.

The 2nd International Symposium on Two-Phase Flow Modelling and Experimentation will be held in 1997, in Italy, provisionally in the early autumn.

Symposium Proceedings can be purchased by di-

rect order to ETS publisher,  
Fax: +39 50 20158.

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## Report on 1995 ASME Forum on Measurement Techniques in Multiphase Flows

### ASME International Mechanical Engineering Congress and Exposition (IMEC&E),

**November 12-17, 1995, San Francisco, CA, USA**

by Timothy J. O'Hern

The Forum on Measurement Techniques in Multiphase Flows was held at the ASME International Mechanical Engineering Congress and Exposition (IMEC&E), November 12-17, 1995, in San Francisco, CA. The forum was jointly sponsored by the Multiphase Flow Technical Committee and the Coordinating Group on Fluid Measurements of the ASME Fluids Engineering Division, and the Heat Transfer In Energy Systems Committee (K-6) of the ASME Heat Transfer Division. The organizers were T. J. O'Hern, A. Naqwi, C. Presser, and R. D. Skocypec.

Measurements in multiphase flows remain an important area in many industrial applications and constantly provide challenges for academic researchers and industrial practitioners alike. The spectrum of problems involving multiphase flow measurements is vast, ranging from jet propulsion to pipe flows. The scope of the Forum was recent developments in multiphase flow measurements, reflecting a balance between basic studies and practical applications. There were 35 papers, with authors from 10 countries, which were published in the Proceedings of the ASME Heat Transfer and Fluids Engineering Divisions, HTD-Vol. 321, FED-Vol. 233. The papers in the volume reflect the variety and richness of the field and the increasing need for accurate multiphase flow measurements in modern and conventional technologies.

The Forum was split into 7 sessions. The session "Combustion and Non-Isothermal Processes" included papers on time resolved CARS thermometry (Kawaguchi et al.), sulfur removal efficiency in a fluidized bed (Sahan), simultaneous measurements of particle size, deposition, and oxygen concentration in thermally stressed jet

fuel (Vilimpoc et al.), size and two-component velocity measurement of pulverized coal particles in a confined furnace (Maeda et al.), coal particle burning by microscopy (Belilovsky et al.), and real-time measurement of thermal properties for multiphase substances (Kaya). The session "Boiling/Phase Change Experiments" included papers on development of a surface array of microscale heaters to measure wall heat transfer underneath single bubbles in nucleate pool boiling (Kim and Kalkur), determination of the boiling enhancement mechanism caused by surfactant addition to water (Ammerman and You), measurements in flashing water jets using a phase-Doppler anemometer (Balachandar et al.), and transient discharge mass flow rate from a cryogenic tank during sudden depressurization (Akyuzlu and Arves). The session "Radiation Based and Other Techniques" included papers on void fraction measurements in bubble columns using computed tomography (Kumar et al.), void fraction measurements in two-phase flow using x-ray attenuation (Albrechtsen et al.), fast-neutron techniques for volume-fraction measurement (Hussein), a coarse tomograph of three phase flow using neural networks (Sorheim), sizing of irregular particles using a phase Doppler system (Naqwi), and spatial filtering velocimetry in multiphase flows (Petra). The two sessions "Bubbly Flow Measurements" included: nonintrusive measurements in dispersed bubbly pipe flow (Stanley et al.), experimental study of bubble dispersion and two-way coupling in a bubbly free shear layer (Rightley and Lasheras), experimental study of flow parameters in vertical three-phase flow (Woods et al.), application of electromagnetic velocity meter for measuring liquid velocity distribution in air-water two-phase flow along a large vertical pipe (Ohnuki

and Akimoto), characterization of multiphase pressure-change phenomena as observed across a bifurcating horizontal tee-junction (McBride et al.), method and instrument for study of rheology of two-and three-phase foams (Feklistov), liquid and gas velocity measurements using LDV in air-water duct flow (Vassallo and Kumar), cavitation nuclei measurements at sea (Gindroz et al.), local measurement in Freon R123 two-phase vertical upflow using bi-optical probe (Saito et al.), and characterization of granular media by analysis of the backscattering spot image (Arhaliass and Snabre). The session "Electrical and other techniques" included: the design and performance of a capacitance sensor for two-phase flow concentration measurements in a square duct (Thorncroft and Klausner), an investigation of wavelike gas-solids flow in pipelines (Knight et al.), electrical impedance tomography measurements in an air-water vertical bubble column (O'Hern et al.), a new algorithm for impedance imaging of two-phase flows (Lemonnier and Peytraud), capacitance measurements of local film thickness with cryogenic liquid flow (Serov et al.), and energy dissipative processes in high

speed water-solid particle erosion (Momber et al.). The final session "Sprays" included estimation of droplet drag and acceleration in swirling spray flames (Presser et al.), an instrument to measure extended particle size and velocity ranges in multiphase flows (Wood and Hess), time-resolved optical imaging of jet sprays and droplets in highly scattering medium (Galland et al.), and sizing study of droplets in an annular mist flow by immersion liquid method (Okada et al.).

The Forum was well attended and very successful. The next Forum on Measurement Techniques in Multiphase Flows will be held at the 1997 IMEC&E, November 16-21, 1997, Dallas, TX.

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## CALL FOR PAPERS

### 6th International Symposium on Gas-Liquid Two-Phase Flows 1997 ASME FED Summer Meeting June 22-26, 1997, Vancouver, B. C.

This Symposium is sponsored by the American Society of Mechanical Engineers (ASME) Fluids Engineering Division.

#### Purpose and Scope:

Gas-liquid flows appear in many engineering systems covering a wide range of applications: boilers and condensers, chemical process plants, nuclear reactors, electronic equipment cooling, and evaporators of refrigeration systems, to name but a few. The purpose of this Symposium is to provide an opportunity for engineers and scientists to meet in technical sessions to present the state-of-the-art, discuss new developments, and exchange ideas in this important area.

Papers are solicited which deal with any aspect of gas-liquid two-phase flow problems: experimental, numerical, analytical, modeling, and design. Topics covered in the Symposium include, but are not limited to, the following:

- hydrodynamic modeling
- two-phase flow instabilities
- flow patterns and transitions
- scaling of gas-liquid flow systems
- turbulence in two-phase flows
- two-phase flows in micro-gravity environments
- two-phase computations
- transport phenomena at phase interfaces
- instrumentation for two-phase measurements
- phenomena in multi-component two-phase flows
- dynamics of bubbles, droplets, and sprays
- new industrial applications of two-phase flows

#### Deadlines:

Abstract (300-500 words), four (4) copies:	July 19, 1996
Notification of abstract acceptance:	August 16, 1996
Full-length draft paper due:	October 4, 1996
Notification of final paper acceptance:	December 27, 1996
Camera ready paper due:	February 21, 1997

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**Report on The Symposium on Electrorheological Flows II**  
**American Society of Mechanical Engineers**  
**International Congress & Exposition**  
**November 12-17, 1995, San Francisco, California, USA**

by Dennis A. Siginer

This is the third Symposium on "Electrorheological Flows" sponsored

by the Fluids Engineering Division of the American Society of Mechanical Engineers (ASME). The first and the second were held

during the ASME Fluids Engineering Conference in Washington, D.C. on June 20-23, 1993 and the ASME International Mechanical

Engineering Congress & Exposition in Chicago, Illinois on November 6-12, 1994, respectively. The papers presented in these

Symposia are published by ASME in bound volumes which can be obtained from ASME headquarters in New York City USA. The bound volume numbers are FED-Vol. 164 (157 pages) and FED-Vol. 205/AMD-Vol. 190 (187 pages), respectively.

The next Symposium in the series also encompassing other smart fluids will be held during ASME International Mechanical

Engineering Congress & Exposition on November 17-22, 1996 in Atlanta, Georgia, USA. The title of the Symposium is

"Rheology and Fluid Mechanics of Nonlinear Materials".

The Fluids Engineering Division and ASME and other divisions within ASME fully recognize the importance of this field to emerging and developing technologies for the 21st century, and in particular its potential in providing a cutting edge to those fields, and intend to continue to organize periodically Symposia in this area to provide a platform for the latest developments.

The Symposium covered a wide spectrum of investigations in the field of electrorheological flows and fluids. The sessions were well attended and interesting new findings both from theoretical and applied points of view were presented.

The list of the papers presented which are published by ASME in a bound volume edited by D.A. Siginer and G.S. Dulikravich is given below:

A Vibration Damper Using Electrorheological Fluids in Squeeze:

Experimental Validation of Theoretical Models  
A.K. El Wahed, J.L. Sproston,  
W. Williams and R. Stanway

ER Linear Reciprocation Drive:  
Performance Limits  
M. Whittle and W.A. Bullough

Electrorheological (ER) Damper  
for Precision Applications  
S.B. Kudallur, G.H. Connors  
and K.W. Buffinton

Measuring Dielectric Constants of  
Electrorheological Fluids by  
Using an Electrodeless Method, a Q-meter  
Y.D. Choi and S.G. Kim

Effect of Strain Rate in the Quasi-Static Regime on  
the Strength of  
Electrorheological Flows  
Y. Li, Y. Chen and H. Conrad

Flow Characteristics of ER Fluids Between Two  
Parallel-Plate Electrodes  
T. Tsukiji and T. Utashiro

Dynamic Properties of Model Electrorheological  
Fluids  
C.M.F. Barry, C.A. Santos and R.G. Stacer

Electro-Magneto-Hydrodynamics: (Part 1)  
Introductory Concepts  
G.S. Dulikravich and S.R. Lynn

Electro-Magneto-Hydrodynamics: (Part 2)  
A Survey of Mathematical Models  
G.S. Dulikravich and S.R. Lynn

Tentative Analysis of Electrorheological Fluids by  
Energy Method  
G.Y. Meng, J.Y. Fang and H.R. Meng

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**Report on Fluidization and Fluid-Particle System  
in 1995 AIChE Annual Meeting  
November 12-17, 1995, Miami Beach, FL, USA**

by Wen-Ching Yang

There were altogether 13 sessions related to fluidization and fluid-particle systems sponsored by Particle Technology Forum at the 1995 AIChE Annual Meeting at Miami Beach, FL, USA. They are Fundamentals of Fluidization and Fluid-Particle Systems, Theory and Practice of Turbulent and Circulating Fluidized Beds, Liquid and Multi-Phase Fluidization, Solids Flow, Handling and Processing, Dynamics and Handling of Particulate Systems, Scale-Up of Multiphase Flow Processes, Advances in Solids Processing Technology, Particle Technology, Environmental Applications of Fluid-Particle Systems, Reaction Engineering in Fluid-Particle Systems, Transport Phenomena in Fluid-Particle Systems, and Fluidization in the Pharmaceutical Industry. In addition, three sessions related to powder technology were also organized. They were On-Line Monitoring Techniques in Particulate and Pharmaceutical Processing, Kinetics of Aggregation and Fragmentation in Particulate Systems, Advances in Powder Technology: A Plenary Tutorial.

As usual, the gathering was an international affair. It was represented by participants from Italy, Switzerland, Canada, Japan, Yugoslavia, Norway, England, Venezuela, Germany, New Zealand, Hungary, The Netherlands, Algeria, Taiwan, Bulgaria, and France. Altogether more than 120 papers were presented.

Professor John Chen of Lehigh University, the winner of 1995 Thomas Baron Award in Fluid-Particle Systems, delivered the Plenary Lecture on "Look a Cluster!". It was a thought-provoking and intellectual-stimulating presentation. The

complete text will be included in the AIChE Symposium Series volume now being prepared for publication in 1996.

The 1995 winners of the Particle Technology Forum Award, Professor Robert Pfeffer of New Jersey Institute of Technology, the Thomas Baron Award in Fluid-Particle Systems, Professor John Chen of Lehigh University, and the Fluidized Processes Recognition Award, Professor L. S. Fan of Ohio State University, were honored in the PTF award dinner held on November 14 at Diminique's Restaurant at Miami Beach, FL, USA. The dinner was presided by the PTF chair, Dr. Reg Davies of Du Pont and attended by representatives of the awards sponsors, Dr. Paul Nelson of Shell Development Company and Dr. Alan Weimer of Dow Chemical Company.

Professor Robert Pfeffer was recognized for his lifetime achievement in chemical engineering teaching and research, and his international leadership in particle science and technology. Professor John Chen was cited for his outstanding research and education contributions in multiphase transport phenomena and fluidization. Professor L. S. Fan was awarded for his excellence in research in the fluidization field, and dedicated service to the fluidization community.

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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.

**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 The International Symposium on Mathematical Modelling of Turbulent Flows December 18-20, 1995, Tokyo, Japan

by Hisaaki Daiguji

"Mathematical Modelling of Turbulent Flows" is a theme of a research project of the Ministry of Education, Science and Culture of Japan. The project has been ardently prosecuted by about 40 members receiving the Grant-in-Aid for Scientific Research on Priority Areas during fiscal years 1993-95. The International Symposium on Mathematical Modelling of Turbulent Flows was planned in the final year as a part of the activities of the steering committee of this research project and was held at the Sanjo Conference Hall in the University of Tokyo, Japan, on December 18-20, 1995.

The objectives of this international symposium are to develop the techniques of computer simulation of turbulent flows and to promulgate them by creating more universal and practical turbulent flow models through the mutual exchange of information among the researchers from different nations.

Main subjects are:

1. Newly developed turbulence models
2. Turbulent flow database by direct numerical simulation and large eddy simulation
3. Turbulent flow physics via direct numerical simulation and large eddy simulation
4. Validation of existing turbulence models through the use of the database
5. Application of existing turbulence models to various flow problems and limitation of their applicability
6. Modelling and simulation of compressible turbulent flows
7. Modelling and simulation of multiphase turbulent flows
8. Simulation and modelling of turbulent flow transition
9. Survey of turbulence models

In the Symposium there were 126 participants including 25 persons from abroad. And there were 52 oral presentations including 15 invited lectures and 19 poster presentations.

Invited lectures are:

1. Schumann U. (DLR Institut für Physik der Atmosphäre, Germany) : "Large Eddy Simulation of Atmospheric Turbulence in the Free Atmosphere"
2. Hanjalic K. (Delft University of Technology, Netherlands) : "On the Potential and Limitations of Some Second-Moment Closures: Recent Experience in Extensive Model Validation"
3. Maxey M. R. (Brown University, USA) : "Simulations of Dispersed Turbulent Multiphase Flow"
4. Shih T-H. (NASA Lewis Research Center,

- USA) : "Development in One-Point Turbulence Closures"
5. Su M. D. (Tsinghua University, China) : "Numerical Simulation of Complex Flow, Its Application and Prospect"
6. Sung H. J. (Korea Advanced Institute of Science & Technology, Korea) : "A New Low-Reynolds-Number  $k-\epsilon-f\mu$  Model for Predictions Involving Multiple Surface"
7. Durbin P. A. (Stanford University, USA) : "Towards Consistent Formulation of Scalar Flux and Reynolds Stress Closure"
8. Binder G. (Laboratoire des Ecoulements Géophysiques et Industriels, Grenoble, France) : "Forced Unsteady Turbulent Wall Flows: Experimental Results and Closure Models"
9. Miyake Y. (Osaka University, Japan) : "Regeneration and Self-Sustenance of Quasi-Streamwise Eddies"
10. Nagano Y. (Nagoya Institute of Technology, Japan) : "Modelling the Turbulent Heat and Momentum Transfer in Complex Flows with Various Prandtl Numbers"
11. Piomelli U. (University of Maryland, USA) : "Large-Eddy Simulation of Non-Equilibrium Flows"
12. Fu S. (Tsinghua University, China) : "Second-Moment Closure Modelling of Turbulence in Non-Inertial Frame"
13. Yoshizawa A. (University of Tokyo, Japan) : "Simplified Statistical Method for Modeling Complex Turbulent Flows: Effects of Compressibility"
14. Metais O. (LEGI/Institut de Mécanique de Grenoble, France) : "Direct and Large-Eddy Simulations of Coherent Vortices in Transitional and Turbulent Shear Flows"
15. Lee M. J. (Pohang University of Science and Technology, Korea) : "Computation of Turbulent Passive Scalar in the Presence of Rapid Strain"

The proceedings of 400 pages containing 60 papers were issued from the Japan Society of Computational Fluid Dynamics and distributed at the registration desk to the participants. And a Special Issue of Fluid Dynamics Research in which about 20 selected papers appear will be published from North-Holland (Elsevier) by January 1997.

Prof. Hisaaki Daiguji

Department of Aeronautics and Space Engineering, Tohoku University, Sendai 980-77,  
Fax: +81-22-217-6987,  
E-mail: n0001@ifscray.ifs.tohoku.ac.jp

## Virtual Technology Market for Particle Technology and Multiphase Processes (Web address: <http://www.seas.gwu.edu/guest/vtmptmp>)

by M.C. Roco

The virtual technology market (VTM) is a mechanism to facilitate the flow of technical information and transfer technology between research providers and research users via the Internet, the World Wide Web. The interaction between universities and industry is a typical situation. This approach may alleviate constraints currently experienced in their communication and collaboration. It takes advantage of the Internet, that offers a new paradigm for developing interdisciplinary, international partnerships. Ideally, the best qualified researcher or research group (research provider) for a given problem from any country and any discipline is put in contact and provide solutions to a research user anywhere in the world. How the VTM for particle technology and multiphase processes works?

- The home page has three main parts: (i) What problem do you need to solve and what kind of help do you need? (ii) What solution or research do you offer? and (iii) A data base with abstracts of selected questions and answers (Q&A) previously submitted to VTM and of selected research projects sponsored by the National Science Foundation(NSF). The VTM administrator has various paths for establishing contacts between the research providers and users, and facilitate their collaboration.
- The questions and answers are handled in a confidential manner by the VTM administrator, unless both parts (research provider and research user) choose otherwise. Direct contacts are encouraged in non-confidential Q&A.

- The research work to develop the system is currently sponsored by NSF. The free use of the system during the NSF sponsorship is guaranteed.

- The home page is administrated by an Internet specialist (Dr. L. Xue, at the George Washington University), with two advisors, one specialized in technology transfer (J.E. Beverly), and another in particle technology and multiphase flow (Dr. M.C. Roco).

The technical areas covered by VTM are:

- particle technology (particle formation in gases, crystallization and precipitation, size enlargement and agglomeration, comminution and attrition, interparticle forces, particle characterization, fluidization, solids transport and handling, particle mixing and segregation, powder mechanics, particulate reaction engineering, dispersion and interfacial phenomena, suspension rheology)
- multiphase processes (for gas-liquid, gas-solids, liquid-solids, and three-phase systems).

This new opportunity for interdisciplinary liaison by Internet with specialists from all over the world in academe, industry, and other research organizations is available beginning on April 1, 1996.

Prof. M.C. Roco  
National Science Foundation  
4201 Wilson Blvd., Rm. 525  
Arlington, VA 22230, USA  
Fax: +1-703-306-0319, E-mail: [mroco@nsf.gov](mailto:mroco@nsf.gov)

### FIRST NOTICE

**International Symposium on "Lubricated Transport of Viscous Materials",  
Tobago, Trinidad and Tobago, West Indies, 7-10 January 1997.**

**PARTICIPATION:** Participation in this Symposium is limited. Prospective authors are invited to submit a one-page abstract by the deadline of May 31, 1996 to Dr. H. Ramkissoon (Symposium LVTM), Department of Mathematics & Computer Science, The University of the West Indies, St. Augustine, Trinidad, W.I.  
Fax: 1-809-645-7132, Phone: 1-809-645-3162, E-mail: [hramki@centre1.uwi.tt](mailto:hramki@centre1.uwi.tt)

**LOCAL ORGANIZING COMMITTEE:** H. Ramkissoon (Chairman), T. Jagai (Secretary), W. Mellowes (Treasurer), K.D. Rahman.

**SCIENTIFIC COMMITTEE:** D.D. Joseph (USA) and H. Ramkissoon (Trinidad) - Co-Chairmen, J. Brill (USA), H.W. Buggisch (Germany), E. Guevarra (Venezuela), R. Oliemans (The Netherlands), J.R. Pearson (UK), M.C. Roco (USA), Y. Tsuji (Japan), L. van Wijngaarden (The Netherlands)

## Future Meetings

Listings include Conference Name, Place, Date and Contact.

### JSME Spring Annual Meeting

Chiba, Japan, April 2-4, 1996  
The Japan Society of Mechanical Engineers,  
Shinanomachi Rengakan Bldg., 35  
Shinanomachi, Shinjuku-ku, Tokyo, 160,  
JAPAN, Fax: +81-3-5360-3508, Tel: +81-3-  
5360-3505

### Optical Methods and Data Proceeding in Heat and Fluid Flow

London, U.K., April 18-19, 1996  
C. Paice, Fax +44 171 222 9881

### 8th Workshop on two-phase flow predictions

Merseburg, GERMANY, April, 1996  
Prof. M. Sommerfeld, Fax +39 3641 46 2878

### Pneumatic and Hydraulic Conveying Systems

Sheraton Palm Coast Hotel, 300 Clubhouse  
Drive, Palm Coast, Florida, April 21-26, 1996  
Engineering Foundation, 345 E 47 Street, New  
York, NY 10017  
Tel +1 212 705 7836, Fax +1 212 705 7441, E-  
mail: engfnd@aol.com  
<http://www.engfnd.org/engfnd>

### Biomass Usage for Utility and Industrial Power

Snowbird, Utah, USA, April 28 - May 3, 1996  
Dr. N.S. Harding, Fax: +1 212 705 7441; E-mail:  
engfnd@aol.com

### Fluid-Particle Interaction IV

Davos, Switzerland, May 12-17, 1996  
Prof. Graham Wallis, E-mail  
graham.b.wallis@dartmouth.edu  
Prof. Gad Hetsroni  
E-mail hetsroni@engry-technion.ac.il

### 4th Asian Symposium on Visualization

Beijing, CHINA, May 15-18, 1996  
Chairman Qing-Ding WEI, Tel & Fax +86-1-  
250-1992, E-mail weiqd@mccux0.me  
Shigeki Toyama Shigeki Toyamach.pku.edu.cn

### 1996 CHINA-JAPAN Symposium on Particuology

Beijing, P. R. CHINA, May 24-25, 1996  
Prof. Genji Jimbo, Tel +81-52-586-5643, Fax  
+81-52-586-5676  
Dr. Fei Wei, Tel +86-10-2595464, Fax +86-10-  
2562768, E-mail dcejy@tsinghua.edu.cn

### 3rd International Symposium on Engineering Turbulence Modeling and Measurements

Crete, GREECE, May 27-29, 1996 (Abstracts  
due: May 1, 1995)  
Prof. W.Rodi, Institut für Hydromechanik,  
Universität Karlsruhe, Kaiserstrasse 12, 76128  
Karlsruhe, GERMANY, Tel +49-721-608-3535,  
Fax +49-721-608-2202, E-mail Rodi@bau-  
verm.uni-karlsruhe.de, Prof. G.Bergeles,

Department Mechanical Engineering, National  
Technical University of Athens, 9 Heroon  
Polytechniou Ave., 15710 Zografou, Greece,  
Tel +30-1-7717881/7706545, Fax +30-1-  
7706545, E-mail  
bergeles@artemis.naval.ntua.gr

### New Tools in Turbulence Modeling

74310 Les Houches, FRANCE, May 21-31,  
1996  
Dr. Olivier Métais-LEGI/IMG, BP 53, 38041  
Grenoble Cedex 9, France  
E-mail; Olivier. Metais@img.fr.

### 2nd European Thermal - Science and 14th UIT National Heat Transfer Conference

Rome, ITALY, May 27 - 31, 1996  
Dr. G.P. Celata, ENEA Casaccia, Energy  
Department, Via Anguillarese, 301  
I-00060 Rome, Italy, Fax +39-6-3048-3026

### 2nd European Thermal-Sciences and 14th UIT National Heat Transfer Conference

Roma, ITALY, May 29-31, 1996  
(Abstracts due: April 5, 1995)  
Dr. G.P. Celata, Tel.: +39 6 3048 3905, Fax:  
+39 6 3048 3026; E-mail:  
celata@risc990.casaccia.enea.it

### Modeling and Control of Fluidized Bed Systems II

Beijing, P. R. China, May 31-June 1, 1996  
Dr. Joachim Werther, Technical University  
Hamburg-Harburg, D 21071 Hamburg,  
Fax: +49 40 7718 2678  
E-mail: Werther@tu-harburg.d400.de

### European Two-Phase Flow Group Meeting 1996

Grenoble, France, June 3-5, 1996  
Participation on invitation only  
Dr. D. Grand, DTP/STR, 17 Rue des Martyrs,  
F38054 Grenoble Cedex 9  
Tel: +33-76-88-39-33, Fax: +33-76-88-51-77

### 6th International Energy Conference and Exposition (ENERGEX '96)

Pechino, CHINA, June 3-7, 1996  
Ms. Liu Feng, Fax: +86 1 257 5691

### Spray 96, Workshop on Sprays, Measurements of Sprays and Atomization Systems

Bremen, Germany, June 4-5, 1996;  
Dr. G. Schulte, University of Bremen, Dept.  
Verfahrenstechnik FB4, Postfach  
330440, 28334 Bremen, Germany  
Tel. +49 421 218 2791, Fax: +49 421 218 5378

### 2nd International Conference on Inverse Problems in Engineering: Theory and Practice - Engineering Foundation

Port aux Rocs, FRANCE, June 9-14, 1996

Dr. G. Milano, Tel.: +39 10 3532865  
Fax: +39 10 311870

**International Conference on Porous Media and its Applications in Science Engineering and Industry**

Kona, Hawaii, USA, June 16-21, 1996  
Prof. K. Vafai, Fax: +1 614 292 3163  
E-mail: vafai1@osu.edu

**12th Annual Conference of ILASS-Europe**

Lund, Sweden, June 19-21, 1996  
Laslo Fuchs, Division of Fluid Mechanics, Lund Institute of Technology,  
Box 118, 221 00 Lund, Sweden;  
Tel: +46 46 222 4300 e-mail: lf@ms.vok.lth.se

**ECOS'96. Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems**

Stockholm, SWEDEN, June 25-27, 1996  
Dr. P. Alvfors, Fax: +46 8 723 0858  
E-mail: ecos96@heat.kth.se

**9th Int. Sympo. on Transport Phenomena (ISTP-9) in Thermal-Fluids Engineering**

Singapore, SINGAPORE, June 25-28, 1996  
ISTP-9 Secretariat, Tel +65-3368855, Fax: +65 3363613

**Summer School on Numerical Modeling in Heat Transfer**

Ile de Porquerolles, FRANCE, July 1-6, 1996  
Prof. M. Adibert, Fax: +3 9128 82 25

**Second International Symposium on Numerical Methods for Multiphas Flows, 1996 ASME Fluids Engineering Division, Summer Meeting**

San Diego, CA, USA, July 7-11, 1996  
(Abstracts due: September 1, 1995)  
C.T. Crowe, Tel +1-509-335-3214, Fax +1-509-335-4662, E-mail crowe@mme.wsu.edu,  
Y. Tsuji, Tel +81-6-877-5111, E-mail tsuji@mupf.meim.osaka-u.ac.jp  
A. Prosperetti, Tel +1-410-516-8534, Fax +1-410-516-7254  
E-mail prosper@polaris.mc.jhu.edu,  
M. Sommerfeld, Tel +49-9131-859501, Fax +49-9131-859503, E-mail martin.sommerfeld@cnve.univerlangen.de  
R. Johnson, Tel +1-208-526-0955,  
Fax +1-208-526-6970, E-mail rwj@incl.gov

**4th International Conference HEAT TRANSFER 96. Advanced Computational Methods in Heat Transfer**

Udine, ITALY, July 8-10, 1996  
Conference Secretariat HEAT TRANSFER 96,  
Fax: +44 1703 292 853, E-mail: CMI@ib.rl.ac.uk

**8th International Symposium on Applications of Laser Techniques to Fluid Mechanics**

Lisbon, PORTUGAL, July 8-11, 1996

Prof. Manuel V. Heitor, Dept. of Mechanical Eng., Inst. Superior Tecnico, Av. Rovisco Pais, P-1096 Lisboa Codex, Portugal  
Tel +351-1-841-7379, Fax +351-1-849-6156

**Fifth World Congress of Chemical Engineering**

San Diego, CA, USA, July 14-17, 1996  
AIChE, Programming Dept. 12th Floor, 345 East 47th Street, New York, NY 10017, USA,  
Tel +1-212-705-7373, Fax +1-212-752-3297

**International Particle Technology Forum**

San Diego, USA, July 14-18, 1996  
(Abstracts due: June 1, 1996)  
Prof. R. Pfeffer, Tel +1-201-596-3429, Fax +1-201-596-6479  
Dr. R. Davies,  
Tel +1-302-695-2839, Fax +1-302-695-2504,  
Prof. M.C. Roco, Tel +1-703-306-1371, Fax +1-703-306-0319)

**15th Multiphase Flow Symposium '96**

Fukui, JAPAN, July 29-31, 1996  
Prof. Fujio Yamamoto, Department of Mechanical Engineering, Fukui Univ., 3-9-1 Bunkyo, Fukui-shi, 910, Japan, Tel/Fax +81-776-25-8534, e-mail yamamoto@fv.mech.fukui-u.ac.jp

**10th International Drying Symposium, IDS 96**

Krakov, POLAND, 30 July - 2 August 1996  
Dr. Z. Pakowski, Fax: +48 42 364923;  
E-mail: IDS96@LODZ1.P.LODZ.PL

**Interfacial Phenomena and Thermophysics in Microgravity, National Heat Transfer Conference**

Houston, Texas, August 3-5, 1996  
Prof. Mohamed S. El-Genk, Institute for Space & Nuclear Power Studies, Chemical & Nuclear Engineering Dept., University of New Mexico, Albuquerque, NM 87131, Tel: +1-505-277-5442, Fax: +1-505-277-2814

**Instrumentation for Particle-Fluid Flow, National Heat Transfer Conference**

Houston, Texas, USA, August 3-6, 1996  
Prof. G.M. Colver, Department of Mechanical Engineering, 2025 H. M. Black Engineering Bldg., Iowa State University, Ames, IA 50011-2106, Tel: +1-515-294-7572, Fax: +1-515-294-3261, E-mail: gmc@iastate.edu

**High Heat Flux Engineering III, SPIE 1996**

Denver, Colorado, USA, August 4-9, 1996  
SPIE, Fax: +1 360 647 1445  
E-mail: abstract@spie.org

**Application of Surface Science to Advancing Flotation Technology**

Naantali, FINLAND, August 11-16, 1996  
Engineering Foundation, 345 East 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>

**International Symposium on Transient Convective Heat Transfer**

Cesme, TURKEY, August 19-23, 1996  
Prof. F. Aringç, Fax: +90 312 210 1331

**CHISA '96 12th International Congress of Chemical and Process Engineering**

Praha, CZECH REPUBLIC, August 25-30, 1996  
CHISA '96, P. O. BOX 857, 111 21 Praha 1,  
Czech Rep., Tel: +42 2 353287  
Tel/Fax: +42 2 3116138, Fax: +42 2 3115529

**Fourteenth International Conference on Nucleation and Atmospheric Aerosols**

Helsinki, Finland, August 26-30, 1996,  
Prof. M. Kulmala, University of Helsinki, Dpt.  
Physics, FIN-00014 Helsinki, Finland  
Tel: +358-0-191 9308; Fax: +358-0-191 8680

**The 19th International Congress on Theoretical and Applied Mechanics**

Kyoto, JAPAN, August 25-31, 1996  
(Abstracts due: January 15, 1996)  
Chairman: Prof. T. Tatsumi, Secretary General  
: Prof. E. Watanabe, Dept. of Civil Eng., Kyoto  
Univ., Sakyo-ku, Kyoto 606-01, Japan,  
Tel +81-75-753-5079, Fax +81-75-752-5296,  
e-mail ictam@strsun1.kuciv.kyoto-u.ac.jp

**3rd International Symposium on Experimental and Computational Aerothermodynamics of Internal Flows**

Beijing, CHINA, September 1-6, 1996  
Prof. Y.U. Shen, Fax: +86 10 2575913

**Hydrotransport 13, Slurry Handling and Pipeline Transport**

Johannesburg, SOUTH AFRICA, September 2-4, 1996  
Mrs. Tracey Wheeler, BHR Group Limited,  
Cranfield, Bedford MK43 OAJ, U.K.  
Tel: +44 0 1234 750422, Fax: +44 0 1234  
750074, E-mail: fluid@bhrgroup.demon.co.uk

**Natural Working Fluids in Refrigeration and Air Conditioning**

Aarhus, DENMARK, September 2-8, 1996  
Mr. M. Arnvig, Tel.: +45 42 884622  
Tlx: 6420249

**ECCOMAS 96: 2nd ECCOMAS Conference on Numerical Methods in Engineering and 3rd ECCOMAS Computational Fluid Dynamics Conference**

Parigi, FRANCE, September 9-13, 1996  
Mr. F. Tapissier, Fax: +33 39 63 56 38  
E-mail: symposia@inria.fr  
ECCOMAS 96, Fax: +33 1 44 27 72 00  
E-mail: eccomas96@ann.jussieu.fr

**6th International Conference HYDROSOFT 96. Hydraulic Engineering Software**

Penang, MALAYSIA, September 10-12, 1996  
Conference Secretariat HYDROSOFT 96  
Fax: +44 1703 292 853

**6th International Symposium on Temperature and Thermal Measurements in Industry and Science (TEMPMEKO-96)**

Torino, ITALY, September 10-13, 1996  
Ing. F. Righini, Tel.: +39 11 3977340  
Fax: +39 11 3977347

**14th European Conference on Thermophysical Properties (ECTP 14)**

Lyon, FRANCE, September 16-19, 1996  
Ing. F. Righini, Tel.: +39 11 397 7340  
Fax: +39 11 397 7347

**Pool Boiling Heat Transfer 2 - EUROTHERM Seminar 48**

Paderborn, GERMANY, September 18-20, 1996  
Prof. D. Gorenflo, Fax: +49 5251 603 522

**Quantitative Infra-Red Thermography, QIRT-3 - EUROTHERM Seminar 50**

Stoccarda, GERMANY, September 2-5, 1996  
Prof. G. Busse, Fax: +49 711 685 2066

**IEA Conference: Heat Pumps Towards the Next Century: New Technologies and Applications**

Toronto, CANADA, September, 1996  
Mr. K. Snelson, Fax: +1 613 954 1235

**International Conference on Nuclear Containment**

Robinson College, Cambridge, UK, September 23-25, 1996  
Prof. F. Oriolo, Tel.: +39 50-585252, Fax: +39  
50-585265, e-mail: oriolo@ccii.unipi.it

**5° Congresso Internazionale sulla Fluidodinamica Multifase, ANIMP**

Amalfi, ITALY, September 26-27, 1996  
G. Ferrari, Tel.: +39 89 964 134, Fax: +39 98 964  
057; E-mail: ferrari@bridgedia.unisa.it

**Summer School Hochschulkurs Mehrphasenstroemungen**

Hannover, Germany, October 7-10, 1996  
Prof. Dr. Mewes, Prof. F. Mayinger, Information: Prof. D. Mewes, Institut fuer  
Verfahrenstechnik, Universitaet Hannover,  
Callinstrasse 36, D-30167 Hannover  
Tel: +49-511 762 3638  
Fax: +49-511 762 3031

**4th International Symposium on Heat Transfer with Exhibition**

Pechino, CHINA, October 7-11, 1996  
Prof. X.F. Peng, Fax: +86 10 255-1224  
E-mail: liy@be.pc2ihep.ac.cn

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

Yokohama, JAPAN, October 15-18, 1996  
Prof. S. Shioda, Interdisciplinary Graduate  
School of Science and Engineering, Tokyo Institute  
of Technology, 4259 Nagatsuta Midori-ku,

Yokohama 226, Japan, Fax +81-45-921-1318

**Third KSME-JSME Thermal Engineering Conference '96-Kyongju**

Kyongju, KOREA, October 20-23, 1996  
Prof. Sang Chun Lee, Tel +82-53-810-2453,  
Fax +82-53-813-3703  
Prof. Motoo Fujii, Tel +81-92-573-9611 (Ext. 650), Fax +81-92-592-0211

**Energy-Related Process Integration Technologies - EUROTHERM Seminar 51**

Manchester, UK, October 26-27, 1996  
Prof. Linnhoff, Fax: +44 61 236 7439

**AIChE 1996 Annual Meeting Session on Turbulent Flows**

Chikago, USA, November 10-15, 1996  
(Proposal due: April 15, 1996)  
Prof. Sanjoy Banerjee, Department of Chemical Engineering, University of California, Santababara, CA 93106, USA  
Tel:+1-805-893-3456, Fax: +1-805-893-4731,  
E-mail: banerjee@anemone.ucsb.edu

**Modeling and Enhancement of Convective and Ebulient Heat Transfer - A Symposium in honor of Prof. Arthur E. Bergles**

Atlanta, Georgia, USA, November 16, 1996  
Dr. R.M. Manglik, Fax: +1 513 556 3390  
E-mail: rmanglik@gauss.uc.edu  
Dr. M.K. Jensen, Fax: +1 518 276 6025  
E-mail: jensem@rpi.edu  
Dr. A. Bar-Cohen, Fax: +1 612 624 1398; E-mail: abc@me.umn.edu  
Dr. A.D. Kraus, Fax: +1 408 649 6324; E-mail: krausa@asme.org

**Experimental Study of Multiphase Flow**

Atlanta Hilton & Tower, Atlanta, Georgia, November 17-22, 1996  
Prof. G. P. Peterson, IMECE Technical Program Chair, Department of Mechanical Engineering, Texas A & M University, College Station, TX 77843-3123, Tel: +1 409 845 5337,  
Fax: +1 409 845 3081  
E-mail: GPPeterson@mengr.tamu.edu

**Molecular and Microscale Heat Transfer in Materials Processing and Other Applications**

Yokohama, JAPAN, December 1-5, 1996  
Prof. I. Tanasawa, Fax: +81 3 3401 6575

**International Conference on Heat Transfer with Change of Phase**

Kielce, Poland, December 8-10, 1996  
Prof. M. Poniewski, Conference secretary: Artur Bartosik, Kielce University of Technology, Al. 1000-lecia P.P.7; Tel: (+48-41) 24333  
e-mail: heat@eden.tu.kielce.pl

**Sixth Australasian Heat and Mass Transfer Conference**

Sydney, AUSTRALIA, December 9-12, 1996  
Dr. C. V. Madhusudana Secretary, 6th AHMTC,

School of Mechanical and Manufacturing Engineering, The University of New South Wales, Sydney, 2052 Australia, Fax:+61 2 663 1222

**5th. Asian Conference on Fluidized-Bed and Three-Phase Reactors**

Hsitou, Taiwan December 16-20, 1996  
Dr. Lii-Ping Leu, Prof. of Chemical Engineering Department, National Taiwan University, Taipei, Taiwan 106; Tel: +886-2-365-7200  
FAX: +886-2-362-3040.

**A Workshop on Computation and Modeling of Multiphase Flows**

Santa Barbara, California, U.S.A. The Week of January 15, 1997 (Scheduled)  
Prof. Sanjoy Banerjee, Tel +1-805-893-3456  
Fax +1-805-893-4731  
E-mail banerjee@anemone.ucsb.edu

**Fifth Pan American Congress of Applied Mechanics PACAM V**

Puctro Rico, U.S.A., January 2-4, 1997  
Prof. Luis E. Suarez, Prof. Marek Rysz, Department of General Engineering, University of Puctro Rico, Mayaguez, P.R. 00681-5000, U.S.A.  
Fax: +1-809-265 3816, +1-809-831 4079,  
Email: PACAMV@RMCE02.UPR.CLU.EDU

**Lubricated Transport of Viscous Materials**

Tobago, Trinidad and Tobago, West Indies, 7-10 January, 1997, (Abstracts due: May 31, 1996)  
Dr. H. Ramkissoon, Department of Mathematics and Computer Science, The University of the West Indies, St. Augustine, Trinidad, W.I.  
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**The 1st Pacific Symposium on Flow Visualization and Image Processing**

Honolulu, Hawaii, February 2-7, 1997  
(Abstracts due: May 1, 1996)  
Prof. S. Mochizuki, Department of Mechanical Systems Engineering, Tokyo University of Agriculture and Technology, Nakacho, Koganei, Tokyo 184, Japan, Tel/Fax: +81 423 88 7088  
E-mail: motizuki@cc.tuat.ac.jp  
WWW: <http://www.cc.tuat.ac.jp/~psfvip-1/>

**Rheology in Mineral Industry**

San Diego, Bahia Hotel, February 17-22, 1997  
Engineering Foundation, 345 East 47th St., New York, N. Y. 10017, Tel: +1 212 705 7836,  
Fax: +1 212 705 7441, E-mail: engfnd@aol.com

**AIChE 1997 Spring Meeting**

Houston, USA, March 9-13, 1997  
(Proposal due: August 1, 1996)  
Dr. Dennis Griffith, E-mail: dgriffith@b-r.com

**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

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

Duke University, Durham, NC USA, May 18-  
22,1997  
Prof. R. P. Behringer of Duke University  
E-mail: bob@phy.duke.edu

**International Conference on Pool and Con-  
vective Boiling**

Irsee, GERMANY, May18-23, 1997  
Prof. F. Mayinger, Fax: +49 89 2105 3451  
E-mail: may@thermo-a.mw.tu-muenchen.de  
Dr. G.P. Celata, Tel.: +39 6 3048 3905  
Fax: +39 6 3048 3026  
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**International Symposium on the Physics of  
Heat Transfer in Boiling and Condensation**

Moscow, RUSSIA, May 21-24, 1997  
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**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

**4th World Conference on Experimental Heat  
Transfer, Fluid Mechanics and Thermody-  
namics**

Brussels, BELGIUM, June 2-6, 1997  
Prof. M.Giot, Tel +32-10-472200, Fax +32-10-  
452692, E-mail gito@term.ucl.ac.be  
Dr. R.K.Shah, Tel +1-716-439-3020. Fax +1-  
716-439-3648, E-mail rkshah@acsu.buffalo.edu

**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

**1997 ASME FED Summer Meeting**

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

Vancouver, Canada, July 22-26, 1997  
(Abstracts due: August 15, 1996)  
Dr. M. C. Roco, Symposium Chair, National Sci-  
ence 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  
Flows**

Vancouver, Canada, July 22-26, 1997  
(Abstracts due: July 19, 1996)

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Tel: +1-505-844-9061, Fax: +1-505-844-8251  
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Prof. Jean Bataille, L.M.F.A., Ecole de Lyon  
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E-mail: bataille@mecaflu.ec-lyon.fr

**Advanced Concepts and Techniques in Ther-  
mal Modelling 2 - EUROTHERM Seminar  
52**

BELGIUM or DENMARK, da definirsi nel 1997  
Prof. J.P. Saulnier, Fax: +33 49 49 81 01

**World Tribology Congress**

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

**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

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

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

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

Beijing, October 10-13, 1997  
Professor Lixing Zhou, Department of Engineer-  
ing Mechanics, Tsinghua University, Beijing  
100084, China, FAX:(86-10)259-5569

**AICHe 1997 Annual Meeting**

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

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

Lyon, FRANCE, June 8-11,1998  
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/

**11th International Heat Transfer Conference**

Seoul, KOREA, August 23-28, 1998  
Prof. S.T.Ro, Tel +82-2-880-7111  
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