

Report

The 9th Millennium International Symposium on Flow Visualization

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Abstract: The 9th Millennium International Symposium on Flow Visualization (9misfv) was held in Edinburgh, Scotland from the 22nd August to the 25th August 2000. The symposium attracted, by a significant amount, the largest number of participants in the history of the symposium series. A total of 396 presentations were made at the symposium. These were distributed through 74 technical sessions covering a full spectrum of topics in 373 oral presentations and 23 poster presentations.

The symposium commenced with an opening address and welcome to delegates by the Symposium Chairman, Professor I. Grant. The technical presentations commenced with Professor G. M. Carlomagno giving the invited Leonardo da Vinci Memorial Lecture entitled "Infrared Thermography: a Particular Surface Flow Visualization Technique." Each day of the meeting commenced with an invited Keynote lecture, given in plenary session, by a recognised authority in the respective area. These were, in order of presentation, Professor Toshio Kobayashi "High Performance Computation and Visualization of Fluid Flows," Dr. Juergen Kompenhans "Qualitative and Quantitative Visualization of Wake Vortices in Industrial Test Facilities," Professor Jim Whitelaw "Aspects of Unsteady Combustion" and Professor Mory Gharib "On the Role of Flow Visualization in the Understanding of Cardiovascular Fluid Dynamics: from da Vinci to Harvey."

During the symposium two awards were made to distinguished scientists. These were the Leonardo da Vinci award to Professor Giovanni Carlomagno and the Asanuma award to Professor Wolfgang Merzkirch.

Keywords: flow visualization, acoustics, aircraft, bluff bodies, cavity flows, channel flows, combustion, Computational Fluid Dynamics (CFD), cylinders, droplet break-up, electrodynamics, fluidics, holography, infrared thermography, interferometry, jets, liquid crystals, low Reynolds number flows, medical, multiphase flows, natural convection, numerical visualization, particle image velocimetry (PIV), particle tracking velocimetry (PTV), porous media flows, rotating fluids, Schlieren, supersonic flows, turbulence, unsteady flows and instability, vortices.

1. Introduction

At the business meeting of the organising committee of the Flow Visualization Symposium series, during the Sorrento 1998 meeting, it was decided to alter the time between symposia from 3 years to 2 years. The 9th 'Millennium' International Symposium on Flow Visualization was therefore held August 22-25, 2000 in Edinburgh, Scotland, UK. The Symposium was the latest in a series of International Flow Visualization Symposia, first held in Tokyo in 1977 and successively in Bochum, Ann Arbor, Paris, Prague, Yokohama, Seattle and Sorrento. The objective of the Symposia has been to provide a forum for communication and information exchange, both quantitative and qualitative, in the broad field of flow visualization applied over a wide range of disciplines that depend upon the technique.

The most recent developments in electronic data base management and electronic publication were used, respectively, to manage the meeting and incorporate an impressive array of both intellectually challenging and aesthetically pleasing presentations within the proceedings. The increase in the number of papers and the higher level of the content meant some challenges in compression for the editorial team. In the event of the continuing popularity of the event, it is likely that future symposia will use multi-CD or DVD format to allow the inclusion of the increasing number of papers by aspiring participants.

2. Symposium Attendance

The Millennium, 9th International Symposium on Flow Visualization attracted the largest number of submissions in the history of the meeting. More than 450 abstracts were offered with 380 electronic papers finally being selected for inclusion on the CD. In addition a significant number of late arrival papers were presented at the meeting. More than 400 delegates attended with accompanying persons taking the total number of participants to well over 500. In parallel, an exhibition took place of commercial companies with special interests in supplying hardware and software to scientists involved in quantitative flow visualization in its many forms.

Figure 1 shows a statistical analysis of recorded attending delegates for the 9misfv and 8isfv. In addition to general interest it indicates trends which may be significant to the organising committee for the 10isfv.

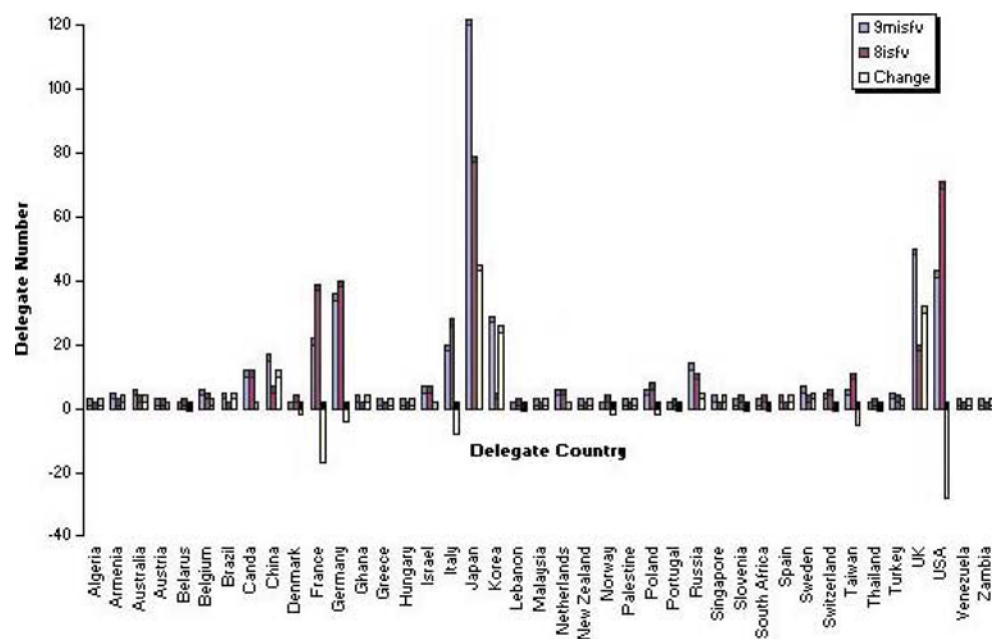


Fig. 1. Comparison of 9misfv and 8isfv delegate numbers.

3. Symposium Keynote Lectures

Each day of the symposium began with a keynote lecture presented by an invited speaker selected from established specialists.

The symposium began with an opening address by Professor Ian Grant, the symposium chairman, welcoming the delegates and outlining the scope of the meeting and describing the meeting organisation and the social program. He acknowledged and thanked the international organising board and honorary board for their helpful and supportive contributions to making the meeting the most successful in the symposium history.

The technical presentations began with Professor G. M. Carlomagno who gave the invited Leonardo da Vinci Memorial Lecture entitled "Infrared Thermography: a Particular Surface Flow Visualization Technique."

The first of the keynote lectures was then given by Professor Toshio Kobayashi and was entitled "High Performance Computation and Visualization of Fluid Flows." Professor Kobayashi introduced recent developments in CFD simulations of turbulent flows. He gave a few examples focusing on time dependent flow

phenomena in complex flow fields, such as a flame propagation in combustion device, swirl flow in engine in-cylinder and noise by a pantograph of the Shin-kansen train.

The second of these lectures was given by Dr. Juergen Kompenhans and was entitled "Qualitative and Quantitative Visualization of Wake Vortices in Industrial Test Facilities." In his presentation Dr. Kompenhans explained that increasing security demands of air traffic control require an improved understanding of the wake vortex behaviour behind transport aircraft. The persistence of aircraft trailing vortices increasingly determines the minimum distance between successive landing air-liners (between 3 and 6 miles, depending on weight of aircraft) and thus limits the passenger throughput rate of an airport. Systematic studies of these phenomena are therefore of great importance and examples of such studies were described.

The third of the invited lectures was given by Professor Jim Whitelaw and was entitled "Aspects of Unsteady Combustion." Professor Whitelaw gave examples of applications of flow visualisation used as means to enhance understanding of unsteady combusting flows. He described techniques such as chemie-luminescence and laser-induced fluorescence. He placed the emphasis in his lecture on opposed flows and their contribution to understanding of extinction, burners with imposed oscillations, sprays, port-injected gasoline and direct-injection Diesel engines.

The fourth of the invited lectures was given by Professor Mory Gharib and was entitled "On the Role of Flow Visualization in the Understanding of Cardiovascular Fluid Dynamics: from da Vinci to Harvey." Professor Gharib presented some of the main advances in the field of cardiofluid dynamics, which have been achieved through implementation of modern in vitro and in vivo flow visualization techniques. He also interestingly highlighted the contribution of da Vinci, perhaps the first person to use scientific methods to explore the dynamic nature of heart's function, and illustrated this by reference to da Vinci's drawings. Professor Gharib then reviewed the field of cardiovascular fluid dynamics in modern times, enjoying as it does a host of modern visualization techniques such as DPIV, ultrasound imaging and magnetic resonance imaging.



Fig. 2. Presentation of Asanuma Award to Professor W. Merzkirch (extreme right).

4. Symposium Subjects and Sessions

The increasing popularity of the meeting is a true indicator of the growing importance of the specialism and the ability of its practitioners, as demonstrated on the enclosed CD-ROM, to take full advantage of the powerful electronic image capture and manipulation tools which are becoming increasingly important in both qualitative and quantitative visualization.

The symposium oral presentations were organised for delivery over 4 days. Each day commenced with an invited lecture followed by formal oral presentation sessions of which there were 74. Within these 74 sessions a total of 373 oral presentations were made. Additionally there was a poster session running in parallel in which 23 presentations were made making a grand total of 396 technical presentations.

The topics covered were diverse and the technical sessions titles reflected this, comprising acoustics, aerospace (2), applications (4), automobiles, bluff bodies, cfd (3), combustion (3), convection, dpiv, fluorescence

(2), heat transfer, holography (2), interferometry (2), jet flows (3), ldv/dgv (2), numerical visualization, physiological flow (2), piv (6), ptv, pump flow, thermography (2), tlc, tomography (2) and turbulence.

5. Symposium Venue and Social Program

During most of the year Edinburgh enjoys the peace, tranquillity and space afforded by Scotland, being geographically on the periphery of Europe. The conference took place, however, during the Edinburgh International Festival when the city becomes the vibrant European cultural centre, where the visual arts, drama, street theatre, music (both classical and popular) can be found in hundreds of venues throughout the city and on many street corners.

Against this incomparable backdrop, conference participants were able to attend special social events planned for the week of the Symposium. In the congested and frenetic atmosphere of Edinburgh during Festival time, early preparation by the local organising committee meant that fully subscribed Festival events, like the Tattoo and River Cruise, were available to participants and accompanying guests. Additionally, a Scottish Highland Coach Tour and visit to the Museum of Flight were arranged.

An Accompanying Guest Programme offered daytime tours and activities, including a walking tour of Georgian Edinburgh, visits to the Scotch Whisky Centre, Camera Obscura, Edinburgh Castle, Palace of Holyrood, the Royal Yacht Britannia, St. Andrews and the Museum of Golf. Local bus excursions were also arranged in Edinburgh City centre and Fife Coastal Towns.

As is the tradition, a banquet was arranged during the symposium attracting the majority of the participants to a pleasant, on-campus venue. The meal commenced with the 'piping in' of the haggis, a tradition in Scottish banqueting, where a (bag) piper, in highland dress leads a retinue carrying a specially prepared haggis. The haggis was then 'addressed', or saluted, by the piper using the familiar poem by Robert Burns. I give below the first verse with English translation from the Lowland Scots language in which it was written. (The full salute and version of the translation can be found at <http://worldburnsclub.com/poems/translations/index.htm>.)

*Fair fa' your honest, sonsie face,
Great chieftain o' the puddin-race!
Aboon them a' ye tak your place,
Painch, tripe, or thairm:
Weel are ye wordy of a grace
As lang's my arm.*

*Fair full your honest, jolly face,
Great chieftain of the spicy meal pudding race!
Above them all you take your place,
Stomach, tripe, or intestines:
Well are you worthy of a grace
As long as is my arm.*

6. Conclusion

As retiring Chairman I am happy to invite you to Kyoto, Japan for the 10th International Symposium on Flow Visualization under the chairmanship of Professor T. Kobayashi (Fig. 3).



Fig. 3. Chairman 9misfv, Professor Grant (second from right), Chairman elect 10isfv, Professor Koboyashi (first from left) with wives and guests.

Acknowledgments

During the preparations for the 9msifv I received much helpful advice and guidance from the international organising committee, honorary board (Fig. 4) and other colleagues worldwide, for which I will always be grateful. I also acknowledge the help and friendly support, both before and during the meeting, of Professor Giovanni Carlomagno.



Fig. 4. The 9misfv International Organising Committee and the Honorary Board.

The local arrangements during the meeting would have been impossible without the good humoured and professional help of a multi-national group of friends, students and ex-students who solved the unsolvable and fixed the unfixable for most delegates during the course of the meeting. I know that all of us felt the words of Rudyard Kipling

*"If you can keep your head when all about you are losing theirs and blaming it on you;
If you can trust yourself when all men doubt you....."*

particularly poignant at that time.

During the preparations for the meeting I was pleased that I was able to communicate personally with everyone who attended and enjoyed very much the personal contact during the symposium. As I am sure previous chairmen will confirm, the whole experience changes one's outlook entirely both on a professional and personal level, irreversibly.

Finally, and most importantly, I acknowledge the organisational and professional skills of my wife. Her support, for months before the meeting, and at the event itself, was invaluable.

Author Profile



Ian Grant: He received his B.Sc. (Hons.) in Physics in 1969 from the University of Edinburgh and his Ph.D. in Experimental Fluid Mechanics in 1972 from the same department. He then undertook post-doctoral studies in the Department of Aeronautics at Imperial College, London. He was appointed lecturer in Applied Physics at Napier University from 1974 till 1977 then moving to the Department of Offshore Engineering at Heriot-Watt University, Edinburgh. He now holds a personal chair at Heriot-Watt where he is director of the Fluid Loading and Instrumentation Centre. His interests cover all aspects of optical diagnostics, data and image processing and electronic media. He was joint editor responsible for Electronic Proceedings for the 8th International Symposium on Flow Visualization in 1998, Electronic Editor of the ICAS 22nd meeting in 2000, and Chairman and joint editor of the 9th Millennium International Symposium on Flow Visualization in 2000.