INTERNATIONAL UNION OF THEORETICAL AND
APPLIED MECHANICS

REPORT 1987

IUTAM
University of Stuttgart
Federal Republic of Germany
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The following members of the Bureau of IUTAM have been elected for the period 1 November 1984 to 31 October 1988:

Officers:
Sir J. Lighthill (UK)  President
Prof. D.C. Drucker (USA)  Vice-President
Prof. L. van Wijngaarden (Netherlands)  Treasurer
Prof. W. Schiehlen (FRG)  Secretary

Members:
Prof. P. Germain (France)  (elected 1976)
Prof. J. Hult (Sweden)  (1984)
Prof. I. Imai (Japan)  (1984)

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University of Stuttgart
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1948 J. Péres (France)
1952 H. L. Dryden (USA)
1956 F.K.G. Odqvist (Sweden)
1960 G. Temple (UK)
1964 M. Roy (France)
1968 W.T. Koiter (Netherlands)
1972 H. Görtler (Germany)
1976 F.I. Niordson (Denmark)
1980 D.C. Drucker (USA)

Past Officers
Vice-President  Treasurer  Secretary
R.V. Southwell H.L. Dryden  J.M. Burgers
(USA) (UK) (Netherlands)

Argentina (1959)
Asociacion Argentina de Mecanica Computacional,
Güemes 3450, 3000 Santa Fe
Chairman: Dr. S.R. Idelsohn
Representative: Dr. Mario Gradowczyk

Australia (1964)
The Australian National Committee for Theoretical and Applied Mechanics of the Australian Academy of Science, GPO Box 783, Canberra City, ACT 2601
Chairman: Prof. B.L. Karihaloo
Representative: Prof. G. Rozvany

Austria (1951)
Austrian National Committee for Theoretical and Applied Mechanics, Österreichische Akademie der Wissenschaften, Dr. Ignaz-Seipel-Platz 2, A-1010 Wien
Chairman: Prof. F. Ziegler
Representative: Prof. F. Ziegler

Belgium (1949)
The National Committee for Theoretical and Applied Mechanics of the Class of Sciences of the Royal Belgian Academy, Hertogstraat 1, B-1000 Brussel
President: Prof. R. Mertens
Vice-President: Prof. M. Crochet
Secretaries: Prof. J. Peters, Prof. J. Kestens
Representatives: Prof. P. Janssens, Prof. J. Kestens, Prof. R. Mertens

Brazil (1982)
Associação Brasileira de Ciências Mecânicas, Pontificia Universidade Católica, Rua Marquês de São Vicente, 225, 22453 Rio de Janeiro
Chairman: Prof. S. Stuckenbruck
Representative: Prof. L. Bevilacqua

Bulgaria (1969)
Bulgarian National Committee for Theoretical and Applied Mechanics at the Bulgarian Academy of Sciences, "Acad. G. Bonchev" str. bl. 8, 1113 Sofia
President: Acad. G. Brankov
Vice-President: Prof. D. Kolarov
Secretary: Assist. Prof. S. Radev
Representatives: Acad. G. Brankov, Prof. D. Kolarov
Canada (1963)
The National Research Council of Canada, Ottawa, K1A OR6
President: Dr. L. Kerwin
Chairman of Canadian National Committee for IUTAM: Prof. B. Tabarrok
Representatives: Prof. E. P. J. Rimrott, Prof. B. Tabarrok, Prof. S. R. Savage, Dr. S. R. Swanson

China (1980)
The Chinese Society of Theoretical and Applied Mechanics, Zhong Guancun Beijing
Chairman: Prof. Zheng Zhemin
Representative: Prof. Lin Tongji, Prof. Qian Lingxi, Prof. Wang Ren, Prof. Zheng Zhemin
The Society of Theoretical and Applied Mechanics, 130 Kee-Lung Rd., Section 3, Taipei, Taiwan 107
President: Dr. Chun-Tsung Wang
Representative: Prof. F. T. Sun

Czechoslovakia (1949)
The Czechoslovak Committee of Theoretical and Applied Mechanics of the Czechoslovak Academy of Sciences, Podhabská 13, 16612 Prague 6
President: Prof. V. Křupka
Secretary: Dr. A. G. Círcek
Representatives: Prof. J. Nemec, Prof. V. Křupka

Denmark (1949)
The Royal Danish Academy of Sciences and Letters (Det Kongelige Danske Videnskabernes Selskab), H. C. Andersen Boulevard 35, DK-1553 Copenhagen V.
President: Prof. Jens Lindhard
Secretary: Prof. Dr. Thor A. Bak
Representatives: Prof. E. B. Hansen, Prof. P. T. Pedersen

Egypt (1976)
Academy of Scientific Research & Technology, 101, Kasr El-Eini St., Cairo
Chairman: Prof. R. H. Dawoud
Secretary: Dr. M. M. A. Nassar
Representative: Prof. R. H. Dawoud

Finland (1952)
The Finnish National Committee on Mechanics, Helsinki University of Technology, SF-02150 Espoo 15
Chairman: Prof. Matti A. Ranta
Secretary: Prof. M. J. Mikkola
Representatives: Prof. M. J. Mikkola, Prof. Matti A. Ranta

France (1949)
Comité National Français de Mécanique, Académie des Sciences, 23, quai Conti, F-75006 Paris, France
President: Prof. Paul Germain
Secretary: G. Duvaut
Representatives: Prof. P. Germain, Prof. G. Iooss, Prof. G. Lespinard, Prof. M. Roseau

Deutsches Komitee für Mechanik, Institut B für Mechanik, Universität Stuttgart, Pfaffenwaldring 9, D-7000 Stuttgart 80
Chairman: Prof. Th. Lehmann
Representatives: Prof. K. Gersten, Prof. E. Krause, Prof. H. Lippmann, Prof. W. Schiehlen

German Dem. Rep., (GDR) (1973)
Academy of Sciences of the GDR, Otto-Nuschke-Strasse 22/23, DDR-1080 Berlin
President: Prof. Dr. sc. med. W. Scheler
Secretary General: Prof. Dr. habil. C. Grote
Representatives: Prof. H. Günther, Prof. J. Altenbach

Greece (1979)
Hellenic Society for Theoretical and Applied Mechanics, National Technical University of Athens, GR-10682 Athens
President: Prof. A. N. Kounadis
Secretary: Prof. S. Pali’petis
Representative: Prof. A. N. Kounadis

Hungary (1948)
Hungarian National Committee for IUTAM, Department of Mechanics, Technical University Budapest, Műegyetem rkp. 3, H-1521 Budapest
President: Prof. János Szabó
Secretary: Prof. S. Kaliszky
Representative: Prof. S. Kaliszky

India (1950)
The Indian National Committee for Theoretical and Applied Mechanics of the Indian National Science Academy, Bahadur Shah Zafar Marg, New Delhi-110 002
Chairman: Prof. N. C. Nigam
Secretary: Dr. H. S. Mukunda
Representatives: Dr. H. S. Mukunda, Prof. R. Narasimha, Prof. N. C. Nigam
Ireland (1984)
Irish National Committee for Theoretical and Applied Mechanics, Royal Irish Academy, 19 Dawson Street, Dublin 2
Chairman: Prof. M. A. Hayes
Secretary: Dr. R. Bates
Representative: Prof. M. A. Hayes

Israel (1950)
The Israel Society for Theoretical and Applied Mechanics, Faculty of Engineering, Tel Aviv University, Tel Aviv, Israel
President: Prof. Z. Hashin
Representatives: Prof. Z. Hashin, Prof. Sol R. Bodner

Italy (1949)
President: Prof. Giulio Maier
Secretary: Prof. Leone Corradi Dell’ Acqua
Representatives: Prof. G. Bianchi, Prof. D. Galletto, Prof. C. Cercignani, Prof. C. Polizzotto

Japan (1951)
The National Committee for Theoretical and Applied Mechanics of the Science Council of Japan, 22-34 Roppongi 7-chome, Minato-ku, Tokyo, 106
President: Prof. Isao Imai
Representatives: Prof. I. Imai, Prof. I. Tani, Prof. Y. Yamamoto, Prof. K. Kawata

Netherlands (1952)
Department for Mechanics of the Royal Institute of Engineers, Secr. Technische Hogeschool Eindhoven, WH 0. 130, Postbus 513, NL-5600 MB Eindhoven
President: Prof. J. Blaauwenwraad
Secretary: Dr. G. Bartelds
Representatives: Prof. J.F. Besseling, Prof. Dr. A.M.A. v.d. Heijden, Prof. L. van Wijngaarden

New Zealand (1979)
The Royal Society of New Zealand, P.O. Box 598, Wellington
President: Dr. T. Hatherton
Executive Officer: Mr. V.R. Moore
Representative: Prof. I.F. Collins

Norway (1949)
The National Committee on Theoretical and Applied Mechanics of the Norwegian Academy of Sciences and Letters, Dept. of Mathematics, University of Bergen, N-5000 Bergen
President: Prof. M. S. Espedal
Representative: Prof. M. S. Espedal

Poland (1952)
Committee for Mechanics of the Polish Academy of Sciences, Swietokrzyska 21, 00-049 Warsaw
President: Prof. W. Gutkowski
Representatives: Prof. W. Szczepinski, Prof. W. Gutkowski

Portugal (1968)
The Portuguese National Committee for Theoretical and Applied Mechanics, Instituto Superior Técnico, Avenida Rovisco Pais, 1096 Lisboa Codex
Chairman: Prof. E.R. de Arantes e Oliveira
Vice-President: Prof. A. Ribeiro Gomes, Prof. J. Novais Barbosa
Secretary: Prof. A. Tovar de Lemos
Representative: Prof. E.R. de Arantes e Oliveira

Roumania (1956)
Adhering organization: vacant
Representative: vacant

Spain (1950)
The Spanish Institute of Aerospace Technology “Esteban Terradas”, Paseo del Pintor Rosales, 34, Apartado 8346, Madrid – 28008
Representative: Dr. M. Bautista Aranda

Sweden (1950)
Swedish National Committee for Mechanics, The Aeronautical Research Institute of Sweden, Box 11021, S-16111 Bromma
President: Prof. J. Carlsson
Secretary: Dr. M. Svenzon
Representatives: Prof. S. Berndt, Prof. J. Hult, Prof. J. Carlsson

Switzerland (1950)
Board of the Federal Institutes of Technology (Eidgenössische Technische Hochschulen Zürich und Lausanne) ETH-Zentrum, CH-8092 Zürich
Chairman: Prof. Heinrich Ursprung
Secretary: Dr. Johannes Fulda
Representatives: Prof. I.L. Ryhming, Prof. M. Sayir
**Turkey** (1977)
Turkish National Committee of Theoretical and Applied Mechanics,
Istanbul Teknik Üniversitesi, Fen-Edebiyat Fakültesi, I.TÜ. Kampüsü,
Maslak, Istanbul
President: Prof. Murat Dikmen
Secretary-General: Prof. Esin Ergintan Inan
Representative: Prof. Murat Dikmen

**UK** (1948)
The Royal Society, 6 Carlton House Terrace, London SW 1Y 5AG
Chairman of British National Committee for Theoretical and Applied Mechanics: Prof. J.T. Stuart
Executive Secretary of the Royal Society: Dr. P.T. Warren
Representatives: Prof. T.B. Benjamin, Sir James Lighthill, Prof. J.T. Stuart, Dr. A.A. Wells, Prof. J.R. Willis

**USA** (1949)
The U.S. National Committee on Theoretical and Applied Mechanics,
National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D.C., 20418
Chairman: Dr. H.N. Abrams
Vice-Chairman: Prof. A. Acrivos
Secretary: Prof. Philip G. Hodge, Jr.
Representatives: Dr. H.N. Abrams, Prof. A. Acrivos, Prof. D.C. Drucker, Prof. L.B. Freund, Prof. P.G. Hodge Jr.

**USSR** (1956)
USSR National Committee on Theoretical and Applied Mechanics, Prospekt Vernadskogo 101, Moscow 117526
President: Prof. I.F. Obraztsov
Secretary: Prof. G.K. Mikhailov
Representatives: Prof. G.G. Chernyi, Prof. K.V. Frolov, Prof. A.Yu. Ishlinsky, Prof. G.K. Mikhailov, Prof. I.F. Obraztsov

**Yugoslavia** (1952)
Yugoslav Society of Mechanics, Kneza Miloša 9/1, 11000 Beograd
President: Prof. B. Vujanović
Secretary: Prof. D. Ružić
Representative: Prof. D. Ružić

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**Affiliated organizations**

**CISM** (1970)
International Centre for Mechanical Sciences, Palazzo del Toro, Piazza Gari-baldi, Udine, Italy
President: Avv. Vinicio Turello
Secretary-General: Prof. G. Bianchi
Rectors: Prof. P. Brousse, Prof. S. Kaliszky, Prof. H. Lippmann
Representative: Prof. G. Bianchi
Representative of IUTAM in CISM: Prof. H. Lippmann

**ICHMT** (1972)
International Centre for Heat and Mass Transfer, Beograd, P.O. Box 522, Yugoslavia
President: Prof. W. Rohsenow
Secretary-General: Prof. N. Afgan
Representative: Prof. N. Afgan
Representative of IUTAM in ICHMT: Prof. L.I. Sedov

**ICR** (1974)
International Committee on Rheology, Prof. N.W. Tschoegl, Division of Chemistry and Chemical Engineering 205-41, California Institute of Technology, Pasadena, California 91125, USA
Chairman: Prof. B. Menk
Secretary: Prof. N. Tschoegl
Representative: Dr. J.R.A. Pearson
Representative of IUTAM in ICR: Prof. F.I. Niordson

**Euromech** (1978)
European Mechanics Committee, Prof. Dr.-Ing. H.H. Fernholz, Hermann-Föttinger-Institut für Thermo- und Fluidodynamik, Technische Universität, Strasse des 17. Juni 135, D-1000 Berlin 12
Chairman: Prof. G.K. Batchelor
Secretary: Prof. H.H. Fernholz
Representative: Prof. G.K. Batchelor
Representative of IUTAM in Euromech: Prof. L. van Wijngaarden

**IAVSD** (1978)
International Association for Vehicle System Dynamics, Prof. H.B. Pacejka,
Delft University of Technology, Vehicle Research Laboratory, P.O. Box 5038, 2600 GA Delft, The Netherlands
President: Prof. L. Segel
Secretary: Prof. H.B. Pacejka
Representative: Prof. H.B. Pacejka
Representative of IUTAM in IAVSD: Prof. W. Schiehlen
ISIMM (1978)
International Society for the Interaction of Mechanics and Mathematics, Prof. E. Kröner, Institute of Theoretical and Applied Physics, University of Stuttgart, Pfaffenwaldring 57, D-7000 Stuttgart 80, FRG
President: Prof. E. Kröner
Vice-President: Prof. G. Barenblatt
Secretary: Prof. W. Wendland
Representative: Prof. W.T. Koiter
Representative of IUTAM in ISIMM: Prof. P. Germain

ICF (1978)
International Congress on Fracture, Prof. T. Yokobori, Institute for Fracture and Safety, Doya Building 802, 17-18 I-Chome Kamisugi, Sendai 980, Japan
Founder President: Prof. T. Yokobori
President: Prof. D. Francois
Secretary-General: Prof. T. Yokobori
Representative: Prof. T. Yokobori
Representative of IUTAM in ICF: Prof. J. Hult

ICM (1982)
International Congress on Mechanical Behaviour of Materials, Professor Yan Minggao, Institute of Aeronautical Materials, Beijing, China
President: Prof. Yan Minggao
Secretary: Dr. Xueren Wu
Representative: Prof. K. Miller
Representative of IUTAM in ICM: Prof. D. C. Drucker

AFMC (1982)
Asian Fluid Mechanics Committee, Professor T.C. Lin, Institute of Mechanics, Chinese Academy of Sciences, Beijing 100080, China
President: Prof. H. Sato
Representative: vacant
Representative of IUTAM in AFMC: Prof. I. Imai

IACM (1984)
International Association for Computational Mechanics, Department of Structural Mechanics, Chalmers University of Technology, S-41296 Gothenburg, Sweden
Secretary: Prof. R.H. Gallagher, Prof. A. Samuelsson
Representative: vacant
Representative of IUTAM in IACM: Prof. E.R. de Arantes e Oliveira

Members of the General Assembly

- Dr. H.N. Abramson (USA)
- Prof. A. Acivos (USA)
- Prof. N. Afgan (Yugoslavia)
- Prof. J. Altenbach (GDR)
- Prof. E.R. de Arantes e Oliveira (Portugal)
- Prof. G. Batchelor (UK)
- Dr. M. Bautista Aranda (Spain)
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- Prof. K. Gersten (FRG)
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- Prof. W. Gutkowski (Poland)
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- Prof. M.A. Hayes (Ireland)
- Prof. A.M.A. van Heijden (Netherlands)
- Prof. P.G. Hodge, Jr. (USA)
- Prof. N.J. Hoff (USA)
- Prof. J. Hult (Sweden)
- Prof. I. Imai (Japan)
- Prof. G. Iosos (France)
- Prof. A.Yu. Ishinskaya (USSR)
- Prof. P. Janssens (Belgium)
- Prof. S. Kaliszky (Hungary)
- Prof. K. Kawata (Japan)
- Prof. J. Kestens (Belgium)
- Prof. W.T. Koiter (Netherlands)
- Prof. D. Kolarov (Bulgaria)
- Prof. A.N. Kounadis (Greece)
- Prof. E. Krause (FRG)
- Prof. V. Kufpka (CSSR)
- Prof. Y.H. Ku (USA)
- Prof. G. Leshpand (France)
- Sir James Lighthill (UK)
- Prof. T.C. Lin (China)
- Prof. H. Lippmann (FRG)
- Prof. R. Mertens (Belgium)
- Prof. G.K. Mikhailov (USSR)
- Prof. M.J. Mikkola (Finland)
- Prof. K. Miller (UK)
- Dr. H.S. Mukunda (India)
- Prof. R. Narasimha (India)
- Prof. J. Nemec (CSSR)
- Prof. N.C. Nigar (India)
- Prof. F.I. Njordson (Denmark)
- Prof. I.M. Obraztsov (USSR)
- Prof. H.B. Pacejka (Netherlands)
- Dr. J.R.A. Pearson (UK)
- Prof. P.T. Pedersen (Denmark)
- Prof. C. Polizzotto (Italy)
- Prof. L. Qian (China)
- Prof. M.A. Ranta (Finland)
- Prof. F.P.J. Rimrott (Canada)
- Prof. M. Roseau (France)
- Prof. G. Rozvany (Australia)
- Prof. D. Ružič (Yugoslavia)
- Prof. L.L. Ryhming (Switzerland)
- Prof. S.B. Savage (Canada)
- Prof. M. Sayir (Switzerland)
- Prof. W. Schichler (FRG)

$ Representing Affiliated Organization. §§ Representing also Affiliated Organization.
Members of the Symposia Panels

The Bureau of IUTAM in 1977 set up two panels charged with the duty of scanning proposals made for IUTAM Symposia in the fields of fluid and solid mechanics. The following members have been elected in 1984 for the period up to and including the 1988 meeting of the General Assembly:

**Fluid Mechanics**
- Prof. H.K. Moffat (UK), Chairman
- Prof. A. Acivos (USA)
- Prof. J.P. Guiraud (France)
- Prof. I. Imai (Japan)
- Prof. R. Narasimha (India)

**Solid Mechanics**
- Prof. S.H. Crandall (USA), Chairman
- Prof. J. Saléont (France)
- Prof. H. Lippmann (FRG)
- Prof. G. Maier (Italy)
- Prof. M. Życzkowski (Poland)

Reports of Symposia held in 1987

1. IUTAM Symposium on Turbulence Management and Relaminarisation, 19-23 January 1987, Bangalore, India.

Scientific Committee
- P. Bradshaw (UK)
- V.G. Chernyi (USSR)
- G. Combe-Bellot (France)
- H.H. Fernholz (FRG)
- H.W. Lippmann (USA), Co-Chairman

Sir James Lighthill (UK)
- H.M. Nagib (USA)
- R. Narasimha (India)
- Co-Chairman
- H. Sato (Japan)

Short summary of scientific progress achieved

The last two decades have witnessed an intensifying effort in learning how to manage flow turbulence: it has in fact now become one of the most challenging and prized technological goals in fluid dynamics. The goal itself is of course not new. More than a hundred years ago, Reynolds already listed factors conducive to laminar and to turbulent flow.

The revival of interest in these problems in recent years can be attributed to the emergence of several new factors. First of all, fresh scientific insight into the structure of turbulence, in particular the accumulated evidence for the presence of significant order in turbulent flow, has been seen to point to new methods of managing turbulence. A second major reason has been the growing realization that the rate at which the world is consuming its reserves of fossil fuels is no longer negligible; the economic value of greater energy efficiency and lower drag has gone up significantly. Finally, the continually declining costs of making a calculation or processing data, because of advances in computer technology, have now made feasible methods of active control that till recently seemed far-fetched.
The papers presented at the Symposium fall naturally into three classes. The first covers the important area of wall-bounded flows, including boundary layers and ducts. This area has naturally attracted the most attention, presumably because of the vast potential in applications. The second class concerns free-shear flows, including jets, mixing layers, and others in which the presence of a wall has little influence on the structure of the flow. The third group, separated flows, shares some of the characteristics of both wall-bounded and free-shear flows. As in fact it developed during the course of the Symposium, there appear to be important differences in the degree to which these three classes of flows can be managed.

It appears to us that the general conclusion that emerges from these studies is that it is useful to make a distinction between flows that are intrinsically unstable (which includes all free-shear and separated flows) and those that are not (e.g., duct flows, and boundary layers not subjected to strong adverse pressure gradients). In the unstable flows, the coherent motion is strong, many of its characteristics can be related to linearly unstable modes, and even the evolution of fluctuating velocities can often be satisfactorily calculated; these flow appear to lend themselves to many different methods of management. On the other hand, the basically stable flows have clearly no linearly unstable motions, possess a relatively weaker coherent motion, and are correspondingly more difficult to manage. It is possible that in this class of flows, the degree to which management can be achieved will remain limited. This does not, of course, mean that what can be achieved is always negligible.

**Countries represented and number of participants**

<table>
<thead>
<tr>
<th>Country</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>1</td>
</tr>
<tr>
<td>Canada</td>
<td>1</td>
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<tr>
<td>FRG</td>
<td>2</td>
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<tr>
<td>India</td>
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<td>Japan</td>
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<td>USA</td>
<td>24</td>
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<tr>
<td>USSR</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
</tr>
</tbody>
</table>

**Proceedings of the Symposium**

The proceedings are to be published by Springer-Verlag, with Prof. R. Narasimha and Prof. H.W. Liepmann as editors.

**Financial Support**

Generous support of the Symposium was provided by the following institutions:

IUTAM, Indian National Science Academy, Council of Scientific & Industrial Research, National Aeronautical Laboratory, Department of Science & Technology, Aeronautics R&D Board.

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**INTERNATIONAL UNION OF THEORETICAL AND APPLIED MECHANICS**

**SCIENTIFIC PROGRAMME**

Session 1  **Wall-bounded Flows**

Section 1A  **Structure**

H.M. Nagib, C.E. Wark, Y.G. Guezennece: Documentation of turbulence producing structures in regular and manipulated boundary layers

J.H. Arakri, D.E. Coles: Measurements in a synthetic turbulent boundary layer

K.R. Sreenivasan: A unified view of the origin and morphology of the turbulent boundary layer structure

Section 1B  **Outer Layer Devices**

K.S. Yajnik, S. Sundaram, R. Sivaram: Evaluation of drag reduction by turbulence control devices

A.M. Savill: Turbulent boundary layer manipulation and modelling in zero and adverse pressure gradients

A. Bertelrud: Computational and experimental studies of LEBUS at high device Reynolds numbers

A. Prabhu, P. Kailas Nath, R.S. Kulkarni, R. Narasimha: Blade manipulators in channel flow

Section 1C  **Surface Manipulation**

A. Dinkelacker, P. Nitschke-Kowsky, W.-E. Reif: On the possibility of drag reduction with the help of longitudinal ridges in the wall

S.P. Wilkinson, B.S. Lazor: Direct drag and hot-wire measurements on thin-element riblet arrays


Kwing-So Choi: The wall pressure fluctuations of modified turbulent boundary layer with riblets

I. Tani, H. Munakata, A. Matsumoto, K. Abe: Turbulence management by groove roughness

T.K. Sengupta, G.K. Suryanarayana, S. Selvaraj: A case for turbulence management by imposed wall excitation for fully developed turbulent flows - a numerical study

Session 2  **Transition**

Section 2A  **Dynamics**

H.F. Robey: The nature of oblique instability waves in boundary layer transition

T.C. Corke, R.A. Mangano: Transition of a boundary layer: controlled fundamental-subharmonic interactions
Y. Kohama: Three-dimensional boundary-layer transition on a concave-convex curved wall
K.S. Yang, P.R. Spalart, H.L. Reed, J.H. Ferziger: Numerical simulation of transition in a decelerating boundary layer
Ch. P. Ritz, R. W. Miksad, E. J. Powers, F. L. Jones, R. S. Solis: Measurement of nonlinear transfer functions for transitioning flows

Section 2B  Control
V. V. Kozlov, Y. Ya. Levchenko: Laminar-turbulent transition control by localized disturbances
A. I. Derzhavina, O. S. Ryzhov, E. D. Terentev: Suppression of unstable oscillations in a boundary layer
M. Gaster: Is the dolphin a red herring?
P. W. Carpenter: The optimization of compliant surfaces for transition delay

Session 3  Relaminarisation, Natural Laminar Flow
P. R. Viswanath, A. Prabhu, G. S. Bhat: Visualization of relaminarising flows: a colour movie
M. Tabatabai, A. Pollard: On the process of inverse transition in radial flow between parallel disks
H.-W. Bewersdorff, R. P. Singh: Turbulent drag reduction and relaminarisation by xanthan gum
W. Pfenninger, J. Viken, C. S. Venmu, G. Volpe: All laminar supercritical LFC airfoils with natural laminar flow in the region of the main wing structure

Session 4  Free Shear Flows
I. Wygnanski, I. Weisbrot: On the pairing process in an excited, plane, turbulent mixing layer
R. J. Hakkinen, J. T. Kegelman, V. Kibens, F. W. Roos, R. W. Wlezien: Experiments on turbulence control in jets and shear flows
R. A. Petersen, M. M. Samet, T. A. Long: Excitation of azimuthal modes in an axisymmetric jet
A. K. M. F. Hussain, H. S. Husain: Passive and active control of jet turbulence
R. E. Breidenthal: Turbulent mixing in accelerating jets
M. A. Badri Narayanan, M. F. Platzer: The mixing mechanism by organised turbulence structures in a plane jet excited by a novel method
T. Srinivas, B. Vasudevan, A. Prabhu: Performance of fluidically controlled oscillating jet

Session 5  Separated Flows
L. W. Sigurdson, A. Rosako: The structure and control of a turbulent reattaching flow
C. Shih, M. Lee, C.-M. Ho: Control of separated flow on a symmetric airfoil

R. Narasimha and H. W. Liepmann

2.

IUTAM Symposium on Advanced Boundary Element Methods: Applications in Solid and Fluid Mechanics, 13-14 April 1987, San Antonio, Texas, USA

Scientific Committee
T. A. Cruse (USA), (Chairman)
Yu. M. Davydov (USSR)
P. Germain (France)
S. Mukherjee (USA)
Y. Yamamoto (Japan)
P. J. Zandbergen (The Netherlands)
F. Ziegler (Austria)

Short summary of scientific progress achieved
The Symposium brought together researchers covering the entire field of advanced boundary element methods in solid mechanics, fluid mechanics, and geomechanics. Presented papers ranged from new theoretical and analytical developments to a variety of applications. The aims of the Symposium included defining the state-of-the-art for BEM research, providing a forum for interchange of ideas between the various application and development areas, and developing new research ideas. The participants were polled regarding future research priorities for the BEM; the results of the survey were forwarded to IUTAM and the NSF agencies. Response to the Symposium indicated a high level of personal interactions and idea exchanges between participants.

Countries represented and number of participants

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Publications of Proceedings
The proceedings are due to be published as a bound volume by the end of 1988; they will be published by Springer-Verlag, Heidelberg (editor: T. A. Cruse).

Financial support
Financial support of the Symposium was generously provided by the International Union of Theoretical and Applied Mechanics (IUTAM), the National Science Foundation (NSF), and Daimler-Benz. The Symposium was co-sponsored by Southwest Research Institute.
SCIENTIFIC PROGRAMME

Monday, April 13
Session 1
F. J. Rizzo: Some Recent Applications and Some General Comments on the Boundary Integral Equation Method
T. J. Rudolphi: A Combined Boundary and Finite Element Implementation for Axisymmetric Thermoelasticity
A. Chandra: Simulation of Rolling Processes by the Boundary Element Method
L. Morino, B. K. Bharadvaj, M. I. Freedman, K. Tseng: A Unified Boundary-Element Approach for Three-Dimensional Unsteady Compressible Aerodynamics for Airplanes and Helicopters in Arbitrary Motion
Y. Tanaka, T. Honma, T. Kaji: Transient Solutions of a Three-Dimensional Convective Diffusion Equation Using Mixed Boundary Elements
H. A. Mang, Z. Y. Chen: On the Symmetricability of Coupling Matrices for BEM-FEM Discretizations of Solids

Session 2
D. H. Peregrine: Steep Unsteady Water Waves and Boundary Integral Methods
M. Guiggiani, P. Casalini: New Developments in the Boundary Element Methods for Plane and Axisymmetric Elasticity
G. Rajen, F. A. Kulacki: A Boundary Element Analysis of Natural Convection in Fluids and Porous Media
R. E. Kleinman, P. A. Martin: Single Integral Equations for Scattering by a Penetrable Obstacle
M. Kithara, J. D. Achenbach: BIE Calculations for Harmonic Waves in a Solid with Periodically Distributed Inhomogeneities
H. Irschick, R. Heuer, F. Ziegler: Free and Forced Vibrations of Polygonal Mindlin-Plates by an Advanced BEM

Tuesday, April 14
Session 3
U. Heise: Condition of a Boundary Integral Equation for the Elasticity Problem, and Round-Off Errors in its Numerical Solution
A. Bossavit: An Investigation of Some Mathematical Structures which Underly Boundary-Integral Methods
C. Polizzotto: A Consistent Formulation of the BEM Within Elastoplasticity Theory
M. Bonnet, H. D. Bui: Regular BIE for Three-Dimensional Crack in Elastodynamics

N. Nishimura, S. Kobayashi: An Improved Boundary Integral Equation Method for Crack Problems
H. Abe, K. Hayashi, S. Takahashi: Stress Intensity Factors for an Embedded Crack Near a Cylindrical Cavity
A. P. S. Selvadurai: Non-Linear Material Interfaces: A Boundary Element Approach

Session 4
J. L. Hess: Development and Application of Panel Methods
T. S. Lu, G. Coulby: Design Problem Relating to a Profile or a Cascade of Profiles: Construction of Orthogonal Networks Using the Riemann Surfaces for the Multiform Singularities
T. Burczynski: Boundary Element Method for Deterministic and Stochastic Shape Design Sensitivity Analysis
B. Poddar, S. Mukherjee: An Integral Equation Analysis of Inelastic Shells
W. Mohrmann: Industrial: Application of the BEM Using DBETSY
J. Dominguez, R. Abascal: Seismic Response of Foundations on Zoned Soils
A. Chaudouet, F. El Yafi: Boundary Element Method Applied to 3D Optimum Design

Poster Session
M. Vable: Improving the Solution of the Boundary Element Method by Changing the Conditioning of the Matrix in Algebraic Equations
T. Willment, P. Bhattacharyya: Boundary Element Methods for Two Dimensional Bi-material Fracture Problems
A. H. Magnusson: An Improved Algorithm for Solving Two Dimensional Potential Field Problems Using the Boundary Element Method; Part I: Curved Elements
G.-M. Han, H.-B. Li: A Numerical Study for Convergence of a Classic 3D Problem Solved by BEM
H. G. Walters, J. C. Ortiz, G. Steven Gipson, J. A. Brewer, III: Overhauser Splines as Improved Boundary Element Types
L. Hadjikov, K. Georgiev, V. Kabardjikov, Ya. Ivanov: Boundary Element Method and Speckle Photography for the Investigation of the Solidification of Filled Polymers
M. Koizumi, M. Utamura: A Polar Coordinate Integration Scheme with a Hierarchical Correction Procedure to Improve Numerical Accuracy

Wednesday, April 15
Session 5
W. L. Wendland: Mathematical Properties and Asymptotic Error Estimates for Elliptic Boundary Element Methods
Thursday, April 16

Session 6


M. Stern, L.M. Taylor: Coupling Boundary Integral and Finite Element Formulations for Nonlinear Halfspace Problems

G. Beer, G. Swoboda: Application of Advanced Boundary Element and Coupled Methods in Geomechanics

J.E. Romate, P.J. Zandbergen: Boundary Integral Equation Formulation for Free Surface Flow Problems in Two and Three Dimensions

M. Rezayat, T.A. Burton: A Special Boundary-Integral Formulation to Simulate a Manufacturing Process

A. H-D. Cheng, M. Predeleanu: Boundary Element Method for Viscoelastic and Dynamic Poroelasticity

N. Tošaka: Integral Equation Method for Analysis of Newtonian and Non-Newtonian Flows

Session 7

S.N. Atluri: Yield-Boundary Element Methods for Large Deformation Elastic and Nonelastic Solid Mechanics

V. Rubenchik: Boundary Integral Equation Method of Higher Computational Accuracy

M. Kamiya: Geometrically Nonlinear Analysis of Elastic Plates by the Boundary Element Method

C.A. Brebbia: The Solution of Parabolic and Hyperbolic Problems Using the Dual Reciprocity Principle BE Formulations

S.T. Raveendra, T.A. Cruse: Boundary Element Fracture Mechanics Modelling

T.A. Cruse

3.

IUTAM Symposium on Nonlinear Stochastic Dynamic Engineering Systems, 21-26 June 1987, Innsbruck/Iglis, Austria

Scientific Committee
V.V. Bolotin (USSR) W.O. Schiehlen (FRG)
K. Hennig (GDR) G.I. Schüeller (Austria),
Y.K. Lin (USA) Co-Chairman
E. Pardoux (France) E.H. Vanmarcke (USA)
J. Salençon (France) F. Ziegler (Austria), Co-Chairman

Short summary of scientific progress achieved

Nonlinear stochastic dynamics of engineering systems provides the tools for basic development progress in various fields of mechanical, structural and aeronautical engineering, particularly in the areas of vehicle dynamics, multi-storey structural dynamics, systems identifcation, offshore structural dynamics, nuclear structures under various stochastic loading conditions (i.e. wind, earthquake, parametric excitations, etc.). The purpose of this Symposium was to present i.e. introduce and critically discuss new ideas and approaches in the area of nonlinear stochastic dynamics. This was most successfully accomplished by 42 contributions by leading experts in the field as well as young, promising researchers. The contributions covered a wide scope from more theoretical analytical and numerical treatment to practical application in various fields. The lively and thorough discussions during the meeting definitely laid ground to further research in this important field of nonlinear dynamics. Last not least, as a great number of new scientific contacts were made, the Symposium contributed significantly to intensify international cooperation in the field.

Countries represented and number of participants

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Publications of Proceedings

The proceedings are due to appear during the second half of 1987 and will be published by the Springer Verlag, Berlin (eds.: F. Ziegler and G.I. Schüeller)
Financial support
Financial support of the Symposium was generously provided by the International Union of Theoretical and Applied Mechanics (IUTAM). Additional support was received by: Austrian National Committee of Theoretical and Applied Mechanics, Bundesministerium für Wissenschaft und Forschung, Bundesministerium für Bauen und Technik, Land Tirol, Stadt Innsbruck, Bundeskammer der gewerblichen Wirtschaft Österreichs, Fachverband der Maschinen- und Stahlbauindustrie Österreichs, Creditanstalt-Bankverein (CA), Bank für Arbeit und Wirtschaft (BAWAG), MAN – Neue Technologie, München, Siemens AG – Österreich, Tyrolian Airways, Austrian Society of Earthquake Engineering (OGE), Institut für Mechanik of Universität Innsbruck, Institut für Allgemeine Mechanik of Technische Universität Wien.

SCIENTIFIC PROGRAMME

Monday, June 21
Session I: Equivalents Linearization and Linearization Techniques
F. Casociati, L. Faravelli: Stochastic Equivalent Linearization Algorithms
P. Hagedorn, J. Wallaschek: On Equivalent Harmonic and Stochastic Linearization for Nonlinear Mechanical Elements
H. Windrich, P. C. Müller, K. Popp: Approximate Analysis of Limit Cycles in the Presence of Stochastic Excitations
F. Kozin: Linearization Techniques for Non-Linear Stochastic Vibrations
M. F. Dimentberg, A. I. Menyailov: Statistical Dynamics of Vibroimpact Systems

Session II: Linearization Techniques
R. N. Iyengar, C. S. Manohar: Van der Pol’s Oscillator Under Combined Periodic and Random Excitation
H. Oda, T. Ozaki, Y. Yamamouchi: A Nonlinear System Identification in the Analysis of Offshore Structure Dynamics in the Random Wave
H. Irgak, H. Hayek, F. Ziegler: Nonstationary Random Vibrations of Continuous Inelastic Structures Taking into Account Finite Spread of Plastic Zones

Tuesday, June 22
Session III: Stability Problems
S. T. Ariaratnam: Stability of Random Vibration of Coupled Nonlinear Systems
W. Wedig: Mean Square Stability and Spectrum Identification
E. Pardoous, D. Talay: Stability of Linear Differential Systems with Parametric Excitation
N. Sri Namachchivaya, H. H. Hilton: Stochastically Perturbed Bifurcations
L. Arnold: Lyapunov Exponents of Nonlinear Stochastic Systems with Applications to Engineering

Thursday, June 25
Session VIII: Closure- and Stochastic Averaging Techniques
Y. Yong, Y. K. Lin, A. Brückner: Exact and Approximate Solutions for Response of Nonlinear Systems under Parametric and External White Noise Excitations
R. A. Ibrahim, A. Soundararajan: Non-Gaussian Response of Nonlinear Oscillators with Fourth Order Internal Resonance
J. B. Roberts: Application of Averaging Methods to Randomly Excited Hysteretic Systems
P. T. D. Spanos, J. R. Red-Horse: A Closed Form Solution for a Class of Non-Stationary Nonlinear Random Vibration Problems
**Session IX: Hysteretic Systems**

Y. Suzuki, R. Minai: Stochastic Seismic Damage and Reliability Analysis of Hysteretic Structures


S. Narayanan: Nonlinear and Nonstationary Random Vibrations of Hysteretic Systems with Application to Vehicle Dynamics

M. P. Singh, R. A. Heller: Modal Analysis of Nonlinear Hysteretic Structures for Seismic Motions

W. D. Iwan, M. A. Moser, L. G. Papazov: The Stochastic Response of Strongly Nonlinear Systems with Coulomb Damping Elements

S. Belizzi, R. Bouc: Identification of the Hysteresis Parameters of a Nonlinear Vehicle Suspension under Random Excitation

---

**Friday, June 26**

**Session X: Reliability Problems**

L. A. Bergman, B. F. Spencer: On the Solution of First Passage Problems in Nonlinear Stochastic Dynamics


M. Chavez: Reliability of Nonlinear Inflated Frame Systems with Uncertain Properties under Random Seismic Loading

P. Grosserode, K. Willam: Statistical Performance of Nonlinear Joints in Space Structures

**G. Schueller and F. Ziegler**

---


**Scientific Committee**

J. P. Boehler (France), Co-Chairman

V. Tvergaard (Denmark), Co-Chairman

P. Germain (France)

Z. Hashin (Israel)

H. Lippmann (FRG)

E. T. Onat (USA)

A. J. M. Spencer (UK)

R. Talreja (Denmark)

J. Willis (UK)

**Short summary of scientific progress achieved**

Natural materials such as soils, rocks and wood, as well as artificial materials such as metals, fiber-reinforced composites and laminates, possess innate or deformation induced oriented microstructures, which give rise to evolving anisotropy in macroscopic behavior, up to failure. The inelastic behavior of such anisotropic solids, in the presence of yielding, damage and failure, is of importance in modern technology and therefore has attracted increasing research interest in constitutive laws, methods of analysis, experiments and design. The various types of natural and deformation induced anisotropies influence, in an intricate and complex manner, irreversible phenomena which occur at different length-scales and lead to failure of materials. Until recently, in most of the work in this area, special cases were considered separately and various ad hoc phenomena. Moreover, most of the present experimental techniques are not entirely suitable to study intricate and possibly important aspects of anisotropic behavior, so that an experimental assessment of theoretical models is often lacking.

The announcement of the Symposium attracted extensive interest and a large number of proposals. The six General Lectures, eighteen Invited Lectures and twenty nine Communications were given by leading experts; fourteen additional contributions were presented in a Poster Session. A booklet of abstracts was made available to participants.

The Symposium was dedicated to the memory of Professor Antoni Sawczuk (1929–1984), who was a leading scientist in the field of the mechanical behaviour of anisotropic solids. The session “Antoni Sawczuk in Memoriam” was organized in order to honour his memory, life and work.

**Countries represented and number of participants**

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**Publications of Proceedings**

The proceedings are due to appear during the summer of 1988 and will be published as part of the European Group on Fracture series of publications, printed and distributed by Mechanical Engineering Publications Ltd, Bury St Edmunds, UK (editor: J. P. Boehler)

**Financial support**

Financial support of the Symposium was generously provided by the International Union of Theoretical and Applied Mechanics (IUTAM) and by the following institutions: Centre Group on Fracture, Centre National de la
Recherche Scientifique (CNRS), Ministère de la Défense (DRET), Ministère de l’Éducation Nationale (DCRI), Institut National Polytechnique de Grenoble, Université Scientifique, Technologique et Médicale de Grenoble, Conseil Général de l’Isère, Ville de Grenoble, Association Universitaire de Mécanique.

**SCIENTIFIC PROGRAMME**

**Monday, August 24**

*Opening Session* (Presiding: J.P. Boehler)

*General Lecture*

J.R. Rice: Crack Tip Fields in Ductile Crystals.

*Session 1: Anisotropic Damage I* (Chairmen: J.P. Boehler and V. Tvergaard)

- D. Kravchenko and D. Sumaru: Micromechanically Based Constitutive Law for Brittle Materials with Application to Concrete and Rocks.
- C. Stolz: On Relationships Between Micro and Macroscales for Particular Cases on Non Linear Behaviour of Heterogeneous Media.

**Tuesday, August 25**

*General Lecture*


*Session 2: Anisotropic Hardening and Induced Anisotropy I* (Chairmen: A.J.M. Spencer and R. Talreja)

- F. Ellyin and Z. Xia: Elastoplastic Stress-Strain Relation Based on a New Anisotropic Hardening Model.
- S. Imai and T. Inoue: An Anisotropic Yield Function Accounting for History Effect.

**Wednesday, August 26**

*General Lecture*

Z. Hashin: Analysis of Damage in Composites.

*Session 4: Anisotropic Damage II* (Chairman: P. Germain)

- K. Markov: Models of Micromorphic Type for Damaged Solids.
- D.H. Allen, C.E. Harris, and S.E. Groves: Damage Modelling in Laminated Composites.

*Poster Session* (Chairman: V. Tvergaard)

- P. Boisse, P. Ladevèze, M. Poss and P. Rougeé: A Large Time Increment Algorithm for Anisotropic Plasticity and Viscoelasticity.

A. Cagnasso and H. J. Latièrè: Tomodensitometric Study of Strain-Hardening and Damage of Aluminium; Scanner X.


M. Milicevic: On Limit Analysis of Polygonal Slab.

L. Noble: Inelastic Constitutive Relations for Concrete and Rock.


Thursday, August 27

General Lecture


Session 5: Anisotropic Hardening and Induced Anisotropy II

(Chairman: J. Willis)


C. Thornton: Induced Anisotropy and Energy Dissipation in Particulate Material; Results from Computer Simulated Experiments.


B. Cambou and A. Al Mansouri: A Micromechanical Description of Induced Anisotropy in Cohesionless Soil.

Friday, August 28

General Lecture

S. S. Wang: Material, Structural and Damage Instabilities and their Interactions in Strongly Anisotropic, Fiber Composites.

Session 7: Anisotropic Hardening and Induced Anisotropy III (Chairmen: J. R. Rice and E. H. Lee)


P. Lipinski and M. Berveiller: Integral Equation and Self-Consistent Method for Inhomogeneous Metals at Large Plastic Deformations.

N. Ohno, S. Murakami and M. Kawabata: Constitutive Description of Aging Effects on Strain-Induced Anisotropy in Creep.


S. Ahzi, G. R. Canova and A. Molinari: Analysis of Interaction Effects between Grains in the Large Deformation Polycrystal Viscoelasticity.


Session 8: Yielding, Fracture and Failure of Anisotropic Materials II

(Chairman: E. H. Lee)

Y. F. Dafulis: Orientational, Hardening, Rate and Thermal Effects on the Yielding of Orthotropic Materials.


R. Nowak and A. Oles: Anisotropy of Failure of Hexagonal Metal Involved by Preferred Crystallites Orientation.
ICA/IUTAM Symposium on Nonlinear Acoustics, 24–28 August 1987, Novosibirsk, USSR

Scientific Committee
V. Akulichev (USSR)  L. Lyamshev (USSR)
L. Bjørne (Denmark)  W. Mayer (USA)
D. Blackstock (USA)  A. Nakamura (Japan)
M. Breazale (USA)  V. Nakoryakov (USSR)
F. Bunkin (USSR)  Co-Chairman
D. Crighton (UK)  K. Naugolnykh (USSR)
V. Dulov (USSR), Vice-Chairman  R. Nigmatulin (USSR)
V. Fomin (USSR)  L. Ostrovsky (USSR)
V. Kedrinskii (USSR), Co-Chairman  B. Pokusaev (USSR)
S. Kinelovsky (USSR),  V. Titov (USSR), Vice-Chairman
Scientific Secretary  I. Yakovkin (USSR)
W. Lauterborn (FRG)  A. Zarembovich (France)

Short summary of scientific progress achieved
Nonlinear acoustics covers a wide range of problems in the field of researching shock waves, finite-amplitude waves, acoustics of multiphase media and cavitation, processes of induced scattering of sound and wave front reversal, acoustic interactions in solids, sonic beam interaction and sound generation by turbulence. The aim of the Symposium is to favour the exchange by information on recent results in this scientific area, fruitful cooperation and establishing scientific contacts between the scientists from different countries, determining the most important and promising problems both in traditional and new field of acoustics. A modern state of both fundamental and applied problems of nonlinear acoustics was widely reflected in 133 papers including 10 invited lectures, presented by the experts in their fields. It is hoped that the wide discussions, seminars and visits to the research institutes have become an important stimulus for further investigations in this field of science.

Countries represented and number of participants

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Publication of Proceedings
The Proceedings of the Symposium in two volumes were published before the Symposium by the Lavrentyev Institute of Hydrodynamics (Novosibirsk, USSR) in the press of the State Public Scientific Library (Novosibirsk).

Financial support
The Symposium was sponsored by the USSR Academy of Sciences. Besides, a financial support was made by the International Union of Theoretical and Applied Physics (IUPAP) and International Union of Theoretical and Applied Mechanics (IUTAM).

SCIENTIFIC PROGRAM

Monday, August 24
Plenary Session. Chairman: V. Kedrinskii
W. Lauterborn, U. Parritz: On the Bifurcation Structure of Bubble Oscillators
R. Wei: Contemporary Nonlinear Acoustics at Nanjing University

Section 1: Sound Generation by Turbulence. Aerodynamic Noises
Chairmen: D. Gonghuan, H. Hamilton
V. S. L’vov, G. E. Fal’kovich, A. V. Shafarenko: Weak Acoustic Turbulence
V. Tandara: Piston Spalps in the Cylinder Liner of Combustion Engines
S. P. Bardakhanov, V. V. Kozlov: Experimental Studies of Generation by Coherent Structure Sound in Shear Flows

Section 2: Parametric Sound Sources and Sonic Detectors. Self-Action of Sonic Beams of High Intensity
Chairmen: D. Gonghuan, M. Hamilton
V. A. Akulichev, V. A. Bulanov, D. N. Shekhovtsev: Nonlinear Interaction of Acoustic Waves with a Helmholtz Resonator
K. A. Naugolnykh, S. A. Rybak: Interaction of Clashing Sound Beams

Section 3: Processes of Induced Scattering of Sound and Wave Front Reversal in Acoustics
Chairmen: E. A. Zabolotskaya, W. Lauterborn
O. Ya. Butkovsky, E. A. Zabolotskaya, Yu. A. Kravtsov, V. V. Ryabikin: Experimental Observation of Stimulated Raman-Type Scattering of Sound by Gas Bubbles in Liquid
V. S. Teslenko: Criteria of Laser Breakdown Applicability for Generation of Shock-Wave and Cavitation Processes
S. Hüller, P. Mulser, H. Schanbel, A. M. Rubenchik: Nonstationary Stimulated Brillouin Scattering
L. M. Lyamshev, P. V. Sakov: Wave Front Reversal with Nonlinear Scattering of Sound by Pulsating Bodies
N. I. Pushkina: Phase Conjugation at the Surface of Quantum Liquid
A. P. Brysev, V. N. Streif' tsov: Sound Phase Conjugation due to Opto-Acoustical Interaction in Semiconductors

Tuesday, August 25

L. A. Crum: Acoustic Cavitation and Medicam Ultrasound
P. Ciuti, A. Francescutto, G. Iernetti, N. Dezhkunov: Acoustic Cavitation in NaCl Water Solutions
V. G. Baidakov, A. M. Kaverin, V. P. Skripov: Velocity, Absorption and Scattering of Ultrasound in Cavitating Superheated Liquid
V. K. Kedrinskii, S. I. Plaksin: Rarefaction Wave Structure in Cavitating Liquid
K. A. Mørch: On the Life Cycle of Acoustically Induced Cavity Clusters

Section 5: Shock Waves. Chairman: V. Titov, L. Bjorne
L. Bjorne: Underwater Explosion Research Based on Model Experiment
V. M. Teshukov: Three-Dimensional Problems of Shock Wave Interaction
R. F. Chisnell: Converging Shocks in a Medium Whose Ratio of Specific Heats is Close to Unity
A. L. Gonor, V. N. Likhachev: Solution of some Nonlinear Problems of Shock Wave Propagation and Bubble Dynamics
O. V. Buryakov, V. F. Kuropatenkov: Shock Waves in Gas Binary Mixtures
B. K. Vodolaga, V. A. Simonenko: The Peculiarities of Shock-Wave Processes at High Pressures in Dense Materials
D. Epstein: Nonlinear Distortion of a Bubble Pulse in a Layered Inhomogeneous Ocean

Section 6: Finite Amplitude Waves. Chairman: L. Ostrovsky, F. Dunn
P. Desch, H. J. Rath: Nonlinear Oscillations of Gas Bubbles in Non-Newtonian Fluids
R. A. Wentzell: Effects of a Real Gas on a Bubble

Section 5: Shock Waves. Chairman: V. Titov, P. Chisnell
O. B. Naimark, V. V. Beljajev: Non-Equilibrium Transitions in Media with Microcracks and Nonlinear Effects in Shock Waves
V. F. Nesterenko, A. N. Lazaridi: Solitons and Shock Waves in One-Dimensional Granular Media
V. P. Korobeinikov, V. V. Markov, I. S. Men'shov: Numerical Modelling of Wave Processes in Coal Mine

Wednesday, August 26

R. I. Nigmatulin: Decaying and Amplification of Shock Wave Pulses in Bubble Liquids, Suspensions and Saturated Porous Media
V. Yu. Liapidevskii: Hyperbolic Two-Phase Flow Model Based on Conservation Laws
V. E. Nakoryakov, B. G. Pokusaev, S. I. Lezhnin, N. A. Pribaturin: Pressure Waves in Two-Phase Slug Structure Medium
P. I. Golubnych, V. M. Gromenko, J. M. Krutov: On the Peculiarities of Cavitational Luminescence in Water and Liquid Hydrocarbons
V. E. Nakoryakov, V. V. Kuznetsov, V. Ye. Donskov: Pressure Waves in Porous Media
L. M. Lyamshev, A. T. Skvortsov: Acoustic Radiation from Three-Dimensional Vortices in a Slightly Compressible Medium
I. B. Esipov, Yu. S. Stepanov: Nonlinear Interaction of Sound Field in Scattering Media
G. Gimenez, C. Cachard, D. Vray: Experimental Analysis of Radiation Pressure Acting on Bubbles

Section 6: Finite Amplitude Waves. Chairman: L. Ostrovsky, F. Dunn
D. G. Crighton: Analytical Techniques for Problems in Nonlinear Acoustics
A. D. Pierce, Y. H. Berthelot: Limiting Amplitudes of Sound Waves Created by Laser Beams Moving over Free Surfaces at Transonic Speeds
T. S. Hart, M. F. Hamilton: Nonlinear Effects in Focused Sound Fields
S. Saito, B. C. Kim: Effect of a Sample Inserted in a Focused Beam on the Nonlinear Generated Second Harmonic Sound
S. N. Kulichkov, I. P. Chunchuzov: To the Problem of Nonlinear Propagation of Infrasound in the Atmospheric Waveguides
R. C. Chivers, J. K. Engelbrecht: Nonlinearity in Ultrasonic Wave Propagation in Biological Tissue
S. N. Gurbatov, A. N. Malakhov, A. I. Saichev: Propagation of Finite Amplitude Noise Acoustic Waves at the Stage of Developed Discontinuities

Thursday, August 27

B. O. Enflo: Propagation of Nonlinear Spherical and Cylindrical Sound Waves in Gases and Liquids
Feng Shaosong: The Reflection and Refraction in Nonlinear Acoustics
Z. A. Gol'dberg: Parametric Instability of Nonlinear Plane Standing Waves in a Liquid
Tao Quintian, Ni Wansun, Miao Guoqiang, Wei Rongjue: Bifurcation and Chaos of Direct Radiation Loudspeaker
P. Költsch: The Noise Cleaning of Steam Boiler Using Nonlinear Sound Waves

Section 6: Finite Amplitude Waves. Chairman: L. Lyamshev, A. Zarembovitch
F. Dunn, J. Zhang: Measurements of the Nonlinearity Parameter B/A in a Mammalian Organ in vivo and in a Cellular Model
D. R. Bacon: Nonlinear Propagation in the Focused Fields Used in Medical Ultrasound
A. R. Rao: Theoretical Model for the Study of Flow and Sound Generated in Arterial Stenosis
Gong Xiufeng, Zhu Zheming, Shi Tao, Huang, Jianhong: Study of Nonlinear Ultrasonic Parameter in Lossy Media

Friday, August 28

Section 7: Solid Body Acoustics. Chairman: I. Yakovkin, M. Breazeale
E. A. Zabolotskaya: Nonlinear Propagation of Sound Beams in a Solid
M. A. Breazeale: Solid State Nonlinearity between 300 and 4 °K
Yu. N. Zhugin, K. K. Krupnikov: The Peculiarities of Front Structure of a Plastic Wave in Quartz in the Phase Mixture Region

A. Nakamura: Soliton Formation Process Calculated for Longitudinal Sound Waves in a Solid Bar
Wang Yao-Jun: Ultrasonic Harmonics in a Molecular Crystal Naphthalene
V. A. Vyun, I. B. Yakovkin: Multistability of Surface Acoustic Wave Acoustoelectronic Interaction
Z. Kazimierczuk: High Power Piezomagnetic Alfer Transducers for Ultrasonic 22 kHz Range
A. Zarembovitch: Some Problems of Nonlinear Solid State Acoustics: Expected and Unexpected Results

Poster Papers were presented additionally in Sections 1, 2, 4, 5, 6, 7.

S. Kinelovsky

6.

IUTAM Symposium on Non-Linear Water Waves, 25-28 August 1987, Tokyo, Japan

Scientific Committee
K. Horikawa (Japan), Co-chairman
K. Kirchgässner (FRG)
M. S. Longuet-Higgins (UK)
H. Maruo (Japan), Co-chairman
J. N. Newman (USA)
M. Roseau (France)
P. G. Saffman (USA)
S. Ya. Sekerzh-Zemtsovich (USSR)
L. van Wijngaarden (The Netherlands)

Short summary of scientific progress achieved

Non-Linear behaviour of surface water waves has recently drawn much attention of scientists and engineers in the fields of oceanography, applied mathematics, coastal engineering, ocean engineering, naval architecture, and others. The objective of the Symposium was to bring together researchers who are actively studying on the non-linear water waves from various viewpoints and to give an opportunity to exchange latest advances. Papers were mainly devoted to the generation and deformation of non-linear water waves and the nonlinear interaction between waves and bodies: various types of non-linear water waves were analyzed on the basis of the Korteweg-de Vries equation, Kadomtsev-Petviashvili equation, non-linear Schrödinger equation, full non-
linear equation and others: experimental studies on breaking waves were presented; numerical methods of calculating second-order non-linear wave-body interaction were proposed. The Symposium and the Proceedings to be published in the near future will promote the study on non-linear water waves through combining the knowledge of researchers in various fields.

**Countries represented and number of participants**

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**Publication of Proceedings**
The proceedings are due to be published in February 1988 by Springer-Verlag, Berlin (editors: K. Horikawa and H. Maruo).

**Financial support**
Financial support of the Symposium has been generously provided by the International Union of Theoretical and Applied Mechanics (IUTAM) and by the following organizations: Japan Society for the Promotion of Science, Commemorative Association for the Japan World Exposition, The Kajima Foundation, Inoue Foundation for Science.

**SCIENTIFIC PROGRAMME**

**Tuesday, 25 August**

**Opening** (Chairman: Horikawa, K.)

**Keynote Lecture** (Chairman: Horikawa, K.; Co-chairman: Nishimura, H.)

Mei, C.C. (USA): Nonlinear effects in water wave diffraction

**Session 1: Evolution of non-linear water waves** (Chairman: Horikawa, K.; Co-chairman: Nishimura, H.)

Tsuchiya, Y. and Yamashita, T. (Japan): Evolutional behaviour and instability of a single wave pulse


**Session 2: Non-linear shallow water waves** (Chairman: Peregrine, D.H.; Co-chairman: Mizuguchi, M.)


Wu, D.-M. (China) and Wu, T.Y. (USA): Precursor solitons generated by three-dimensional disturbances moving in a channel

Sugimoto, N. and Kakutani, T. (Japan): Asymptotic behavior of a shallow-water soliton reflected at a sloping beach

Kodama, Y. (Japan): Normal form and solitons in the shallow water waves

Yasuda, T., Mishima, T. and Tsuchiya, Y. (Japan): Energy distribution of shallow water swell under the maximum probability condition

**Session 3: Non-linear water waves in a finite region** (Chairman: Kajitani, H.; Co-chairman: Kinoshita, T.)

Shemer, L., Kit, E. and Miloh, T. (Israel): Experimental and theoretical study of nonlinear sloshing waves in a tank

Bryant, P.J. (New Zealand): Nonlinear waves in circular basins

Nishimura, H. and Takewaka, S. (Japan): Numerical analysis of wave motion using the Lagrangian description

Jami, A. and Pot, G. (France): Transient approaches of non-linearities in naval hydrodynamics

Hwang, H.H., Tsi, C.P. and Chen, Y.Y. (Taiwan, China): The theoretical studies on nonlinear standing wave

**Wednesday, 26 August**

**Keynote Lecture** (Chairman: Maruo, H.; Co-chairman: Shibayama, T.)

Peregrine, D.H. (UK): Recent development in the modelling of unsteady and breaking water waves

**Session 4: Breaking water waves** (Chairman: Maruo, H.; Co-chairman: Shibayama, T.)

Mori, K. (Japan): Steady breakers on 2-dimensional wave generated by submerged foil

Banner, M.L. (Australia): Surging characteristics of spilling regions of quasi-steady breaking water waves

Tulin, M.P. and Cointe, R. (USA): A theory of steady and unsteady spilling breakers

Svendsen, I.A. and Buhr Hansen, J. (Denmark): The interaction between breakers and cross-shore currents in a surf zone

**Session 5: Non-linear water waves** (Chairman: Grimshaw, R.H.J.; Co-chairman: Mimura, N.)

Lichter, S. (USA): Subharmonic resonance of nonlinear crosswaves: Theory and experiment
Kawahara, T., Toh, S. and Takaoka, M. (Japan): Pulse interactions and wave evolutions in an unstable dissipative dispersive system
Nadaoka, K. and Hino, M. (Japan): Nonlinear wave deformation on a beach with arbitrary profile
Saffman, P.G. (USA): Application of Hamiltonian methods to the structure and stability of water waves of permanent form

**Poster session 1: Non-linear water waves** (Chairman: Mei, C.C.; Co-chairman: Nishimura, H.)

Tomita, H. and Sawada, H. (Japan): An experimental investigation into non-linear resonant wave interactions in the ship model basin
Kirby, J.T., Renji, P. and Vengayil, P. (USA): One-dimensional and weakly two-dimensional waves in varying channels: numerical examples
Lee, S.-J. (Korea), Yates, G.T. and Wu, T.Y. (USA): A theoretical and experimental study of precursor solitary waves generated by moving disturbances
Hwang, H.H., Lin, C. and Kao, C.C. (Taiwan, China): the turbulent flow fields and vortex structures inside surf zone

**Session 6: Wave-current interaction and interfacial waves** (Chairman: Saffman, P.G.; Co-chairman: Mizuguchi, M.)
Yuen, H.C., Crawford, D.R. and Caponi, E.A. (USA): Amplification of current effects on short waves by a long wave field
Li, J.C. (China), Hui, W.H. and Donelan, M.A. (Canada): Effects of velocity shear on the stability of surface water wave trains
Pullin, D.I. and Grimshaw, R.H.J. (Australia): Large amplitude interfacial solitary waves

**Thursday, 27 August**

**Keynote lecture** (Chairman: Tulin, M.P.; Co-chairman: Maeda, H.)
Faltingsen, O.M. (Norway): Second order non-linear interactions between waves and low frequency body motion

**Session 7: Second-order wave-body interaction** (Chairman: Tulin, M.P.; Co-chairman: Maeda, H.)
Hwang, J.H., Kim, Y.J. and Kim, S.Y. (Korea): Non-linear hydrodynamic forces due to two-dimensional forced oscillation
Kioka, W. (Japan): Nonlinear diffraction loads upon three-dimensional bodies of arbitrary shape

**Papanikolau, A. (Greece): On calculations of nonlinear wave-body interaction effects**

**Session 8: Slow-drift wave force** (Chairman: Hermans, A.J.; Co-chairman: Mimura, N.)
Kyoizuka, Y. (Japan): Second-order wave forces acting on a horizontal circular cylinder in irregular waves
Anama, J.A.P. and Pese, C.P. (Brazil): Slow drift and trapping of waves on submerged structures
Huijsum, R.H.M. (The Netherlands): Slowly varying wave drift forces in current
Matsui, T. (Japan): Second-order hydrodynamic forces on moored vessels in random waves

**Poster session 2: Non-linear wave-body interaction** (Chairman: van Wijngaarden, L.; Co-chairman: Shibayama, T.)
Grabitz, G. and Meier, G.E.A. (FRG): Nonlinear instability waves in channels and jets
Miyata, M. (Japan): Long internal waves of large amplitude
Li, Y.Z., Miao, G.P., Fu, Q.Q. and Zhu, D.X. (China): Transmission and reflection of a planar soliton
Hong, G.W. (China): Nonlinear interaction of waves and vertical wall
Clement, A. and Ferrant, P. (France): Superharmonic waves generated by the large amplitude heaving motion of a submerged body
Bertram, V. and Jensen, G. (FRG): A new approach to nonlinear waves generated by a body moving steadily at a free surface
Naito, S., Takagi, K. and Nakamura, S. (Japan): Extreme wave forces acting on a floating structure
Choi, H.S. and Kim, D.J. (Korea): Large slow drift of a ship in slightly modulated beam seas
Marthinsen, T. (Norway): The statistics of slow drift oscillations with nonlinear restoring forces

**Session 9: Body-induced non-linear water waves** (Chairman: Faltingsen, O.M.; Co-chairman: Kinoshita, T.)
Hermans, A.J. and Brandsma, F.J. (The Netherlands): Nonlinear ship waves at low Froude number
Eggers, K. (FRG): On stationary waves superposed to the flow around a body in uniform stream
Germain, J.P. (France): Non-linear long waves and obstacles
Friday, 28 August

Session 10: Second-order non-linear water waves (Chairman: Roseau, M.; Co-
chairman: Maeda, H.)
Barthel, V. and Mansard, E.P.D. (Canada): Second-order waves - Importance
in experiment and nature
Kimura, A. (Japan): Deformation of the two-dimensional low-frequency wave
spectrum in the shallow water region
Gu, M. and Zhou, Z. (China): An analysis of second order waves in a wave tank
by 3-probe correlation analysis and by square-law operations

Closing (Chairman: Maruo, H.)

K. Horikawa and H. Maruo

7.

IUTAM Symposium on Fundamental Aspects of Vortex Motion 31 August -
4 September 1987, Tokyo, Japan

Scientific Committee
H. Hasimoto (Japan), Chairman
H. Aref (USA)
J.J. Keller, Switzerland
T. Maxworthy (USA)
D.W. Moore (UK)
R. Moreau (France)
E.-A. Muellner (FRG)
P.G. Saffman (USA)
L. van Wijngaarden (The Netherlands)

Short summary of scientific progress achieved

The advent of high speed computers and new experimental techniques is
revealing new phenomena in fluid which can be explained only on the deep
understanding of the fundamental aspects of vortex motion forming their
basis. The aims of the Symposium were to disseminate such phenomena and
to explore new ideas and methods. The 70 contributions given by leading
scientists exposed to stimulating extensive discussions among 110 expert partici-
pants were very impressive and are expected to throw new light on future
research of this fascinating field of fluid mechanics.

Countries represented and number of participants
Australia ..................... 3 The Netherlands ................ 5
Canada ....................... 1 New Zealand .................... 1
China ......................... 2 Norway ............................. 1
France .................... 6 Switzerland .................... 1
F.R. Germany ............... 9 Taiwan, R.O.C. .................. 1
Israel ....................... 1 United Kingdom ................. 5
Japan .................. 63 USA ............................. 11
Total .................... 110

Publications of Proceedings
The Proceedings will appear in Fluid Dynamics Research (published by North
Holland) and will simultaneously appear in book form under the title Vortex
Motion.

Financial support
Financial support of the Symposium was provided by the International Union
of Theoretical Fluid Mechanics (IUTAM) and by several foundations and
companies in Japan through the Local Organizing Committee.

SCIENTIFIC PROGRAMME

August 31

Lectures
Hasimoto, H.: Elementary Aspects of Vortex Motion
Saffman, P.G.: The stability of vortex arrays to two and three dimensional
disturbances
Caffisch, R.: Nonlinear analysis for the evolution of vortex sheets
Jimenez, J.: Linear instability of inviscid vortex streets
Dritschel, D.G.: The repeated filamentation of vorticity interfaces
Van Atta, C.W., Gharib, M. & Hammache, M.: Three-dimensional structure
of ordered and chaotic vortex streets behind circular cylinders at low Reynolds
numbers
Kuwabara, S.: Pseudo-canonical formulation of 3-dimensional vortex motion
and voronoi model analysis

Posters
Baker, G.R.: Vortex layers and vortex streets
Krasny, R.: Numerical simulation of vortex sheet evolution
Caperan, Ph. & Verron J.: Numerical simulation of a physical experiment on
two-dimensional vortex merging
Kimura, Y.: Chaos and collapse of a system of point vortices
Yamada, H., Yamabe, H., Itoh, A. & Hayashi, H.: Numerical analysis on a flow-
field produced by a pair of rectilinear vortices approaching a circular cylinder
Okude, M. & Matsui, T.: Process of formation of vortex street in the wake behind a flat plate
Graham, J.M.R. & Cozens, P.D.: Vortex shedding from edges including viscous effects
Shirayama, S., Kuwahara, K. & Tamura, T.: Simulation of vortex interaction behind a bluff body
Soh, W. K., Hourigan, K. & Thompson, M. C.: The shedding of vorticity from a smooth surface
Wu, J.-Z., Wu, J.-M. & Wu, C.-J.: A viscous compressible theory on the interaction between moving bodies and flow field in the \((\alpha, \beta)\) framework

September 1

Lectures
Moffat, H.K.: Generalized vortex rings with and without swirl
Pullin, D.I. & Moore, D.W.: The vortex pair in a compressible ideal gas
Hama, F.R.: Genesis of the L.I.A.
Sym, A.: Geometry of vortex motion in L.I.A.
Fukumoto, Y. & Miyazaki, T.: Three-dimensional distortions of a vortex filament: Exact solution of the localized induction equation
Dallmann, U.: Three-dimensional vortex structures and vorticity topology
Meiburg, E., Lasher, J.C. & Ashurst, Wm. T.: Topology of the vorticity field in three-dimensional shear layers and wakes
Veit, J.J.W. van der: Fundamentals of three-dimensional vortex motions around solid bodies

Posters
Auerbach, D.: Some open questions of the flow of vortex rings
Coles, D.E. & Schatzle, P.R.: An experimental study of vortex ring fusion
Ishii, K., Liu, C.H. & Kuwahara, K.: Motion and decay of vortices
Tokunaga, H., Satofuka, N. & Itinose, K.: Full simulation of turbulent shear flows in a plane channel using eighth order accurate method of lines
Krause, E.: Numerical prediction of vortex breakdown
Bearman, P.W. & Takamoto, M.: Vortex shedding behind rings and discs
Wei, Q.-D. & Lin, R.-S.: Vortex induced dynamic loads on a non-spinning volleyball
Ohji, M.: Structure of modulated wavy vortical flows in the circular Couette system
Kimura, R.: Cell formation by buoyant plumes produced by Rayleigh-Taylor instability
Niiro, H.: Inertial instability of the Stewartson E° layer

September 2

Lectures
Maxworthy, T.: Waves on vortex cores
Novikov, E.A.: Break-down and reconnection of vortex filaments
Melander, M.V. & Zabusky, N.J.: Interaction and reconnection of vortex tubes via direct numerical simulations
Takagi, R. & Hussain, A.K.M.F.: Singular interaction of vortex filaments
Kida, S. & Takaoka, M.: Reconnection of vortex tubes

September 3

Lectures
Schmucker, A. & Gersten, K.: Vortex breakdown and its control on delta wings
Hornung, H. & Elsenaar, A.: Detailed measurement in the transonic vortical flow over a delta wing
Tatsumi, T.: Dynamics of large-scale eddies in turbulent flows
Farge, M.: Vortex motion in a rotating stratified fluid layer
Honji, H.: Vortex motions in stratified wake flows
Faltinsen, O.M. & Braathen, A.: Interaction between shed vorticity, free surface waves and forced roll motion of a two-dimensional floating body
Kiya, M. & Ishii, H.: Vortex dynamics simulation of interacting vortex rings and filaments

Posters
Pismaner, R.A.: Anomalous diffusion and anomalous stretching in vortical flows
Nakano, T.: Vorticity field in a cascade model of turbulence
Gibson, C.H.: Isoenstrophy points and surface in turbulent flow and mixing
Takematsu, M. & Kita, T.: The behavior of isolated free eddies in a rotating fluid: Laboratory experiment
Shingubara, S., Hagiwara, K., Fukushima, R. & Kawakubo, T.: Transition process from one celled vortex to two celled vortex
Mathias, M., Stokes, A.N., Hourigan, K. & Welsh, M.C.: Low-level flow induced acoustic resonances in ducts
Minota, T., Kambe, T. & Murakami, T.: Acoustic emission from interaction of a vortex ring with a sphere
Kawahashi, M., Brocher, E. & Collini, P.: Coupling of vortex shedding with a cavity
Mochizuku, O., Kiya, M. & Tazumi, M.: Vortex-body interaction in a jet-circular cylinder sound generation system
Modi, V.J., Mokhtarian, F., Yokomizo, T., Ohta, G. & Oinuma, T.: Bound vortex boundary layer control with application V/STOL airplanes
Noto, K., Honda, M. & Matsumoto, R.: Coherent motion of turbulent thermal plume in stably stratified fluid

September 4

Lectures
Müller, E.-A. & Obermeier, F.: Vortex sound
Thompson, M.C., Hourigan, K., Welsh, M.C. & Soh, W.K.: Prediction of vortex shedding from bluff bodies in the presence of a sound field
Polvani, L.M., Zabusky, N.J. & Flierl, G.R.: Applications of contour dynamics to two layer quasigeostrophic flows
Griffiths, R.W.: Vortex dynamics in rotating thermal convection at large Rayleigh numbers
Aref, H., Kadthe, J.B., Zawadzki, I., Campbell, L.J. & Eckhardt, B.: Point vortex dynamics: Recent results and open problems
Mory, M.: Coherent vortices in a turbulent and rotating fluid
Giga, Y. & Kambe, T.: Large time behavior of the vorticity of 2D viscous flow and vortex formation in 3D flow

H. Hashimoto

Other Meetings
The Bureau met in Stuttgart, FRG, on April 11 and 12, 1987.
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**Payment of Annual Dues**
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**Bank Accounts of IUTAM**

Treasurer: Prof. Dr. Ir. L. van Wijngaarden, T.H. Twente, Postbus 217, 7500 AE Enschede, The Netherlands.

Assistant Treasurer: Prof. Philip G. Hodge, Jr., 107 Akerman Hall, University of Minnesota, Minneapolis, MN 55455, USA

Marquette Bank University, 718 Washington Avenue S.E., Minneapolis, Minnesota 55414 (USA), acc. nr. 103-1178

Bank Mees & Hope NV, Oude Delft 165, 2611 HB Delft (The Netherlands), acc. nr. 259185051

Deutsche Bank A.G., Filiale Darmstadt, D-6100 Darmstadt (FRG), acc. nr. 2363398
Representation in other organizations

ICSU
Prof. J. Hult represents IUTAM in the General Committee of the International Council of Scientific Unions.

CODATA
Prof. D.C. Drucker acts as Representative of IUTAM in the Committee on Data for Science and Technology.

COSPAR
Prof. W. Fiszdon acts as Representative of IUTAM in the Committee on Space Research.

COSTED
Prof. R. Narasimha acts as Representative of IUTAM in the Committee on Science and Technology in Developing Countries.

IUPAP
Sir James Lighthill represents IUTAM as an associate member of the International Commission on Acoustics under IUPAP.

SCOPE
Prof. G.M. Lespinard acts as Representative of IUTAM in the Scientific Committee on Problems of the Environment.

SCOR
Prof. T.B. Benjamin represents IUTAM in the Scientific Committee on Oceanic Research.

CTS
Prof. S. Berndt acts as Representative of IUTAM in the Committee on the Teaching of Science.

Donations in 1987

Donations given to IUTAM Symposia are recorded under the heading “Financial support” of the Reports of Symposia held in 1987.

Report on The activities of the Congress Committee during 1987

The Congress Committee continued its work of planning for the 17th International Congress of Theoretical and Applied Mechanics, which will be held in Grenoble, France, 21-27 August 1988. No formal meetings of the Congress Committee were held during the year, but the Executive Committee met in Paris on 18th and 19th September 1987, in order to confirm the final arrangements.

Invitations were sent to the opening and closing lecturers, and to the sectional lecturers, as agreed by the Executive Committee in August 1986, and all invitations have been accepted. As previously reported, special sessions are planned on three topics (Mechanics of large deformation and damage, The dynamics of two-phase flow, and Mechanics of the earth’s crust.) The Convenors of these sessions have completed their programmes and two of the three Convenors were able to attend the meeting of the Executive Committee in Paris in order to discuss the detailed arrangements.

Approximately 560 papers will be selected by the International Program Committee. About one half of these will be presented orally, and the other half in poster discussion sessions. The decisions concerning type of presentation were based on the nature of the subject matter, and not on quality; the same standards of quality apply to papers accepted for either type of presentation. The International Papers Committee will be greatly assisted by the recommendations from the National Committees of nine of the larger countries of the Union, namely Canada, France, FRG, Japan, People’s Republic of China, Poland, UK, USA and USSR.

Final plans have been made by the French hosts for all the arrangements, scheduling, excursions, and all other details concerning the Congress. The Executive Committee looks forward to a successful Congress, and is grateful to the local organisers for all their efforts in this regard.

H.K. Moffatt

Report on Relations with ICSU

The 23rd meeting of the General Committee of ICSU took place 29-30 October 1987 in Rome. The President of ICSU, Sir John Kendrew, drew attention to the following activities of ICSU, which were currently being planned:

1) International Geosphere-Biosphere Programme (IGBP)

The Special Committee set up for this very extensive programme had held its first meeting in July 1987. The Executive Director of IGBP, Thomas Rosswall,
was present in Rome and outlined the scope of IGBP, which is planned to span a decade (1990s).

2) International Space Year (ISY)
COSPAR in 1986 had proposed that the year 1992 be designated as the International Space Year (ISY). The Executive Board of ICSU had received this proposal favourably and set up a Coordinating Committee, which would report at the forthcoming General Assembly in 1988.

3) Third World Academy of Sciences (TWAS)
A number of joint ventures had been undertaken with TWAS, including a lectureship programme, a system for making books and journals available to scientists in Third World countries, and the setting up of a directory of Third World scientific institutions.

The President expressed concern about difficulties in maintaining present levels of financial support of Unions, Committees, and Commissions, etc., in view of recent reductions in the Unesco Subvention. He also expressed thanks to the U.S. National Academy of Sciences and the Royal Society for making funds available to compensate for this decrease. The Treasurer of ICSU, K. Thurau, gave more details on the financial situation and on the proposed 1988 Budget. The Bio Unions and the Earth, Space, Physical and Chemical Unions held separate meetings in conjunction with the General Committee meeting. The latter group expressed its support of the IGY programme, and suggested that not only scientific but also educational and media aspects be included in the planning of the programme.

The President reminded the General Committee of the extensive results presented 1986 by the ICSU Symposium of the Environmental Consequences of Nuclear War (ENWUR) on the biological, medical and physical effects of the large-scale use of nuclear weapons, findings now being made available in book form.

The Information/Press Officer of ICSU, Alison Clayson, reported on the establishment of the new ICSU newsletter Science International as well as other activities to increase the visibility of ICSU.

The 22nd General Assembly of ICSU will be held in Beijing 21-16 September 1988.

Jan Hult

Report
on
Committee on Data for Science and Technology

The strong national groups, such as the one in the USA, are very active and productive. The Office of Standard Reference Data in the National Bureau of Standards and its counterparts elsewhere in the world provide a needed service in each country, coordinating the work done in universities, industry and government laboratories. Voluntary cooperation through CODATA has enhanced these activities and provides a framework for worldwide dissemination of the information through the CODATA BULLETIN series. Unfortunately, Pergamon Press has decided to stop handling the BULLETIN and CODATA has not yet found a viable alternative. Task Group reports suitable for the Bulletin format will be printed and distributed by the Secretariat in the meantime.

Work of possible interest to our mechanics community in the areas of materials and computers is progressing but CODATA activities are not yet of much direct significance to most of us. The total budget of CODATA is less than $400,000/yr. of which about half comes from the 17 national members and much of the rest from UNESCO and other contracts and grants.

Daniel C. Drucker

Report
on
International Commission on Acoustics

The 1987 meeting of the International Commission on Acoustics was held in Rome on 13 and 14 April. Much of the meeting was devoted to planning the 13th International Congress of Acoustics, to be held in Belgrade, Yugoslavia from 24 to 31 August 1989. A promisingly interesting programme, covering all areas of acoustics and including eleven plenary lectures, was sketched out. This Congress will be followed by “satellite symposia” to be held in Zagreb (Electroacoustics, 1 to 3 September) and in Dubrovnik (Sea Acoustics, 4 to 6 September). It was agreed, furthermore, after consideration of detailed proposals from five countries, that the proposal from the People’s Republic of China to host the 14th Congress (1992) in Beijing should be accepted.

The Commission also agreed that IUPAP (the parent Union of ICA) should be asked to co-sponsor the IUTAM Symposium on Elastic Wave Propagation being held in Galway, Ireland from 21 to 26 March 1988. This proposal, made because of the importance to acoustics of the subject matter of that Symposium, was accepted by IUPAP later in the same year.

J. Lighthill

Report
on
Committee of the Teaching of Science (CTS)

The activities of CTS, financed by grants from ICSU, the Unions and Unesco, are mainly aimed at helping solve educational problems in developing coun-
tries. During 1987 the publication was completed of the nine volume series “Science and Technology Education” (see earlier reports). A meeting of the full Committee was held in Paris on 2 and 3 April 1987. Among topics discussed were the Bangalore Conference follow-up, public understanding of science, a revised ICSU CTS Newsletter, and locally-produced equipment for science teaching. Professor D.J. Waddington, University of York, UK is the secretary of CTS.

S. B. Berndt

Report on

International Centre for Mechanical Sciences (CISM)

1. Courses and Seminars

The regular programme of courses and seminars planned by the Scientific Council for 1987, took place in the two Scientific Sessions, the Gauss Session (June-July, 1987) and the von Mises Session (September–October, 1987). The topics, always at an advanced level, included different fields of mechanics and related computer sciences, both at a basic and applied level. Some courses and seminars were sponsored by UNESCO and CNR (National Research Council of Italy).

The Gauss Session (June-July, 1987);
- Analysis and Estimation of Stochastic Mechanical Systems
- Bone Mechanics
- Recent Advances in Computational Nonlinear Mechanics

The von Mises Session (September–October, 1987)
- Non-Smooth Mechanics and Applications
- Time-Frequency Representation of Signals and Systems
- Shake-Down: Theory and Applications
- Applied Mathematics for Flexible Manufacturing Systems

2. Various International Events

Besides the courses various other activitie were organized by CISM in 1987. The following ones were particularly noteworthy:

Post-Graduate Programme in Mechanical Sciences (November 1986–October 1987) This initiative (started in November 1985) was devoted to the basic formation of researchers working in the field of Mechanical Sciences. The Programme, partially supported by the Italian Ministry of Foreign Affairs, was open to researchers from all countries, with particular reference to the developing ones. Similarly to the first year of activity, the 1986–87 Programme included one two month course on Continuum Mechanics and several shorter courses on other topics in Mechanical Sciences, such as Fluid Mechanics, Elasticity, Plasticity, etc. The third year Programme will start in November 1988.

ICMI/ICSU-CTS Seminar on “Mathematics as a Service Subject” (April 6–10, 1987) The International Commission on Mathematical Instructions (ICMI) and the Committee for the Teaching of Science of the International Council of Scientific Unions (ICSM-CTS) organized this Seminar for the study of the teaching of Mathematics to scientists, engineers, economists and students of other disciplines which are increasingly making use of quantitative methods.

School of Professional Advancement on “Acoustic Emission Methods in Science and Technology” (June 22–27, 1987) This School was jointly organized and sponsored by CISM and the Polish Academy of Sciences and was held in Jablonna (near Warsaw).

Symposium on “Sensitivity Analysis and Optimal Shape Design” (June 29–July 4, 1987) The Symposium was held in Jablonna (near Warsaw) and was sponsored by CISM and the Polish Academy of Sciences.

Workshop on “Mechanics and Informatics toward Automatic Manufacturing” (March 30–April 1, 1987) The Workshop was intended for researchers and industry managers with the purpose of pointing out and discussing the new problems emerging in today’s manufacturing process.

3. Editorial Activities

The lectures of several of the courses held at CISM are published in book form and distributed by Springer Verlag, Vienna-New York.

The following books were printed in 1987:
A. Morecki - Biomechanics of Engineering: Modelling, Simulation, Control
J.P. Bohler - Applications of Tensor Functions in Solid Mechanics
A. Blaquière, S. Diner, G. Lochak - Information Complexity and Control in Quantum Physics
D. Krajcinovic, J. Lemaitre - Continuum Damage Mechanics: Theory and Applications
G. Del Piero - Manutenzione, Riparazione e Durabilità delle Strutture in Cemento Armato

The international journal for rapid publication “Mechanics Research Communications” (bimontly), created by CISM and Pergamon Press, Oxford-New York in 1973, published in 1987 its fourteenth volume. It contains short communications on research related to a wide domain of both theoretical and applied Mechanics. The journal, whose Editor-in-Chief is Professor Bruno A. Boley, plays an important role in implementing CISM’s aims and activities.
4. Scholarships
During the courses a limited number of participants who were not supported by their own Universities, were granted free lodging and board by the Centre, priority being given to young researchers coming from countries that contribute to CISM’s operating resources. Travel expenses as well as board and lodging of participants from developing countries have been covered by UNESCO.

5. International participation
In 1987, 52 lecturers from 12 countries delivered lectures in the Gauss and von Mises Sessions. The two Sessions were attended by 357 participants coming from 34 countries. Besides, the international meetings were attended by numerous participants from European and extra European countries.

G. Bianchi

Report

International Centre for Heat and Mass Transfer (ICHMT)

During 1987 the International Centre for Heat and Mass Transfer organized three Scientific Conferences:

- International Seminar on Transient Phenomena in Multiphase Flow,
- International Symposium on Heat and Mass Transfer in Gasoline and Diesel Engines, and

The International Seminar on Transient Phenomena in Multiphase Flow was held from May 24 to 30, 1987 in Dubrovnik, Yugoslavia chaired by Prof. N. Afgan, ICHMT, Yugoslavia. The Seminar was devoted to transient phenomena in multiphase flows, including wave propagation, turbulence, system transients, etc. Attention was given to achieving better understanding of the underlying physics of the phenomena. In particular, the role of transient phenomena in governing heat and mass transfer have been stressed. The program included following topics: Fundamental formulations for time-varying multiphase flows, interfacial wave phenomena, turbulences phenomena in TPF, transient behaviour in TPF, pressure wave propagation in TPF phenomena. The Seminar sponsored by UNESCO was attended by 98 participants from 13 countries. During the course of Seminar 14 invited introductory lectures and 44 papers were presented. Invited lecturers were: G. K. Batchelor (UK), G. P. Celata (Italy), J. M. Delhaye (France), G. F. Hewitt (UK), R. T. Lahey (USA), R. I. Nigmatulin (USSR), F. Mayinger (FRG), M. S. Plesset (USA), B. G. Poku-saev (USSR), D. F. Ross (USA), A. Serizawa (Japan), D. B. Spalding (UK), N. Zuber (USA), L. van Wijngaarden (Netherlands). Hard bound Proceedings will be published in 1988 by Hemisphere Publishing Corporation, official publisher of the ICHMT. The UNESCO grant made possible attendance and presentation of paper for M. El Kassaby, Mu'tah University, Jordan.

The ninetenth ICHMT International Symposium on Heat and Mass Transfer in Gasoline and Diesel Engines was held on August 24-28, 1987 in Dubrovnik, Yugoslavia. The Symposium Organizing Committee, Chaired by Prof. D. B. Spalding, Imperial College, (UK), selected for presentation 45 papers in addition to 6 invited lectures. Topics covered included: Experimental information on heat transfer between the gas in the cylinder and its surroundings (wall, piston crown, etc.) and on the scavenging process; Methods of predicting gas motion, mixing and heat transfer in the cylinder and combustion space; Mixture preparation in gasoline engines; Heat and mass transfer processes within the gasoline-engine manifold; Theoretical and experimental studies of fuel-spray injection and fuel film formation and vaporisation; heat transfer between the cooling fluid and the engine block, including air cooling; Heat transfer to and from valves, valve seats and associated ducting; Novel measurement techniques for temperatures, pressure and velocity and other relevant properties. The Symposium Program Committee included: D. B. Spalding (Chairman, UK), Shi-Shao-Xi (China), L. Belik (CSSR), M. M. Elkoth (Egypt), P. Pinchant (France), G. T. Sato (Japan), E. Olsson (Sweden), J. Waving (UK), M. G. Krugov (USSR), R. Trifunović (YU). 120 participants from 21 countries attended the Symposium. The UNESCO grants made possible attendance of three participants from developing countries: X. Wei Xin (China), S. El Elman (Egypt) and J. David (India). Preprints of all lectures and presented papers were available to participants. Selected papers and lectures will be published in the Symposium Proceedings by Hemisphere Publishing Corporation.

The Advanced Course on Computer Simulation for Fluid Flow, Heat and Mass Transfer and Combustion in Reciprocating Engines was held on August 31-September 4, 1987 in Dubrovnik, Yugoslavia under the direction of Prof. N. C. Markatos, National Technical University of Atina, Greece. Faculty members were: D. B. Spalding (UK), A. P. Watkins (UK), R. J. O'Rourke (USA), J. I. Ramos (USA), J. R. Riznic (Course Secretary, YU). The Advanced Course was organized to give students the benefit of a structured presentation on the principles of computer simulation of fluid flow in general and also the special features of internal combustion engines simulation together with design principles of gasoline, diesel and rotary engines. Lectures were delivered during morning sessions and computer workshops took place in the evening sessions, when participants were able to set and solve their own simple problems on computers installed for the occasion. 16 participants from 6 countries (Italy, Netherlands, Spain, Sweden, UK and YU) attended the course. Preprints and handouts of all lectures were available to participants. The lectures will be published in the Proceedings of the Advanced Course by Hemisphere Publishing Corporation. 15 Lectures were presented by Faculty Members. Topics covered included: Modelling Heat and Mass Transfer in Spark-Ignition, Diesel and Rotary Engines, Modelling of Fluid Flow and
Sprays in Diesel Engines, Turbulent Combustion in IC Engines, Multidimensional Modelling and currently available solutions.


For 1988 we have planned the following meetings: May 16–20, 1988 Dubrovnik, YU, International Seminar Near Wall Turbulence; Chairman: Prof. Stephen Kline, Stanford University, USA;

August 22–26, 1988 Dubrovnik, YU, Advanced Course Electronic Equipment Cooling; Director: Prof. Allan D. Kraus, Department of the Navy, Naval Postgraduate School, Monterey, USA;

August 29–September 2, 1988 Dubrovnik, YU, XX International Symposium Heat Transfer in Electronic and Microelectronic Equipment; Chairman: Prof. A. Bergles, Rensselaer Polytechnic Institute, Troy, USA, Scientific Secretary: Prof. E. Ganić, University of Sarajevo, Yugoslavia.

N. Afgan

Report on

European Mechanics Committee (Euromech)

During 1987 the European Mechanics Committee organized the following Euromech Colloquia:

Euromech 215 15–19 September, Genova, Italy: Mechanics of sediment transport in fluvial and marine environments
Euromech 220 18–20 March, Cambridge, England: Mixing and chemical reactions in turbulence flows
Euromech 221 15–17 June, Lulea, Sweden: The mechanical effects of welding
Euromech 222 1–3 June, Wageningen, The Netherlands: Unsteady cavitation and its effects
Euromech 223 16–18 June, Tampere, Finland: Vibration and stability of axially moving materials
Euromech 224 6–10 July, Kardzhali, Bulgaria: Kinetic theory aspects of evaporation and condensation phenomena

Euromech 225 13–15 July, Cranfield, England: The aerodynamics of spacecraft
Euromech 226 2–5 September, Nottingham, England: Nonlinear and other non-classical effects in surface acoustic waves
Euromech 227 31 Aug.–3 Sept., Saint-Etienne, France: Mechanical behaviour of adhesive joints
Euromech 228 21–25 September, Exeter, England: Boundary layer instability and transition
Euromech 229 5–9 October, Stuttgart, Germany: Nonlinear applied dynamics
Euromech 231 6–9 October, Smolenice, Czechoslovakia: Constitutive equations in viscoelasticity: applications and methods of solution.

H. H. Fernholz

Report on

International Association for Vehicle System Dynamics (IAVSD)

The 10th IAVSD Symposium on the Dynamics of Vehicles on Roads and Tracks was held at Praha, Czechoslovakia, 24–28 August 1987, hosted by the Faculty of Mechanical Engineering of the Czech Technical University CVUT in collaboration with Motor Car Research Institute UVMV Praha and Research Institute of Locomotives CKD Praha.

The following scientists were appointed by the Board of IAVSD to serve as members of the Scientific Committee: M Apetaur (chairman), R. J. Anderson (Canada), P. Lugner (Austria), P. Michelberger (Hungary), H. B. Pacek (Netherlands), Y. Saito (Japan), L. Segel (USA), R. S. Sharp (United Kingdom), A. Slaba (Poland), A. Elkins (USA), K. Knothe (Berlin-West), N. Matsui (Japan), G. Sauvage (France), Z. Y. Shen (China), J. Siba (Czechoslovakia), W. Schiehlen (Federal Republic Germany).

68 papers were presented, including 5 state-of-the-art papers, 39 ordinary (full) papers and 24 poster papers. Of those 5 came from Austria, 2 from Australia, 1 from Bulgaria, 4 from Canada, 3 from China, 6 from Czechoslovakia, 11 from FRG, 1 from France, 1 from German Democratic Republic, 3 from Hungary, 7 from Japan, 2 from Netherlands, 6 from Poland, 1 from Soviet Union, 9 from United Kingdom and 6 from USA. The 144 delegates who responded to the invitation of the Scientific Committee represented 19 countries from around the world. Out of them 33 participants came from the organizing country.

The symposium covered a broad field of problems, dealing with the tools of vehicle dynamics (mathematical modelling, identification method, experi-
mental methods) as well as with their application in the rather complex question of the vehicle – man – surroundings interactions.

5 State-of-the-art papers were read, dealing with
- identification methods for vehicle system dynamics,
- dynamic interaction of vehicles with tracks and roads,
- injury sequence and injury severity as the consequence of the dynamic response of the vehicle during and after collision,
- dynamic measurements in the research and development of rail vehicles,
- road vehicle suspension system design.

They were published in the journal Vehicle System Dynamics, Volume 16, number 3, 1987.

The full papers were presented in joint sessions every morning and in parallel sessions on road and rail topics in the afternoon the first two days. These sessions were chaired by A.D. de Pater, A. Slibar, K. Knothe, H.B. Pacejka, P. Lugner, W. Schiehlen, M. Mitschke, L. Segel and A. H. Wickens.

A novelty in the organization of the IAVSD Symposium was the introduction of the poster sessions in the afternoon the third day. The reason was to increase the number of the papers presented and to enable closer personal discussions in small groups. The chairmen of the poster sessions were R.J. Anderson, R.S. Sharp, J.A. Elkins, Z.Y. Shen and G. Sauvage. The Scientific Committee of the Symposium when evaluating the poster sessions found this form of presentation interesting and applicable for future symposia. The full papers and poster papers form the content of the Proceedings.

A small exhibition of the Czechoslovak historical and contemporary automobiles was arranged the third day in order to show to the participants the industrial background of the motor car research in Czechoslovakia. The fourth day afternoon was devoted to the visit of the railway testing circuit of the Czechoslovak Railways connected with the lecture about the Czechoslovak rail vehicles industry.

Social events were held every evening with the hope to make the stay of the participants in Praha more agreeable and colourful. A festive ceremony was held at the farewell dinner, when H.B. Pacejka was given the Golden Medal of the Czech Technical University CVUT for the scientific as well as organizational success. A.D. de Pater obtained the Medal of the Czechoslovak Society for Mechanics (IUTAM) for his outstanding scientific work, and A. Slibar was named Honorary Member of IAVSD for his remarkable efforts supporting the scientific and social navel of the Association. The composition of the new Board of IAVSD was announced at the same occasion: L. Segel (USA), president; A.H. Wickens (UK), 1st vice president; M. Apetaur (Czech), 2nd vice president; H.B. Pacejka, (Neth.), secretary general; R.S. Sharp, (UK), treasurer. Trustees: J.A. Elkins (USA), J.K. Hedrick (USA), M. Iguchi (Japan), W. Kortüm (FRG), M. Mitschke (FRG), O. Nordström (Swed.), A.D. de Pater (Neth.), G. Sauvage (France). Representative of IUTAM: W.O. Schiehlen (FRG).

In its meeting, the Board of IAVSD has decided to appoint professor R.J. Anderson (Queen's University, Kingston, Canada) as chairman of the Scientific Committee of the 11th Symposium which will be held in Kingston August 28 to September 2, 1989. Professor Z. Shen has been asked to prepare the 12th Symposium scheduled for August 1991 in Beijing.

H.B. Pacejka

Report

on

International Society for the Interaction of Mechanics and Mathematics (ISIMM)

The Society has now nearly 250 members from 28 countries. Its main activities are

a) To organize a “Symposium on Trends in Applications of Pure Mathematics to Mechanics” (STAMM) every second year;

b) to support irregularly held minisymposia on topics in line with the aims of the Society;

c) to become patron of scientific meetings if these correspond to the aims of the Society;

d) to edit scientific books written by members of the Society in the spirit of the Society.

STAMM 7 was held under the chairmanship of J.F. Besseling and W. Eckhaus in Wassenaar, The Netherlands, December 7–12, 1987 with the participation of 60 scientists from 16 countries. Main topics were Instability, Bifurcations, Transition to chaos, Perturbation methods, Multibody dynamics, Non-classical materials. The proceedings will be printed by Springer in 1988.

Two minisymposia have been held, namely on “Unilateral Problems in Mechanics”, Rome, Italy, April 6–8, local organization by M. Como, A. Grimoldi, F. Maceri, and P. Podio-Guidugli, 64 participants from 9 countries and on “Kinetic Theory and Extended Thermodynamics”, Bologna, Italy, May 18–22, organization by T. Ruggerie and J. Müller, 82 participants from 10 countries.

E. Kröner
Report
on
International Congress on Mechanical
Behaviour of Materials (ICM)
The Fifth International Conference on Mechanical Behaviour of Materials (ICM 5) was held in Beijing, June 2–6, 1987 with about 400 participants from about 25 countries. The office of ICM was transferred to Beijing with Professor Yan Minggao, Institute of Aeronautical Materials, Beijing, China as chairman. The next conference ICM 6 will be held 1989 in Kyoto, Japan.

J. Carlsson

Report
on
Asian Fluid Mechanics Committee (AFMC)
The Committee organizes a Symposium every three year, whose title is “Asian Congress of Fluid Mechanics”. The First Congress was held in Bangalore, India in 1980, the Second in Beijing, China in 1983 and the Third in Tokyo, Japan in 1986. The contributions of these Symposia were published in a series of Proceedings of Asian Congress of Fluid Mechanics. The Fourth Symposium will take place in Hong Kong in August 19–23, 1989. The present Officers of AFMC are Professor H. Sato (President), Professor T. C. Lin (Vice-President), Professor R. Narasimha (Vice-President), Professor N.W.M. Ko (Secretary). The relations between IUTAM and AFMC are very useful for both associations.

T. C. Lin

STATUTES
Statuts de l'Union Internationale
de Mécanique Théorique et Appliquée

ART. I
"L'Union Internationale de Mécanique Théorique et Appliquée" ci-après dénommée "l'Union" est une organisation scientifique à la fois internationale et non-gouvernementale.

ART. II
Les Principaux objectifs de l'Union sont
a) de constituer un lien entre personnes et organisations engagées dans le travail scientifique (théorique ou expérimental) concernant la mécanique ou les sciences associées;
b) d'organiser les congrès internationaux de mécanique théorique et appliquée par l'intermédiaire de son Comité permanent des Congrès (cf. Art. XII ci-après), et d'organiser d'autres réunions internationales sur des sujets relevant de la mécanique théorique et appliquée;
c) de s'engager en d'autres activités visant à promouvoir le développement de la mécanique, aussi bien théorique qu'appliquée, en tant que branche de la science.

ART. III
L'autorité suprême de l'Union est son Assemblée Générale.
Cette Assemblée détient le pouvoir de décider sur toute question affectant l'Union, notamment sur toute modification de ses Statuts. Sur des questions spécifiées, elle peut déléguer tout ou partie de ses pouvoirs à un ou à des organismes appropriés.
La composition de l'Assemblée Générale est régie par l'article VI ci-après.
Les réunions de l'Assemblée Générale doivent se tenir aux dates fixées par le Bureau de l'Union (cf. Art. XI ci-après) ou sur la demande de 10 Membres au moins de cette Assemblée.

ART. IV
Dans toutes ses décisions, l'Assemblée Générale doit être guidée par la tradition de libre coopération scientifique internationale développée par les Congrès Internationaux de Mécanique Théorique et Appliquée. En poursuivant ses objectifs, l'Union respectera le principe général de non-discrimination et reconnaîtra le droit pour tout homme de science dans le monde d'adhérer ou de s'associer à une activité scientifique internationale sans rencontrer d'opposition pour motif de race, de religion, de philosophie politique, d'origine ethnique, de citoyenneté, de langage ou de sexe.

ART. V
Dans les votes de l'Assemblée Générale, chaque membre ne dispose que d'une voix.
Pour une modification des Statuts, la majorité requise est de deux tiers des votes exprimés.
Pour toute autre décision la majorité simple des votes exprimés est requise.
Tout membre se trouvant dans l'impossibilité d'être présent à une réunion peut désigner, à l'avance et par lettre adressée au Secrétariat Général, un autre membre qu'il charge de voter en son nom.
Dans l'intervalle entre réunions de l'Assemblée Générale, un vote peut être émis par correspondance sur proposition formulée par le Bureau (cf. Art. XI ci-après). En pareil cas, le résultat du vote n'est valablement obtenu que si le nombre des participants effectifs n'est pas inférieur aux deux tiers du nombre total des membres de l'Assemblée Générale.

ART. VI
L'Assemblée Générale se compose :
a) des représentants des "organisations adhérentes" (cf. art. VIII);
b) des membres élus par l'Assemblée Générale de l'Union et qui doivent être des personnes réellement engagées dans le travail scientifique concernant la mécanique ou les sciences associées ;
c) s'il y a lieu, et sur décision de l'Assemblée Générale, des représentants de comités ou groupes d'hommes de science.
La durée de fonction de tout membre élu doit être précisée, lors de son élection, par l'Assemblée Générale.

ART. VII
L'Assemblée Générale doit tendre à une représentation adéquate de tout groupe d'hommes de science poursuivant des recherches en mécanique théorique ou appliquée et non représentés par une organisation adhérente.

ART. VIII
Les organisations d'hommes de science en mécanique théorique ou appliquée (ou les unions de telles organisations) qui représentent effectivement une activité scientifique indépendante dans un pays ou dans un territoire bien défini peuvent être admises dans l'Union par l'Assemblée Générale comme "organisations adhérentes" pourvu que leur dénomination exclut tout malentendu quant à la qualification du pays ou du territoire en cause.
En principe, une seule organisation pourra être admise pour chaque pays ou chaque territoire.

ART. IX
Chaque "organisation adhérente" dispose d'un certain nombre de représentants dans l'Assemblée Générale et doit acquitter une cotisation annuelle à l'Union (cf. Art. XIV ci-après).

ART. X
Des organisations internationales dont les domaines principaux d'activité sont en étroite relation avec ceux de l'Union peuvent être admises par l'Assemblée Générale en qualité "d'organisations affiliées" à l'Union.

Chaque organisation affiliée a la faculté de désigner un observateur qui est invité à participer, sans droit de vote, à l'Assemblée Générale de l'Union. Le Bureau de l'Union (Article XI) a réciproquement la faculté de désigner un observateur, sans droit de vote, au Conseil Scientifique ou à l'organe équivalent de l'organisation affiliée.
L'organisation affiliée et l'Union sont tenues de s'informer mutuellement de toutes leurs activités importantes et des mesures affectant leur fonctionnement.
En préparant les rencontres scientifiques internationales qu'elles organisent, l'Union et chaque organisation affiliée sont tenues de prendre soigneusement en considération toutes les décisions déjà prises par l'Union et les organisations affiliées de manière à assurer la bonne coordination de toutes ces activités scientifiques.
Les organisations affiliées n'ont à payer aucune cotisation annuelle à l'Union.

ART. XI
Pour exécuter les décisions de l'Assemblée Générale et pour assurer entre ses sessions le travail de l'Union, l'Assemblée Générale élit les membres d'un Bureau pour une durée de quatre ans au plus. Le Bureau est composé d'un Comité Directeur (un Président, le précédent Président qui remplit la fonction de Vice-Président, un Secrétariat Général et un Trésorier) et de quatre autres membres de l'Assemblée Générale.
Les membres, qui ne sont pas au Comité Directeur, ne peuvent être reçus plus de deux mandats consécutifs. Les membres du Bureau nouvellement élus entrent en fonction au 1er novembre qui suit l'Assemblée Générale qui a précédé à leur élection.
Le Bureau doit se réunir au moins une fois par an. Tout membre du Bureau empêché de prendre part à une réunion de celui-ci peut désigner par lettre adressée au Secrétariat Général un autre membre de l'Assemblée Générale pour le remplacer à cette session.
Le Secrétariat Général centralise toutes les questions concernant le fonctionnement de l'Union y compris ses relations avec les organisations adhérentes, affiliées ou autres.
Le domicile légal de l'Union se situe au domicile du Secrétariat Général.
Le Bureau a le droit de désigner un trésorier-assistant en tout pays où l'Union est titulaire d'un compte bancaire. Les trésoriers-assistants peuvent être désignés en dehors des membres du Bureau mais parmi les membres de l'Assemblée Générale.
Le Bureau doit dresser un budget prévisionnel pour l'année à venir, administrer les finances de l'Union et soumettre à l'Assemblée Générale un rapport financier annuel.
Le Vice-Président remplit les fonctions du Président pendant toute période où celui-ci se trouve empêché de les exercer.
Entre les réunions de l'Assemblée Générale, il incombe au Bureau de désigner

1) Adoptés par l'Assemblée Générale de l'Union le 22 août 1984 à Lyngby (Danemark).
un remplaçant temporaire pour remplir les fonctions du Vice-Président, du Secrétaire Général ou du Trésorier si cela s'avère nécessaire.

ART. XII
L’Assemblée Générale désigne un Comité permanent des Congrès chargé de l’organisation à intervalles réguliers des Congrès Internationaux de Mécanique Théorique et Appliquée.
a) Le Président de l’Union préside aussi ce Comité des Congrès.
b) Les Membres de ce Comité sont élus par l’Assemblée Générale; ce sont des hommes de science actifs dans le domaine de la mécanique théorique ou appliquée, n’appartenant pas nécessairement à l’Assemblée Générale.
c) Le Comité des Congrès élit ou réélit, pour une durée qu’il juge convenable, son Secrétaire Général.

ART. XIII
Les ressources financières de l’Union sont constituées par:
a) les cotisations annuelles des “organisations adhérentes”; 
b) les dons et subventions que l’Union peut recevoir.
L’Union doit tenir une liste de ses bienfaiteurs où doivent être mentionnés pour chaque année les noms des personnes ou institutions qui ont fait bénéficier l’Union de donations, legs ou subventions.

ART. XIV
Le nombre des représentants d’une “organisation adhérente” et le montant de la cotisation annuelle qu’elle doit acquitter sont déterminés, selon le tableau suivant, par la catégorie à laquelle désirait appartenir l’organisation, après accord de l’Assemblée Générale.

<table>
<thead>
<tr>
<th>Catégorie</th>
<th>Nombre de représentants</th>
<th>Nombre d'unités de la cotisation annuelle</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>II</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>III</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>IV</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>V</td>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>

Le montant de l’unité de cotisation annuelle est fixé par l’Assemblée Générale, au moins une année avant celle à laquelle cette cotisation devient exigible.

Résolution de l’Assemblée Générale de Pallanza
(27 juin 1950)
En confirmation des opinions exprimées précédemment à l’Assemblée Générale de septembre 1948 au moment où les présents statuts ont été adoptés:
1. L’Assemblée Générale estime que, dans les pays où il existe plus d’une organisa-

nisation nationale active dans le champ de la mécanique théorique et appliquée, un comité spécial de coordination doit être formé. En général, il est convenu de reconnaître une seule organisation adhérente dans chaque pays.
2. L’Assemblée Générale estime que sa composition devra être graduellement modifiée de façon à ce qu’elle comprenne principalement les représentants des organisations adhérentes à l’Union, la catégorie des membres élus devant être réservée à des cas particuliers et exceptionnels. Dans ce but, elle fait part de son intention de réduire le nombre des membres élus lorsque, en 1952, ils seront arrivés au terme de leur mandat.

Règles de fonctionnement du Comité des Congrès de l’Union
1. Le Comité des Congrès se réunit au moins une fois lors de chaque Congrès.
2. Le Comité des Congrès peut instituer un Comité Exécutif chargé de prendre en son nom toutes les décisions nécessaires pendant la période qui s’écoule entre deux Congrès successifs, et de lui en faire rapport à sa prochaine réunion. Le Comité Exécutif comprend le président et le secrétaire du Comité des Congrès et un ou plusieurs membres désignés par le comité des Congrès.
3. L’organisation effective d’un Congrès est confiée à un Comité local d’Organisation, élu par le pays ou l’organisation qui invite, et ce Comité est également responsable de la publication des Comptes rendus du Congrès. Le Comité d’Organisation fera son rapport au Comité des Congrès soit au cours du Congrès qu’il organise, soit avant, s’il l’juge préférable.
4. Le Comité d’Organisation devra obtenir l’approbation du Comité des Congrès (normalement par l’intermédiaire du Comité Exécutif) pour toutes les questions relevant de la politique générale du Comité des Congrès, en particulier pour celles qui concernent:
   4.1 le but du Congrès;
   4.2 la sélection des communications pour le Congrès;
   4.3 le choix des conférences générales pour le Congrès;
   4.4 la désignation des présidents de sessions du Congrès;
   4.5 les principes généraux régissant les arrangements financiers du Congrès.
5. Le comité d’Organisation percevra, de tous les membres du Congrès, une contribution (dont le montant sera proposé par le Comité du Congrès et approuvé par le Bureau) afin de couvrir les dépenses administratives du Comité du Congrès. Ces contributions seront reversées à l’IUTAM immédiatement après le Congrès.

Statutes of International Union of Theoretical and Applied Mechanics

I

“The International Union of Theoretical and Applied Mechanics” hereinafter called “the Union” is an international non-governmental scientific organization.
II
The principal objectives of the Union are
a) to form a link between persons and organizations engaged in scientific work (theoretical or experimental) in mechanics or in related sciences;
b) to organize international congresses of theoretical and applied mechanics through a standing Congress Committee (Article XII), and to organize other international meetings for subjects falling within the field of theoretical and applied mechanics;
c) to engage in other activities meant to promote development of mechanics, both theoretical and applied, as a branch of science.

III
The highest authority of the Union is its General Assembly.
The General Assembly has the power to decide all questions affecting the Union, including alterations of the Statutes. On specified questions it may delegate its power to appropriate bodies.
The composition of the General Assembly is regulated in Article VI.
Meeting of the General Assembly will take place at times decided by the Bureau (Article XI) or on the request of at least 10 members of the General Assembly.

IV
In all its decisions the General Assembly shall be guided by the tradition of free international scientific cooperation, developed in the International Congresses for Theoretical and Applied Mechanics.
In pursuance its objectives the Union shall observe the basic policy of nondiscrimination and affirm the rights of scientists throughout the world to adhere to or to associate with international scientific activity without regard to race, religion, political philosophy, ethnic origin, citizenship, language or sex.

V
In voting every member of the General Assembly shall dispose of one vote.
For an alteration of the Statutes the majority required is 2/3 of the votes brought forward.
For all other decisions a simple majority of the votes brought forward is required.
Any member who is unable to attend a meeting may by a letter to the Secretary General constitute another member of the General Assembly as proxy.
Between meetings of the General Assembly voting may be carried out by correspondence upon proposals made by the Bureau (Article XI); in this case decisions will be valid only provided the number of persons taking part in the vote is not less than 2/3 of the total membership of the General Assembly.

VI
The General Assembly is composed of
a) representatives of the adhering organizations (Article VIII);
b) members elected by the General Assembly of the Union, who shall be persons actually engaged in scientific work in mechanics or in related sciences;
c) representatives of committees and groups of scientists, if so decided by the General Assembly.
The term of an elected member shall be determined by the General Assembly at the time of the election.

VII
The General Assembly shall provide for an adequate representation of any group of scientists carrying out research in theoretical or applied mechanics and not represented by an adhering organization.

VIII
Organisations of scientists in theoretical or applied mechanics (or unions of such organizations) which effectively represent independent scientific activity in a country or in a definite territory can be admitted by the General Assembly as adhering organizations of the Union provided they can be listed under a name that will avoid any misunderstanding about the country or territory represented.
In general only one organization from each country or territory will be admitted.

IX
Each adhering organization shall have representatives in the General Assembly of the Union, and pay an annual subscription to the Union in accordance with Article XIV.

X
International organizations mainly occupied in fields closely related to that of the Union can be admitted by the General Assembly as affiliated organizations of the Union.
Each affiliated organization has the right to appoint an observer, who is invited to take part in the General Assembly without voting rights. The Bureau of the Union (Article X) has the reciprocal right to appoint a nonvoting observer to the corresponding council or other executive body of the affiliated organization.
The affiliated organization and the Union are mutually obliged to keep each other informed about all important activities of and organizational measures taken.
In organizing international scientific meetings the Union and each of the affiliated organization are obliged to consider carefully all measures already taken by the Union and its affiliated organizations in order to coordinate such international scientific activities. Affiliated organizations pay no annual dues to the Union.

XI

To execute the decisions of the General Assembly and to carry out work between meetings, the General Assembly elects members of a Bureau for a period of at most four years. The Bureau consists of the officers (President, the retiring President who serves as Vice-President, Secretary-General, and Treasurer) and four other members of the General Assembly. The maximum continuous period of service as a member of the Bureau, other than an officer, is limited to eight years. Newly elected members of the Bureau enter into office on the date of November 1, following the General Assembly at which they were elected. The Bureau will meet at least every year. A member of the Bureau who is prevented from attending a meeting may by letter to the Secretary-General designate another member of the General Assembly as a replacement. The Secretary-General will act as a permanent center for all matters affecting the Union, including relations with adhering, affiliated and other organizations.

The legal domicile of the Union shall be the place where the Secretary-General lives.

The Bureau is authorized to appoint Assistant-Treasurers in those countries where the Union has a bank account.

The Assistant-Treasurers must be members of the General Assembly but need not to be members of the Bureau.

The Bureau shall draft a budget for each coming year, and shall administer the finances. The Bureau shall submit an annual financial report to the General Assembly.

The Vice-President shall normally fulfill the duties of the President should the President become unable to discharge them.

Between meetings of the General Assembly the Bureau shall decide who shall undertake the duties of the Vice President, Secretary-General, or Treasurer should a temporary replacement be necessary.

XII

The General Assembly establishes a standing Congress Committee which is responsible for the organization of International Congresses of Theoretical and Applied Mechanics at regular intervals.

a) The President of the Union shall also serve as President of the Congress Committee.

b) The members of the Congress Committee are appointed by the General Assembly as scientists active in theoretical or applied mechanics and need not be members of the General Assembly.

c) The Congress Committee appoints a Secretary, without stated terms of office.

d) The rules of procedure of the Congress Committee shall be approved by the General Assembly.

XIII

The financial means of the Union are formed by:

a) the annual subscriptions of the adhering organizations;

b) gifts and grants.

The Union shall maintain a roll of benefactors on which shall be inscribed annually the names of those persons or institutions which have accorded gifts, legacies or other subventions to the Union.

XIV

The number of representatives of an adhering organization and the amount of the annual subscription to be paid by that organization will be regulated according to one of the following categories, as proposed by the adhering organization and after approval of the General Assembly of the Union:

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of representatives</th>
<th>Units of annual subscription</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>II</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>III</td>
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<td>5</td>
</tr>
<tr>
<td>IV</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>V</td>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>

Changes in the amount of the unit annual subscription will be decided by the General Assembly not less than one year in advance.

Resolution of the General Assembly at Pallanza

(June 27, 1950)

In confirmation of the views already expressed at the General Assembly of September 1948 when the present statutes were framed:

1. The General Assembly expects that in those countries where more than one national organization is active in theoretical and applied mechanics, a national coordinating committee will be formed. In general it is expected to recognize only one adhering body in each country;

2. The General Assembly believes that a gradual transition should be made in its composition, so that ultimately it will consist mainly of representatives of organizations adhering to the Union with the category of elected members.

1) Adopted by the General Assembly on August 22, 1984 in Lyngby (Denmark).
reserved for exceptional and unusual cases. To this end it gives notices of its
intention to reduce the number of elected members when the terms of the pre-
sent elected members expire in 1952.

Rules of procedure for the Congress Committee of IUTAM

1. The Congress Committee meets at least once at every Congress.
2. The Congress Committee may appoint an Executive Committee to take
all necessary actions on its behalf in the period between two successive Con-
gresses, and to report to it at its next meeting. The Executive Committee will
consist of the president, the secretary and one or more members appointed by
the Congress Committee.
3. The actual organization of a Congress is delegated to a local Organizing
Committee, elected by the host-country or host-organization, which is also
responsible for publication of its Proceedings. The Organizing Committee will
report to the Congress Committee either during or, if it sees fit, before the
Congress which it organizes.
4. The Organizing Committee will obtain the approval of the Congress
Committee (normally through the Executive Committee) with regard to all
matters affecting the general policy of the Congress Committee, in particular
with regard to:
   4.1 the scope of the Congress;
   4.2 the screening of papers of the Congress;
   4.3 the selection of general lectures for the Congress;
   4.4 the appointment of chairmen of sessions of the Congress;
   4.5 the broad principles regarding financial arrangements for the Congress.
5. The Organizing Committee will levy a fee (the level to be recommended
by the Congress Committee and approved by the Bureau) for administrative
expenses of the Congress Committee, from all Congress members. This fee
will be paid over to IUTAM after the Congress.

Procedure for election of the Bureau of IUTAM

1. At the General Assembly, preceding the one at which the new Bureau is elec-
ted, an Electoral Committee (EC) shall be elected, consisting of the President
of the Union and two to four other members of the Assembly, who are not
members of the Bureau.

2. The President is Chairman of the EC.

List of Publications

a) Annual Reports, available at the Secretariat
   The Union publishes since 1948 every year a Report with detailed informa-
tion on all its activities.

b) Publications on Symposia, etc., available from the publisher
   1. Problems of Cosmical Aerodynamics, Proceedings of the Symposium on the
      Motion of Gaseous Masses of Cosmical Dimensions held at Paris, France,
      August 16-19, 1949, organized by IUTAM and IAU.
      Published by: Central Air Documents Office, Army-Navy-Air-Force, UB
      Building, Dayton 2, Ohio, USA.
   2. Colloque international de Mecanique, Pallanza, Lago Maggiore, Italia, 23-24
      juin 1950, organise par l’IUTAM.
      Publie par le Consiglio Nazionale delle Ricerche, Roma, Italia, dans “La
      Ricerca Scientifica”, annnee 20, n° 12, pp. 1917-1942, dec. 1950.
   3. Colloquium on Plastic Flow and Deformation within the Earth, Hershey,
      Pennsylvania, USA, September 12-14, 1950, organized by IUTAM and
      IUGG.


7. *Colloquium on Photoelasticity and Photoplasticity* (Bruxelles, Belgium, 29-31 July 1954). Published by Imprimerie Dioncre, Chaussée de Boondael, 602-602 a, Ixelles-Bruxelles (Belgium).


56. IUTAM Symposium on Buckling of Structures (Harvard University, Cambridge, Massachusetts, USA, June 17-21, 1974). The Proceedings of the Symposium edited by B. Budiansky have been published by Springer-Verlag, Berlin, 1976.


   The Proceedings of the Symposium have been published by Société Française de Mécaniciens as a special issue of Revue Française de Mécanique, Paris, 1976.


   The Proceedings of the Symposium, edited by D.G. Provis and R. Radok, have been published by Springer-Verlag, Berlin, 1977 as Vol. 64 in the series Lecture Notes in Physics.


70. *IUTAM Symposium on Dynamics of Vehicles on Roads and Tracks* (Vienna, Austria, 19-23 September 1977).


   The Proceedings of the Symposium, edited by N.H. Ibragimov and L.V. Ovsiannikov, have been published by the USSR Academy of Sciences, Siberian Branch, 1978.


78. *IUTAM Symposium on Structural Control* (Waterloo, Ontario, Canada, 4-7 June 1979).

79. *IUTAM Symposium on the Physics and Mechanics of Ice* (Copenhagen, Denmark, 6-10 August 1979).

80. *IAHR/IUTAM Symposium on Practical Experiences with Flow-Induced Vibrations* (Karlsruhe, FRG, 3-6 September 1979).


94. **IUTAM Symposium on High Temperature Gas Dynamics** (Liblice, Czechoslovakia, 15-19 September 1981). The Proceedings of the Symposium, edited by M. Pichal, have been published by the Institute of Thermomechanics, Czechoslovak Academy of Sciences, Prague, Czechoslovakia.


111. *IUTAM Symposium on Turbulence and Chaotic Behavior in Fluids* (Kyoto, Japan, 5-10 September 1983). The Proceedings of this Symposium, edited by T. Tatsumi, have been published by North-Holland, Amsterdam 1984.


c) Proceedings of the International Congresses for Applied Mechanics. Until September 4, 1964 the organization of the International Congresses for Applied Mechanics was supervised by the "International Committee for the Congresses of Applied Mechanics" and for each Congress separately entrusted to a local Organizing Committee undertaking also the publication of the Proceedings. Consequently, there is no central point from which Proceedings can be ordered, and for each volume, application must be made to the publishers who took care of that particular volume.

Since September 4, 1964 the same task will be fulfilled by the Standing Congress Committee of IUTAM, and local Organizing Committees to be established.

The titles of the volumes and the names of the publishing firms are given below.


6. 6th Congress, Paris (France), 22-29 September 1946. Proceedings not published (was given in the hands of Gauthier-Villars, Paris).


8. 8th Congress, Istanbul (Turkey), 20-28 August 1952. Proceedings published by the Organizing Committee (Vol. I, Vol. II). Faculty of Sciences, University of Istanbul, P.O. Box 245, Istanbul (Turkey), 1953.


11 th Congress, Munich (Germany), 30 August – 5 September 1964.

12 th Congress, Stanford, Cal. (USA), 26-31 August 1968.
The Proceedings, edited by M. Hetényi and W.G. Vincenti, have been published by Springer-Verlag, Berlin (Germany), 1969.

13 th Congress, Moscow (USSR), 21-26 August 1972.
The Proceedings, edited by E. Becker and G.K. Mikhailov, have been published by Springer-Verlag, (Germany), 1973.

14 th Congress, Delft (The Netherlands), 30 August – 4 September 1976.


(Please note: The publications listed above, except the Annual Reports, are not available at the IUTAM Secretariat. Please order directly from the publisher.)
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