SPRING 2002

Division of Fluid Dynamics Newsletter

DFD News

A Division of The American Physical Society

2001 DFD FELLOWS

Jean-Marc Chomaz, Ecole Polytechnique, Paris
for fundamental and elegant studies of linear and nonlinear global modes in shear flows, and for the discovery of a new zig-zag instability of vortices in stratified media.

Karl Helfrich, Woods Hole Oceanographic Institution
for laboratory, analytical, numerical and observational contributions to understanding waves, hydraulic control, abyssal ocean circulation, thermals, plumes, viscous fingering and other areas of geophysical fluid dynamics.

Alan Kerstein, Sandia National Laboratories
for substantial and enduring original contributions to turbulence dynamics, turbulent mixing, and turbulent combustion, and for insightful technical leadership among peers and students.

Edgar Knobloch, University of California, Berkeley
for innovative applications of modern mathematical tools such as bifurcation and group theory to the analysis of nonlinear structures in fluid flows and for elucidation of fundamental dynamical mechanisms.

Sanjiva Lele, Stanford University
for seminal contributions to the understanding of compressible turbulent flows and pioneering work in computational acoustics.

Amable Linan, School of Aeronautics, Madrid
for seminal contributions to the aerodynamics of combustion, in particular to the structure and stability of diffusion flames, and for the other elegant applications of asymptotic methods of fluid mechanics.

Geoffrey McFadden, National Institute of Standards and Technology
for fundamental insights into the effect of fluid flow on crystal growth and for an innovative approach to phase field methods in fluid mechanics.

Hermann Riecke, Northwestern University
for pioneering work on pattern formation in non-linear non-equilibrium systems, especially in Taylor-vortex flow, binary-mixture convection, and electro-convection in nematics.

Nominations For DFD Officers

The APS/DFD Nominating Committee is soliciting nominations for the offices of Vice-Chair, and Executive Committee Member (two open positions). Suggestions for nominations from the division membership should be sent to:

Sandra Troian
Chair of the Nominating Committee
Department of Chemical Engineering
Princeton University
Princeton, NJ 08544-5263
tel: 609/258-4574
email: stroian@princeton.edu

by May 15, 2002. Please note that the Vice-Chair serves in successive years as Chair-Elect, then as Chair and finally as Past Chair of the APS/DFD.

Inside...

2001 APS/DFD Prize & Award

Fluid Dynamics Prize

Recognizes major contributions to fundamental fluid dynamics made during a career of outstanding work in the United States.

Howard Brenner, Massachusetts Institute of Technology

for his outstanding and sustained research in physicochemical hydrodynamics, the quality of his monographs and textbooks, and his long-standing service to the fluid mechanics community.

Otto Laporte Award

Recognizes outstanding research accomplishments pertaining to the physics of fluids).

John Kim, University of California, Los Angeles

For his pioneering work in the development of direct numerical simulation as a tool in turbulence research and for his important contributions to the understanding of the physics and control of turbulent boundary layers.

Francois Frenkiel Award

Recognizes significant contributions to fluid mechanics that have been published in Physics of Fluids during the preceding year by young investigators.

Charles Meneveau and Stefano Cerutti, Johns Hopkins University

title: Statistics of filtered velocity in grid and wake turbulence (Phys. Fluids 12, 1143 (2000).

Andreas Acrivos Dissertation Award

Greg Voth, Cornell University

title: Lagrangian acceleration measurements in turbulence at large Reynolds numbers (advised by Eberhard Bodenschatz).

Nominations for 2003

Fluid Dynamics Prize

Nominations should be sent to the 2003 Committee Chair:

Paul Steen
Department of Chemical Engineering
Cornell University
Ithaca, NY 14853

tel: 607/255-4749
email: phs7@cornell.edu

Otto Laporte Award

Nominations should be sent to the 2003 Committee Chair:

Fazle Hussain
Department of Mechanical Engineering
University of Houston
Houston, TX 77204-4792

tel: 713/743-4545
email: fhussain@uh.edu

For information about the nomination requirements, go to http://www.aps.org/praw/ nomguide.html

DFD MEETINGS

Highlights of the 54th Annual Meeting San Diego, California

Despite concerns about diminished attendance due to world events, the November 2001 DFD meeting in San Diego concluded with nearly 1100 registrants and 15 exhibitors. The program got under way early Sunday morning and was highlighted by the Awards Ceremony in the afternoon. Dr. Howard Brenner of MIT received the 2001 Fluid Dynamics Prize and presented his lecture titled "Physico-chemical Hydrodynamics." The 2001 Otto Laporte Award was presented to Dr. John Kim of UCLA who offered his lecture titled "Control of Turbulent Boundary Layers: State of the Art - 2001." Sunday's activities ended with a Latin-flavor reception in the San Diego Marriott's Marina Ballroom. Monday and Tuesday events included Invited Lectures by Kerry Emanuel, Walter Munk, Andrea Prosperetti, Norbert Peters, Y.C. Fung, Dale Pullin and Jean-Marc Chomaz. A special mini-symposium in honor of Charles Van Atta highlighted the schedule on Monday. Three additional mini-symposia were part of the program on Sunday which included Control of Fluid Flows, Fluid Dynamics of Building Ventilation, and Fluid Dynamics of the Gulf of California.

The Gallery of Fluid Motion was part of the activities in the San Diego Ballroom, sharing space with exhibitors and the employment center. Videos and posters were judged by a panel of experts who selected twelve winners from nearly 50 entries. Poster winners were: Shen and Thoroddsen for "Granular Jets;" Bomphrey, Taylor and Thomas for "Visualizing the Flow Structures Around Flying Insects;" Villermaux and Duplat for "Stretching, Folding, Merging;" Gauthier for "Instability Patterns Between Two Rotating Disks;" Bush for "Fluid Fishbones;" and Fermigier for "Sand Ripples in a Rotating Tank." Video winners were: Ruith and Meiburg for "Breakdown Modes of Swirling Flow;" A. Gharib, Kremers and M. Gharib for "Dancing in Flatland;" Mikkelsen, Versluis, Koene, Bruggert, van der Meer, van der Weele and Lohse for "Granular Eruptions: Void Collapse and Jet Formation;" Nikitopoulos for "Bubble Behavior in the Shear Layer of a Bubbly Jet;" Bottausci for "Vorticity Filaments;" and Koehler, Shen, Stone and Tee for "Air Entrainment from Falling Droplets." The winning entries will appear in the Gallery of Fluid Motion article to be published in the September 2002 issue of Physics of Fluids.

The location of the 2001 meeting, the San Diego Marriott Hotel and Marina, was applauded for its scenic location and proximity to the revitalized downtown area of San Diego known as the Gaslamp Quarter. The local organizing committee at the University of California, San Diego, thanks everyone for their attendance and participation in making this a successful meeting.

Information About The 55th Annual Meeting In Dallas, Texas

The 55th Annual Meeting of the American Physical Society's Division of Fluid Dynamics (Meeting ID: DFD02) will be held in Dallas, Texas, November 24-26, 2002. The meeting will be hosted by Southern Methodist University and the University of Texas at Austin. Professor Peter E. Raad is the Chair of the Organizing Committee. The official web site for the meeting is http://www.engr.smu.edu/dfd2002. The abstract deadline is August 2, 2002.

2002 Meeting Site

The 2002 DFD Annual Meeting will be held at the Wyndham Anatole-Hotel-Dallas Market Center, the largest convention resort hotel in the Southwest. Located just north of downtown in the heart of the Market District, downtown businesses and attractions are just minutes away. Convenient to the airports, Dallas/Fort Worth International Airport is located 18 miles from the hotel, and Dallas Love Field Airport is located 15 miles from the hotel.

Dallas, Texas

Information about the city of Dallas and the tourist attractions can be found at the Dallas Convention and Visitors Bureau web site: http://www.dallascvb.com.

View of Dallas Skyline

MUSINGS ON THE DFD MEETING

K.R. Sreenivasan and H.A. Stone

We arbitrarily start with 1973. The meeting that year was held in New Haven, CT. It began on Monday at 9 AM and was concluded at about noon on Wednesday. It included a plenary session of one-hour duration and four invited talks of the same length. The plenary session consisted entirely of the Otto Laporte lecture given by C.C. Lin and the invited talks were given by George Veronis, Joe Keller, Willem Malkus and Henk Tennekes. The contributed papers, of which there were a total of 158, were split into three parallel sessions. The speakers had about 15 minutes each, and each session was interrupted by a 30-minute coffee break. (The total working time, allowing for the parallel sessions, was about 50 hours.) The session chairs, including plenary and invited talks, were Tony Maxworthy, Stan Corrsin, Dick Dobbins, Ira Bernstein, John Laufer, Paul Libby, Vivan O'Brien, Joseph Johnson III, Bob Deissler, C.S. Yih, Mahinder Uberoi, Forbes Dewey, Peter Wegener, Milton Plesset (Business meeting), Ray Emrich, George Springer and John Buckmaster. The APS bulletin for the meeting occupied less than 30 pages. Les Kovasznay was the only one whose name appeared on four abstracts—this being the largest number for any one person in the meeting.

Move forward to the 2001 meeting held in San Diego, CA. It had about 1000 contributed papers split roughly among 15 parallel sessions (with shorter time per talk than in 1973); at least 32 contributors coauthored more than 4 abstracts, and four had seven. The total working time went up by a factor of more than four. A larger number of invited talks, special minisymposia, a plenary award session, poster session, gallery of fluid motion, employment center, book and instrumentation exhibits, and so forth were in evidence. The bulletin grew to about 240 pages in length. Add to this the various satellite meetings of the editorial boards of the Annual Review of Fluid Mechanics, Physics of Fluids, Journal of Fluid Mechanics, and so forth. And, as in some recent years, special purpose meetings of one sort or another, either honoring a colleague or reviewing programmatic themes, have been arranged. DFD has come a long way, and appears to have grown in strength, appeal and excitement. But do the numbers tell the full story? This note reflects on some of the changes and presents some modest conclusions.

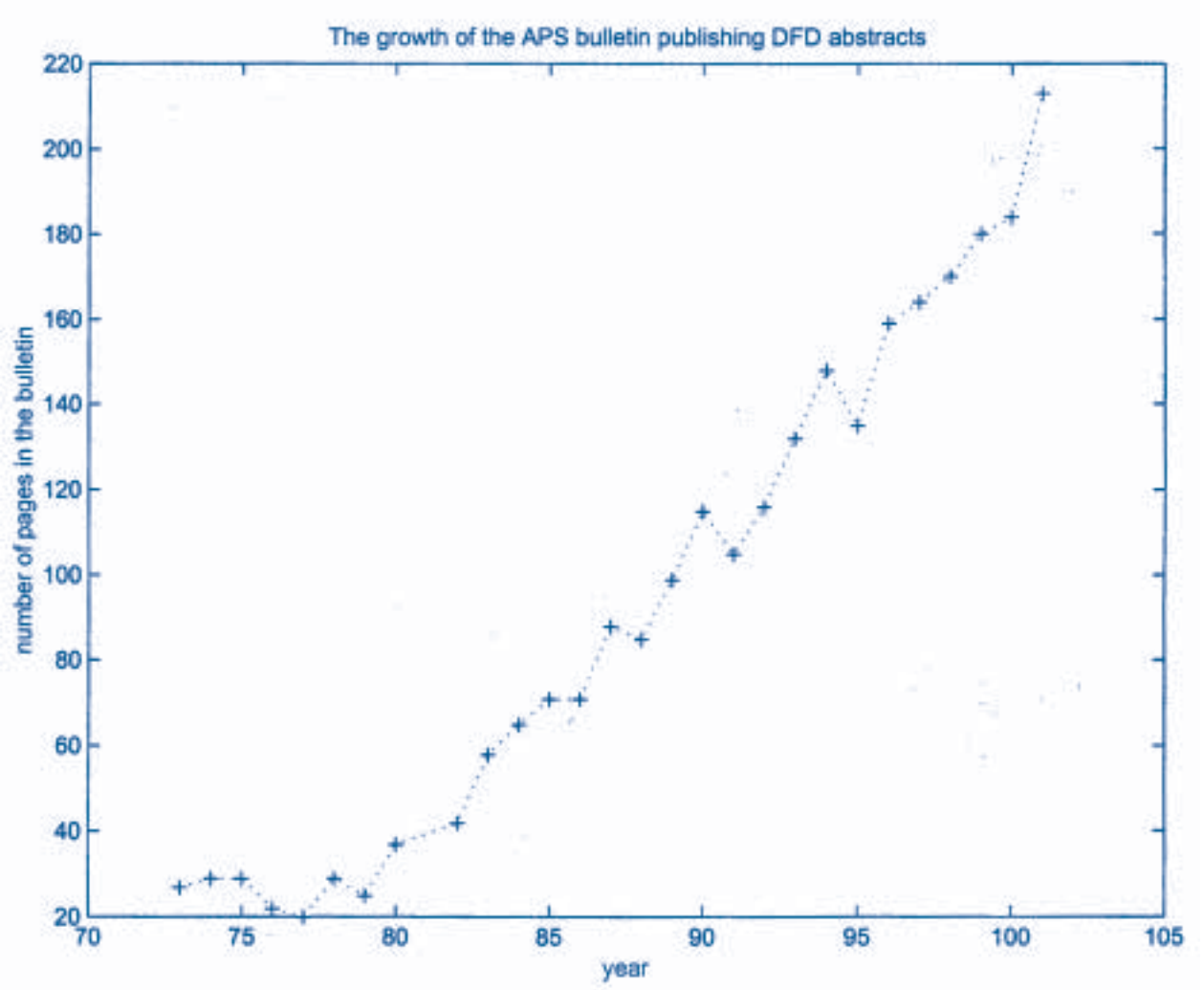
The figure below shows the growth in the number of pages of the DFD bulletin between 1973 and 2001. This number is not exactly proportional to the number of abstracts, but is a good measure because the size of the abstract has not changed much. The conversion factor remains roughly six abstracts per page. It is clear that there was a discernible dip in the late seventies but, small fluctuations aside, the number of abstracts has grown relentlessly in the last twenty-five years, reflecting the growth from its minimum in 1977 by a factor 10. Many other things have changed. Although we have no statistics to prove the point, more papers appear to be presented by students and younger researchers. This is a good sign. The mechanics and discipline of presentation have improved tremendously: now we hardly see transparencies written in illegible handwriting, nor encounter speakers who are shocked to learn that they are still in their introductory phase at the end of their allotted time. The schedule has become tighter, proceedings more formal and the pace faster. The DFD meeting was essentially an American meeting in the early days whereas it has acquired an increasingly international character. For instance, only 4 out of the 158 abstracts had foreign addresses in 1973 whereas 179 of the nearly 1100 registrants in 2001 were from abroad. (The two statistics are slightly different, but we hope that they make the point nevertheless.) Not everything has changed, however: turbulence accounted for slightly less than 30% of the abstracts in 1973, and this fraction was about the same in 2001—although the focus and tools have changed over time. The pleasure of seeing colleagues from other parts of the country, and other countries, has always remained the same.

What has attracted this increasing number of people to the subject, or at least to the meeting? And how has all this growth been possible? The number of DFD abstracts is but one indicator of the growth; just look at the number of pages in JFM, though the rejection rate for the journal has not varied much over its life-span. Obviously, the number of positions in fluid mechanics, say in universities, has not increased ten-fold in these twenty-five years. As far as we know, almost all (including those that support large groups) are complaining about the shortage of research funding. And, at any rate, has the advancement of the subject been commensurate with the quantity of

papers? Or, has something essential slipped by us while we are focusing, year after year, on quantitative measures of the rather unquantifiable process by which we generate new knowledge?

To get some answers, we solicited a few informal opinions during the 2001 meeting from an admittedly small sample. People with strong opinions are not always reliable, but they are the only ones who are ready to give them freely, so the views represented below have to be taken with a grain of salt. A few themes resonated quite strongly. First, if one missed every other meeting, or perhaps two in between, one would not miss a whole lot; most presentations have become incremental extensions of the previous year's work, and are second or third order in originality. Admittedly, some of this is an inevitable consequence of introducing students to research and scientific presentations. Second, research in fluid mechanics has become an increasingly collaborative activity, and there are more large groups in existence. Doing research at some level, enough for a ten-minute DFD presentation, is now easier once one acquires a few items, such as a modest desk-top computer, a PIV apparatus, or some CCD cameras. Third, a bit of high-tech hype, both in research and presentations, has helped. The drudgery of an experiment is often relieved by the computer. Fourth, the small-scale excitements that one often glimpses in some DFD talks have not been forged together in a way that appears to an outsider, including funding agencies and scientists from other disciplines, to be a substantial increase in our understanding, or ability to solve practical problems, or impact scientific progress in other fields. Finally, more and more graduate students are entering the market, without being able to find jobs in areas in which they received their training.

But there are positive developments. The growth that has occurred has been at the intersection of fluid mechanics



and other disciplines such as multiphase and reacting flows, biological and other complex fluids, modern nonlinear dynamics, interfacial phenomena, microfluids, granular media, biomedical applications, geophysical fluid dynamics, flow control, new experimental tools, and, of course, computers in various manifestations. Overall, we don't fear that the subject is getting too fissured. If it is indeed getting so, unexpected interconnectedness that one sees has balanced it. There are areas in which fluid mechanics has had measurable impact—for instance, the biomedical area of drug delivery. There is no doubt that the subject is livelier now than it was in 1977. On the whole, we think that the inclusive nature of fluid mechanics has been responsible for the growth of the subject itself, and the meeting. About graduate students, it is true that some recent graduate students haven't found jobs in areas in which they were educated: some have gone on to finance, some to bioinformatics, some to other areas such as computational physics in a broad sense. This must be viewed as the strength of the subject. There are very few fields where quantitative thinking can be put to as rigorous a test as in fluid mechanics. The subject forces a unique discipline that could be a great asset to students. We hope that fluid mechanics education will continue to be broad, and prepare students for a variety of interesting pursuits.

We hope that all the students will contribute to the subject, but suspect that most will move on. All of which makes for a fascinating development.

As a final remark, since DFD is a part of the American Physical Society, it is instructive to compare the growth of DFD with those of other divisions of APS. We have not undertaken that exercise in any detail. A limited sample for the last four years, supplied by the APS meetings staff, shows that the March and April meetings have not changed much. Most comparable to us in one sense is the meeting of the Division of Plasma Physics, and it has remained the same or perhaps declined a bit in strength. Again, we think that it emphasizes the inclusiveness of fluid mechanics as a subject.

In summary, we think that it is imperative not to lose sight of our collective responsibility to improve our understanding and identify those qualitative and quantitative ways by which principles of fluid mechanics can further a broad domain of science and technology. Indeed, this is the future of our subject. Forging bonds with other neighboring fields of science, which are ever increasing in number, is the only way that we can continue to grow as a community and remain relevant without dilution.

SHORT SAD NOTES

We note with sadness the passing of four distinguished members of our fluid dynamics community – John Allen, George Carrier, Satish Dhawan and Philip Drazin.

John Allen, Professor of Physics at St. Andrews, Scotland, was the co-discoverer, with Petre Kaptiza and Don Misener at Cambridge, of the superfluidity of He–4 in 1938. He died at the age of 94.

George Carrier was the T. Jefferson Coolidge Professor of Applied Mathematics at Harvard University for many years and was the recipient of both the Otto Laporte Award and the Fluid Dynamics Prize of the APS/DFD. He was elected a member of the National Academy of Science in1967 and of Engineering in1974, was a recipient of the Theodore von Kármán Prize in 1979, and was awarded the National Medal of Science in 1990. He died in early March at the age of 83.

Satish Dhawan, well known for the direct measurement of the wall shear stress in laminar and turbulent boundary layers and transition to turbulence, died at the age of 81. He was one of the early Ph.D. students of Hans Liepmann and was former Director of the Indian Institute of Science. Prof. Dhawan was the Head of the Indian Space Research Organization and was elected to the National Academy of Engineering in 1978.

Philip Drazin was a leading contributor to the field of hydrodynamic stability. In 1999, he was awarded the Symons Gold Medal, the premier award of the Royal Meteorological Society. He moved to Bath in 2000 following his retirement from the University of Bristol, which he had joined in 1960 and where he held the position of the Wills Professor of Mathematics. He died of cancer at age 67.

Finally, information about purchase of the CD of the special David Crighton Memorial Concert can be found at http://www.damtp.cam.ac.uk/people/mem/crighton.html.

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