

# **REPORT 2006**



INTERNATIONAL UNION OF THEORETICAL AND  
APPLIED MECHANICS

# REPORT 2006



Eindhoven University of Technology  
THE NETHERLANDS

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## Bureau: Officers and Members

The following members of the Bureau of IUTAM have been elected for the period 1 November 2004 to 31 October 2008:

### Officers

Professor L.B.Freund (USA)	President
Professor H.K. Moffatt (UK)	Vice-President
Professor J. Engelbrecht (Estonia)	Treasurer
Professor D.H. van Campen (Netherlands)	Secretary-General

### Members

Professor T. Kambe (Japan)	(elected 2004)
Professor A. Kluwick (Austria)	(elected 2004)
Professor N. Olhoff (Denmark)	(elected 2004)
Professor Z. Zheng (China)	(elected 2004)

## Secretariat

IUTAM-Secretariat, Department of Mechanical Engineering,  
Eindhoven University of Technology, 5600 MB Eindhoven, The Netherlands

Telephone: +31 40 247 2710, Telefax: +31 40 243 7175

E-mail: [sg@iutam.net](mailto:sg@iutam.net)

Internet: <http://www.iutam.net> or <http://www.iutam.org> or <http://www.iutam.info>

## Past Officers

<i>Elected</i>	<i>President</i>	<i>Vice-President</i>	<i>Treasurer</i>	<i>Secretary</i>
1948	J. Péres (France)	R.V. Southwell (UK)	H.L. Dryden (USA)	J.M. Burgers (Netherlands)
1952	H.L. Dryden (USA)	J. Péres (France)	G. Temple (UK)	F.A. v. d. Dungen (Belgium)
1956	F.K.G. Odqvist (Sweden)	H.L. Dryden (USA)	G. Temple (UK)	M. Roy (France)
1960	G. Temple (UK)	F.K.G. Odqvist (Sweden)	W.T. Koiter (Netherlands)	M. Roy (France)
1964	M. Roy (France)	G. Temple (UK)	W.T. Koiter (Netherlands)	H. Görtler (Germany)
1968	W.T. Koiter (Netherlands)	M. Roy (France)	H. Görtler (Germany)	F.I. Niordson (Denmark)
1972	H. Görtler (Germany)	W.T. Koiter (Netherlands)	D.C. Drucker (USA)	F.I. Niordson (Denmark)

1976	F.I. Niordson (Denmark)	H. Görtler (Germany)	D.C. Drucker (USA)	J. Hult (Sweden)
1980	D.C. Drucker (USA)	F.I. Niordson (Denmark)	E. Becker (Germany)	J. Hult (Sweden)
1984	J. Lighthill (UK)	D.C. Drucker (USA)	L.v. Wijngaarden (Netherlands)	W. Schiehlen (Germany)
1988	P. Germain (France)	J. Lighthill (UK)	L.v. Wijngaarden (Netherlands)	W. Schiehlen (Germany)
1992	L.v. Wijngaarden (Netherlands)	P. Germain (France)	B.A. Boley (USA)	F. Ziegler (Austria)
1996	W. Schiehlen (Germany)	L.v. Wijngaarden (Netherlands)	L.B. Freund (USA)	M.A. Hayes (Ireland)
2000	H.K. Moffatt (UK)	W. Schiehlen (Germany)	L.B. Freund (USA)	D.H. van Campen (Netherlands)
2004	L.B. Freund (USA)	H.K. Moffatt (UK)	J. Engelbrecht (Estonia)	D.H. van Campen (Netherlands)

## Past Congress Presidents

<i>Nr.</i>	<i>Year</i>	<i>Place</i>	<i>Congress-President</i>
1	1924	Delft, The Netherlands	C.B. Biezeno
2	1926	Zürich, Switzerland	E. Meissner
3	1930	Stockholm, Sweden	A.F. Enström
4	1934	Cambridge, UK	C.E. Inglis
5	1938	Cambridge, USA	K.T. Compton
6	1946	Paris, France	H. Villat
7	1948	London, UK	R.V. Southwell
8	1952	Istanbul, Turkey	K. Erim
9	1956	Brussels, Belgium	F.H. van den Dungen
10	1960	Stresa, Italy	G. Colonnetti
11	1964	Munich, Germany	H. Görtler
12	1968	Stanford, USA	N.J. Hoff
13	1972	Moscow, USSR	N.I. Muskhelishvili
14	1976	Delft, The Netherlands	W.T. Koiter
15	1980	Toronto, Canada	F.P.J. Rimrott
16	1984	Lyngby, Denmark	F. Niordson
17	1988	Grenoble, France	P. Germain and M. Piau
18	1992	Haifa, Israel	J. Singer
19	1996	Kyoto, Japan	T. Tatsumi
20	2000	Chicago, USA	H. Aref
21	2004	Warsaw, Poland	W. Gutkowski

## **Adhering Organizations**

### **Argentina (1959)**

Asociación Argentina de Mecánica Computacional  
Güemes 3450, 3000 Santa Fe  
President/Chair: Dr. S. R. (Sergio) Idelsohn  
Contact: Dr. S. R. (Sergio) Idelsohn  
Representatives in IUTAM: Dr. S. R. (Sergio) Idelsohn

### **Australia (1964)**

The Australian National Committee for Mechanical Sciences of the Australian Academy of Sciences  
GPO Box 783, Canberra City, ACT 2601  
President/Chair: Dr. F. (Francis) Rose  
Contact: Dr. F. (Francis) Rose  
Representatives in IUTAM: Dr. J.P. (Jim) Denier, Prof. E.O. (Ernie) Tuck

### **Austria (1951)**

Austrian National Committee for Theoretical and Applied Mechanics of the Austrian Academy of Sciences  
Dr.-Ignaz-Seipel-Platz 2, A-1010 Wien  
President/Chair: Prof. H. (Hans) Troger  
Contact: Prof. A. (Alfred) Kluwick  
Representatives in IUTAM: Prof. A. (Alfred) Kluwick

### **Belgium (1949)**

The National Committee for Theoretical and Applied Mechanics of the Royal Academies for Science and Arts of Belgium  
Hertogsstraat 1, B-1000 Brussels  
Secretary: Prof. Roland Decuypere  
President/Chair: Prof. P. (Philippe) Boulanger  
Contact: Prof. R. (Roland) Keunings  
Representatives in IUTAM: Prof. P. (Philippe) Boulanger, Prof. E. (Erik) Dick, Prof. D.V.H. (Dirk) Vandepitte

### **Brazil (1982)**

Associação Brasileira de Ciências Mecânicas  
Avenida Rio Branco 124/18° andar, 20040-001 Rio de Janeiro  
President/Chair: Prof. V. (Valder) Steffen Jr.  
Contact: Prof. L. (Luiz) Bevilacqua  
Representatives in IUTAM: Prof. L. (Luiz) Bevilacqua

**Bulgaria (1969)**

Bulgarian National Committee on Theoretical and Applied Mechanics of the Bulgarian Academy of Sciences

1, 15 novembre str., BG-1040 Sofia

President/Chair: Prof. A. (Anguel) Baltov

Secretary: Dr. E. (Evtim) Ttoshev

Contact: Prof. A. (Anguel) Baltov

Representatives in IUTAM: Prof. A. (Anguel) Baltov

**Canada (1963)**

The National Research Council of Canada,

Montreal Road, Ottawa, Canada K1A 0R6

National Committee for IUTAM

President/Chair: Prof. S.B. (Stuart) Savage

Contact: Prof. S.B. (Stuart) Savage

Representatives in IUTAM: Prof. J.S. (Jorn) Hansen, Prof. S.B. (Stuart) Savage,

Prof. S. (Suresh) Shrivastava, Prof. J.W. (Jean) Zu

**Chile (1996)**

The Chile National Committee on Theoretical and Applied Mechanics Academia Chilena de Ciencias

Almirante Montt 454, Santiago, Chile

President/Chair: Dr. F. (Francisco) Rothhammer Engel

Secretary: Dr. T. (Tito) Ureta Aravena

Contact: Prof. F. (Fernando) Lund

Representatives in IUTAM: Prof. F. (Fernando) Lund

**China (1980)**

The Chinese Society of Theoretical and Applied Mechanics

15 Zhong Guan Cun Road, Beijing 100080

President/Chair: Prof. E. (Er-jie) Cui

Contact: Prof. W. (Wei) Yang

Representatives in IUTAM: Prof. Y. (Yi-long) Bai, Prof. E. (Er-jie) Cui,

Prof. W. (Wei) Yang, Prof. Z. (Zhemin) Zheng

**China-Hong Kong (1996)**

The Hong Kong Society of Theoretical and Applied Mechanics (HKSTAM)

Department of Mechanical Engineering, Hong Kong University of Science and Technology, Kowloon, HK

President/Chair: Prof. Q.P. (Qing-Ping) Sun

Secretary: Dr. Y.-K. (Yi-Kuen) Lee

Contact: Dr. Y.-K. (Yi-Kuen) Lee

Representatives in IUTAM: Prof. T.X. (Tongxi) Yu

**China-Taipei (1980)**

The Society of Theoretical and Applied Mechanics  
Institute of Applied Mechanics, National Taiwan University, Taipei, Taiwan 106  
President/Chair: Prof. T.-T. (Tsong-Tsong) Wu  
Secretary: Prof. W.-F. (Wen-Fang) Wu  
Contact: Prof. W.-F. (Wen-Fang) Wu  
Representatives in IUTAM: Prof. C.-C. (Chien-Ching) Ma,  
Prof. W.-C. (Wei-Chung) Wang

**Croatia (1994)**

Croatian Society of Mechanics  
Ivana Lucica 5, HR-10000 Zagreb, Croatia.  
President/Chair: Prof. F. (Franjo) Matejcek  
Contact: Prof. G. (Goran) Turkalj  
Representatives in IUTAM: Prof. G. (Goran) Turkalj

**Czech Republic (1993/1949)**

The National Committee of Theoretical and Applied Mechanics  
Academy of Sciences of the Czech Republic, Institute of Thermomechanics, Dolejškova  
5, CZ-18200 Prague 8  
President/Chair: Dr. R. (Rudolf) Dvorák  
Secretary: Prof. M. (Miloslav) Okrouhlik  
Contact: Dr. R. (Rudolf) Dvorák  
Representatives in IUTAM: Dr. R. (Rudolf) Dvorák

**Denmark (1949)**

National Committee for Theoretical & Applied Mechanics,  
The Royal Danish Academy of Sciences and Letters, H.C. Andersens Boulevard 35,  
DK-1553 Copenhagen V.  
President/Chair: Prof. T. (Tom) Fenchel  
Secretary: Prof. H. (Henrik) Breuning-Madsen  
Contact: Prof. N. (Niels) Olhoff  
Representatives in IUTAM: Prof. N. (Niels) Olhoff, Prof. J.N. (Jens Nørkær) Sørensen

**Egypt (1976)**

Academy of Scientific Research and Technology  
Egyptian Committee of Theoretical and Applied Mechanics 101 Kasr El Eini Street,  
Cairo, Egypt.  
Secretary General: Prof. Z.Z. Momeh  
President/Chair: Prof. M.K. (Mohamed) Ismail  
Contact: Prof. M.K. (Mohamed) Ismail  
Representatives in IUTAM: Prof. M.K. (Mohamed) Ismail

**Estonia (1992)**

Estonian Committee for Mechanics,  
Akadeemia tee 21, EE-12618 Tallinn  
President/Chair: Prof. J. (Juri) Engelbrecht  
Contact: Prof. J. (Juri) Engelbrecht  
Representatives in IUTAM: Prof. J. (Juri) Engelbrecht

**Finland (1952)**

The Finnish National Committee on Mechanics  
Helsinki University of Technology, Att. Prof. Mauri Määttänen,  
P.O.Box 4300, FIN-02015 TKK, Finland  
President/Chair: Prof. M. (Mauri) Määttänen  
Secretary: Prof. J. (Juha) Paavola  
Contact: Prof. M. (Mauri) Määttänen  
Representatives in IUTAM: Prof. M. (Mauri) Määttänen, Prof. J. (Juha) Paavola

**France (1949)**

Comité National Français de Mécanique, Académie des Sciences  
23, quai Conti, F-75006 Paris  
President/Chair: Prof. S. (Sébastien) Candel  
Secretary: Prof. L. (Frederic) Dias  
Contact: Prof. S. (Sébastien) Candel  
Representatives in IUTAM: Prof. A. (Ahmed) Benallal, Prof. L. (Frederic) Dias,  
Prof. S. (Stéphane) Zaleski, Prof. A. (André) Zaoui

**Georgia (2000)**

National Committee of Theoretical and Applied Mechanics  
I. Vekua Institute of Applied Mathematics of Tbilisi State University,  
2 University Str., Tbilisi 0143  
Co-Chairman: Prof. G. (George) Jaiani, Prof. D. (Demuri) Danelia  
President/Chair: Prof. G. (George) Jaiani  
Secretary-General: Prof. G. (Gela) Kipiani  
Contact: Prof. G. (George) Jaiani  
Representatives in IUTAM: Prof. G. (George) Jaiani

**Germany (1950)**

Deutsches Komitee für Mechanik (DEKOMECH)  
Hamburg University of Technology, Institute of Modelling and Computation,  
Denickestraße 17, D-21073 Hamburg  
President/Chair: Prof. P. (Paul) Steinmann  
Secretary: Prof. O. (Otto) von Estorff  
Contact: Prof. O. (Otto) von Estorff  
Representatives in IUTAM: Prof. P. (Peter) Eberhard, Prof. C. (Christian) Miehe,  
Prof. W. (Wolfgang) Schröder, Prof. A. (André) Thess

**Greece (1979)**

Hellenic Society for Theoretical and Applied Mechanics  
National Technical University of Athens, Laboratory of Steel Structures,  
42 Patission street, GR-10682 Athens  
President/Chair: Prof. A.N. (Anthony) Kounadis  
Secretary: Prof. I. (Ioannis) Vardoulakis  
Contact: Prof. D.E. (Dimitri) Beskos  
Representatives in IUTAM: Prof. A.N. (Anthony) Kounadis

**Hungary (1948)**

Hungarian National Committee for IUTAM  
Department of Structural Mechanics, Budapest University of Technology  
and Economics, Műegyetem rkp. 3, H-1521 Budapest  
President/Chair: Prof. S. (Sandor) Kaliszky  
Secretary: Prof. G. (Gábor) Stépán  
Contact: Prof. S. (Sandor) Kaliszky  
Representatives in IUTAM: Prof. S. (Sandor) Kaliszky

**India (1950)**

National Committee for Theoretical and Applied Mechanics of the Indian National  
Science Academy  
Bahadur Shah Zafar Marg, New Delhi - 110 002  
President/Chair: Prof. N.K. (Narinder) Gupta  
Contact: Prof. N.K. (Narinder) Gupta  
Representatives in IUTAM: Prof. G. (Gautam) Biswas, Prof. S.M. (Suresh) Deshpande,  
Prof. N.K. (Narinder) Gupta

**Ireland (1984)**

Irish National Committee for Mathematical Sciences  
Royal Irish Academy, 19 Dawson Street, Dublin 2  
President/Chair: Dr. R. (Richard) Watson  
Secretary: ()  
Contact: Prof. P.E. (Padraic) O-Donoghue  
Representatives in IUTAM: Prof. P.E. (Padraic) O-Donoghue

**Israel (1950)**

The Israel Society of Theoretical and Applied Mechanics  
Faculty of Mechanical Engineering, Technion-Israel Institute of Technology,  
Haifa 32000  
President/Chair: Prof. M.B. (Miles) Rubin  
Contact: Prof. M.B. (Miles) Rubin  
Representatives in IUTAM: Prof. I. (Isaac) Goldhirsch, Prof. M.B. (Miles) Rubin

**Italy (1949)**

Associazione Italiana di Meccanica Teorica ed Applicata

Piazza Leonardo da Vinci 32, I-20133 Milano

President/Chair: Prof. G. (Giuseppe) Rega

Secretary: Prof. A. (Angelo) Morro

Contact: Prof. A. (Angelo) Morro

Representatives in IUTAM: Prof. C. (Carlo) Cercignani, Prof. G. (Giulio) Maier,

Prof. P. (Paolo) Podio-Guidugli, Prof. F. (Furio) Vatta

**Japan (1951)**

The National Committee for Theoretical and Applied Mechanics

Science Council of Japan, 7- 22-34 Roppongi, Minato-ku, Tokyo 106-8555

President/Chair: Prof. T. (Toshio) Kobayashi

Contact: Prof. T. (Tsutomu) Kambe

Representatives in IUTAM: Prof. T. (Tsutomu) Kambe, Prof. T. (Toshio) Kobayashi,

Prof. K. (Koji) Uetani, Prof. E. (Eiichi) Watanabe

**Korea, Republic of (1989)**

Korean Society of Theoretical and Applied Mechanics

Department of Aerospace Engineering, Seoul National University, Seoul 151-742

President/Chair: Prof. J.Y. (Jung Yul) Yoo

Secretary: Prof. S.J. (Seung Jo) Kim

Contact: Prof. S.J. (Seung Jo) Kim

Representatives in IUTAM: Prof. J.Y. (Jung Yul) Yoo

**Latvia (1992)**

Latvian National Committee for Mechanics

Latvian Academy of Sciences, Akademijas laukums 1, Riga LV-1524

President/Chair: Prof. V. (Vitauts) Tamuzs

Contact: Prof. V. (Vitauts) Tamuzs

Representatives in IUTAM: Prof. V. (Vitauts) Tamuzs

**Netherlands (1952)**

Netherlands Mechanics Committee

c/o Eindhoven University of Technology, Department of Mechanical Engineering,

P.O. Box 513, NL 5600 MB Eindhoven

President/Chair: Prof. D.H. (Dick) van Campen

Contact: Prof. D.H. (Dick) van Campen

Representatives in IUTAM: Prof. R (René) de Borst, Prof. D.H. (Dick) van Campen,

Prof. A.A. (Anton) van Steenhoven



**New Zealand (1979)**

The Royal Society of New Zealand, Committee on Mathematical & Information Sciences

P.O. Box 598, Wellington

President: Dr. Jim Watson

Chief Executive Officer: Dr. S.C. Thompson

Contact: Dr. G. (Graham) Weir

Representatives in IUTAM: Dr. G. (Graham) Weir

**Norway (1949)**

National Committee on Theoretical and Applied Mechanics

Norwegian Acad. Sciences and Letters, Dept. of Maths, University of Oslo,

P.O.Box 1053, Blindern, N-0316 Oslo 3

President/Chair: Prof. B.N. (Bjorn) Gjevik

Contact: Prof. B.N. (Bjorn) Gjevik

Representatives in IUTAM: Prof. B.N. (Bjorn) Gjevik

**Poland (1952)**

Committee for Mechanics of the Polish Academy of Sciences

ul. Swietokrzyska 21, PL-00 049 Warszawa

President/Chair: Prof. A. (Andrzej) Styczek

Contact: Prof. W. (Witold) Gutkowski

Representatives in IUTAM: Prof. W. (Witold) Gutkowski, Prof. G. (Gwidon) Szefer

**Portugal (1968)**

Portuguese Society of Theoretical, Applied and Computational Mechanics

Laboratorio Nacional de Engenharia Civil, Avenida do Brasil 101, 1700-066 Lisboa

President/Chair: Prof. C.A. (Carlos) Mota Soares

Contact: Prof. J. A. C. (João) Martins

Representatives in IUTAM: Prof. J. A. C. (João) Martins

**Romania (1956)**

Romanian Academy, Department of Mathematics, Romanian National Committee of Theoretical and Applied Mechanics

Calea Victoriei 125, 71102 Bucharest, Romania

President/Chair: Prof. N.D. (Nicolai) Cristescu

Secretary: Dr. G. (Gabriela) Marinoschi

Contact: Prof. N.D. (Nicolai) Cristescu

Representatives in IUTAM: Prof. N.D. (Nicolai) Cristescu

**Russia (1992/1956)**

Russian National Committee on Theoretical and Applied Mechanics

Prospekt Vernadskogo 101 : 1 , Moscow 119526

President/Chair: Prof. G.G. (Gorimir) Chernyi

Secretary: Prof. G.K. (Gleb) Mikhailov

Contact: Prof. G.K. (Gleb) Mikhailov

Representatives in IUTAM: Prof. F.L. (Felix) Chernousko,

Prof. G.G. (Gorimir) Chernyi, Prof. G.K. (Gleb) Mikhailov, Prof. N.F. (Nikita) Morozov

**Saudi Arabia (1988)**

King Abdullaziz City for Science and Technology

Directorate of Technology and International Cooperation,

P.O. Box 6086, Riyadh 11442

President/Chair: Dr. S.A. (Saleh) Al-Athel

Contact: Mr. F.S. (Fahad) Huraib

Representatives in IUTAM: Dr. S.A. (Saleh) Al-Athel

**Serbia (2006/1952)**

Serbian Society of Mechanics

Kneza Milosa 9/1, 11000 Belgrade

President/Chair: Prof. D.M. (Dragoslav) Sumarac

Secretary: Prof. D.S. (Dragoslav) Kuzmanovic

Contact: Prof. D.D. (Dobroslav) Ruzic

Representatives in IUTAM: Prof. D.M. (Dragoslav) Sumarac

**Slovakia (1993)**

The Slovak Society for Mechanics

Council of Scientific Societies, Stefánikova 49, SK-811 04 Bratislava

President/Chair: Prof. J. (Jozef) Brilla

Contact: Prof. J. (Jozef) Brilla

Representatives in IUTAM: Prof. J. (Jozef) Brilla

**Slovenia (1994)**

Slovene Mechanics Society, Faculty of Mechanical Engineering

University of Maribor, Smetanova 17, 2000 Maribor

President/Chair: Prof. L. (Leopold) Skerget

Secretary: Prof. J. (Jure) Marn

Contact: Prof. J. (Jure) Marn

Representatives in IUTAM: Prof. L. (Leopold) Skerget

**South Africa (1994)**

National Research Foundation (NRF), South African Association for Theoretical and Applied Mechanics (SAAM)

South African ICSU Secretariat, P.O. Box 2600, Pretoria 0001

President/Chair: Dr. I. M. A. (Igle) Gledhill

Contact: Prof. C.G. (Charl) du Toit

Representatives in IUTAM: Prof. C.G. (Charl) du Toit

**Spain (1950)**

Instituto Nacional de Tecnica Aeroespacial

Carretera de Ajalvir km. 4,00, Torrejón de Ardoz, 28850 Madrid

Contact: Mr. A. (Angel) Moratilla

Representatives in IUTAM: Mr. A. (Angel) Moratilla

**Sweden (1950)**

Swedish National Committee for Mechanics

Malmö University, SE-205 06 Malmö

President/Chair: Prof. P. (Per) Ståhle

Secretary: Prof. S. (Staffan) Lundström

Contact: Prof. S. (Staffan) Lundström

Representatives in IUTAM: Prof. A. (Anders) Boström, Prof. D. (Dan) Henningson, Prof. B. (Bengt) Lundberg

**Switzerland (1950)**

Board of the Federal Institutes of Technology (Rat der Eidgenössischen Technischen Hochschulen)

ETH-Zentrum, CH-8092 Zürich

President/Chair: Prof. A.J.B. (Alexander) Zehnder

Secretary: Dr. S. (Sebastian) Brändli

Contact: Prof. P.A. (Peter) Monkewitz

Representatives in IUTAM: Prof. J. (Jürg) Dual, Prof. P.A. (Peter) Monkewitz

**Turkey (1977)**

Turkish National Committee of Theoretical and Applied Mechanics

Istanbul Teknik Üniversitesi, Fen-Edebiyat Fakültesi, Maslak 80626 Istanbul

President/Chair: Prof. Y. (Yalcin) Aköz

Secretary: Prof. M.A. (Mehmet Ali) Tasdemir

Contact: Prof. M.A. (Mehmet Ali) Tasdemir

Representatives in IUTAM: Prof. E.S. (Erdogan) Suhubi

**UK (1948)**

The Royal Society, UK Panel for IUTAM

6 Carlton House Terrace, London SW1Y 5AG

President/Chair: Prof. B.L. (Bhushan) Karihaloo

Secretary: Prof. N. (Nigel) Peake

Contact: Prof. N. (Nigel) Peake

Representatives in IUTAM: Prof. P.W. (Peter) Carpenter, Prof. B.L. (Bhushan)

Karihaloo, Prof. N. (Nigel) Peake, Prof. T.J. (Timothy) Pedley

**Ukraine (1995)**

National Committee of Ukraine on Theoretical and Applied Mechanics

S.P.Timoshenko Institute of Mechanics, 3 Nesterov Str., Kyiv 03680

President/Chair: Prof. A.N. (Alexandr) Guz

Secretary: Prof. J.J. (Jeremiah) Rushchitsky

Contact: Prof. J.J. (Jeremiah) Rushchitsky

Representatives in IUTAM: Prof. A.N. (Alexandr) Guz

**USA (1949)**

The U.S. National Committee on Theoretical and Applied Mechanics

The National Academies, 500 Fifth Street NW, Washington, DC 20001

President/Chair: Prof. N. (Nadine) Aubry

Secretary: Prof. C.T. (Carl) Herakovich

Contact: Prof. C.T. (Carl) Herakovich

Representatives in IUTAM: Prof. H. (Hassan) Aref, Prof. T. (Ted) Belytschko,

Prof. C.T. (Carl) Herakovich, Prof. W.G. (Wolfgang) Knauss, Prof. L.G. (Gary) Leal

**Viet Nam (1990)**

Vietnamese Association of Mechanics (VAM)

Hoi Co Hoc Vietnam, 264 Doi Can, Hanoi

Secretary: Prof. Do Sanh

President/Chair: Prof. N. (Nguyen) Van Dao

Contact: Prof. N. (Nguyen) Van Dao

Representatives in IUTAM: Prof. N. (Nguyen) Van Dao

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## Affiliated Organizations

### **CISM (1970)**

International Centre for Mechanical Sciences

Palazzo del Torso, Piazza Garibaldi, I-33100 Udine, Italy

Rectors of CISM: Prof. Giulio Maier (Resident Rector), Prof. Jean Salençon and Prof. Wilhelm Schneider

President/Chair: Prof. A.V. (Vinicio) Turello

Secretary: Prof. B.A. (Bernhard) Schrefler

Contact: Prof. B.A. (Bernhard) Schrefler

Representative of CISM in IUTAM: Prof. B.A. (Bernhard) Schrefler

Representative of IUTAM in CISM: Prof. H.K. (Keith) Moffatt

Representative of CISM in IUTAM-CC: Prof. B.A. (Bernhard) Schrefler

### **ICHMT (1972)**

International Centre for Heat and Mass Transfer

Mechanical Engineering Dept., Middle East Technical University,  
06531 Ankara, Turkey

President/Chair: Prof. G.F. (Geoffrey) Hewitt

Secretary: Prof. F. (Faruk) Arinc

Contact: Prof. F. (Faruk) Arinc

Representative of ICHMT in IUTAM: Prof. F. (Faruk) Arinc

Representative of IUTAM in ICHMT: Dr. R. (Rudolf) Dvorák

### **ICR (1974)**

International Committee on Rheology

President/Chair: Prof. J.C. (Jae Chun) Hyun

Secretary: Prof. M.H. (Manfred) Wagner

Contact: Prof. M.H. (Manfred) Wagner

Representative of ICR in IUTAM: Prof. L.G. (Gary) Leal

Representative of IUTAM in ICR: Prof. F. (Frithiof) Niordson

Representative of ICR in IUTAM-CC: Prof. L.G. (Gary) Leal

### **IAVSD (1977)**

International Association for Vehicle System Dynamics

Prof. Michael Valásek, Department of Mechanics, Faculty of Mechanical Engineering,  
Czech International University in Prague, Kalovo Nanesti 13, 121 35 Praha 2,  
Czech Republic

President/Chair: Prof. H. (Hans) True

Secretary: Prof. M. (Michael) Valásek

Contact: Prof. M. (Michael) Valásek

Representative of IAVSD in IUTAM: Prof. P. (Peter) Lugner

Representative of IUTAM in IAVSD: Prof. W. (Werner) Schiehlen

**EUROMECH (1978)**

European Mechanics Society

University of Padova, Faculty of Engineering, Dipartimento di Costruzioni e Trasporti,  
35131 Padova, Italy

President/Chair: Prof. P. (Patrick) Huerre

Secretary: Prof. B.A. (Bernhard) Schrefler

Contact: Prof. B.A. (Bernhard) Schrefler

Representative of EUROMECH in IUTAM: Prof. P. (Patrick) Huerre

Representative of IUTAM in EUROMECH: Prof. T.J. (Timothy) Pedley

**ISIMM (1978)**

International Society for the Interaction of Mechanics and Mathematics

Prof. A. (Adriano) Montanaro Università degli Studi di Padova,

Via Belzoni 7, 35131 Padova Italy

President/Chair: Prof. M. (Mario) Pitteri

Secretary: Prof. A. (Adriano) Montanaro

Contact: Prof. A. (Adriano) Montanaro

Representative of ISIMM in IUTAM: Prof. M.A. (Michael) Hayes

Representative of IUTAM in ISIMM: Prof. G. (Gérard) Itoos

Representative of ISIMM in IUTAM-CC: Prof. M.A. (Michael) Hayes

**ICF (1978)**

International Congress on Fracture

Prof. T. Yokobori, School of Science and Engineering, Teikyo University,  
Toyosatodai 1-1, Utsunomiya, 320, Japan

President/Chair: Prof. K. (Krishnaswamy) Ravi-Chandar

Secretary: Prof. A.T. (A.T.) Yokobori Jr.

Contact: Prof. R.M. (Robert) McMeeking

Representative of ICF in IUTAM: Prof. R.M. (Robert) McMeeking

Representative of IUTAM in ICF: Prof. J.B. (Jean-Baptiste) Leblond

Representative of ICF in IUTAM-CC: Prof. B.L. (Bhushan) Karihaloo

**ICM (1982)**

International Congress on Mechanical Behaviour of Materials,

Prof. F. Ellyin, Dept. of Mechanical Engineering, University of Alberta,  
Edmonton, Canada T6G 2G8

President/Chair: Prof. F. (Fernand) Ellyin

Secretary: Prof. T. (Toshihiko) Hoshide

Contact: Prof. F. (Fernand) Ellyin

Representative of ICM in IUTAM: Prof. F. (Fernand) Ellyin

Representative of IUTAM in ICM: Prof. S.R. (Sol) Bodner

Representative of ICM in IUTAM-CC: Prof. F. (Fernand) Ellyin

**AFMC (1982)**

Asian Fluid Mechanics Committee  
Institute of Mechanics, Chinese Academy of Sciences,  
No. 15, North Sihuanxi Rd, Beijing, 100080, China  
President/Chair: Prof. J. (Jiachun) Li  
Contact: Prof. J. (Jiachun) Li  
Representative of AFMC in IUTAM: Prof. J. (Jiachun) Li  
Representative of IUTAM in AFMC: Prof. H. (Heng) Zhou

**IACM (1984)**

International Association for Computational Mechanics  
Prof. E. Oñate, International Center for Numerical Methods in Engineering,  
Edificio C-1, Gran Capitán s/n, E-08034 Barcelona, Spain  
President/Chair: Prof. E. (Eugenio) Oñate  
Secretary: Dr. S. R. (Sergio) Idelsohn  
Contact: Dr. S. R. (Sergio) Idelsohn  
Representative of IACM in IUTAM: Prof. J.T. (John Tinsley) Oden  
Representative of IUTAM in IACM: Prof. R. (Eduardo) de Arantes e Oliveira  
Representative of IACM in IUTAM-CC: Prof. T. (Ted) Belytschko

**CACOFD (1992)**

Caribbean Congress of Fluid Dynamics  
c/o The Department of Math and Computer Science, The University of the West Indies,  
St. Augustine, Trinidad, West Indies  
President/Chair: Prof. F. (F.) Malpica  
Secretary: Dr. D. M. G. (Donna) Comissiong  
Contact: Prof. H. (Harold) Ramkissoon  
Representative of CACOFD in IUTAM: Prof. H. (Harold) Ramkissoon  
Representative of IUTAM in CACOFD: Prof. D.D. (Daniel) Joseph

**IABEM (1994)**

International Association for Boundary Element Methods  
Prof. M. Bonnet, CNRS et Ecole Polytechnique, Laboratoire de Mecanique des Solides,  
Ecole Polytechnique, 91128 Palaiseau cedex, France  
Secretary: Prof. R. Callego  
President/Chair: Prof. M. (Marc) Bonnet  
Contact: Prof. M. (Marc) Bonnet  
Representative of IABEM in IUTAM: Prof. M. (Marc) Bonnet  
Representative of IUTAM in IABEM: Prof. G.R. (Günther) Kuhn

**ISSMO (1996)**

International Society for Structural and Multidisciplinary Optimization

Prof. G. Rozvany, Department of Structural Mechanics,

Budapest University of Technology and Economics,

Muegyetem rkp. 3, Kmf 35, H-1521 Budapest, Hungary

President/Chair: Prof. M.P (Martin) Bendsøe

Secretary: Prof. B.M. (Byung) Kwak

Contact: Prof. N. (Niels) Olhoff

Representative of ISSMO in IUTAM: Prof. G. (George) Rozvany

Representative of IUTAM in ISSMO: Prof. N. (Niels) Olhoff

Representative of ISSMO in IUTAM-CC: Prof. M.P (Martin) Bendsøe

**HYDROMAG (1996)**

International Association for Hydromagnetic Phenomena and Applications

Prof. S. Asai, Dept of Mat. Sciences, University of Nagoya,

Furo-cho, Chikusa-ku, Nagoya 464-0, Japan

President/Chair: Prof. R. (René) Moreau

Secretary: Prof. A. (André) Thess

Contact: Prof. A. (André) Thess

Representative of HYDROMAG in IUTAM: Prof. R. (René) Moreau

Representative of IUTAM in HYDROMAG: Prof. H.K. (Keith) Moffatt

Representative of HYDROMAG in IUTAM-CC: Prof. R. (René) Moreau

**IHAV (1997)**

International Institute of Acoustics and Vibration

Prof M. J. Crocker. Dept. of Mechanical Engineering, Auburn University,

201 Ross Hall, Auburn, AL 36849 USA

President/Chair: Prof. F. (Franz) Ziegler

Secretary: N.J. (Nicole) Kessissoglou

Contact: Prof. M.J. (Malcolm) Crocker

Representative of IHAV in IUTAM: Prof. M.J. (Malcolm) Crocker

Representative of IUTAM in IHAV: Prof. J.D. (Jan) Achenbach

**ICA (1998)**

International Commission for Acoustics

President/Chair: Prof. P.A. (Philip) Nelson

Secretary: Prof. S. (Sonoko) Kuwano

Contact: Prof. S. (Sonoko) Kuwano

Representative of ICA in IUTAM: Prof. S.H. (Stephen) Crandall

Representative of IUTAM in ICA: Prof. A. (Anders) Boström



**ICTS (2002)**

International Congresses on Thermal Stresses

Prof. Richard B. Hetnarski, St. Raphael, Apt. 1209, 7117 Pelican Bay Blvd.,  
Naples, Fl 34108, USA

President/Chair: Prof. R.B. (Richard) Hetnarski

Secretary: Prof. T.R. (Theodore) Tauchert

Contact: Prof. R.B. (Richard) Hetnarski

Representative of ICTS in IUTAM: Prof. R.B. (Richard) Hetnarski

Representative of IUTAM in ICTS: Prof. M. (Masato) Abe

## Members of the General Assembly

<i>Member</i>	<i>Representative of</i>	<i>Remarks</i>
Prof. A. (Andreas) Acrivos		Member-at-Large
Dr. S.A. (Saleh) Al-Athel	Saudi Arabia	
Prof. H. (Hassan) Aref	USA	Chair WP-9
Prof. Y. (Yi-long) Bai	China	
Prof. A. (Anguel) Baltov	Bulgaria	
Prof. T. (Ted) Belytschko	USA	
Prof. A. (Ahmed) Benallal	France	
Prof. L. (Luiz) Bevilacqua	Brazil	
Prof. G. (Gautam) Biswas	India	
Prof. S.R. (Sol) Bodner		Member-at-Large Representative in ICM
Prof. B. (Bruno) Boley		Member-at-Large
Prof. R. (René) de Borst	Netherlands	
Prof. A. (Anders) Boström	Sweden	Representative in ICA
Prof. P. (Philippe) Boulanger	Belgium	
Prof. J. (Jozef) Brilla	Slovakia	
Prof. D.H. (Dick) van Campen	Netherlands	Bureau member
Prof. P.W. (Peter) Carpenter	UK	
Prof. C. (Carlo) Cercignani	Italy	
Prof. F.L. (Felix) Chernousko	Russia	
Prof. G.G. (Gorimir) Chernyi	Russia	
Prof. N.D. (Nicolai) Cristescu	Romania	
Prof. E. (Er-jie) Cui	China	
Dr. J.P. (Jim) Denier	Australia	
Prof. S.M. (Suresh) Deshpande	India	
Prof. L. (Frederic) Dias	France	
Prof. E. (Erik) Dick	Belgium	
Prof. J. (Jürg) Dual	Switzerland	
Dr. R. (Rudolf) Dvorák	Czech Republic	Representative in ICHMT
Prof. P. (Peter) Eberhard	Germany	
Prof. J. (Juri) Engelbrecht	Estonia	Bureau member
Prof. L.B. (Ben) Freund		Bureau member
Prof. P. (Paul) Germain		Member-at-Large
Prof. B.N. (Bjorn) Gjevik	Norway	
Prof. I. (Isaac) Goldhirsch	Israel	
Prof. N.K. (Narinder) Gupta	India	
Prof. W. (Witold) Gutkowski	Poland	
Prof. A.N. (Alexandr) Guz	Ukraine	
Prof. J. (Jorn) Hansen	Canada	



<b>Member</b>	<b>Representative of</b>	<b>Remarks</b>
Prof. M.B. (Miles) Rubin	Israel	
Prof. S.B. (Stuart) Savage	Canada	
Prof. W. (Werner) Schiehlen		Representative in IAVSD Member-at-Large
Prof. W. (Wolfgang) Schröder	Germany	
Prof. S. (Suresh) Shrivastava	Canada	
Prof. L. (Leopold) Skerget	Slovenia	
Prof. A.A.(Anton) v. Steenhoven	Netherlands	
Prof. E.S. (Erdogan) Suhubi	Turkey	
Prof. D.M. (Dragoslav) Sumarac	Serbia	
Prof. G. (Gwidon) Szefer	Poland	
Prof. J.N. (Jens Nørkær) Sørensen	Denmark	
Prof. V. (Vitauts) Tamuzs	Latvia	
Prof. T. (Tomomasa) Tatsumi		Member-at-Large
Prof. A. (André) Thess	Germany	
Prof. E.O. (Ernie) Tuck	Australia	
Prof. G. (Goran) Turkalj	Croatia	
Prof. K. (Koji) Uetani	Japan	
Prof. N. (Nguyen) Van Dao	Viet Nam	
Prof. D.V.H. (Dirk) Vandepitte	Belgium	
Prof. F. (Furio) Vatta	Italy	
Prof. W.-C. Wang	China-Taipei	
Prof. E. (Eiichi) Watanabe	Japan	
Prof. G. (Graham) Weir	New Zealand	
Prof. L. (Leen) van Wijngaarden		Member-at-Large
Prof. W. (Wei) Yang	China	Chair WP-7
Prof. J.Y. (Jung Yul) Yoo	Republic of Korea	
Prof. T.X. (Tongxi) Yu	China-Hong Kong	
Prof. S. (Stéphane) Zaleski	France	
Prof. A. (Andre) Zaoui	France	
Prof. Z. (Zhemín) Zheng	China	Bureau member
Prof. F. (Franz) Ziegler		Member-at-Large
Prof. J.W. (Jean) Zu	Canada	

**Observers to the General Assembly**

<i>Name</i>	<i>Country</i>	<i>Representative of</i>
Prof. J.D. (Jan) Achenbach	USA	Chair Solids Symposium Panel
Prof. F. (Faruk) Arinc	Turkey	ICHMT
Prof. D. (Dominique) Barthès-Biesel	France	Chair WP-6
Prof. M. (Marc) Bonnet	France	IABEM
Prof. S.H. (Stephen) Crandall	USA	ICA
Prof. M.J. (Malcolm) Crocker	USA	IIAV
Prof. F. (Fernand) Ellyin	Canada	ICM
Prof. R.B. (Richard) Hetnarski	USA	ICTS
Prof. G.A. (Gerhard) Holzapfel	Sweden	Chair WP-6
Prof. P. (Patrick) Huerre	France	EUROMECH Chair Fluids Symposium Panel
Prof. J. (Jiachun) Li	China	AFMC
Prof. P. (Pierre) Ladevèze	France	Chair WP-5
Prof. P.F. (Paul) Linden	USA	Chair WP-8
Prof. P. (Peter) Lugner	Austria	IAVSD
Prof. R.M. (Robert) McMeeking	USA	ICF Chair WP-4
Prof. R. (René) Moreau	France	HYDROMAG
Prof. J.T. (John Tinsley) Oden	USA	IACM
Prof. F. (Friedrich) Pfeiffer	Germany	Chair WP-2
Prof. H. (Harold) Ramkissoon	West Indies	CACOFD
Prof. G. (George) Rozvany	Hungary	ISSMO
Prof. B.A. (Bernhard) Schrefler	Italy	CISM

## Members of the Congress Committee

\*Year indicates end of term

<i>Member</i>	<i>Country</i>	<i>Year*</i>	<i>Remarks</i>
Prof. H. (Hassan) Aref	USA	2008	Member of XCCC
Prof. N. (Nadine) Aubry	USA	2008	
Prof. D.(Dominique) Barthès-Biesel	France	2008	
Prof. M.P. (Martin) Bendsøe	Denmark	2008	Member of XCCC Representative of ISSMO
Prof. D.E. Beskos	Greece	2010	
Prof. D.H. (Dick) van Campen	Netherlands	2008	
Prof. A. (Alberto) Carpinteri	Italy	2008	
Prof. G.-D. (Gengdong) Cheng	China	2008	
Prof. D. (David) Durban	Israel	2008	
Prof. F. (Fernand) Ellyin	Canada	2010	Representative of ICM
Prof. L.B. (Ben) Freund	USA	2008	President Member of XCCC
Prof. I.G. (Irina) Goryacheva	Russia	2008	
Prof. P. (Peter) Gudmundson	Sweden	2008	
Prof. M.A. (Michael) Hayes	Ireland	2010	Representative of ISIMM
Prof. C.T. (Carl) Herakovich	USA	2010	
Prof. T. (Tutomu) Kambe	Japan	2008	
Prof. B.L. (Bhushan) Karihaloo	UK	2008	Representative of ICF
Prof. A. (Alfred) Kluwick	Austria	2010	
Prof. T.A. (Tomasz) Kowalewski	Poland	2008	Member of XCCC
Prof. E.J. (Edwin) Kreuzer	Germany	2010	
Prof. S. (Stelios) Kyriakides	USA	2008	
Prof. P. (Pierre) Ladevèze	France	2008	
Prof. L.G. (Gary) Leal	USA	2008	Representative of ICR
Prof. J.B. (Jean-Baptiste) Leblond	France	2010	
Prof. F. (Fernando) Lund	Chile	2008	
Prof. P.A. (Peter) Monkewitz	Switzerland	2008	
Prof. N.F. (Nikita) Morozov	Russia	2010	
Prof. N. (Nigel) Peake	UK	2010	
Prof. T.J. (Timothy) Pedley	UK	2008	Secretary of XCCC
Prof. B.A. (Bernhard) Schrefler	Italy	2010	Member of XCCC Representative of CISM
Prof. A. (André) Thess	Germany	2008	
Prof. E.O. (Ernie) Tuck	Australia	2010	
Prof. V. (Viggo) Tvergaard	Denmark	2008	

<i>Member</i>	<i>Country</i>	<i>Year*</i>	<i>Remarks</i>
Prof. M.G. (Manuel) Velarde	Spain	2010	
Prof. G. (Genki) Yagawa	Japan	2010	

## Members of the Symposia Panels

In 1977 the Bureau of IUTAM set up two panels charged with the duty of scanning proposals made for IUTAM Symposia in the fields of fluid and solid mechanics. In 1992 that duty was extended to include scanning of proposals for IUTAM Summer Schools.

<b>Symposia Panel for Fluid Mechanics:</b>			
<i>Member</i>	<i>Country</i>	<i>Year*</i>	<i>Remarks</i>
Prof. P. (Patrick) Huerre	France	2008	Chair
Prof. D. (Dan) Henningson	Sweden	2008	
Prof. L.G. (Gary) Leal	USA	2008	
Prof. D.H. (Howell) Peregrine	UK	2008	
Prof. K. R. (Katepalli) Sreenivasan	Italy	2010	
<b>Symposia Panel for Solid Mechanics</b>			
<i>Member</i>	<i>Country</i>	<i>Year*</i>	<i>Remarks</i>
Prof. J.D. (Jan) Achenbach	USA	2008	Chair
Prof. W. (Wolfgang) Ehlers	Germany	2008	
Prof. G. (Gábor) Stépan	Hungary	2010	
Prof. V. (Viggo) Tvergaard	Denmark	2008	
Prof. J. (John) Willis	UK	2008	

\*Year indicates end of term

## Members of the Working Parties

Based on the assessment of IUTAM, the General Assembly agreed in Cambridge, UK (August 2002) to establish nine Working Parties.

A Working Party in a certain subfield of the mechanics is meant to structure the overlapping activities between IUTAM on the one hand and the relevant Affiliated Organizations and sister International Unions on the other. Also, Working Parties should identify important growth areas of the field.

More detailed background information on Working Parties, including their Terms of Reference, is given in the IUTAM Report on Working Parties. A pdf file of the latest version of this report can be downloaded from the IUTAM website (<http://www.iutam.net/iutam/Organization/index.php/12>).

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A listing of the Working Parties and their current membership is given below.

**WP-1: Non-Newtonian Fluid Mechanics and Rheology**

Members: Prof. L.G. (Gary) Leal, USA (chair); Prof. D.V. (David) Boger, Australia;  
Prof. R. (Roland) Keunings, Belgium; Prof. J. R. A. (Anthony) Pearson, UK

**WP-2: Dynamical Systems and Mechatronics**

Members: Prof. F. (Friedrich) Pfeiffer, Germany (chair); Prof. F.L. (Felix) Chernousko, Russia; Prof. R.S. (Robin) Sharp, UK; Prof. M. (Masayoshi) Tomizuka, USA;  
Prof. H.Y. (Hiroshi) Yabuno (Japan)

**WP-3: Mechanics of Materials**

Members: Prof. C.T. (Carl) Herakovich, USA (chair); Prof. O. (Olivier) Allix, France;  
Prof. T. (Tatsuo) Inoue, Japan; Prof. S. (Stelios) Kyriakides, USA, Prof. Y. (Yulong) Li

**WP-4: Materials Processing**

Members: Prof. R.M. (Robert) McMeeking, USA (chair); Prof. S. (Shigeo) Asai, Japan;  
Prof. C.W. (Christopher) Macosko, USA; Prof. R. (René) Moreau, France

**WP-5: Computational Fluid and Solid Mechanics** (this WP acts as link between IUTAM and IACM)

Members: Prof. P. (Pierre) Ladevèze, France (chair); Prof. E. R. (Eduardo) de Arantes e Oliveira, Portugal; Prof. Y.K. Cheung, China-Hong Kong; Prof. J. (Jacob) Fish, USA;  
Dr. S. R. (Sergio) Idelsohn, Argentina; Prof. J. T. (Tinsley) Oden, USA

**WP-6: Biomechanics**

Members: Dr. G.A. (Gerhard) Holzappel, Austria (chair); Prof. D. (Dominique) Barthès-Biesel, France; Prof. J.E. (Joan) Bechtold, USA; Prof. R.W. (Ray) Ogden, UK;  
Prof. K. (Kazuo) Tanishita, Japan

**WP-7: Nano- and Micro-Scale Phenomena in Mechanics**

Members: Prof. W. (Wei) Yang, China (chair); Prof. F. (Fernand) Ellyin, Canada;  
Prof. Y. (Yonggang) Huang, USA; Dr. G. (Graham) Weir, New Zealand

**WP-8: Geophysical and Environmental Mechanics**

Members: Prof. P.F. (Paul) Linden, USA; Prof. H. (Hervé) Le Treut, France;  
Prof. J.W. (John) Rudnicki, USA; Prof. J. Srinivasan, India; Dr. P. (Luis) Thomas, Argentina

**WP-9: Education in Mechanics and Capacity Building**

Members: Prof. H. (Hassan) Aref, USA (chair); Prof. L. (Luiz) Bevilacqua, Brazil;  
Dr. I. (Igle) Gledhill, South Africa; Prof. H. (Haiyan) Hu, China; Prof. K.R. (Katepalli) Sreenivasan, Italy



## **Donations in 2006**

Donations given to IUTAM Symposia are recorded under the heading “Financial Support” of the Reports of Symposia and Summer Schools held in 2006.

## **IUTAM Representation in ICSU and its Scientific Committees**

<i>Acronym</i>	<i>Organization/Scientific Committee</i>	<i>Representative of IUTAM</i>
ICSU	International Council for Science	Prof. L.B. Freund
COSPAR	Committee on Space Research	Prof. G. G. Chernyi
SCOPE	Scientific Committee on Problems of the Environment	Prof. P.F. Linden
SCOR	Scientific Committee on Oceanic Research	vacancy

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## Reports of IUTAM Symposia held in 2006

### 06-1 IUTAM Symposium on Multiscale Problems in Multibody System Contacts

Stuttgart, Germany, February 20 - February 23, 2006

#### a) Scientific Committee

Peter Eberhard (Chair, Germany), Jorge Ambrósio (Portugal), Christoph Glocker (Switzerland), Anders Klarbring (Sweden), Stefan Luding (The Netherlands), Panos Papadopoulos (USA), Xiaoting Rui (P.R. China), Werner Schiehlen (IUTAM representative, Germany), Bill Stronge (UK)

#### b) Short summary of scientific progress achieved

The investigation of multiscale problems in multibody system contacts is a most interesting and timely topic which is subject of intensive research for more than one decade. While many questions have been answered and the mechanically sound description and simulation is increasingly applied in practical engineering problems, this IUTAM Symposium facilitated discussions between researchers active in the field and enabled us to review the state-of-the-art and to identify for the years to come the hot topics which require further efforts.

It was especially useful to bring together scientists from closely related but traditionally distinct fields such as multibody system contact, molecular dynamics, finite element contact, collision detection or the mathematics of unilateral contact. It is observed that the once clear boundaries between these fields blur and an exchange of ideas will accelerate the development with mutual benefits.

Multiscale problems occur very naturally in contact mechanics. Typically the contact forces and stresses are very high and they are transmitted within a very short period of time. This leads to questions, e.g. how the slow rigid body motion and the fast motion changes can be considered simultaneously or how interface effects couple to wave propagation and the large-scale motion.

The purpose of the symposium was to provide a basis for discussion and exchange of new concepts and ideas between scientists from all over Europe and the world. Emphasis was also placed on sharing algorithms and concepts with young researchers who only recently entered the stage of mechanical contacts.

The program of the symposium was organized in 13 sessions about

- Particle Adhesion
- Impact of Elastic Bodies
- Contact in Applications

- Frictional Contact
- Granular Media I and II
- Gears and Bearings
- Multiscale Aspects
- Fracture
- Complementarity
- FE Contact and Mortar
- Non-Smooth Models
- Contact in Multibody Systems

and a total of 42 talks was presented and lively discussed in the 4 working days of the symposium. It may be mentioned that there was not a single 'no-show' at the conference – neither in the talks nor among the registered participants. Besides the presentations and discussions in the scientific program there was time for social interaction during two receptions, an excursion and the conference dinner.

### **c) Countries represented and number of participants**

The meeting attracted 57 fully registered participants from 17 different countries: Belgium (1), Brazil (1), Canada (1), China (4), Denmark (1), Finland (3), France (1), Germany (31), Italy (1), Lithuania (1), Netherlands (2), Poland (2), Portugal (2), Russia (1), Spain (2), Switzerland (2), UK (1), as well as several students and PhD-students who attended the talks, too.

### **d) Publication of Proceedings of the Symposium**

The proceedings of the symposium will be published by Springer (former Kluwer Academic Publisher) in late 2006. Editor is Peter Eberhard.

### **e) Financial supports**

The Symposium was mainly sponsored by the Institute of Engineering and Computational Mechanics and the University of Stuttgart.

### **f) Scientific program**

#### **February 20**

#### **Session 1 – Particle Adhesion**

**J. Tomas** - *Micromechanics of particle adhesion – an analytical approach*

#### **Session 2 – Impact of Elastic Bodies**

**E. Keskinen**, T. Vuoristo, V.-T. Kuokkala, M. Martikainen - *Multibody analysis of axially elastic rod chains*

**R. Zander**, M. Foerg, H. Ulbrich - *Impacts on beam structures: interactions of wave propagation and global dynamics*

**R. Seifried**, W. Schiehlen - *Computational analysis and experimental investigation of impacts in multibody systems*

**J.P. Meijaard** - *Lateral impacts on flexible beams in multibody dynamics simulations*

### **Session 3 – Contact in Applications**

**F.G. Rauter**, J. Pombo, J. Ambrósio, M.S. Pereira - *Multibody modeling of pantographs for catenary-pantograph interaction*

**V.M. Järvenpää**, L. Yuan - *Numerical modeling of paper machine roll contact with regenerative out-of-roundness excitations*

S. Divenyi, M.A. Savi, **H.I. Weber**, L.F. Penna Franca - *Experience and simulation in dynamic systems with discontinuities*

### **Session 4 – Frictional Contact**

**W. Stamm**, A. Fidlin - *Regularization of 2D frictional contacts for rigid body dynamics*

**R. Keppler**, W. Seemann - *A dynamical model for the elasto-plastic contact with rigid contact areas*

**A. Konyukhov**, K. Schweizerhof - *On a continuous transfer of history variables for frictional contact problems based on interpretations of covariant derivatives as a parallel translation*

**A. Lünenschloss** - *A multigrid approach in the numerical problem of tangential contact*

## **February 21**

### **Session 5 – Granular Media I**

**J. Harting** - *Computer simulations of particle flows – an overview on available techniques and their applicability*

**I. Sielamowicz**, T.A. Kowalewski - *Digital particle image velocimetry as a new technique in granular flow measurements*

**R. Kačianauskas**, R. Balevičius, D. Markauskas - *Discrete element method in simulation of granular materials*

### **Session 6 – Granular Media II**

**S. Luding** - *A discrete model for long time sintering*

**F. Fleissner**, P. Eberhard - *Parallel load balanced particle simulation with hierarchical particle grouping strategies*

**S. McNamara** - *On the quasi-static behavior of granular packings*

**M. Molenda**, J. Horabik - *Grain-to-grain contact conditions and its impact on in-bulk behavior of granular material*

### **Session 7 – Gear and Bearings**

**L. Mauer** - *Contact modelling of meshing gearwheels in MBS*

**B. Schweizer**, P. Ziegler - *Impact studies of gear trains in combustion*

**J. Zeischka** - *Ball bearing modeling based on accurate contact stiffness for efficient mechanical system simulation*

### **Session 8 – Multiscale Aspects**

S. Mattern, G. Blankenhorn, M. Breidt, N. van Vinh, S. Höhler, **K. Schweizerhof**, D. Hartmann, F. Stangenberg - *Comparison of building collapse analysis results from finite elements and rigid body models*

**D. Dureisseix**, P. Alart - *Influence of a domain decomposition coarse space on the numerical homogenization of a non smooth discrete system*

**L.-Q. Chen** - *Multiscale analysis of a cantilever with a contact boundary*

**A.S. Kulshov** - *First integrals of equations of motion of a heavy rotational symmetric body on a perfectly rough plane*

### **February 22**

#### **Session 9 – Fracture**

K. Kolk, **G. Kuhn** - *A module for the simulation of 3D fatigue crack propagation in BEM and FEM environments*

A. Gus, O. Menshykov, **W.L. Wendland**, V. Zozulya - *The 3D elastodynamic contact problem for plane cracks*

**P. Meinke** - *Multiscale problems in railway contact dynamics*

#### **Session 10 – Complementarity**

**S. Launis**, E. Keskinen, C. Bohatier, F. Dubois - *Complementary models for log grinding*

**S. Ebrahimi**, P. Eberhard - *Frictional impact of planar deformable bodies solved by a linear complementarity problem formulation*

**C. Liu**, Z. Zhao, B. Chen - *The admissible state space and bouncing motion for a robotic system*

### **February 23**

#### **Session 11 – FE Contact and Mortar**

**B. Wohlmuth** - *Hybrid methods for contact problems*

**C. Hesch**, P. Betsch - *Application of the discrete null space method to domain decomposition and large deformation contact problems*

**P. Pedersen** - *Contact indentations determined by a direct super finite element approach*

#### **Session 12 – Non-Smooth Models**

M. Moeller, **C. Glocker** - *Analogous non-smooth models of mechanical and electrical systems*

**E. Pennestri**, P.P. Valentini, L. Vita - *Dynamic analysis of intermittent-motion mechanisms through the combined use of Gauss principle and logical functions*

**H. Wang**, Z. Chang, C. Zhang - *Cross-over impact in geometric closed mechanisms*

**X. Rui**, L. Yun, B. He, G. Wang, F. Yang, Y. Lu - *Advances in discrete time transfer matrix method of multibody systems*

**Session 13 – Contact in Multibody Systems**

J. Pombo, **J. Ambrósio** - *New developments on the wheel-rail contact problem for railway dynamics*

**S. Najafabadi**, J. Kövecses, J. Angeles - *Generalization of the energetic coefficient of restitution for collisions in multibody systems*

**M. Arnold** - *Multi-rate time integration for large scale multibody system models*

**Report composed by Peter Eberhard**

**06-2 IUTAM Symposium on Interactions for Dispersed Systems in Newtonian and Viscoelastic Fluids**

Guanajuato, Mexico, March 26 - March 31, 2006

**a) Scientific Committee**

G. M. Homsy (USA, Chair), J. R. Zenit (Mexico, co-Chair), E. J. Hinch (UK), D. Lohse (The Netherlands), L. G. Leal (USA), E. Ramos (Mexico), J. Magnaudet (France), T. Kombe (Japan)

**b) Short summary of scientific progress achieved**

The Symposium focused on the hydrodynamics and fluid mechanics of multiphase systems, a topic generally important in a wide variety of applications, including oil and natural gas production, improved combustion of fuels, improved safety of soils and soil footings to seismic events, processing of polymeric solutions to make new products, and many others. The technical focus of the Symposium was on interactions for non-dilute multiphase systems in both Newtonian and viscoelastic fluids. We brought together the world's experts to discuss challenges and approaches to study the problem of interactions. There was significant interaction between communities that do not often meet together, for example the granular media, suspension mechanics, and bubbly turbulent flow communities found common ground on the one hand, as did the Stokes flow, microfluidics, and complex fluid communities on the other. Significant progress was made in all these areas.

A second objective of the meeting was to significantly involve mechanics researchers in Mexico. Co-hosting this Symposium and holding it in Mexico built on the momentum already created by our Mexican colleagues in furthering fluid mechanics research within the Mexican Physical Society. A large cross-section of the Mexican fluid mechanics community drawn from the entire country was in attendance, as were a number of Mexican graduate students. In this regard, the Symposium was a tremendous success.

**c) Countries represented and number of participants**

The meeting included 48 invitees from 13 countries and 15 Mexican graduate students. The invitees were distributed according to the following list. France (8), England (2), USA (19), India (1), China (1), Japan (3), The Netherlands (3), Canada (1), Russia (1), Poland (1), Argentina (1), Mexico (7), Brazil (1). Unfortunately, there were a few problems with processing visas that resulted in 4 cancellations.

**d) Publication of Proceedings of the Symposium**

A Report on the Symposium was published by Morton M. Denn, Eckart H. Meiburg, Jeffrey F. Morris, Eric S. G. Shaqfeh, and Todd M. Squires, with a preamble by Roberto Xenit and George M. Homsy, appeared in *Physics of Fluids*, Vol 18, 121501-1 (2006),

together with selected papers from the Symposium. All papers went through the standard reviewing process for Physics of Fluids. A booklet of extended abstracts is available on-line as EPAPS document no. E-PHFLE6-18-030611. This document is clearly referenced in the Physics of Fluids report and can be reached via a direct link in the online articles html reference section or via the EPAPS home page at <http://www.aip.org/pubservs/epaps.html> .

### e) Financial supports

The Symposium was supported by the following organizations:  
 International Union of Theoretical and Applied Mechanics (IUTAM)  
 US National Science Foundation (NSF)  
 Academy of Science for the Developing World (TWAS)  
 Universidad Nacional Autonoma de Mexico (UNAM)  
 Consejo Nacional de Ciencia y Tecnologia (CONACyT)  
 Division de Fluidos y Plasmas, Sociedad Mexicana de Fisica

### f) Scientific program

#### Monday, March 27, 2006

Elisabeth Guazzelli, *Sedimentation of small particles*  
 Jeff Morris, *Outstanding microscale questions in continuum modeling of concentrated suspension flow*  
 Maria Ekiel-Jezewska, *Clusters of particles falling in a viscous fluid with periodic boundary conditions*  
 Prabhu R. Nott, *The collective dynamics of self-propelling particles in a fluid medium*  
 Eric Shaqfeh, *The dynamics of rodlike particles under sedimentation and induced-charge electrophoresis*  
 Evgeny Asmolov, *Evolution of nonlinear large scale fluctuations in sedimenting suspensions*  
 Eric Climent, *Particle interactions in a sheared suspension*  
 Octavio Manero, *Rheology of complex fluids*  
 Todd Squires, *Active and nonlinear microrheology of complex materials*  
 Roger Bonnecaze, *The flow, memory and aging of soft particle pastes*  
 Morton Denn, *Unusual interfacial coupling in suspensions of liquid crystalline droplets in a flexible polymer matrix*

#### Tuesday, March 28, 2006

Howard Stone, *Colloidal Armor*  
 Pascale Aussillous, *Liquid marbles*  
 Andrew Belmonte, *Motion of objects in wormlike micellar gels*  
 Patrick Anderson, *Drop deformation in confined geometries*



Hector Ceniceros, *On the accurate computation of the motion of drops in axisymmetric Stokes flow*

Dominique Langevin, *Drainage of foams made with non-Newtonian configurations*

Enrique Geffroy, *Drop deformation under elongational flows with significant vorticity*

Jacques Magnaudet, *Bubble-bubble and bubble-wall interactions at finite Reynolds number*

Nicolas Bremond, *Interaction of cavitating bubbles*

Ian Eames, *Flow signatures from collapsing vapour bubbles*

Dominique Legendre, *Bubble-bubble interaction in viscous fluid*

Shu Takagi, *Lift force acting on bubbles in aqueous surfactant solutions*

Abraham Medina, *Injection and coalescence of bubbles in a quiescent inviscid liquid*

### **Wednesday, March 29, 2006**

Melany Hunt, *Experiments on liquid-solid flows*

Eckart Meiburg, *Settling of small particles in homogeneous turbulence: settling velocity enhancement by two-way coupling*

Osamu Sano, *Collapse and growth of cavity regions in granular media due to viscous flow*

Francois Charru, *Wavelength selection of sand ripples*

Lou Kondic, *Sheared granular systems under gravity*

Phllippe Gondret, *Granular avalanches in fluids: slope relaxation and grain flux*

Roberto Zenit, *The motion of air bubbles in non-Newtonian liquids*

Denis Rodrigue, *The effect of viscoelasticity and surface tension on the motion of liquid drops*

Carlos Malaga, *A bubble in a polymer solution*

Javier Diez, *Contact line instability in partial wetting configurations*

Raul Montiel, *Some aspects of the deformation of flexible particles in a mobile interface*

### **Thursday, March 30, 2006**

Detlef Lohse, *Bubbles in micro- and nanofluidics*

Zhan-Hua Silber-Li, *Mixing behavior of fluids with magnetic nano-particles in microchannels*

Wendy Zhang, *Round humps and near cusps: Selective withdrawal of viscous liquids*

Shelley Anna, *Cusps and threads: observations of microscale tip streaming*

Eduardo Ramos, *Capillary boiling*

Sascha Hilgenfelt, *Yielding and failure of foam*

**Report composed by George Homsy**

**06-3 IUTAM Symposium on Plasticity at the Micron Scale**

Lyngby, Denmark, May 21 - May 25, 2006

**a) Scientific Committee**

A. Benallal (France), N.A. Fleck (U.K.), L.B. Freund (USA, IUTAM Representative), E. van der Giessen (The Netherlands), J.W. Hutchinson (USA), A. Needleman (USA), B. Svendsen (Germany), V. Tvergaard (Denmark, Chairman).

**b) Short summary of scientific progress achieved**

The purpose of the symposium was to gather a group of leading scientists working in areas of importance to length scale dependent plasticity. This includes work on phenomenological strain gradient plasticity models, studies making use of discrete dislocation models, and even atomic level models. Experimental investigations are central to all this, as all the models focus on developing an improved understanding of real observed phenomena.

The opening lecture was given by Professor Norman Fleck, Cambridge University. Both experimental and theoretical approaches were reviewed, and recent results for the surface roughness at grain boundaries were presented based on experiments and crystal plasticity modeling.

A number of presentations focused on experiments for metals at a small length scale, e.g. using indenters or a small single crystal compression test. It was found that there are other causes of the size effects than the geometrically necessary dislocations related to strain gradients. Several lectures on scale dependent phenomenological plasticity theories discussed different methods of incorporating the characteristic material length. This included lower order gradient plasticity theories as well as higher order theories, within standard plasticity models or crystal plasticity. Differences in the ways of incorporating higher order boundary conditions resulted in some eager discussion.

Various methods for discrete dislocation modeling of plastic deformation were used in some of the presentations to obtain a more detailed understanding of length scale effects in metals. This included large scale computations for dislocation dynamics as well as new statistical mechanics approaches to averaging of dislocation plasticity. Furthermore, at a somewhat larger length scale, applications of scale dependent plasticity to granular media and to cellular solids was discussed.

There was a lively and informative discussion after each of the 36 lectures presented. It was the general opinion, expressed by many participants, that the professional level of the symposium was very high, due to the very high quality of the lecturers, and due to the stimulating discussions.

**c) Countries represented and number of participants**

There were a total of 66 invited participants. The geographic distribution of the participants was: China (1), Denmark (16), France (4), Germany (7), Greece (1), Hungary (1), Italy (1), Japan (2), Netherlands (7), Sweden (5), South Africa (1), UK (4), USA (16).

**d) Publication of Proceedings of the Symposium**

The proceedings of the symposium will be published as a special issue of the international journal 'Modelling and Simulation in Materials Science and Engineering', IOP Publishing Ltd., UK. The guest editor of the special issue will be Viggo Tvergaard. The journal editor, W.A. Curtin, was one of the symposium lecturers.

**e) Financial supports**

The Symposium was held at The Technical University of Denmark, and was supported by the University. Financial support was obtained from Novo Nordisk A/S and the Villum Kann Rasmussen Foundation. In addition, IUTAM made a Grant available for partial support of travel and subsistence costs, where needed.

**f) Scientific program****May 22, 2006**

N.A. Fleck (Opening lecture) *Review of phenomena involving strain gradient plasticity*

D.M. Dimiduk, *Experiments and Three-Dimensional Dislocation Simulations of Micro-crystal Plasticity in Selected Materials*

G.M. Pharr, *Influences of Indenter Geometry on the Indentation Size Effect*

W.O. Soboyejo, *Plasticity at Small Scales: From Experiments to Mechanics Models*

M.G.D. Geers, *Second-order crystal plasticity: strengthening versus weakening*

S. Forest, *Continuum modeling of relative and absolute size effects in crystal plasticity*

P. Gudmundson, *Modelling of interfaces at plastic deformations on the micron scale*

P.R. Onck, *A strain divergence theory for size effects in cellular solids*

**May 23, 2006**

S. Turteltaub, *Modeling of damage and plasticity induced by martensitic transformations in ferrous alloys*

A. Benallal, *Some remarks on gradient models with softening*

- E. van der Giessen, *Discrete dislocation plasticity and size effects*  
B. Devincre, *Hall-Petch effect in ultra-fine grained materials: Comparison between 2D and 3D dislocation dynamics simulations*  
V. Deshpande, *Discrete dislocation plasticity analysis of size effects in single and polycrystals*
- R.H.J. Peerlings, *An implicit gradient plasticity theory for predicting size effects*  
G.Z. Voyiadjis, *Temperature and strain rate dependent yield functions for dynamic localizations of metals*  
C.F. Niordson, *Size-effects in porous metals*

**May 24, 2006**

- I. Vardoulakis, *On the concept of constitutive stress in granular media consisting of soft grains*  
H. Vehoff, *From in-situ crack growth tests to nano indentation in ultra fine grained materials*
- J.W. Kysar, *Plastic deformation in nanoscale materials*  
L. Anand, *A gradient theory of single-crystal plasticity with slip-rate-gradient strengthening and backstress due to dislocation densities*  
T. Arsenlis, *Continuum Crystal Plasticity from Dislocation Dynamics*
- J.L. Bassani, *On Lower-Order Gradient Plasticity*  
L.P. Mikkelsen, *Delamination of thin elastic films on elasticplastic substrates including material length scales*  
Y. Huang, *A Model of Size Effects in Nano-Indentation*
- I. Groma, *Derivation of the evolution equation of dislocation from the principle of maximum entropy*  
P. Steinmann, *A coupled continuum-atomistic approach to defect mechanics at the sub-micronscales*  
J.S. Stölken, *Grain-Scale Interactions: Effects on Boundary Layers, Yield Strength, and Intergranular Fracture*

**May 25, 2006**

- W.A. Curtin, *Fracture in Thin Film Metal Sandwich Structures*  
A.A. Benzerga, *Discrete Dislocation Predictions of Size effects in Plasticity: Role of Dislocation Generation, Patterning and Interfaces*
- R. Sedláček, *Continuum dislocation-based model of plastic deformation on the micron scale*

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A. Acharya, *The structure of Phenomenological Mesoscopic Field Dislocation Mechanics and its relation to Lower-Order Gradient Plasticity*

G. Borino, *A thermodynamically consistent gradient plasticity theory and comparison with other formulations*

B.N. Legarth, *Strain-gradient effects in anisotropic materials*

Y. Wei, *A multi-scale fracture model and application to analyses of nanocrystalline materials*

M. Kuroda, *Simulations of micro-bending of a thin foil using a scale dependent crystal plasticity model*

T. Saif, *In-situ studies of deformation and failure in nano grained metal films using micro instruments*

**Report composed by Viggo Tvergaard**

**06-4 IUTAM Symposium on Hamiltonian Dynamics, Vortex Structures, Turbulence**

Moscow, Russia, August 25 - August 30, 2006

**a) Scientific Committee**

Valery V. Kozlov (Chair, Russia), Alexey V. Borisov (Co-Chair, Russia), Peter A. Davies (Co-Chair, UK), Jacques Verron (Co-Chair, France), Keith Moffatt (IUTAM Representative, UK), Mikhail A. Sokolovskiy (Scientific Secretary, Russia), Hassan Aref (USA), Victor L. Berdichevsky (USA), Denis Blackmore (USA), Xavier Carton (France), Roger H. J. Grimshaw (UK), GertJan F. van Heijst (The Netherlands), Ziv Kizner (Israel), Konstantin V. Koshel (Russia), Ivan S. Mamaev (Russia), Vyacheslav V. Meleshko (Ukraine), Gregory M. Reznik (Russia), Victor I. Yudovich (Russia), George M. Zaslavsky (USA)

**b) Short summary of scientific progress achieved**

Last few decades have shown that serious hopes and prospects of the progress in the research of real turbulent vortex motions are essentially related to the combined use of mathematical methods, computer simulation and laboratory experiments. These approaches have led to a series of interesting results which allow us to study the processes from new perspectives. The main goal of this meeting was to bring together leading scientists engaged in fundamental and applied works in the fields mentioned above, promote an exchange of views and experience and propose new directions for research in the future. The Symposium focused on theoretical and applied aspects of the processes of formation and evolution of various flows, wave and coherent structures in gas and fluid. Much attention was paid to the studies of nonlinear regular and chaotic regimes of vortex interactions, advective and convective motions.

Areas of emphasis include:

- Hamiltonian formalism and its application to the dynamics of discrete structures and continuums.
- Theory of integrability.
- Mathematical methods in the theory of vortices.
- Stability and bifurcations.
- Methods of statistical hydrodynamics.
- Problems of geophysical hydrodynamics.
- Computer-assisted methods in studying dynamical systems.
- Laboratory experiments in studying turbulence and vortices.

**c) Countries represented and number of participants**

A total of 73 registered participants from 11 countries: Brazil (1), France (8), Israel (3), Italy (1), Japan (3), Lithuania (2), The Netherlands (2), Russia (29), UK (10), Ukraine (4), USA (10).

**d) Publication of Proceedings of the Symposium**

Proceeding of reviewed selected papers (up to 10 pages) will be published by Springer-Verlag Heidelberg in 2007 year under edition by V. V. Kozlov.

**e) Financial supports**

Symposium was sponsored by:

- International Union of Theoretical and Applied Mechanics (IUTAM)
- Steklov Mathematical Institute of Russian Academy of Sciences (MI RAS)
- Branch of Mathematics of RAS
- Russian Foundation for Basic Research (RFBR)
- Institute of Computer Sciences
- Springer Sciences and Business Media

**f) Scientific program**

During Symposium sessions 19 plenary (40 min.) and 47 sectional (20-min.) oral presentations were scheduled. Besides, a memorial session devoted to the memory of the professor V. I. Yudovich has been carried out.

**Day 1: Friday, 25 August Plenary Session-1**

Keith Moffatt (UK) Opening lecture 1 *Vortex structures: the legacy of Helmholtz and Kelvin*

George Zaslavsky (USA) Opening lecture 2 *Nonintegrability and fractional kinetics along the filamented surfaces*

Hassan Aref (USA) *Vortex dynamics of wakes*

Yoshifumi Kimura (Japan) *Motion of an elliptic vortex ring and particle transport*

Vladimir Vladimirov (UK) *Vibrodynamics of solid+fluid*

Vyacheslav Meleshko (Ukraine) *Near wall control and transport properties of two-dimensional vortex structures*

G rard Iooss (France) & Pavel Plotnikov (Russia) *Three-dimensional double-periodic travelling gravity water waves*

Gregory Reznik (Russia) & Vladimir Zeitlin (France) *Nonlinear dynamics of semi-transparent equatorial waveguide*

Anatoly Neishtadt (Russia) *On adiabatic invariance in volume-preserving systems*

**Day 2: Saturday, 26 August Plenary Session-2**

Yasuhide Fukumoto (Japan) *Analogy of a vortex-jet filament with the Kirchhoff elastic rod and its dynamical extension*

Chjan Lim (USA) *Stability and phase transition to super-rotation in barotropic vortex dynamics on a rotating sphere*

Alexey Borisov, Ivan Mamaev & Sergey Ramodanov (Russia) *Motion of rigid bodies and vortex structures in a perfect fluid*

Ziv Kizner (Israel) *Stability of hetonic quartets. Exploring transitions in baroclinic modons*

Shigeo Kida, Takeshi Watanabe & Takao Taya (Japan) *Unstable-periodic-flow analysis of Couette turbulence*

Gert-Jan van Heijst (The Netherlands) *Forced and decaying two-dimensional turbulence*

Vladimir Zakharov (Russia, USA) *Dynamics of almost parallel vortex lines*

Stephen Wiggins (UK) *High dimensional Hamiltonian dynamical systems: Theory and computational realization for theoretical chemistry*

Nathan Paldor (Israel) *The validity of the nondivergence assumption in 2D vortex dynamics on the rotating Earth*

Valery Kozlov & Natalia Denisova (Russia) *On Lagrangian turbulence*

### **V. I. Yudovoch Memorial Session**

G rard Iooss (France), Vladimir Vladimirov (UK), Victor Berdichevsky (USA)

### **Day 4: Monday, 28 August Section Problems of Turbulence**

Victor Berdichevsky (USA) *Statistical mechanics of vortex lines*

Sergei Fedotov (UK) & Vicen  M ndez (Spain) *Hamilton-Jacobi equation and travelling waves involving anomalous transport and non-Markovian random processes*

Vyacheslav Meleshko, Eugene Nikiforovich, Alexandre Gourjii (Ukraine) & Ronald Adrian (USA) *Dynamics of hairpin vortex packets in wall turbulence*

Sergey Badulin (Russia), Alexander Babanin (Australia), Vladimir Zakharov (Russia, USA) & Don Resio (USA) *Weakly turbulent law of wind wave growth*

Alexandr Vul'fson (Russia) *Distribution function for convective thermals in the atmospheric boundary layer*

### **Section Hamiltonian Formalism and Its Applications**

Bolotin Sergey (Russia) *Dynamics of skew products of symplectic maps*

Jair Koiller (Brazil) & Kurt Ehlers (USA) *Rubber rolling: geometry and dynamics of 2-3-5 distributions*

### **Section Mathematical Methods in the Theory of Vortices**

Kevin O'Neil (USA) *Families of translating neutral vortex street configurations*

Elena Milyute, Valentina Milyuvene & Algimantas Milyus (Lithuania) *Some questions of dynamics of substance in the spherical vortex*

Oleg Bakunin (Russia) *Reconstruction of flow topology and percolation scalings*

Ivan Mamaev, Alexey Borisov & Alexandr Kilin (Russia) *Transition to chaos in the dynamics of point vortices*

Luca Zannetti (Italy) *Vortex equilibria in confined domains*



Lorena Barba (UK) & Oscar Velasco Fuentes (Mexico) *Lagrangian flow geometry of tripole vortex simulations*

Tatyana Krasnopolskaya & Vyacheslav Meleshko (Ukraine) *Evaluation of petroleum patch transport in coastal zones by matrix method*

Banavara Shashikanth (USA) *Symmetric pairs of point vortices interacting with a neutrally buoyant 2D circular cylinder*

### **Day 5: Tuesday, 29 August Section Laboratory Experiments**

Benjamin Cariteau & Jan-Bert Flór (France) *Cyclone interactions in a stratified rotating fluid*

Estelle Guyez, Jan-Bert Flór & Emil Hopfinger (France) *Diapycnal mixing in Taylor-Couette flow*

Sabine Décamp & Joël Sommeria (France) *Vortex generation by dense water overflow on a incline slope*

Petr Denissenko (UK), Gregory Falkovich (Israel) & Sergei Lukaschuk (UK) *Clustering of floaters by waves*

Efim Kudashev (Russia) *Resolution on near-wall pressure in turbulence on the basis of functional approach*

Valery Okulov, Igor Naumov (Russia), Wen Zhong Shen & Jens Nørkær Sørensen (Denmark) *Triplet of helical vortices*

### **Section Stability and Bifurcation**

Andrei Il'ichev & Georgy Tsyppin (Russia) *Transition to instability and reversible bifurcations of flows with phase transition in horizontally extended domains of a porous medium*

Igor Bakholdin (Russia) *Shocks with regular and stochastic structures in non-dissipative and low-dissipative dispersive systems*

Aleksandr Shvets & Tatyana Krasnopolskaya (Ukraine) *Hyper-chaos in piezoceramic systems with limited power-supply*

### **Section Computer-Assisted Methods in Studying Dynamical Systems**

Roman Shamin (Russia) *About solvability and numerical simulation of nonstationary flow of ideal fluid with a free boundary*

Konstantin Volosov (Russia) *New method of construction of solutions of the quasilinear parabolic equations in the parametrical form*

### **Section Theory of Integrability**

Denis Blackmore (USA) *Non-integrable perturbations of the dynamics of two point vortices*

Sergey Suetin (Russia) *On an integrable system and spectral properties of some class of discrete Sturm-Liouville operators*

## Section Problems of Geophysical Hydrodynamics-1

Achim Wirth & Jacques Verron (France) *Non-traditional eddy dynamics*

Peter Jan van Leeuwen (The Netherlands) *The propagation of stratified monopoles on a sphere*

Alan Hinds, Ted Johnson & Robb McDonald (UK) *Beach zone vortices near stepped topography*

Philippe Caillol & Roger Grimshaw (UK) *Rossby solitary waves in the presence of a critical layer*

Sergei Medvedev (Russia) & Vladimir Zeitlin (France) *Weak turbulence of short equatorial waves*

## Day 6: Wednesday, 30 August Section Problems of Geophysical Hydrodynamics-2

Chantal Staquet (France) *Interaction of inertia-gravity waves with a baroclinic shear flow*

Maxim Budyansky, Mikhail Uleysky & Sergey Prants (Russia) *Fractal advection of passive scalar in a wavy jet*

Georgi Sutyrin (USA) *Inertial pulsations of lens-like stratified anticyclonic vortices*

Georgi Sutyrin (USA) & Xavier Carton (France) *Evolution of an intense baroclinic vortex in a sheared flow*

Xavier Carton & Xavier Perrot (France) *Vortex interaction in an unsteady large-scale shear/strain flow*

Kirill Karelsky & Arakel Petrosyan (Russia) *Modified shallow water equations. Simple waves and Riemann problem*

Konstantin Koshel, Dmitry Stepanov & Yury Izrailsky (Russia) *Estimation of optimal for chaotic transport frequency of nonstationary flow oscillation*

Andrey Sigalov & Nathan Paldor (Israel) *The unified theory of linear shallow water equation on the rotating plane*

Dmitrii Cherniy, Vyacheslav Meleshko & Stanislav Dovgiy (Ukraine) *Topological aspects of the vortex structure of tornado*

Oleg Derzho (Russia) *A theory for internal gravitational waves with trapped recirculation core in deep fluids*

Ilya Kostin & Grigory Panasenko (France) *Khokhlov-Zabolotskaya-Kuznetsov type equation in heterogeneous media*

Sergei Muzylev (Russia) *Effect of an ice cover on edge waves*

Valery Zyryanov (Russia) *On the stability of stratified quasigeostrophic currents with vertical shear*

Mikhail Sokolovskiy (Russia) & Jacques Verron (France) *Motion of  $N+1$  vortices in a two-layer rotating fluid*

**Report composed by Mikhail Sokolovskiy**

**06-5 IUTAM Symposium on Discretization Methods for Evolving Discontinuities**

Lyon, France, September 04 - September 07, 2006

**a) Scientific Committee**

D.E. Beskos (Greece), R.de Borst (Co-chair, The Netherlands), A. Combescure (Chair, France), T. Belytschko (Co-chair, USA), C. Farhat (USA), D. Gross (Germany), B. Karihaloo (UK), N. Olhoff (Denmark, IUTAM representative), U. Perego (Italy)

**b) Short summary of scientific progress achieved**

The seminar has been organised to permit wide interactions between the participants. The number of invited talks has been limited to 25 and each speaker had 30 minutes for his presentation plus 10 minutes for discussion. In keeping with IUTAM policy there were no parallel sessions. Each invited speaker was allowed to take up to two PhD students free of charge. They were all invited to present a poster and to participate in the discussions and other activities. The time schedule was enforced weakly in order to maximize interaction between the participants.

The seminar was devoted to theoretical issues and numerical simulations of moving discontinuities. The presentations were organised according to a matrix with theories on one axis (fracture, damage, interfaces, dislocations) on one axis, and numerical methodologies on the other axis (PUM/XFEM methods, embedded FEM methods, discontinuous Galerkin methods, meshfree methods) on the other axis. It has been tried to have at least one presentation in each entry of this matrix, thus leading to an optimal cross-fertilization.

The symposium also permitted to compare static and dynamic problems and applications coming from different communities: civil engineering, mechanical engineering, forming processes, and biomechanics. Some of the participants came from the applied mathematics community, and they have given an interesting input in the discussions.

**c) Countries represented and number of participants**

The total number of participants was 38 from 10 different countries. The division of the delegates from the different countries was as follows: USA 6, France 6, UK 4, Germany 3, Netherlands 3, Italy 2, Belgium 1, Greece 1, Spain 1 and Sweden 1.

10 PhD students from France, Germany, Spain and the Netherlands participated in the symposium.

**d) Publication of Proceedings of the Symposium**

All invited speakers except for one have submitted a full paper of 14 to 20 pages. All papers have been reviewed and have been handed over to Kluwer on 10 March, 2007.

## e) Financial supports

Apart from the contractual support by Kluwer and the conference facilities made available by INSA Lyon, the following financial support was received:

- Reception on Tuesday evening offered by INSA Lyon
- Région Rhone-Alpes has supported the costs of the proceedings
- CNRS has given a grant of 1500 Euros to support the symposium
- AUM (Association Universitaire de Mécanique) has provided a support of 1500 Euros

## f) Scientific program

### Monday, 4 September

E.Kuhl “*On the application of discontinuous Galerkin methods to interface problems*”

R. Haber “*Modelling evolving discontinuities with spacetime discontinuous Galerkin methods*”

T. Belytschko “*On finite element and meshfree methods for crack propagation*”

B. Karihaloo “*Accurate simulation of frictionless and frictional cohesive crack growth in quasi-brittle materials using XFEM*”

W.K. Liu “*Multiresolution mechanics of materials*”

E.H. van Brummelen “*Conservation at fluid-structure interfaces under incompatibility*”

F. Hild “*Measurement and identification techniques for evolving discontinuities*”

### Tuesday, 5 September

F. Chinesta “*The natural element method for simulating evolving discontinuities*”

H. Askes “*Meshless discretisation of nonlocal damage theories*”

A. Gravouil “*Application of X-FEM to real cracks and elastic-plastic fatigue crack growth*”

R. de Borst “*The cohesive-segments method for the simulation of dynamic fracture*”

G. Holzapfel “*Modelling of evolving discontinuities in biological tissues*”

J. Réthoré “*A discrete model for the propagation of discontinuities in a fluid-saturated medium*”

G. Meschke “*X-FEM-based analyses of cementitious materials: hygro-mechanical formulation and energy based modelling of crack propagation*” *propagation of discontinuities in a fluid-saturated medium*”

### Wednesday, 6 September

S. Bordas “*A combined extended finite element and level set method for biofilm growth*”

G. Ventura “*Single domain quadrature techniques for discontinuous and non-linear enrichments in local Partition-of-Unity F.E.M.*”

G. Wells “*A finite element formulation for modelling phase separation problems*”

Y. Renard “*High order finite element method for cracked domains*”

F. Armero “*Recent developments in the formulation of finite elements with embedded discontinuities for the modelling of failure in solids*”

A. Pandolfi “*Variational cohesive fracture models and three-dimensional crack tracking*”

J. Oliver “*Evolving material discontinuities: numerical modelling in the context of the strong discontinuity approach*”

D. Beskos “*Numerical determination of crack stress and deformation fields in gradient elastic solids*”

B. Bourdin “*Numerical implementation of a variational formulation for brittle fracture*”

## **Postersession**

### **Thursday, 7 September**

N. Moes “*Recent progress in the development of the eXtended Finite Element Method: mixed problems, explicit dynamics and 3D fracture mechanics*”

A. Combescure “*Recent advances in dynamic crack propagation simulations using TX-FEM methods*”

**Report composed by Alain Combescure and René de Borst**

## **06-6 IUTAM Symposium on Computational Physics and New Perspectives in Turbulence**

Nagoya, Japan, September 11 - September 14, 2006

### **a) Scientific Committee**

C. Cambon (France), P. A. Davidson (UK), B. Eckhardt (Germany), T. Gotoh (Japan), J. Jiménez (Spain), Y. Kaneda (Japan, Chairman), R. Narasimha (India, IUTAM Representative), A. Pouquet (USA), K. R. Sreenivasan (Italy)

### **b) Short summary of scientific progress achieved**

Recent developments in computational capabilities have been rapid and dramatic. Such dramatic quantitative progress may bring about qualitative changes in our understanding of turbulence, and open a new phase of turbulence research by providing an opportunity to study the nature of fully developed turbulence in unprecedented detail.

Leading experts in turbulence research were brought together at this Symposium to exchange ideas and discuss, in the light of recent progress in computational approaches, new perspectives in turbulence and present and future roles of numerical simulations as well as those of experiments and theories. The Symposium aimed to foster vigorous interaction between those who pursue computations and those concerned with developments in experiment and theory.

A total of 13 oral sessions and 2 poster sessions, as well as a panel session at the end of the Symposium, were organized over a period of four days. Special emphasis was given in this Symposium to fundamental aspects of the physics of turbulence. Stimulating presentations and discussions were made on various topics including the following:

1. Computational physics and theory for canonical turbulence (Direct numerical simulation of canonical turbulence problems, Theory and mathematics of turbulence)
2. Experimental approach to fundamental problems in turbulence (Scaling laws, Coherent structures, Low-dimensional dynamics)
3. Turbulence modeling and numerical methods (Large Eddy Simulation, Wavelet analysis, Spectral closure)
4. Geophysical, astrophysical and complex turbulence (Rotational and stratified turbulence, Magnetohydrodynamic turbulence)

### **c) Countries represented and number of participants**

The meeting attracted 104 participants from 13 countries: China (2), Cyprus (1), France (8), Germany (4), India (1), Israel (1), Italy (2), Japan (66), Netherlands (1), Sweden (1), UK (5), USA (11), Spain (1).

### **d) Publication of Proceedings of the Symposium**

The proceedings of the symposium will be published by Springer Science and Business Media. Editor is Y. Kaneda.

**e) Financial supports**

The organizers extend their thanks to the following for sponsorship of this IUTAM symposium:

- International Union of Theoretical and Applied Mechanics
- The 21st Century COE Program “Frontiers of Computational Science”
- The Kajima Foundation
- Research Foundation for the Electrotechnology of Chubu
- The Kao Foundation for Arts and Sciences
- Daiko Foundation
- Springer Science and Business Media

**f) Scientific program**

**September 11, 2006**

**Session A**

**J. Jiménez (Invited Lecture)**, *Contributions and Challenges of Computational Turbulence Research*

**K. R. Sreenivasan (Invited Lecture)**, *Classical and Quantized Turbulence*

**Session B**

**Z. Warhaft (Invited Lecture)**, *Recent Advances in Lagrangian and Eulerian Experiments in High Reynolds Number Turbulence*

**Y. Tsuji**, J. H. M. Fransson, P. H. Alfredsson and A. V. Johansson, *Shear Effect on Pressure and Particle Acceleration in High-Reynolds-Number Turbulence*

K. A. Chauhan, **H. M. Nagib** and P. A. Monkewitz, *On the Development of Wall-Bounded Turbulent Flows*

**Session C**

**B. Eckhardt**, S. Grossmann and D. Lohse (**Invited Lecture**), *Global Transport Properties and Scaling in Taylor-Couette and Other Shear Flows*

**J. C. R. Hunt**, I. Eames, J. Westerweel and T. Robinson, *Mechanics of Inhomogeneous Turbulence and Interfacial Layers*

**K. Iwamoto**, T. Tsukahara, H. Nakano and H. Kawamura, *Effect of Large-Scale Structures upon Near-Wall Turbulence*

**Poster Presentation 1**

T. Watanabe, *Anomalous Scaling Laws of Passive Scalar Intermittency in Three-Dimensional Turbulence*

T. Arimitsu, N. Arimitsu, K. Yoshida and H. Mouri, *Multifractal PDF Analysis of Turbulence*

K. Yoshida and T. Arimitsu, *Numerical Simulation of Quantum Fluid Turbulence*

P. D. Mininni, A. Alexakis and A. Pouquet, *Scale Interactions in Hydrodynamic Turbulence at Large Reynolds Numbers*

- S. Mochizuki, K. Ohta, T. Kameda and H. Osaka, *Scaling Law of the Near Wall Flow Subjected to an Adverse Pressure Gradient*
- T. Kameda, S. Mochizuki and H. Osaka, *Non-Equilibrium and Equilibrium Boundary Layers without Pressure Gradients*
- T. Kenchi and M. Matsubara, *Experimental Study of Laminar Turbulent Boundary Layer Transition Influenced by Anisotropic Free Stream Turbulence*
- R. Matsumura, S. Koyama, Y. Hagiwara and R. Matsubara, *Turbulent Drag Reduction by Wall Deformation Synchronized with Flow Acceleration*
- S. Toh and T. Ogasawara, *Self-Similar Telegraph Equation Describing Turbulent Relative Dispersion*
- F. Godefert, L. Liechtenstein, C. Cambon and J. Scott, *A Model for the Far-Field Anisotropic Acoustic Emission of Rotating Turbulence*
- Y. Sakai, S. Tagawa, K. Nagata, T. Kubo and J. C. R. Hunt, *On Turbulence Characteristics around the Two-Dimensional Symmetric Aerofoil : Kinematic Simulation and Experiments*
- Y. Sakai, K. Uchida, T. Kubo and K. Nagata, *Statistical Features of Scalar Flux in a High-Schmidt-Number Turbulent Jet*
- N. Yokoi, R. Rubinstein and A. Yoshizawa, *Eddy Viscosity in MHD Turbulence: Incorporation of the Alfvén Effect and its Application*
- N. Hu, Y-P. Shi and Z-S. She, *Dynamics Mixed Subgrid-Scale Stress Model with an Energy Dissipation Constraint*
- K. Nozawa and T. Tamura, *Large Eddy Simulation of a Turbulent Boundary Layer Flow over Urban-Like Roughness*
- M. Neophytou, D. Hamlyn and R. Britter, *Turbulent Flow Structures in Transport and Mixing Processes in Complex Urban Geometries*

## September 12, 2006

### Session D

- A. Pouquet**, A. Alexakis, P. Mininni and D. Montgomery (**Invited Lecture**), *Structures in 3D Magnetohydrodynamic Turbulence*
- Y. Kaneda**, T. Ishihara, K. Morishita and Y. Mizuno (**Invited Lecture**), *Some Attempts at Computer Aided Understanding of Turbulence*
- T. Ishihara**, H. Higuchi and Y. Kaneda, *Multifractal Analysis by Using High-Resolution Direct Numerical Simulation of Turbulence*
- M. Tanahashi**, K. Fujibayashi and T. Miyauchi, *Fine Scale Eddy Cluster and Energy Cascade in Homogeneous Isotropic Turbulence*

### Session E

- P. A. Davidson**, Y. Kaneda and T. Ishida (**Invited Lecture**), *The Role of Angular Momentum Invariants in Homogeneous Turbulence*
- T. Gotoh**, Y. Watanabe, T. Nakano and Y. Shiga (**Invited Lecture**), *Turbulence in 4 Dimensions*



**R. Fisher**, F. Cattaneo, P. Constantin, L. Kadanoff, D. Lamb and T. Plewa, *3D Large-Scale DNS of Weakly-Compressible Homogeneous Isotropic Turbulence With Lagrangian Tracer Particles*

### Session F

**M. Farge**, K. Schneider, K. Yoshimatsu, N. Okamoto and Y. Kaneda, *Wavelet-Based Extraction of Coherent Vortex Tubes from Homogeneous Isotropic Turbulent Flows*

**K. Schneider** and M. Farge, *Decaying 2D Turbulence in Bounded Domains: Influence of the Geometry*

### Session G

**F. Toschi**, *Acceleration of Heavy Particles in Turbulence*

**J. Bec**, *Clusters and Voids of Heavy Particles in Turbulent flows*

**J. Schumacher**, *Reynolds Number Effects on the Mixing of Scalars*

### Poster Presentation 2

A. K. Kuczaj and B. J. Geurts, *Control over Multiscale Mixing by Broad-Band Forcing of Turbulence*

M. Umeki and O. Kitoh, *Very Large Scale Structure in Turbulence Plane Couette Flow*

H. Mouri, A. Hori and Y. Kawashima, *Vortex Tubes in Turbulence Velocity Fields at High Reynolds Numbers*

P. J. Staplehurst, P. A. Davidson and S. B. Dalziel, *On the Evolution of Rotating Turbulence*

H. Hanazaki, *Effects of the Slow Modes in the Differential Diffusion in Stratified Sheared Turbulence*

T. Matsumoto, T. Mizukami and S. Toh, *Numerical Study of 3-D Free Convection under Rotation: Mean Wind and Bolgiano-Obukhov Scaling*

Y. Kitamura and Y. Matsuda, *The Horizontal Energy Spectra and Cascade Processes in Rotating Stratified Turbulence*

K. Ishioka, *A Spectral Method for Unbounded Domains and its Application to Wave Equations in Geophysical Fluid Dynamics*

S. Murakami and T. Iwayama, *Parameter Dependence of Eastward-Westward Asymmetric Jets in Forced Barotropic 2D Turbulence on a  $\beta$ -plane*

S. Takehiro, M. Yamada and Y. Hayashi, *Scaling Properties of Circumpolar Jets in Two-Dimensional Incompressible Turbulence on a Rapidly Rotating Sphere*

T. Miyazaki, Y. Li, H. Taira, S. Hoshi and N. Takahashi, *Statistics of Quasi-Geostrophic Vortex Patches*

N. Takahashi and T. Miyazaki, *The Breakdown of a Columnar Vortex with Axial Flow*

M. Uhlmann, A. Pinelli, A. Sekimoto and G. Kawahara, *Coherent Structures in Marginally Turbulent Square Duct Flow*

Y. Hattori, Y. Fukumoto and K. Fujimura, *Evolution of an Elliptical Flow in Weakly Nonlinear Regime*

J. Ruppert-Felsot, M. Farge and P. Petitjeans, *Wavelet Analysis of Vortex Breakdown*

W. A. Kareem, S. Izawa, A. K. Xiong and Y. Fukunishi, *Extraction of Multi-Scale Vortical Structures from a Homogeneous Isotropic Turbulence*

K. Araki and H. Miura, *Orthonormal Divergence-Free Wavelet Analysis of Nonlinear Energy Transfer Process in Rolling-up Vortices*

K. Yoshimatsu and N. Okamoto, *Wavelet-Based Statistics of Energy Transfer in High-Resolution Direct Numerical Simulations of Three-Dimensional Homogeneous Isotropic Turbulence*

### Session H

**C. Meneveau** and S. Chester (**Invited Lecture**), *Modeling Turbulent Flow over Fractal Trees with Renormalized Numerical Simulation*

**I. Procaccia** (**Invited Lecture**), *On the Anomalous Scaling Exponents in Nonlinear Models of Turbulence*

### Session I

**Y-P. Shi**, W-B. Feng, K-Q. Ding and Z-S. She, *Nonlocal Similarities in Turbulent Fields and Dynamic Fractal Subgrid-Scale Stress Model for Large-Eddy Simulation*

G. Khujadze and **M. Oberlack**, *New One- and Two-Point Scaling Laws in Zero Pressure Gradient Turbulent Boundary Layer Flow*

**T. Tatsumi** and T. Yoshimura, *Statistical Theory of Turbulence and Numerical Analysis*

### Session J

**C. R. Doering** (**Invited Lecture**), *Limits on Enstrophy Production in the 3-D Navier-Stokes Equations*

**R. Narasimha** (**Invited Lecture**), *Direct Numerical Solution of the Boussinesq Equations for Cloud Like Flows*

### Session K

**K. Moffatt**, *Magnetostrophic Turbulence and the Geodynamo*

**A. A. Schekochihin** and S. C. Cowley, *Anisotropic MHD Turbulence in Space and Interstellar Plasmas*

## September 14, 2006

### Session L

**C. Cambon** (**Invited Lecture**), *Strongly Anisotropic Turbulence Using Statistical Theory: Still a Computationally Demanding Problem*

**J. R. Herring** and Y. Kimura, *Structure Formation in Stratified Turbulence*

**L. Smith**, *Multi-Scale Coupling in Rotating and Stratified Flows*

P. Otheguy, A. Deloncle, P. Billant and **J. Chomaz**, *Three-Dimensional Stability of Vortices in a Stratified Fluid*

**G. Brethouwer**, P. Billant and E. Lindborg, *Stably Stratified Fluids*

### Session M

H. Touil, M. Y. Hussaini, T. Gotoh, **R. Rubinstein** and S. L. Woodruff, *Intrinsic Langevin Models for Turbulence*

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J. Peinke, S. Lück, A. Nawroth, **M. Siefert** and R. Friedrich, *Stochastic Analysis and New Insight into Turbulence*

**S. Kurien**, *Helicity within the Kolmogorov Phenomenology of Turbulent Flows*

**F. Hamba**, *Analysis of the Reynolds Stress Using the Green's Function*

**Panel Session**

C. Cambon, P. A. Davidson, B. Eckhardt, T. Gotoh, J. Jiménez, R. Narasimha, A. Pouquet and K. R. Sreenivasan

**Report composed by Yukio Kaneda**

**06-7 IUTAM Symposium on Dynamics and Control of Nonlinear Systems with Uncertainty**

Nanjing, China, September 18 - September 22, 2006

**a) Scientific Committee**

H.Y. Hu (Chair, China), E. Kreuzer (Co-Chair, Germany), F.L. Chernousko (Russia), A. H. Nayfeh (USA), G. Rega (Italy), K. Sobczyk (Poland), G. Stepan (Hungary), H. Troger (Austria), W. Schiehlen (Germany, IUTAM Representative)

**b) Short summary of scientific progress achieved**

The last decade has witnessed an increasing interest towards various intelligent and robust controls for nonlinear dynamic systems with uncertainty since most information used in system modeling, analysis, design and control is approximate by nature. That is, uncertainties exist in almost every system to be studied. Such a fact is calling more and more attention to the modelling and simplification of dynamic systems subject to uncertain environment, the fine analysis and robust design of controlled dynamic systems, resulting in new control strategies due to understanding of nonlinear phenomena and artificial intelligence, the combination of passive control, active control and semi-active control, as well as the interaction among sensors, controllers and actuators.

The Symposium focused on the topics of modeling, identification, stability analysis, nonlinear dynamics, control and robust control of systems with uncertainties. It served as a forum for the scientists working in either stochastic systems or deterministic systems with parametric/structural uncertainty so as to exchange the advancement of their recent studies. The Symposium lasted five days with 40 presentations. The involved researches include: (1) Modeling and identification of nonlinear systems with uncertainty; (2) Dynamics subject to system uncertainty; (3) Dynamics of high-dimensional systems; (4) Vibration control of nonlinear systems; (5) Time-delay systems and delayed feedback control; ranging from classical mechanics systems to smart structures, robots, modern vehicles, and micro-mechatronic systems. New results in modeling, analysis, computation, experiments were achieved.

During the symposium, a Round-Table Meeting was held. 18 leading scientists had a fruitful discussion on the recent advances and trends in nonlinear dynamics and control. They agreed that the scientists in mechanics should take the advantages of their skillful experiences in dynamical modeling to promote combined research with theoretical analysis, computation, and experiments, to pay close attention to the problems of nonlinear dynamics and control arising from the frontiers, such as nanotechnologies, micro-mechatronic systems, life sciences and so on, as well as the key projects in engineering. They suggested that the young scientists should broaden their view of knowledge and to enhance their ability in conducting scientific experiments.

**c) Countries represented and number of participants**

The symposium attracted 41 participants from 14 countries: Austria (1), Brazil (2), China including Hong Kong (15), Germany (5), Hungary (1), India (1), Italy (3), Japan (1), Poland (2), Russia (3), Swiss (1), UK (2), USA (3) and Vietnam (1).

**d) Publication of Proceedings of the Symposium**

The symposium proceedings, edited by H.Y. Hu and E. Kreuzer, will be published by Springer Science and Business Media (former Kluwer Academic Publisher) in September, 2007.

**e) Financial supports**

The Symposium was supported in part by

- International Union of Theoretical and Applied Mechanics (IUTAM)
- National Natural Science Foundation of China (NSFC)
- Nanjing University of Aeronautics and Astronautics (NUAA)
- Springer-Verlag

**f) Scientific program****September 18****Session - Dynamics with uncertainty I**

**E. Kreuzer**, A. Gaull, *The method of cell mapping applied to randomly perturbed dynamical systems*

**S. F. Masri**, R. Ghanem, P. Arrate, *Data-based stochastic models of uncertain nonlinear systems*

**X. B. Liu**, *On the maximal Lyapunov exponent for a stochastic bifurcation system*

**Session - Dynamics with uncertainty II**

**W. Q. Zhu**, Z. H. Liu, *Stability and response of quasi-integrable Hamiltonian systems with time-delayed feedback control*

**T. F. Filippova**, *Trajectory tubes in control and estimation problems under uncertainty*

**S. K. Au**, D. P. Thunnissen, *Uncertainty propagation in complex engineering systems by advance Monte Carlo methods*

**Session – Dynamics of time-delay systems I**

**Y. N. Kyrycho**, K. B. Blyuss, A. Gonzalez-Buelga, **S. J. Hogan**, D. J. Wagg, *Real-time dynamic substructuring: stability and Hopf bifurcation in a neutral delay differential system*

**J. Xu**, Y. Y. Zhang, *Dynamics due to non-resonant double Hopf bifurcation in van der Pol-Duffing system with delayed position feedback*

**September 19****Session – Dynamics control I**

**F. L. Chernousko**, *Dynamics of a body controlled by internal motions*

**S. P. Yang**, C. Z. Pan, *Modeling and control of systems with hysteretic actuator*

**K. Yunt**, C. Glocker, *A combined continuation and penalty method for the determination of non-smooth hybrid mechanical trajectories*

**Session – Dynamics control II**

**J. Awrejcewicz**, *Numerical prediction and experimental observation of triple pendulum dynamics*

**P. Barthels**, J. Wauer, *Controlled vibration suppression of structural telescopic systems*

**P. B. Goncalves**, D. Orlando, *Influence of a pendulum absorber on the nonlinear behavior and instabilities of a tall tower*

**Session – Nonlinear dynamics I**

**W. Zhang**, M. H. Yao, *Many pulses homoclinic orbits with a Melnikov method and chaotic dynamics for nonlinear nonplanar motion of a cantilever beam*

A. Steindl, A. Teufel, **H. Troger**, *Rotating stick-slip-separation waves*

**Q. S. Lu**, Q. Y. Wang, X. Shi, H. X. Wang, *Synchronization and transitions of firing patterns in coupled neurons: effects of noise and time delay*

**L. Q. Chen**, X. D. Yang, *Parametric resonance of an axially accelerating viscoelastic beam with non-typical boundary conditions*

**September 20****Session – Dynamics with uncertainty III**

**W. Schiehlen**, R. Seifried, *Impact systems with uncertainty*

**Y. F. Jin**, H. Y. Hu, *Moment stability of stochastic delayed systems with delayed feedback control*

**T. Bodai**, M. Wiercigroch, A. Fenwick, *Ray-stability for range-dependent background sound speed profiles*

**Session – Dynamics control III**

**I. Ananievski**, *Synthesis of bounded control for nonlinear uncertain mechanical systems*

**T. Kapitaniak**, *Synchronization of oscillators suspended on the elastic structure*

**September 21****Session – Dynamics with uncertainty IV**

**W. V. Wedig**, *Stability and density analysis of stochastic Duffing oscillators*

**C. Proppe**, C. Wetzel, *Overtuning probability of railway vehicles under wind gust loads*

**J. X. Xu**, H. L. Zou, *Uncertainties in deterministic dynamical systems and the coherence of stochastic dynamical systems*

**Session – Nonlinear dynamics II**

**H. Yabuno**, Y. Kunitoh, T. Inoue, Y. Ishida, *Nonlinear analysis of rotor dynamics by using the method of multiple scales*

N. D. Anh, **N. Q. Hai**, W. Schiehlen, *Application of extended averaged equations to nonlinear vibration analysis*

**Session – Dynamics of time-delay systems II**

**G. Stepan**, T. Insperger, *Robust time-periodic control of time-delayed systems*

**Z. H. Wang**, H. Y. Hu, *Stability of time-delay systems with uncertain parameters*

**P. Wahi**, G. Stepan, A. Chatterjee, *Self-interrupted regenerative turning*

**Session – Nonlinear dynamics III**

**W. Lacarbonara**, A. Paolone, F. Vestroni, *Linear and nonlinear elastodynamics of nonshallow cables*

**Z. Q. Wu**, Y. S. Chen, *Singularity analysis on constrained bifurcation*

**September 22****Session – Nonlinear dynamics IV**

**A. K. Bajaj**, P. Davies, R. Ippili, T. Puri, *Nonlinear multi-body dynamics of seat-occupant systems using experimentally identified viscoelastic models of polyurethane foam*

**S. Lenci**, G. Rega, *Nonlinear normal modes of homoclinic orbits and their use for dimension reduction in chaos control problems*

**L. Bevilacqua**, *Determination of the dynamic fractal dimension of wire shaped structures: direct and inverse problems*

**Session – Dynamics with uncertainty V**

**X. L. Leng**, *Numerical analysis of bifurcation and chaos response in a crooked rotor system under white noise disturbance*

**W. Xu**, Q. He, S. Li, *A modified digraph cell mapping method for approximating the invariant manifolds*

**Session – Nonlinear dynamics V**

A.J. Dick, **B. Balachandran**, C. Mote, Jr., *Nonlinear vibration modes and energy localization in micro-resonator arrays*

**H. Y. Hu**, M. L. Yu, *Robust flutter suppression of the airfoil with a control surface driven by an ultrasonic motor*

**Report composed by Haiyan Hu**

**06-8 IUTAM Symposium on Flow Control with MemS**

London, UK, September 19 - September 22, 2006

**a) Scientific Committee**

Professors Peter Bearman (Imperial College), Thomas Bewley (UCSD USA), Jean-Paul Bonnet (Université de Poitiers - chair), Kenneth Breuer (Brown University, USA), Peter W. Carpenter (University of Warwick, UK), Kwing-So Choi (University of Nottingham, UK), Hans Fernholz (Technical University of Berlin, Germany), Mark Glauser (Syracuse University, USA), John Kim (University of California, USA), Michael Leschziner (Imperial College), David Limebeer (Imperial College), Beverley McKeon (CalTech, USA), Jonathan F. Morrison (Imperial College - chair), Andrew Pollard (Queen's University, Canada), Sedat Tardu (L.E.G.I, France).

**b) Short summary of scientific progress achieved**

In consultation with the Scientific Committee, and more generally with the Symposium at large, responses to two questions were sought:

- Achievements to date – where are we in effective flow control?
- What are the remaining most important challenges?

Responses were grouped into five groupings: sensors, actuators, flow definition, drag reduction and separation control.

- **Sensors.** Only one paper was offered concerning wall sensors (wall shear). This is perhaps surprising given their importance. Thermal sensors for measuring wall shear stress remain popular, despite being nonlinear and the inherent limitations to frequency response set by heat loss to the substrate. By comparison, techniques for the measurement of wall pressure are at a better stage of development, sensors are more robust and nearly linear. Typically the rms wall pressure is 10 – 20 times the rms wall shear stress. Development is still required for both and some key questions arose, such as accuracy and noise. For example, with filtering, how much freedom does a robust controller offer?
- **Actuators.** Many achievements to date such as Zero-Net-Mass-Flux (ZNMF) jets are built on silicon (bimorph, piezoelectric, small deflection, high frequency) and the semi-conductor industry. There was a strong focus on ZNMF jets, but are these necessarily the best for all control problems? There are potentially many different other types of actuator, and many innovations in new materials (e.g. polymers, C nanotubes – with/without dpoing, composites). Pernod introduced Magneto-Mechanical Microsystems (MMMs): here there some issues regarding instabilities and/or non-continuum effects. In summary, it seems that the fluids community needs a better appreciation of what is available, and there are outstanding issues regarding the provision of cost-effective MEMS with a quick turn around.



- Flow definition. We have a good understanding on how to apply modern control theory to fluids mechanics, and linear control theory seems promising. Key questions are:
  1. What is the minimum information required for flow control – density and location of sensors?
  2. Merits of blackbox vs. “intelligent” control?
  3. How should a cost function be best defined?
  4. Need for better model reduction: smaller state-space models (controllability, observability are key); incorporation of better, and/or distributions of, sensors/actuators.
- Drag Reduction. We understand the fluid mechanics fairly well – but largely at low Reynolds number (“bottom-up”). It is not all clear that the fundamental processes at high Reynolds number are intrinsically the same (“top-down”) – what are the implications for flow control? Bewley stressed the importance of overlapping./decentralised controllers (fast~local, slow~non-local) and practical problems require issues of realizability to be addressed.
- Separation Control. This is probably the goal that is closest to application in a real system. Different types of actuator (or even variations on the same basic design) may all achieve separation delay even though the actuator may induce different flow physics. This may enable a more straightforward design (fewer parameters) and permit a greater emphasis on other considerations (e.g. robustness). For closed-loop control, optimum design requires coupled actuator-algorithm design from the start: e.g. shear-layer response time depends on actuator speed.

In terms of applications, much of the focus and investment is on the aeronautical sector, while, in fact, both marine and automotive sectors offer vast energy savings. John Kim pointed out that worldwide ocean shipping consumes 2.1 million barrels of oil per annum whereas the airline industry only uses 1.5 million. It is therefore somewhat ironic that several effective methods are known for reducing skin-friction drag in water flows but few work in air. However, it suggests that more investment should be targeted towards drag reduction of ships and road vehicles.

However, the ACARE 2020 targets have largely been adopted by the European airline industry. The challenge of achieving 50% reduction in fuel burn implies a wing/fuselage drag reduction of about 20%, an improvement in engine efficiency of about 20%, with the remainder coming from improved traffic management. In theory, arrays of microjets, dimples, pimples or other actuators combined with suitable sensors and control systems could produce substantial reductions in drag. Whether this is possible or not remains an open question. An estimate for the number of sublayer streaks present at any one time on the fuselage of an Airbus A340-300 in cruise is 109, and shows the scale of the problem for active control. Clearly, advances in the application of model reduction techniques to wall turbulence are an essential prerequisite before any sophisticated control technique involving cost functions and adjoint equations can be used. Fundamental differences between the behaviour of boundary layers at operational

Reynolds numbers and the low Reynolds numbers at which control schemes have showed some success have yet to be addressed.

It is likely that only open-loop methods for turbulent skin-friction reduction that do not require a control system are likely to be feasible for practical application by 2020. The only such methods currently known are spanwise oscillations, randomized roughness and riblets.

It is clear that the industry/academe divide remains: the horizons needed by the aeronautical industries are far too short for what is expected. However, in Europe, environmental issues constitute a significant driver for research funding. But there is a need to encourage mechanisms for discipline crossover/hopping. Moreover, the fluids community needs to engage with MEMS and control people.

#### **e) Countries represented and number of participants**

The meeting attracted approximately 120 participants from UK(50), France(28), Germany(6), Italy(1), USA(20), Australia(3), Israel(2), Canada(1), Switzerland(1), Spain(1), Sweden(1), China & Hong Kong (3), India(1) and Korea(1). Of these, approximately 12 participants came from the aeronautical and automotive industries.

#### **d) Publication of Proceedings of the Symposium**

A volume with all papers presented at the Symposium is currently being compiled, to be published by Springer next year.

#### **e) Financial supports**

The Scientific Committee is indebted to IUTAM for the provision of financial support to some of the invitees in order that they might attend the Symposium. Additional sponsorship was also provided by ERCOFTAC, Airbus, QinetiQ, CCLRC, the Wing Technologies Centre, Department of Aeronautics, Imperial College and the Turbulence Platform Grant, Department of Aeronautics, Imperial College.

#### **f) Scientific program**

##### **Tuesday 19 September**

**Session 1: Mems Devices - Chairs: Hans Fernholz and Kenny Breuer**

**Keynote Speaker:** High Power Density MEMS, *Mark Spearing*

**Keynote Speaker:** MEMS for flow control: technological facilities and MMMS alternatives, *Philippe Pernod*

MEMS-based actuators for flow control applications, *D. Arnold, T. Nishida, M. Sheplak and L. Cattafesta*

Suction and oscillatory blowing actuator, *G. Arwatz, I. Fono, and A. Seifert*

Numerical investigation of a micro-valve pulsed-jet actuator, *K. Kudar and P.W. Carpenter*

Characterization of the flow induced by high amplitude clearance pulsed micro-jets, *F. Harambat, J.J. Lasserre, J.F. Beaudoin, C. Edouard, and J.L. Aider,*

Magnetically actuated microvalves for active flow control, *O. Ducloux, Y. Deblock, A. Talbi, P. Pernod, V. Preobrazhensky, and A. Merlen*

Micromachined shear stress sensors for flow control applications, *M. Sheplak, L.N. Cattafesta, and T. Nishida*

### Wednesday 20 September

**Session 2: Separation Control** -Chairs: *Peter Bearman and Beverley McKeon*

**Keynote Speaker:** Control of cavity-driven separated boundary layer, *Dan Henningson*

**Keynote Speaker:** Active and passive controls for form drag reduction, *Haecheon Choi*

High resolution PIV study of zero-net-mass-flow lift enhancement of NACA 0015 airfoil at high angles of attack, *J. Soria and T. Stephens*

ONERA/IEMN contribution within the ADVACT program: actuators evaluation  
*E. Garnier, M. Pruvost, O. Ducloux, A Talbi, L. Gimeno, P. Pernod, A. Merlen and V. Preobrazhensky*

Separation control along a NACA0015 airfoil using a dielectric barrier discharge actuator, *J. Jolibois, M. Forte, and E. Moreau*

Active control of disk wake, *H. Higuchi, J. Qiu, S. Ide and G. Gandlin*

Surface pressure based estimation for flow control applications, *L. Ukeiley*

High amplitude forcing of boundary layers to control separation, *M.P. Simens and J. Jiménez*

**Session 3: Applications** – Chairs: *Jean-Paul Bonnet and Mark Glauser*

**Keynote Speaker:** Progress in feedback flow control for practical applications  
*Mark Glauser*

Modeling and development of synthetic jet actuators in flow separation control application, *Q. Gallas, E. Levallois, and P. Gilliéron*

Drag reduction of a 3D bluff body by closed loop control using oscillating vortex generators and wall pressure measurement, *J.F. Beaudoin, O. Cadot, J.L. Aider and J.E. Wesfried*

Active flow control: an industrial perspective, *N. Wood*

State of the art and future directions in the application of MEMS to flow control,  
*C. Warsop*

Flow control in turbomachinery using micro jets, **S-J. Hiler**, *T. Ries, M. Kürner*

#### Thursday 21 September

**Session 4: Drag Reduction and Mixing** – *Chairs: Tom Bewley & Andrew Pollard*

**Keynote Speaker:** No-loop, open-loop and closed-loop - experiments in turbulence control, *Kenny Breuer*

**Keynote Speaker:** Physics and control of turbulent boundary layers, *John Kim*

Minimum sustainable drag for constant volume-flux channel and pipe flows,

**I. Marusic**, *D. D Joseph, and K. Mahesh*

Enhancement of suboptimal controllability of the near wall turbulence, *O. Doche,*

**S. Tardu**, *and V. Kubicki*

Towards improvements of opposition control of a flat plate turbulent boundary layer,

**M. Pamiès**, *E. Garnier, A. Merlen, and P. Sagaut*

Direct numerical simulation of electromagnetic forcing, **S. Montesino**,

*J-P. Thibault, S Tardu and P Filippini*

Boundary layer control for drag reduction by Lorentz forcing, **P. Xu** *and K-S. Choi*

Multi-scale flow control for efficient mixing: laboratory generation of unsteady multi-scale flows controlled by multi-scale electromagnetic forces, *S. Ferrari,*

**P. Kewcharoenwong**, *L. Rossi, and J.C. Vassilicos.*

**Session 5: Synthetic Jets** – *Chairs: John Kim and Kwing-So Choi*

**Keynote Speaker:** Synthetic jets and their applications in controlling fluid/thermal systems, *Miki Amitay*

Is Helmholtz Resonance a problem for micro-jet actuators? **D.A. Lockerby**,

*P.W. Carpenter and C. Davies*

Passive scalar mixing enhancement in a boundary layer using a perpendicular synthetic jet, **G. Mitchell**, *E. Benard, V. Uruba, and R.K. Cooper*

Towards a practical piezoceramic diaphragm based synthetic jet actuator for high subsonic applications - effect of excitation amplitude and frequency on effectiveness and efficiency, **L.D. Gomes**, *W. Crowther, and N.J. Wood*

Measurements of synthetic jets in a boundary layer, *Jabbal and S. Zhong*

Large eddy simulation of a synthetic jet in stagnant ambient and turbulent cross-flow,

**D. Wu** *and M.A. Leschziner*

Poitiers: European Forum on Flow Control II: Part 1: collaborative studies on flow separation control, **W.L. Siaw** *and J-P Bonnett*

Poitiers: European Forum on Flow Control II: Part 2: collaborative studies on dynamic systems, low order models and quiet turbulence, **P. Jordan** *and J. Delville*

**Friday 22 September****Session 6: Close-Loop Control** – Chairs: *David Limebeer & Peter Carpenter*

**Keynote Speaker:** Multiscale retrograde identification, estimation and forecasting of chaotic nonlinear systems, *Thomas Bewley*

**Keynote Speaker:** On the active control of spatially growing waves in laminar boundary layers, *Mike Gaster*

Evolutionary optimization of feedback controllers for thermoacoustic instabilities, *Hansen, P Koumoutsakos, A.S.P. Niederberger, and L. Guzzela*

Active cancellation of tollmien-schlichting instabilities in compressible flows using a closed-loop controller, *M. Engert, A. Patzold, and W. Nitsche*

**Closing Discussion** - Chairs: *Jonathan Morrison and Jean-Paul Bonnet***Poster Programme**

Experimental optimization of bionic dimpled surfaces on bodies of revolution for drag reduction, *C-C. Zhang, L. Ren, Q-P. Liu, J-B. Feng, and Y-M. Qing*

Optimal boundary flow control: equivalence of adjoint and co-state formulations and solutions, **R. Vepa**

Biomimetic flight and flow control: learning from the birds, **R. Vepa**

The effects of aspect ration and end condition on the control of free shear layers development and force coefficients for flow past four cylinders in the in-line square configuration, **K. Lam, L. Zou, and R.M. So**

Numerical simulation on the control of drag force and vortex formation by difference wavy (varicose) cylinders, **K. Lam, Y. F. Lin, and R.M. So**

Optimal growth modes of flows in complex geometries, **A. Sharma, S. Sherwin, and N Adbesemed**

Simulations of control of early transition in poiseuille flow, **J. McKernan,**

*J.F. Whidborne, and G. Papadakis*

A switched reduced-order dynamical system for fluid flows under time-varying flow conditions, **H.H. Howard, A.J. Kurdila, and A.K. Jammulamadaka**

Control of subsonic flows with high voltage discharges, **P. Magnier, B. Dong, D. Hong, A. Leroy-Chesneau, and J. Hureau**

Control of flow-induced vibration of two side-by-side cylinders using micro actuators, *B.Q. Li, Y. Liu, K. Lam, W.J. Li, and J.R. Chug*

Control of flow separation on a wing profile using PIV measurements and POD analysis **J. Favier, A. Kourta, and G. Leplat**

Passive multi-scale flow control by fractal grids, **R.E.E. Seoud** and *J.C. Vassilicos*

Flow control of near-wall turbulence, **B. Frohnappfel, P. Lammers, and J. Jovanovic,**

Multi-scale flow control for efficient mixing: simulation of electromagnetically forced turbulent-like laminar flows, **E. Hascoet, L. Rossi and J.C. Vassilicos**

Jet vectoring through the suppression of a global instability, **V.G. Chapin, N. Boulanger, and P. Chassaing**

Control of the shear-layer in the wake of an axisymmetrical airfoil using a DBD plasma actuator, **M. Forte**, J. Jolibois, E. Moreau and G. Touchard

Separation control along a NACA0015 airfoil using a dielectric barrier discharge actuator, **J. Jolibois**, M. Forte, and Eric Moreau

Characteristics of small-scale synthetic jets - numerical investigation, H. Tang and S. Zhong

Optimal and robust control of magnetohydrodynamic channel flow instabilities, K. Debbagh, **P. Cathalifaud**, and C. Airiau

Optimal control of three-dimensional perturbations in a recirculation flow, **Marquet**, D. Sipp, and L. Jacquin

Cylinder drag minimization using 'belt' actuators, Poncet, **P. Koumoutsakos**, R. Hildebrand and G-H. Cottet

Poster abstract: Inlet flow control based on a low dimensional approach in the indoor environment, **D.R. Marr**, J.W. Hall, and M.N. Glauser

Large eddy simulations of transitional and turbulent flows in synthetic jet actuators, **S. Patel** and D. Drikakis

Influence of turbulence modelling for the simulation of controlled cavity flow, **I. Mary**, F. Daude and G. Nolin

Vortex shedding behind a tapered cylinder and its control, **O.N.Ramesh** and R.S. Chopde

Control of a separated flow over a smoothly contoured ramp using vortex generators, **T. Duriez**, J-L. Aider, and J. E. Wesfreid

Characterization of the performance of a new micro pulsed jet, C. Edouardy, G. Giovannelli, **J-L Aider**

Identification and control of noise source mechanisms in a transonic axisymmetric jet, **A.M. Hall**, J. Pinier, and M. N. Glauser

**Report composed by Jonathan Morrison and Jean-Paul Bonnet**

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**06-9 IUTAM Symposium on Computational Contact Mechanics**  
Hannover, Germany, November 05 - November 09, 2006**a) Scientific Committee**

Tod A. Laursen (Duke University, USA), Joao A.C. Martins (Technical University of Lisbon, Portugal), Udo Nackenhorst (University of Hannover, Germany), Michel Raous (CNRS, France), Barbara Wohlmuth (University of Stuttgart, Germany), Peter Wriggers (University of Hannover, Germany, chair).

**b) Short summary of scientific progress achieved**

Computational methods for the analysis of contact problems are under development since more than three decades. The aim of the symposium was to bring scientists together who work in this area of research or in closely related subjects. During the symposium 37 scientists from more than 11 countries presented their newest findings in the area of discretization techniques for contact, algorithms and interesting numerical simulations of contact problems.

The symposium gave detailed insight in the newest development in the area of simulation techniques for contact problems. The presentations included new mathematical techniques like multi-level approaches. New discretization techniques like the mortar-method were considered for finite deformations and used within primal-dual active set strategies. But also advanced applications of unilateral contact to masonry structures, decohesion analysis and tractive rolling of tires were among many interesting presentations which showed the wide applicability of the newest algorithms and formulations but also their limitations.

During the symposium scientists from leading research groups in computational contact mechanics, including the disciplines of mechanics and applied mathematics, had a fruitful exchange of experience. Many still open questions were discussed after the presentations, in the coffee breaks and during the social events. Here also new friendships were established and will lead to future joint collaboration in science and in organization of next minisymposia and workshops in the area of computational contact mechanics. Hence in total the IUTAM symposium was a success.

**c) Countries represented and number of participants**

Australia, Brasil, China, France, Germany, Greece, Italy, Poland, Spain, Russia and USA  
Total number of participants: 39

**d) Publication of Proceedings of the Symposium**

The proceedings will be published with Kluwer. Deadline for the submission of papers is end of January 2007.

**e) Financial supports**

Since the Leibniz Universität Hannover provided financial support for this meeting, no financial support from IUTAM is needed.

**f) Scientific program****Monday, November 6, 2006**

- F. Lebon, *Multigrid Methods for Unilateral Contact Problems with Friction*  
A. Konyukhov, *Symmetrization of various friction models based on an Augmented Lagrangian approach*  
S. Hüber, *A Non-Linear Multilevel Approach for Frictional Contact Problems*  
H. Zhang, *Some Advances in Mathematical Programming Method for Numerical Simulation of Contact Problems*  
A. Pandolfi, *Time-Discretized Variational Formulation of Nonsmooth Frictional Contact*  
T. Laursen, *Recent Extensions of Mortar-Based Contact Formulations: Lubrication Modelling and Parallel Implementations*  
S. Brunßen, *Application for a Primal-Dual Active Set Strategy for Unilateral Geometrically and Material Non-Linear Dynamic Contact Problems*  
J.-M. Bielsa, *The Influence of Contact Pressure on the Dynamic Friction Coefficient in Cylindrical Rubber-Metal Contact Geometries*  
A. Pinto da Costa, *The Effects of Obstacle Curvature and Material Anisotropy on Frictional Directional Instabilities*  
R. Niekamp, *Software Component Technology Applied to Coupled Simulations*

**Tuesday, November 7, 2006**

- G. Stavroulakis, *Unilateral Analysis of Masonry Bridges, using Interfaces of Damage Mechanics*  
D. Sheng, *Frictional Contact for Pile Installation*  
J.-M. Bielsa, *Two F.E.M. Approaches for the Prediction and Quantification of "Stick-Slip" Phenomena on Rubber-Metal Sliding Contacts*  
G. Zavarise, *A Coupled Contact and Decohesion Analysis of Laminated Beams*  
J. L. Perez, *Discrete Deformation Analysis applied to Contact for Engineering and Architecture*

**Report composed by Peter Wriggers**



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## Report of the IUTAM Summer School held in 2006

### Report on the IUTAM - CISM Summer School on Biomechanical Modelling at the Molecular, Cellular and Tissue Levels

Udine, Italy, September 11 - September 15, 2006

#### a) Organization

The IUTAM summer school on “Biomechanical Modelling at the Molecular, Cellular and Tissue Levels” was held at the International Centre for Mechanical Sciences (CISM) at Udine, Italy, from September 11 to 15, 2006.

#### b) Lecturers

The summer school was taught by the following lecturers:

- Professor Gang Bao, Department of Biomedical Engineering, Georgia Institute of Technology, Atlanta, USA
- Dr. M. Dao, Materials Science and Engineering, MIT, USA (Professor Subra Suresh was invited)
- Professor G.A. Holzapfel, Royal Institute of Technology (KTH), Sweden and Graz University of Technology, Austria (and coordinator)
- Professor J.D. Humphrey, Biomedical Engineering, Texas A&M University, USA
- Professor P.J. Hunter, The Bioengineering Institute, University of Auckland, New Zealand
- Professor R.W. Ogden, Department of Mathematics, University of Glasgow, UK (and coordinator)

#### c) Summer School Aims and Covered Topics – Scientific Report

The aim of the course was to present a state-of-the-art overview of biomechanical modelling at the molecular, cellular and tissue levels, with particular reference to nanostructures, cells, growth and remodelling, and the cardiovascular system. This included experimental, continuum mechanical and computational aspects.

The course consisted of the following contributions. Lectures on the importance of the nanoscale that focused on the underlying molecular mechanisms of biological materials and their interactions at the molecular level. Protein mechanics, and the mechanics of molecular motors, in particular were addressed (6 lectures by G. Bao, Georgia Institute of Technology). Six lectures (by M. Dao, MIT) were provided on cell mechanics, with emphasis focused on the forces on and deformation of single cells and subcellular components. Human red blood cells and the mechanical response of human cancer cells were discussed in detail. Anisotropic and nonlinear elasticity was then used to explain arterial wall models that include fiber dispersion and residual stress. The basis for

comparing theory and experiment for soft tissues and issues of convexity and material stability were examined, along with some aspects of the Work-Like Chain model for describing the mechanics of molecules (5 lectures by R.W. Ogden, University of Glasgow). Lectures on a constrained mixture framework were provided by J.D. Humphrey, Texas A&M University (6 lectures). In particular, the important role of growth and remodeling in arteries, collagen synthesis and degradation, the biomechanical characterization of aneurysms, active smooth muscle tone and cerebral vasospasm was highlighted. The 6 lectures by G.A. Holzapfel, KTH Stockholm/TU Graz, focused on the mechanics of human arteries in health and disease, on structural quantification of collagen and related modelling, on collagen fiber remodelling in arterial walls and on the aortic dissection with a particular emphasis on the dissection properties of human arteries; experimental and numerical approaches were presented. Histological structure and function of the heart were covered (6 lectures) by P.J. Hunter from the University of Auckland in addition to presentation of the latest research on cellular electrophysiology, metabolic models, electromechanics (including myocardial activation), and 3D finite element modeling of the heart. Finally, information about the physiome project was presented with the particular emphasis on multi-scale modeling.

#### **d) Participants**

The course was attended by 98 participants (91 PhD students and postdoctoral researchers and 7 Professors) in mechanical and civil engineering, applied mathematics, physics, biomedical engineering, bioengineering, and material sciences, representing 23 countries.

#### **e) Publication of Proceedings of the Summer School**

The course notes will be published within the CISM Lecture Notes series (Springer-Verlag, Vienna). They are in an advanced stage of preparation.

#### **f) Financial support**

The summer school was sponsored by IUTAM and CISM

**Report composed by Gerhard A. Holzapfel and Ray W. Ogden**

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## **Reports of the IUTAM Working Parties**

### **WP-1 - Non-Newtonian Fluid Mechanics and Rheology**

No report submitted on WP-1.

### **WP-2 - Dynamical Systems and Mechatronics**

No report submitted on WP-2.

### **WP-3 - Mechanics of Materials**

A major re-alignment in the membership of WP-3 occurred after November 1, 2006. A new chair was elected by the General Assembly during its meeting at Brown University in August, 2006. Two new members of the Working Party have been approved by the Bureau. They are Olivier Allix (France) and Stelios Kyriakides (USA). Tatsuo Inoue (Japan) continues as a member of the WP-3. Additional members that will enhance the global representation are under consideration.

It is anticipated that the major activity of the Working Party during the coming year will focus on specific goals and its relationship with other Working Parties. In particular, there is apparent overlap with WP-4: Materials processing; WP-5: Computational fluid and Solid Mechanics; WP-6: Biomechanics; WP-7: Nano- and Micro-Scale Phenomena in Mechanics; WP-8; and Geophysical and Environmental Mechanics.

**Report composed by Carl T. Herakovich, Chair of WP-3**

### **WP-4 - Materials Processing**

No report submitted on WP-4.

### **WP-5 - Computational Fluid and Solid Mechanics**

The main computational mechanics event of 2006 was, on July 16-22, the 7th World Congress of the IACM (International Association for Computational Mechanics). This conference was a great success. About two thousand participants came, of whom 844 were from North America, 576 from Europe, 454 from Asia, 53 from South America, 18 from Australia and 9 from Africa (Cameroon: 2, Tunisia: 2, South Africa: 5). The 14 mini-symposia co-sponsored by IUTAM and IACM were officially designated by the organizers of the congress as sanctioned by the IUTAM through the cooperative

agreement between IACM and IUTAM. The next important meeting for the computational mechanics community will be the U.S. National Congress on Computational Mechanics, July 23-26, 2007 in San Francisco. Thus, the computational mechanics community has the opportunity to attend one international congress every year.

The 2006 meeting of WP5 took place on July 20th in Los Angeles during the 7th World Congress of IACM, with all the members but Y.K. Cheung present. Professor E. Arantes e Oliveira announced his retirement as chairman of WP5 and was cheerfully thanked for the great work he did.

The working party was pleased to see the success of its proposal to have mini-symposia co-sponsored by IUTAM and IACM. The members of WP5 would also like to see co-sponsored IUTAM-IACM symposia in which WP5 could intervene; the agreement process should be discussed with IUTAM and IACM.

Another question discussed in Los Angeles was what could be done to foster the scientific and technological development of the African continent, particularly Northern African countries and South Africa.

**Report written by Pierre Ladevèze, Chairman of WP-5**

## **WP-6 - Biomechanics**

2006 was a very successful year for the community of Biomechanics and Biomechanical Engineering with numerous high level conferences, meetings and workshops including the highlight namely the “5th World Congress of Biomechanics” which took place at The Munich University of Applied Sciences in June 2006 (Chair: D Liepsch, Munich). Most of the IUTAM members involved in biomechanics were present at this Congress. The World Congress of Biomechanics with about 2000 participants was the biggest event which ever took place in the history of biomechanics.

Biomechanics is a worldwide growing area, and biology and biochemistry is getting more dominant thereby. Activities within biomechanics are well appreciated within the whole theoretical and applied mechanics community, and reach good evaluations. For example, the activities of the bioengineering division of the Japan Society of Mechanical Engineering have a very high score by the evaluation committee of societies. The number of workshops on biomechanics organized by people with a background in mechanics, engineering or mathematics is increasing, and new positions in academia (from the assistant level to the level of a full professor) and industry have been established worldwide in 2006. Particularly the number of graduate students and young researchers are increasing rapidly and the class rooms are filled with young enthusiastic people who disseminate a stimulating atmosphere.

One specific example here mentioned was the 14th CISM-IUTAM Summer School on “Biomechanical Modelling at the Molecular, Cellular and Tissue Levels” held at the International Centre for Mechanical Sciences, Udine, Italy in September 2006 (Chair: GA Holzapfel, Graz University of Technology, Austria and Royal Institute of Technology (KTH), Sweden; Co-Chair: R Ogden, University of Glasgow, UK). The aim of the course was to present a state-of-the-art overview of biomechanical modelling at the molecular, cellular and tissue levels, with particular reference to nanostructures, cells, growth and remodelling, and the cardiovascular system. This included experimental, continuum mechanical and computational aspects. The course was overbooked and finally attended by 98 participants (91 PhD students and postdoctoral researchers and 7 Professors) in mechanical and civil engineering, applied mathematics, physics, biomedical engineering, bioengineering, and material sciences, representing 23 countries.

In the following selected events on Biomechanics are listed where IUTAM-members were involved. One category lists events devoted to Biomechanics, while another lists conferences, meetings and seminars which were not specifically devoted to biomechanics, but considered keynote or plenary lectures and MiniSymposia on Biomechanics. This category is here described in more detail.

#### **Conferences, meetings and schools devoted to Biomechanics:**

- *The 18th meeting of Bioengineering*, Bioengineering Division of the Japan Society of Mechanical Engineering, Niigata, Japan, January 13-14, 2006
- *The 29th Annual meeting of the Japan Society of Biorheology*, Fukuoka, Japan, June 15-16, 2006
- *2006 Summer Bioengineering Conference*, Amelia Island, FL, USA, June 21-25, 2006
- *5th World Congress of Biomechanics*, Munich, Germany, July 29 – August 4, 2006
- *14th CISM-IUTAM Summer School on Biomechanical Modelling at the Molecular, Cellular and Tissue Levels*, International Centre for Mechanical Sciences (CISM) in Udine, Italy, September 11-15, 2006
- *New Trends in Biomechanical Modelling: from Molecular Statistics to Continuum Mechanics*, hosted by the International Center of Mathematical Encounters, Castro Urdiales, Cantabria, Spain, September 25-29, 2006
- *Seminar on Computational Biomechanics*, organized by the SINTEF ICT and SINTEF Health Research, Trondheim, Norway, November 2, 2006

- *11th International Conference on Human Biomechanics 2006*, Hrotovice, Czech Republic, November 13-16, 2006
- *The 17th Biofrontier meeting, Bioengineering Division of the Japan Society of Mechanical Engineering*, Ueda, Japan, November 11-12, 2006
- *2nd GAMM Seminar on Continuum Biomechanics*, Freudenstadt-Lauterbad, Germany, November 22-24, 2006

**Conferences, meetings and seminars which were not specifically devoted to biomechanics, but which considered plenary or keynote lectures and MiniSymposia and sessions on Biomechanics:**

- *77th Annual Meeting of the Gesellschaft für Angewandte Mathematik und Mechanik (GAMM)*, Berlin, Germany, March 27-31, 2006  
One Young Researcher's MiniSymposia on "Nano-to-macro characterization of hard and soft biological tissues: The contribution of applied mechanics and mathematics".

One section (4 sessions) was devoted to Biomechanics

- o Arterial wall and blood circuit mechanics (5 talks)
- o Soft tissue biomechanics (4 talks)
- o Bone mechanics, growth and remodelling (5 talks)
- o Modelling and moving biological systems (6 talks)

- *British Applied Mathematics Colloquium, Keele University*, April 24-27, 2006  
MiniSymposium on "Nonlinear elasticity and nanotechnology in biomedical systems" – 6 talks (2 sessions)

Plenary lectures:

- o J Keener, University of Utah, USA, How cells make measurements
- o H Gao, Max Planck Institute, Stuttgart, Germany (now Brown University), Nanomechanics of biological materials
- o R Ogden, University of Glasgow, UK, Biomechanics of soft biological tissue: fibrous structure and arterial walls

- *3rd European Conference on Computational Mechanics. Solids, Structures and Coupled Problems in Engineering*, Lisbon, Portugal, June 5-9, 2006

Plenary lecture:

- o P Hunter, Auckland, New Zealand, Computational bioengineering

Keynote lectures:

- o GA Holzapfel, Graz University of Technology, Austria and KTH, Sweden, Mechanobiology: computation and clinical application
- o C Hellmich, TU Vienna, Austria, Computational micromechanics of biological materials: bone and wood

- 5 separate MiniSymposia on biomechanics related topics:
  - o Biomechanical simulations
  - o Computational biomechanics
  - o Modeling in mechanobiology
  - o Multiscale mechanics of biological materials and other natural composites
  - o Soft tissue
  
- *12th MAFELAP-Conference*, Brunel University, West London, June 13-16, 2006  
One MiniSymposium on “Computational multifield and multiscale methods in continuum biomechanics“
  
- *15th US National Congress of Theoretical and Applied Mechanics*, Boulder, 25-30 June 2006  
Plenary lecture:
  - o S Kim, Purdue University, USA, Future research in biomechanics
  
- 7 separate MiniSymposia on biomechanics related topics:
  - o Biological and biologically inspired materials (8 talks)
  - o Applications of mechanics to biological problems (16 talks)
  - o Biomechanics of tissues (11 talks)
  - o Cell and molecular mechanics (12 talks)
  - o Ecologically friendly materials (5 talks)
  - o Mechanics issues in bioengineering (9 talks)
  - o Mechanics of materials from nature (7 talks)
  
- *13th International Symposium on Applications of Laser Techniques to Fluid Mechanics*, Lisbon, Portugal, 26-29 June, 2006  
Keynote lecture:
  - o K Tanishita, Keio University, Japan, Transport phenomena in the cardiovascular system related to vascular diseases
  
- *International Symposium on Trends in the Applications of Mathematics to Mechanics*, Vienna, July 10-14, 2006  
Plenary lecture:
  - o R Ogden, University of Glasgow, UK, Application of nonlinear elasticity theory to the biomechanics of soft biological tissues, with particular reference to arterial walls
  
- 2 sessions on Biological/Smart materials and Systems (6 talks)
  
- *13th International Heat Transfer Conference*, Sydney, August 13-18, 2006  
Keynote lecture:
  - o K Tanishita, Keio University, Japan, Oxygen transfer in the cerebral tissue

- *43rd Annual Meeting of the Society of Engineering Science*, Penn State University, August 2006
  - o 2nd symposium on mechanics of soft materials and soft tissues (5 sessions, 20 talks)
  - o Modeling and characterization of biological materials and biomaterials (3 sessions, 12 talks)
  
- *6th European Solid Mechanics Conference*, Budapest, Hungary, August 28 – September 1, 2006  
Plenary lecture:
  - o GA Holzapfel, Graz University of Technology, Austria and KTH, Sweden, Constitutive modeling of soft biological tissue: applications to arterial walls

One MiniSymposium on biomechanics (6 talks) and one session on biomechanics (8 talks)
  
- *IUTAM Symposium on Discretization Methods for Evolving Discontinuities*, Lyon, France, September 4-7, 2006  
A few lectures were devoted to biomechanics related topics
  
- *19th Nordic Seminar on Computational Mechanics*, Lund University, Sweden, October 20-21, 2006  
Keynote lecture:
  - o GA Holzapfel, Graz University of Technology, Austria and KTH, Sweden, Rupture analysis for human atherosclerotic plaques

Four sessions on biomechanics

**Report composed by Gerhard A. Holzapfel, Chairman of WP-6**

### **WP-7 - Nano- and Micro-Scale Phenomena in Mechanics**

No report submitted on WP-7.

### **WP-8 - Geophysical and Environmental Mechanics**

No report submitted on WP-8.



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**WP-9 - Education in Mechanics and Capacity Building**

WP-9 looks after several important areas in education and capacity building that serve as IUTAM's "service interface" to the outside world and to other scientific communities.

The Working Party has been reconstituted with H. Aref as chair.

Prof. M. Hassan (Sudan) has left the WP due to the pressures of other business, and Dr. I. Gledhill (South Africa) has joined. Currently, Prof. Yilong Bai (China) is phasing out and will be succeeded by Prof. Haiyan Hu (China). The WP is looking to add a member with expertise on the issues of South America.

While the WP has been somewhat inactive during the past year due to a change in membership, it was clear from discussions at the GA in Providence that several of the initiatives IUTAM is contemplating (e.g., the notion of associate membership) would be in areas under the purview of this WP. It was felt that aligning IUTAM's and WP-9's activities with ICSU initiatives in education and outreach would be wise. In particular, the establishment of new regional offices for ICSU should inform IUTAM investments in the area of outreach.

**Report composed by Hassan Aref, Chairman of WP-9**

## Summary Record of the General Assembly Meeting 2006

Summary Record of the General Assembly of IUTAM in Providence, Rhode Island, USA, on 12 and 13 August 2006.

The General Assembly of IUTAM convened in Room 001 of the Salomon Building on the Brown University Campus.

The schedule of sessions was as follows:

### Saturday 12 August 2006

14.00 – 17.30 h: General Assembly: 1st session

### Sunday 13 August 2006

10.00 – 12.00 h General Assembly, Lectures

10.00 – 10.50 h H. Gao – Multiscale cohesive laws: Inspiration from hierarchical adhesion systems in nature

10.50 – 11.10 h Break

11.10 – 12.00 h G. Karniadakis – Predictability and uncertainty in computational mechanics

14.00 – 17.30 h: General Assembly: 2nd session

### Attendance:

#### *Members with voting rights:*

A. Acrivos (USA, Member-at-Large), H. Aref (USA), Y. Bai (China), T. Belytschko (USA), A. Benallal (France), L. Bevilacqua (Brazil), B. Boley (USA, Member-at-Large), R. de Borst (Netherlands), P. Boulanger (Belgium), D. van Campen (Netherlands), N. Cristescu (Romania), J. Denier (Australia), L. Dias (France), J. Dual (Switzerland), P. Eberhard (Germany), J. Engelbrecht (Estonia), B. Freund (USA), I. Gledhill (South Africa), I. Goldhirsch (Israel), N.K. Gupta (India), W. Gutkowski (Poland), D. Henningson (Sweden), C. Herakovich (USA), S. Kaliszky (Hungary), T. Kambe (Japan), B. Karahaloo (UK), A. Kluwick (Austria), G. Leal (USA), B. Lundberg (Sweden), C. Ma (China Taipei), G. Maier (Italy), K. Moffatt (UK), Z. Momeh (Egypt), P. Monkewitz, M. Morozov (Russia), M. Määttänen (Finland), F. Niordson (Denmark, Member-at-Large), N. Olhoff (Denmark), P. O'Donoghue (Ireland), J. Paavola (Finland), T. Pedley (UK), P. Podio-Guidugli (Italy), W. Schiehlen (Germany, Member-at-Large), S. Shrivastava (Canada), T. Tatsumi (Japan, Member-at-Large), E. Tuck (Australia), G. Turkalj (Croatia), E. Watanabe (Japan), G. Weir (New Zealand), W.C. Wang (China-Taipei), L. van Wijngaarden (Netherlands, Member-at-Large), W. Yang (China), A. Zaoui (France), Z. Zheng (China)

*Non-voting observers:*

J. Achenbach (USA; chair Solid Mechanics Panel), D. Barthes-Biesel (France, chair WP-6), S. Crandall (USA; repres. of ICA), M. Crocker (USA; repres. of IIAV), G. Rozvany (Hungary; repres. of ISSMO), B. Schrefler (Italy, repress. Of CISM)

*Members with voting rights represented by proxies:*

O. Bostrom (Sweden), represented by Lundberg  
E. Cui (China), represented by Z. Zheng  
E. Dick (Belgium), represented by F. Boulanger  
J. Hansen (Canada), represented by S. Shrivastava  
M. Hayes (Ireland), represented by D. van Campen  
Ph. Hodge (USA, Member-at-Large), represented by B. Freund  
T. Kobayashi (Japan), represented by T. Kambe  
W. Knauss (USA), represented by T. Belytschko  
C. Miehe (Germany), represented by P. Eberhard  
S. Savage (Canada), represented by S. Shrivastava  
W. Schröder (Germany), represented by P. Eberhard  
A. van Steenhoven (Netherlands), represented by L. van Wijngaarden  
V. Tamuzs (Latvia), represented by J. Engelbrecht  
A. Thess (Germany), represented by P. Eberhard  
K. Uetani (Japan), represented by T. Kambe  
D. Vandepitte (Belgium), represented by F. Boulanger  
F. Ziegler (Austria, Member-at-Large), represented by A. Kluwick

**Agenda Saturday 12 August 2006, 14.00 – 17.30 h**

1. Opening of the meeting by the President  
Minutes of the General Assembly in Warsaw (Poland), on 17 and 18 August 2004  
(Report 2004, pp. 81-107)
2. Report by the Secretary-General
3. Report by the Treasurer on financial matters
4. Preliminary discussion on annual dues
5. Report by the Secretary of the Congress Committee
6. Matters concerning Adhering Organizations
  - 6.1. Serbia and Montenegro
  7. Matters concerning Affiliated Organizations
    - 7.1. ICA (International Commission for Acoustics)
8. Reports and preliminary discussions on Working Parties
  - 8.1 Chair Reports on the Working Parties
  - 8.2 Change of Chairpersons of several Working Parties
9. Report on relations with ICSU
10. Matters concerning Inter-Union Committees
11. Matters concerning non-ICSU organizations
12. Preliminary discussion on Associate Membership
13. Proposal for Electoral Committee

14. Preliminary discussion on future IUTAM Symposia. Reports from Symposia Panels
15. Preliminary discussion on future International Summer Schools on Mechanics
16. Proposal for an extra IUTAM Summer school in 2007
17. Preliminary discussion on appointment terms of members of Symposia Panels

Agenda Sunday 13 August 2006, 14.00 – 17.30 h

18. Continued discussion and final decision regarding future IUTAM Symposia
19. Continued discussion and final decision regarding future International Summer Schools on Mechanics
20. Continued discussion and final decision regarding annual dues
21. Continued discussion and final decision regarding Working Parties
22. Continued discussion and final decision regarding Associate Membership
23. Election of members of the Electoral Committee
24. Election of members of the Congress Committee of IUTAM
25. Continued discussion and final decision on appointment terms of members of Symposia Panels, including election of one new member on each Panel
26. Date and venue of the next General Assembly
27. Any other business

## **Proceedings of the General Assembly**

### **Item 1 – Opening of the meeting by the President**

The President, Professor L.B. Freund, greeted all members and observers welcome. The Participants were also welcomed by Dr. Clyde Briant, Vice-President of Research at Brown University and former Dean of Engineering.

Then, the President formally opened the meeting and welcomed in particular four past Presidents of IUTAM: Professors K. Moffatt, F. Niordson, W. Schiehlen and L. van Wijngaarden.

The minutes of the General Assembly held in Warsaw, Poland, in 2004 were adopted.

### **Item 2 – Report by the Secretary-General**

The Secretary-General, Professor D.H. van Campen, submitted the following report to the General Assembly on the activities of IUTAM since the last General Assembly in Cambridge, USA, on 17 and 18 August 2002:

Mr. President, Dear Colleagues,

Two years have passed since our last General Assembly in Warsaw, Poland. During that time I have had the sad duty of recording the deaths of two of our distinguished colleagues and friends who have served our Union. May I ask all of you to stand in honor of our deceased, while I read their names.

Professor Isao Imai (read by Professor Tomomasa Tatsumi).

Professor Isao Imai passed away on 24 October 2004, at the age of 90 by cardiac insufficiency. He was born in 1914 in Ta-lien (now Lu-ta), China, and grew up in Kobe, Japan. He graduated from the University of Tokyo in 1936 and started his academic career in the Department of Physics, Faculty of Science, of the same University. At that time 1936, "Fluid Mechanics" was in a brilliant state of innovation. Classical "Hydrodynamics" had already been in a deadlock, and new research fields such as "High-speed aerodynamics", "Boundary layer theory" and "Statistical theory of turbulence" had opened a new era of "Modern Fluid Dynamics".

Professor Imai's early works on "Wing theory of arbitrary cross-section", "Transonic similarity of high-speed flows" and "Theory of slow viscous flows" are all excellent contributions to these "Modern Fluid Dynamics". In recognition of these outstanding achievements, he has been awarded "The Prize of Japan Academy" together with "The Imperial Award" in 1959.

One can easily recognize that prominent feature of Professor Imai's works lies in their physical generality and mathematical elegance. These characteristic features of his research have been further extended to new research fields, like "Magneto Hydrodynamics (MHD)" and "Generalized Functions". Actually, his contributions to these subjects have resulted in the basic reformulation of the theories of "Electromagnetism" and "Hyper-function" from the view point of "Fluid Dynamics".

Professor Imai's activity has also been displayed in several administrative posts of academic institutions such as "President of the Japan Physical Society", "President of the Japan Society of Fluid Mechanics", "Vice-President of the International Union of Pure and Applied Physics (IUPAP)", and "Member of the Bureau of IUTAM". In Appreciation of these academic services, he has been honored as the "The Person of Distinguished Services in Culture" in 1979 and awarded "The Order of Cultural Merit" in 1988 and "The First Order of Merit" in 1992.

The last day of Professor Imai's life unexpectedly came just two days before the opening of the IUTAM Symposium on "Elementary Vortices and Coherent Structures: Significance in Turbulence Dynamics", held from 26-28 October 2004 in Kyoto, to which his presence had been expected. During the Opening Session of the Symposium, a tribute to him has been paid by Professor Keith Moffatt, President of IUTAM at that time, and a silent prayer has been offered to him by all participants of the Session.

Professor Wladyslaw Fiszdon of Poland died on 25 October 2004. He received his aviaional engineering education at the Sorbonne University and the Ecole Nationale Superieure de l'Aeronautique in France, and subsequently obtained exceptional professional experience in the UK during the Second World war.

Professor Fiszdon was internationally recognized for his many scholarly contributions to a variety of fields including the interaction between oscillatory shock wave and boundary layer, flows in rarefied gases, the mechanics of liquid helium along with the formation of vortices, and the evolution of heat pulses with a special fascination for the problem of quantum physics.

Professor Fiszdón was Vice-Rector of the Warsaw University and also a member of the Presidium of the Polish Academy of Sciences.

He organized a series of Biennial Symposia on Advanced Problems and Methods in Fluid Mechanics, which attracted the international elite of Eastern and Western countries in a period when the possibility of co-operation between scientists from countries of both blocks was limited.

Professor Fiszdón was Member-at-Large of IUTAM since 1992. He will be missed by his friends and the scientific community for his spirit and passion for work along with his scientific contributions.

Our sympathy and grateful thoughts for what they did for our Union go to their families and their nations.

#### *Adhering Organizations*

There are now 49 Adhering Organizations.

Following a decision taken by the previous General Assembly in Warsaw, the membership of Morocco has been suspended.

In the past year there have been contacts with Armenia and Lithuania, which might result in the establishment of an Adhering Organization there.

#### *Affiliated Organizations*

The reports presented by the Affiliated Organizations in the past two years are included in the IUTAM Reports 2004 and 2005.

The developments with respect to CACOFD and ICA will be addressed under item 7 of the agenda. Some additional matters concerning the Affiliated Organizations are mentioned below.

#### *Representation with Affiliated Organizations*

*AFMC.* The Bureau appointed Prof. Heng Zhou, past Vice-President of AFMC and professor at Tianjin University, Tianjin, China, as the new representative of IUTAM in AFMC. He succeeds Professor Isao Imai in this capacity.

*CISM.* Since 1985 Professor Leen van Wijngaarden has represented IUTAM in CISM. He has informed the Bureau that time has come to be replaced in this capacity. The Bureau appointed Prof. Keith Moffatt as the new representative of IUTAM in CISM.

#### *Working Parties*

Following the decisions taken by the previous General Assembly, the Bureau has implemented the principle of rotating chairmanship within the existing membership of the WPs. The consequences will be dealt with under item 8 of the agenda.

#### *Symposia and Summer Schools*

There were nine IUTAM Symposia in 2004, which were all attended well. The average attendance was 70. Additionally, there was one Summer School in 2004, in Beijing, China, with over 90 participants. In 2005 there were five IUTAM Symposia,

which were all attended well. The average attendance was 63. That year, there was one Summer School, in CISM, Udine, with more than 50 participants.

On request by the organizers, two Symposia from the 2004/2005 package have been shifted to 2006.

For 2006 nine IUTAM Symposia are being organized, whereas seven Symposia are scheduled for 2007.

#### *Sponsorship*

The Bureau agreed to co-sponsor without financial support the Fifth International Conference on Nonlinear Mechanics, which will be held in Shanghai, China, from 11-14 June 2007.

For this event the procedure for co-sponsoring by IUTAM of non-IUTAM events as set by the Bureau has been applied.

#### *Closure of Assessment Actions*

Following a decision by the previous General Assembly, a letter has been written to the Assessment Panel, indicating that the assessment actions have been closed and thanking the Panel, and in particular its Chairman and Secretary, for their valuable work.

#### *IUTAM website*

The IUTAM website continues to run smoothly and it is of great help to the Secretary-General. The major website developments over the past two years have been described in the IUTAM Newsletters. Besides keeping the List of Addresses, the Events Calendars and the data on the Adhering Orgs, the Affiliated Orgs and the Working Parties up to date, these developments mainly are related to the implementation of the decisions taken by the previous General Assembly and the restructuring of a number of web-pages.

#### *IUTAM Newsletter*

The revived IUTAM Newsletter is appearing twice a year since 2002.

#### *Publications*

After some transition problems related to the merger from Kluwer with Springer, the publication of Symposia Proceedings is gradually running smoothly. The after-sales of the Symposia Proceedings are developing favorably.

Currently, I am investigating with the representative of Springer if the Symposium Proceedings can be brought into the Science Citation Index.

D.H. van Campen, Secretary-General

The report by the Secretary-General was adopted.

The President thanked the Secretary-General for his report.

**Item 3 – Report by the Treasurer on financial matters**

The Treasurer, Professor J. Engelbrecht, submitted the following report to the General Assembly.

Mr. President and colleagues in the General Assembly,

With reference to the Accountants's Report 2005, IUTAM's assets as of 31 December 2005 stood at 411,920 USD. This reflects of a budget surplus of 16,704 USD for the year that was accompanied by the loss from the translations of other currencies (euros), so the final excess of cash revenues collected over expenses paid was 3,254 USD. This however balanced our previous gains from such transactions.

The main source of revenue for the Union is subscription dues. Adhering organizations which are represented in the General Assembly continue to pay dues on a more or less regular schedule. The total income from dues in 2005 was 95,744 USD which included also 19,042 USD for the previous years. In 2006, the sum of dues collected as of June 30, is 64,233 USD which is about 65% of the total sum of 99,216 USD. Regrettably, there are a small number adhering organizations for which dues are seriously in arrears. Several other Unions in the ICSU family are more strict with such cases. I propose to the General Assembly that in the future we shall add to the invoices the request to transfer the dues before June 30 of the current year.

The cash reserves of the Union earned interest in the amount of 5,319 USD in 2005 (cf 5,761 USD in 2004). This amount is derived from saving accounts in banks in the United States and in the Netherlands.

The level of support of symposia and summer schools sponsored by the Union has been 5,000 USD per such event. During 2005, awards were provided to four symposia and one summer school. A grant of 15,000 USD is still earmarked for ICTAM 2008 from closing accounts of ICTAM 2004 as a seed money but not still paid (see financial report in 2004). In 2006, three symposia and one summer school were awarded as of June 30.

The cost of travel for members of the Bureau and of the Executive Committee of the Congress Committee totalled 34,430 USD for 2005, influenced by the distance to the venue of the ICTAM 2008.

The cost of the administration is principally the cost of operating the office of Secretary General and totalled 23,475 USD in 2005. This is considerably less compared to the cost during the previous years.

The financial records of the Union are subject to an audit by an independent accounting firm each year. In recent years, this audit has been conducted by UWP UNITREU GmbH in Eschborn, Germany with great care and helpfulness. A formal



report and certification was submitted to ICSU by March 15th as expected. IUTAM also pays annual dues (2704 USD in 2006) to ICSU as a scientific member.

The amount shown as bank fees represents per transaction costs charged by banks for receiving dues payments, arranging symposium awards and conducting other business. These fees have been pretty stable, except in 2004 due to the ICSU grant.

In summary, the financial state of the Union has remained stable for some years. The successful ICTAM 2000 and ICTAM 2004 have given a good surplus to the accounts of the Union. The incomes of the Union during the last years have exceeded the expenses, which gives a confidence for the future.

Finally, it is a pleasure to acknowledge the help and advice provide by assistant treasurers Professor Ben Freund and Professor Dick van Campen. The accounting tables introduced by the previous Treasurer professor Ben Freund make the accounting very clear and efficient.

Respectfully submitted,  
J. Engelbrecht, Treasurer

The report by the Treasurer was adopted.  
The President thanked the Treasurer for his report.

Prof. L. van Wijngaarden questioned about how to deal with countries that are in arrears for several years. The President responded that there is an established procedure to deal with this. The Treasurer starts to discuss this with the local contact person and the Representative of the country in the General Assembly. If this does not help, then the Secretary-General sends a formal letter to the Adhering Organization, indicating that their membership is at risk.

Prof. B. Schrefler asked what happens if a country is suspended and re-applies after, e.g. ten years. The Treasurer and the President responded that it is usually another group that re-applies, whereas there may sometimes be political changes in the country at hand. All of this results in a completely new start.

Prof. A. Acrivos urged the Bureau to get more interest out of the saving accounts.

#### **Item 4 – Preliminary discussion on annual dues**

Following his report the Treasurer led a brief discussion on the annual dues as follows:

The annual dues are based on the average OECD-index. The latest OECD figures as of May 2006 show an increase of consumer prices in the OECD area by 2.6%- 2.8%, being certainly different for different countries. In the USA, for example, the CPI increased

over 3%, while in Japan the increase has been considerably less (0.3%-0.4 %). The trend is increasing after the minimum in 2004 (less than 2%).

Our dues have developed as follows (see previous reports):

year	2004	2005	2006	2007
dues, USD	656	670	676	696

The increase of dues has been less than the OECD-index but they have followed an almost linear increase except in 2003-2004, when due to the Euro-zone difficulties it was decided to keep the level of the 2003 dues for 2004.

Based on the general trends, the Treasurer proposed to increase the dues for 2008 with 2% to 710 USD and those for 2009 with a further 2.2% to 726 USD. For those adhering organizations who prefer paying in equal amounts, the dues for 2008 and 2009 are then 718 USD.

*It was noted that the final decision regarding annual dues would be made in the second session of the General Assembly, see item 20 below.*

Prof. B. Boley and W. Schiehlen remarked that IUTAM has been quite restrictive with respect to the number of Symposia and that, given the current financial situation, there could be somewhat more flexibility in this respect. Then, the quality of the proposals could play a role in deciding on their acceptance.

The Treasurer agreed with this viewpoint.

### **Item 5 – Report by the Secretary of the Congress Committee**

The Secretary of the Congress Committee, Professor T.J. Pedley, submitted the following report:

Mr President and Colleagues,

It is my job at this point to report to you on the progress of the planning and preparations for the 22nd ICTAM in Adelaide, Australia, 24-30 August 2008, and in particular to tell you of the decisions made by the Congress Committee (CC) at its meeting yesterday morning.

1. First, I can report that the Local Organizing Committee (LOC), led by the Congress President, Professor Ernie Tuck, and its Secretary-General, Dr. Jim Denier, has everything well in hand for the 22nd ICTAM. The Executive of the Congress Committee (XCCC) visited Adelaide in August 2005 and were very pleased with the facilities, and the full CC was impressed by the LOC's report yesterday. Many of you will have visited the Congress website (<http://ictam2008.adelaide.edu.au>) where the preliminary announcement is posted. The structure of the Congress will be the same as the 21st ICTAM in Warsaw.

2. The first item for the CC's decision was to select opening and closing lecturers, from a shortlist prepared by the XCCC from a large number of suggestions sent in by members of the CC, the GA and other relevant bodies. The results of the CC vote was to

as Opening Lecturer: Professor John Hutchinson (USA)

as Closing Lecturer: Professor Jörg Imberger (Australia)

3. At its meeting in 2005, the XCCC selected 6 topics for Mini-symposia, which are given below with the names of those who have agreed to serve as co-Chairs. The co-Chairs will be arranging for three one-hour introductory lectures in each Mini-symposium.

*Mini-symposia*

*MS 01. Cohesive zone models of fracture and failure*

Co-chairs:

Professor A. Carpintieri (Italy)

Professor T. Siegmund (USA)

*MS 02. Multi-component materials - modeling on different scales*

Co-chairs:

Professor H. Petryk (Poland)

Professor F. Rose (Australia)

*MS 03. Dynamics and control of walking*

Co-chairs:

Professor F. Pfeiffer (Germany)

Professor H. Yabuno (Japan)

*MS 04. Classical and quantum vortex rings*

Co-chairs:

Professor H. Aref (USA)

Professor C. Barenghi (UK)

*MS 05 Fluid dynamics of animal swimming and flying*

Co-chairs:

Professor J. Blake (UK)

Dr. J. Wang (USA)

*MS 06 Mechanics of colloidal Systems*

Co-chairs:

Dr. D. Langevin (France)

Professor P. Pusey (UK)

4. The CC also selected the names of 17 scientists who will be invited to give Sectional Lectures, with a number of reserves. These names are given below. My own most urgent job after this meeting is to issue invitations to all Sectional Lecturers, because we wish to include their names on the First Announcement of the Congress, to be produced during October or November of this year.

*Sectional Lecturers*

*Solids*

H.F. Durrant-Whyte (Australia)  
 N.A. Fleck (U.K.)  
 N.K. Gupta (India)  
 J.W. Rudnicki (USA)  
 N. Sottos (USA)  
 P. Wriggers (Germany)

*Fluids*

W.-R. Hu (PR China)  
 F. Hussain (USA)  
 D. Lohse (Netherlands)  
 D. Quéré (France)  
 J.N. Sorensen (Denmark)  
 T. Yamagata (Japan)

*Fluids/Solids*

D. Bigoni (Italy)  
 S. Hilgenfeldt (USA)

*Fluids/Solids (cont.)*

O. Jensen (UK)  
 O. Pouliquen (France)

5. Next I should report that the CC has also selected the names of those to be invited as (equal) co-chairs of all 48 Prenominated Sessions (PNS), with one reserve in each case.
6. Following the procedure adopted in Warsaw, the CC is to allow the Co-chairs of Mini-Symposia to invite a maximum of three regular speakers, to go into contributed lecture slots, in addition to the introductory lecturers, without the possibility of being over-ruled by the International Papers Committee.  
 As a new feature the PNS co-Chairs will be allowed to invite a maximum of two regular speakers, to go into contributed lecture slots, without the possibility of being over-ruled by the International Papers Committee.
7. I should announce to the GA that we have had bids to host ICTAM 2012 from the cities of Montreal, Canada and Beijing, China, and the CC heard excellent presentations from representatives of both these cities. I have also had an indication that a bid will come from Edinburgh, UK. The CC will make a decision on the venue for the 2012 Congress during the Adelaide Congress.
8. Finally, the CC has drawn up a shortlist of candidates for election by the GA to serve on the CC in place of those who have come to the end of their terms. There are 7 people who have served just one four-year term on the CC, and they should be re-elected automatically. These are Professors T. Belytschko (USA), D.E. Beskos (Greece), F. Ellyin (Canada), M.A. Hayes (Ireland), E.J. Kreuzer (Germany),

E.O. Tuck (Australia), M.G. Veklarde (Spain). However, Prof. Belytschko has indicated that he is not available to serve for a second term. The General Assembly is asked to confirm the re-election of the others.

There are 6 CC members who have served more than one term and who would normally retire from the CC. These are Professors N.A. Fleck (UK), A. Kluwick (Austria), V.V. Kozlov (Russia), B.A. Schrefler (Italy), K. Sobczyk (Poland), E. Wayanabe (Japan). However, Prof. Kluwick is on the IUTAM Bureau and Prof Schrefler is on the XCCC, so both should be re-elected automatically. I am sure we would like to record our gratitude to the remaining retiring members for their cooperation in the work of the CC over at least 8 years.

Members of the GA have to vote for 5 from a shortlist of 11 candidates.

T.J. Pedley, Secretary Congress Committee

The report by the Secretary of the Congress Committee was adopted.  
The President thanked the Secretary for his report.

#### **Item 6 – Matters concerning Adhering Organizations**

##### 6.1. *Serbia and Montenegro*

Recently, the Bureau has been informed that, by a decision of their Assembly, the name of the Yugoslav Society of Mechanics has been changed into Serbian Society of Mechanics. In fact, this change is due to the political changes in Serbia and Montenegro, whereas the group of scientists involved remains the same.

*It was agreed to accept the Serbian Adhering Organization under the new name.*

#### **Item 7 – Matters concerning Affiliated Organizations**

##### 7.1. *CACOFD*

During the Bureau meetings in Warsaw (August 2004) and Adelaide (August 2005) the current scope of CACOFD has been discussed. It was concluded that this scope is too small and that CACOFD should include both fluids and solids in its scope, whereas it should also expand to cover the Latin-American region. Following those discussions, CACOFD is in the process of transforming itself into a new organization, to be named LACCOTAM: Latin American and Caribbean Congress of Theoretical and Applied Mechanics. In 2008 LACCOTAM wants to organize its first Congress under the new name. The Secretary-General has received a written report on the transformation of CACOFD to LACCOTAM including the proposed Statutes of LACCOTAM. This report has been enclosed in the material distributed to the General Assembly prior to the meeting.

*It was agreed to support the transition from CACOFD to LACCOTAM, provided this transition is supported by the Adhering Organizations from the Latin American countries Argentina, Brazil and Chile through their representatives. The Secretary-General should write letters on this matter to the representatives from these Adhering Organizations.*

7.2. *ICA (International Commission for Acoustics)*

ICSU has informed the Secretary-General that last year ICA applied for admission as Scientific Union Member of ICSU. The Executive Board of ICSU did not feel that this was appropriate but suggested that they would view favourably an application from ICA for Scientific Associate status so long as no objections were received and the requisite letters of support subsequently obtained.

Professor S. Crandall, the representative of ICA in IUTAM, presented some transparencies with facts and figures on the case.

The President pointed out that the Bureau proposes to the General Assembly to support the application from ICA for Scientific Associate status within ICSU.

*The General Assembly agreed by substantial majority to support the application of ICA for Scientific Associate Status within ICSU. The Secretary-General should inform ICSU on this.*

**Item 8 – Reports and preliminary discussion on Working Parties**

8.1. *Reports on the Working Parties*

The Secretary-General has received reports from the WPs 1, 3, 5, 6, 7, 8 and 9. Last year the WP-2 produced an extensive status report. All reports mentioned have been enclosed to the material distributed to the General Assembly.

Professor L. van Wijngaarden remarked that he feels that IUTAM does not take advantage of the Working Parties to a sufficient extent. Most Working Parties are doing an excellent job. Because the Working Parties are active in tracing new fields, they should also give recommendations on topics for Symposia, sectional lectures at ICTAMs, etc.

The President pointed out that this was originally meant to be one of the key issues for Working Parties and that it is important that Working Parties are taking initiatives in this.

8.2. *Change of Chairpersons of several Working Parties*

The Chairpersons of the WP-1 (Non-Newtonian Fluid Mechanics and Rheology), WP-3 (Mechanics of Materials), WP-5 (Computational Fluid and Solid Mechanics) and WP-9 (Education in Mechanics and Capacity Building) have informed the Secretary-General that they wish to resign in this capacity. This is

mostly in agreement with the principle of rolling chairmanship, approved during the previous General Assembly in Warsaw.

It is to be noted that over the past year Prof. H. Aref has kindly accepted to be “acting chair” of the WP-9, in this way providing a connection to the Subcommittee on Associate Membership, see item 12 of the Agenda.

The Bureau has prepared a proposal for new Chairpersons for these WPs. Additionally, and also in agreement with the principle of rolling chairmanship, the Bureau has prepared a proposal for a change of the chair position of the WP-6 (Biomechanics).

*It was noted that the decision regarding the above proposals would be made in the second session of the General Assembly, see item 21 below.*

### **Item 9 – Report on matters relating to ICSU**

The President reported that IUTAM was represented at the 28th ICSU General Assembly (held in Suzhou, China, from 18-21 October 2005) by the Vice-President and Professor Yilong Bai. Their report has been enclosed in the material distributed to the members of the General Assembly.

The Vice-President presented a summary report with the main topics discussed during the ICSU General Assembly, all of those being related to the strategic plan of ICSU for the period 2006-2011. The following topics are of particular interest to IUTAM:

- (1) Mission statement of ICSU: Strengthening international *Science* for the benefit of *Society*. An important aim of the strategic plan is to generate greater comprehension of science by society.
- (2) Universality of Science and Capacity Building seeks to ensure non-discrimination and equity of opportunity, as well as the building of capacities of countries, especially those in the developing world. Here, ICSU decided to close the Committee on Science and Technology in Developing Countries (COSTED) in 2002 and, subsequently, to set up four Regional Offices for the developing world. Through its involvement in AIMS, IUTAM is highly visible in the African region, whereas in the Asian region our Affiliated Organization AFMC is expected to play an important role. It is expected that for the Caribbean and Latin American region, the new organization LACCOTAM, evolving from our Affiliated Organization CACOFD, will become important. Last but not least, our Working Party No. 9 on Education in Mechanics and Capacity Building has been set up to become the focal connecting body between IUTAM and these regional organizations.
- (3) Environment, Sustainable Development and Renewable Energy. This topic fits well within the scope of our Working Party No. 8 on Geophysical and Environmental Mechanics. It is to be noted that among the activities approved by ICSU is the International Polar Year 2007/2008. A proposal for co-sponsorship by IUTAM of a summer school in this field will be discussed under item 16 of the agenda.

(4) The ICSU Grants Programme is currently under review. In case ICSU will be able to provide funding for the 2008 Grants Programme, IUTAM ought to be prepared to submit a proposal for this Programme.

The President thanked the Vice-President for his report.

On request by the President, Dr. I. Gledhill presented a short survey on the needs with respect to Capacity Building from the side of the developing countries. It appears that for Capacity Building besides the more traditional symposia other types of events like summer schools, workshops, post-doctoral programs, fellowships, exchange programs and student conferences might also be of importance. Here, the support and presence of well-known colleagues, acting as supervisors/mentors, can foster links.

#### **Item 10 – Inter-Union Committees and Commissions**

Nothing to report

#### **Item 11 – Matters concerning non-ICSU organizations**

Nothing to report

#### **Item 12 – Preliminary discussion on Associate Membership**

It was agreed to postpone this item to the second session and to combine it with item 22.

#### **Item 13 – Proposal for Electoral Committee**

The President presented a slate of names for the Electoral Committee which had the approval of the Bureau. Election is reported under item 23.

#### **Item 14 – Preliminary discussion on future IUTAM Symposia**

The Secretary-General had received 24 proposals for IUTAM Symposia in 2008/2009, listed below.

- F.1 *150 Years of Vortex Dynamics* (Lyngby, Denmark)
- F.2 *Turbulence in the Atmosphere and Oceans* (St. Andrews, UK)
- F.3 *The Physics of Wall-Bounded Turbulent Flows on Rough Walls* (Cambridge, UK)
- F.4 Moved to Solids Proposals
- F.5 *New Horizons in Compressible Turbulence* (Poitiers, France)
- F.6 *Laminar-Turbulent Transition* (Stockholm, Sweden)
- F.7 *Non-Spherical Particle Aerodynamics* (Aalborg, Denmark)
- F/S.1 *System Identification Using Feed-Forward Neural Networks* (Kanpur, India)
- F/S.2 *Mathematical Modeling and Physical Instances of Granular Flows* (Reggio Calabria, Italy)
- F/S.3 *First LACCOTAM Conference* (Margarita)
- S.1 *The Vibration Analysis of Structures with Uncertainties* (St. Petersburg, Russia)



- S.2 *Modelling Nanomaterials and Nanosystems* (Aalborg, Denmark)
- S.3 *Recent Advances of Acoustic Waves in Solids* (China-Taipei)
- S.4 *Emerging Trends in Rotor Dynamics* (New Delhi, India)
- S.5 *Multi Functional Material Structures and Systems* (Bangalore, India)
- S.6 *Progress in the Theory and Numerics of Configurational Mechanics*  
(Kaiserslautern, Germany)
- S.7 *Cellular, Molecular and Tissue Mechanics* (Ann Arbor, USA)
- S.8 *Dynamic Fracture and Fragmentation* (Albuquerque, USA)
- S.9 *Mechanics Modeling of Nanomaterials and Systems*  
(College Station, TX, USA)
- S.10 *Pure and Applied Nonlinear Dynamics in Mechanics*  
(College Park, MD, USA)
- S.11 *Variational Concepts with Applications to the Mechanics of Materials*  
(Bochum, Germany)
- S.12 *Theoretical, Modelling and Computational Aspects of Inelastic Media*  
(Rondebosch, South Africa)
- S.13 *Continuum Mechanics at Micro- and Nano-scale: How small can it go?*  
(Aberdeen, Scotland)
- S.14 *Multiscale Modelling of Fatigue, Damage and Fracture in Smart Materials Systems* (Freiberg, Germany)
- S.15 *Modelling of Microstructured Materials* (Loughborough, UK)

These proposals had been reviewed by the two Symposia Panels. All proposals and the preliminary reports of the Panels had been enclosed in the material distributed to the members of the General Assembly. During a joint meeting of the Symposium Panels in Providence, Rhode Island, USA, on 11 August 2006, the proposals had been grouped into three categories according to the system used since 1978.

The recommendations of the two Panels were reported by Prof. D. Henningson, replacing the Chairman of the Fluids Symposia Panel, and Prof. J.D. Achenbach, Chairman of the Solids Symposia Panels.

*It was agreed to accept altogether no more than 16 Symposia for the years 2008 and 2009.*

Professor G. Leal suggested that in future requests for proposals it should be pointed out that, if the proposer has submitted a similar proposal for consideration at a previous General Assembly, it should be made clear somehow in what respect the proposal is different.

Professor Niordson explained that with respect to the ranking of the proposals the General Assembly decided already long ago that in the first session members of the General Assembly are enabled to move one or more of the proposals ranked A to the B category, whereas moving proposals ranked B to the A category is not possible.

After preliminary discussion the proposals coded F.1, F.2, F.3, F.6, S.1, S.3, S.4, S.6, S.7, S.8, S.11, S.14 were ranked “alpha”, those coded F.5, F/S.1, F/S.2, S.2, S.5, S.9, S.10, S.12, S.13, S.15 were ranked “beta”, whilst the remaining two proposals, coded F.7 and F/S.1 were ranked “gamma”.

*It was agreed that the proposals ranked “alpha” would be accepted in the second session, whereas those ranked “gamma” would not be accepted. The proposals ranked “beta” would be further considered at the second session.*

### **Item 15 – Preliminary discussion on future IUTAM Summer Schools on Mechanics**

The Secretary-General had received the following two proposals for IUTAM Summer Schools:

SS.1 *Advanced Integral Equation Methods in Computational Mechanics*  
(CISM, Udine, Italy, 2008)

SS.2 *Mechanics in Microfluidics* (Beijing, China, 2009)

The proposal coded SS.1 had been reviewed by the Solids Symposia Panel and it was ranked “alpha”. The proposal coded SS.2 had been reviewed by both Panels. The Fluids Panel had ranked the proposal “alpha”, whereas the Solids Panel had ranked the proposal “beta”.

*It was agreed that proposal coded SS.1 should remain ranked “alpha” and, hence, it would be accepted in the second session. The proposal coded SS.2 should be ranked “beta” and, hence, it should be further considered in the second session.*

The President thanked the two Panels and their Chairmen on behalf of the General Assembly for their careful scrutiny of the proposals for IUTAM Symposia and IUTAM Summer Schools.

*It was agreed that the final decision on future IUTAM Symposia and Summer Schools would be made in the second session under items 18 and 19, respectively.*

### **Item 16 – Proposal for an extra Summer School in 2007**

It was agreed to postpone this item to the second session following item 19.

### **Item 17 – Preliminary discussion on appointment terms of members of Symposia Panels**

At the previous meeting in Warsaw in 2004, the General Assembly approved re-appointment of all members of the Symposia Panels for a four-year term. The reasoning was that all regular members of the Symposia Panels had served for one four-year term, whereas also the Panel Chairmen had acted in this capacity for one four-year term. However, in order to have a certain continuity of experience it might be appropriate if half of the Panel membership would change every four years.

Now, if one would continue to let the membership of the Symposia Panels unchanged until 2008, it appears to be very difficult to put this “continuity principle” into practice at a reasonable time. In that case, the General Assembly would appoint in 2008 the new membership of the Symposia Panels for the period till 2012. Subsequently, the General

Assembly could decide in 2012 to appoint half of the regular membership of the Panels for an additional two-year period and the other half for another four-year period, which would imply that the above "continuity principle" could be put into practice only as of 2014.

In order arrive at an earlier start of the "continuity principle", the Bureau proposed that one member of each Panel resigns already in 2006 (i.e. after 6 years of service altogether. (Two Panel members, who are also active in other IUTAM bodies, are willing to do this.) Then, in August 2006 the General Assembly should appoint one new member on each Panel. Furthermore, the Bureau proposed to the General Assembly to let one current member on each Panel continue in 2008 for two more years, implying that in 2008 half of the membership of both panels will be renewed. In this way, starting from 2008, we would be in a position to have the "continuity principle" implemented.

*It was agreed to accept the above proposal on the appointment terms of the members of the Symposia Panels and to decide on the specific changes in the membership of the Panels during the second session.*

The meeting then adjourned.

### **The meeting reconvened on 13 August 2006.**

#### **Item 18 – Continued discussion and final decision regarding future IUTAM Symposia**

*The General Assembly decided to accept the 12 symposia proposals, rated "alpha", and coded F.1, F.2, F.3, F.6, S.1, S.3, S.4, S.6, S.7, S.8, S.11, S.14.*

*Furthermore, the General Assembly decided to reject the 2 symposia proposals, rated "gamma", and coded F.7, F/S.1.*

After further discussion of the remaining 10 proposals, rated "beta", a vote was taken. *The following further 4 proposals were finally accepted:*

- *F/S.2 Mathematical Modeling and Physical Instances of Granular Flows*
- *S.2 Modelling Nanomaterials and Nanosystems*
- *S.5 Multi Functional Material Structures and Systems*
- *S.12 Theoretical, Modelling and Computational Aspects of Inelastic Media*

#### **Item 19 – Continued discussion and final decision regarding future International Summer Schools on Mechanics**

*The General Assembly decided to accept the Summer School coded SS.1 and rated "alpha".*

*After further discussion the General Assembly decided to accept the Summer School coded SS.2 and rated "beta".*

#### **Item 16 (postponed) – Proposal for an extra Summer School in 2007**

The Secretary-General had received a proposal for an extra IUTAM Summer School on Sea-ice in 2007. This proposal had been enclosed to the material distributed to the

General Assembly. The Bureau had agreed to send this proposal to the Symposia Panels for review. Based on the review comments by the Symposia Panels and in view of the importance of the visibility of IUTAM in the International Polar Year 2007/2008, the Bureau proposed to include this Summer School in the 2007 program as a co-sponsored event, to which a small grant will be assigned.

*After further discussion it was agreed to accept this Summer School as a co-sponsored event for 2007.*

**Item 20 – Continued discussion and final decision regarding annual dues**

Following the proposal made by the Treasurer, Professor J. Engelbrecht, see item 4, *the General Assembly decided with four votes opposed the following amounts for the units of dues:*

*US \$ 710 in 2008*  
*US \$ 726 in 2009*

**Item 21 – Continued discussion and final decision regarding Working Parties**

*With reference to the proposal under item 8, the General Assembly appointed:*

- Prof. L.G. Leal as chairman of the WP-1 on Non-Newtonian Fluid Mechanics and Rheology,
- Prof. C.T. Herakovich as chairman of the WP-3 on Mechanics of Materials,
- Prof. P. Ladeveze as chairman of the WP-5 on Computational Fluid and Solid Mechanics,
- Prof. G.A. Holzapfel as chairman of the WP-6 on Biomechanics,
- Prof. H. Aref as chairman of the WP-9 on Education in Mechanics and Capacity Building

**Item 12 (postponed) and item 22 – Discussion on Associate Membership**

The President, introducing the case, mentioned that during its meeting last year in Adelaide, Australia, the Bureau set up a subcommittee with the task to work out a proposal on Associate Membership for the General Assembly. The report by the subcommittee has been enclosed in the material distributed to the General Assembly. Then, the President invited the Vice-President, in his capacity as member of the subcommittee, to make a summary of the report. Next, there should be a discussion by the General Assembly.

Prior to summarizing the report, the Vice-President mentioned that

- during composing the report the subcommittee consulted with the IUTAM Working Party No. 9. After having incorporated their comments, the subcommittee consulted with the full Bureau and then finalized the report.
- during the previous General Assembly the point had been raised that IUTAM should open the door for more countries to participate, in particular those from the developing world. Currently, these countries do not participate for financial or organizational reasons.
- the present proposal is in harmony with the Article IV of the IUTAM Statutes concerning free international scientific co-operation, non-discrimination and the rights

of scientists throughout the world. Additionally, in view of developments with respect to AIMS and LACCOTAM, the proposal can be considered to be timely.

In summarizing the report, the Vice-President pointed out that the prime criteria for eligibility for associate membership of any country X should be:

- (a) that X be in the developing world and not already a member of IUTAM;
- (b) that X can demonstrate a significant existing research activity in TAM, and a desire to extend this activity through association with IUTAM;
- (c) that an existing member country of IUTAM has research and/or teaching contacts in X and is prepared to support the application and act in a 'mentor' capacity for X; and
- (d) that there exist in X a nationally recognized organization (e.g. a national academy) with approved Statutes (or equivalent), which represents all interested parties within the TAM community in X, and which can act as the *Adhering Associate Organization* for the purpose of official communication with, and representation in, IUTAM.

Whether a country satisfies these criteria or not would be a matter of judgement in each case by the General Assembly.

Of course, the major problem might be a financial one. The subcommittee recommends that there is a certain level of membership dues for associate members and that this should be set at three-quarters of the annual subscription of a Category 1 Adhering Organization (for a full four-year period, payable quadrennially in advance, i.e. once every four years; the current quadrennial subscription would thus be  $\frac{3}{4}$  of \$676, i.e. \$507).

In any case there will be a review of all associate members at four-year intervals, implying that a particular associate membership would cover at least a period of two General Assemblies and one ICTAM.

The right of an Associate Organization is to appoint one member in the General Assembly with voting rights on all matters except elections. If a proxy vote is exerted, this would be by the representative of the corresponding mentor organization.

Acceptance of the proposal on associate membership would imply a change of Statutes. The success of this initiative will require a pro-active involvement of the delegates of our Adhering Organizations. It is not expected that there will be a flood of applications for the proposed associate membership.

Then, the President thanked the Vice-President for his summary and invited the members of the General Assembly to provide comments.

Prof. G. Maier remarked that the proposal is consistent with a recent message by Prof. K. Sreenivasan, Director Centre for Theoretical Physics in Trieste, in the framework of the World Forum on environmental issues.

Prof. Kluwick remarked that one of the aims of IUTAM is to disseminate mechanics into the World and within this context we have to make a strong move to the developing world. Hence, this matter is very important for capacity building. He did not have fear for a flood of applications and expressed strong support.

Dr. I. Gedhill, expressing strong support to the proposal, mentioned that in the countries under concern there is not always

- an awareness of the importance of science and technology,
- an adequate grant system for traveling and participating in international meetings
- critical mass in the university labs, whereas it may be difficult for people to leave teaching responsibilities
- capacity of research is not always there, in terms of numbers of people available to do research, quality of people, adequate time to do representable research

Finally, Dr. Gledhill proposed to change the wording mentorship into partnership.

Prof. T. Belytschko, speaking on behalf of the US National Committee for TAM, congratulated the subcommittee on their well thought of proposal.

Prof. L. Bevilacqua also congratulated the subcommittee and suggested to rephrase criteria c by expressing that existing member countries of IUTAM should be prepared to support an application for associate membership and to be in a partnership position. Furthermore, he commented that the restriction voting rights for associate members may give rise difficulties.

Prof. W. Schiehlen, underlining the importance of the proposal, pointed out that with respect to the number of countries it might be good to consult some additional sources:

- Information on the situation in ICSU can be obtained from the ICSU website. Currently, there are 107 national members in ICSU. These are divided in three categories, i.e. full scientific members (82), scientific associates (14) and scientific observers (11).
- IACM, one of our largest Affiliated Organizations, has currently 53 national members, out of which 8 are also IUTAM members.  
ICTAM, our Olympics in mechanics, attracted in 2000 accepted papers from 54 countries out of submitted papers from 66 countries. ICTAM 2004 attracted accepted papers from 73 countries out of submitted papers from 63 countries.

Looking at the above numbers, it can be concluded that there is a potential of 5 to 25 candidate countries for membership

Furthermore, Prof. Schiehlen made the following comments with respect to the proposal:

- Associate members, as defined in the report, do have voting rights on the one hand, but are defined to be countries not so well developed on the other.
- In the proposed new Statute X the term developing world is not well defined. It is to be advised to consult existing lists of countries from the World Bank and the OECD and the different categories defined therein.
- The proposed subscription dues for associated members could be considered to constitute a new category and some of our existing adhering organizations may consider to go to this new category.
- The ISCU Statutes offer clear definitions of the adhering members, the associated members and the observers and it might be useful to follow these definitions to some extent, as well as the procedures for these categories as established by ICSU (e.g.

associated membership is restricted to 6 years, if an associated member fails to pay dues, its voting rights are lost; again the observer status is limited to 6 years).

- It would be nice if IUTAM could offer each starting associate member the support for one Summer School. This could be supported by an IUTAM Study Group, which might be a more appropriate mechanism than the use of a mentor organization.

Prof. L. van Wijngaarden, expressing sympathy towards the idea of the proposal, commented that there are some points in the proposed Statutes and the proposed general procedures which should be changed:

- Experience within IUTAM up to now shows that in most cases non-paying countries do not have a strong national organization. On the other hand, one cannot require at the same time that “there exists in X a national recognized organization ... , which represents all interested parties within the TAM community in X ... “(criterion d for associate membership).

Prof. Van Wijngaarden proposed to change this into “there exists in X a nationally visible organization ... , which may act as the Adhering Associated Organization in X for the purpose ... “.

- The proposed Statutes should be more specific about the possible ending of the associate membership status. In particular, after a certain period there should be a decision either to stop or to take steps towards promotion to full member as Adhering Organization.
- The role of the mentor organization should be made more clear. The Bureau should always take the first step in exploring the possibility of a new associate member. The role of the mentor organization should be more to give guidance. This should be reflected in the c for associate membership: “an existing member country of IUTAM has ... contacts in X and is prepared to provide support and guidance to the applicant”.

Then, the President asked for a show of hands of all who are in favor that we should go forward along the lines set by the proposal, thereby taking account of the remarks made during the discussion. Thereby it is aimed at presenting an updated proposal to the General Assembly for voting at its next meeting in Adelaide.

*The General Assembly unanimously approved proceeding in this way. It was also agreed that the subcommittee for Associate Membership should remain active in preparing the updated proposal.*

### **Item 23 – Election of members of the Electoral Committee**

*The General Assembly elected unanimously the following persons as members of the Electoral Committee:*

Prof. L.B. Freund (USA, chair), Prof. A. Acrivos (USA), Prof. Y. Bai (China), Prof. W. Schiehlen (Germany), Prof. L. van Wijngaarden (Netherlands).

### **Item 24 – Election of members of the Congress Committee of IUTAM**

*The General Assembly decided to re-elect the following persons as members of the Congress Committee for the period 2006 through 2010:*

Prof. D.E. Beskos, Greece  
Prof. F. Ellyin, Canada  
Prof. B.A. Schrefler  
Prof. M.A. Hayes, Ireland, representative of ISIMM  
Prof. E.J. Kreuzer, Germany  
Prof. E.O. Tuck, Australia, President of ICTAM08  
Prof. M.G. Velarde, Spain

*The General Assembly decided to elect the following persons as members of the Congress Committee for the period 2006 through 2010:*

Prof. C.T. Herakovich, USA  
Prof. J.B. Leblond, France  
Prof. N.F. Morosov, Russia  
Prof. N. Peake, UK  
Prof. G. Yagawa, Japan

*The new membership of the Congress Committee is recorded in the following table:*

Prof. H. (Hassan) Aref, USA, 2008, member of XCCC  
Prof. N. (Nadine) Aubry, USA, 2008  
Prof. D. (Dominique) Barthès-Biesel, France, 2008  
Prof. M.P. (Martin) Bendsøe, Denmark, 2008, member of XCCC, representative of ISSMO  
Prof. D.E. (Dimitri) Beskos, Greece, 2010  
Prof. D.H. (Dick) van Campen, Netherlands, 2008  
Prof. A. (Alberto) Carpinteri, Italy, 2008  
Prof. G.-D. (Gengdong) Cheng, China, 2008  
Prof. D. (David) Durban, Israel, 2008  
Prof. F. Ellyin, Canada, 2010, representative of ICM  
Prof. L.B. (Ben) Freund, USA, 2008, President, member of the XCCC  
Prof. I. (Irina) Goryacheva, Russia, 2008  
Prof. P. (Peter) Gudmundson, Sweden, 2008  
Prof. M.A. (Michael) Hayes, Ireland, 2010, representative of ISIMM  
Prof. C.T. (Carl) Herakovich, USA  
Prof. T. (Tsutomu) Kambe, Japan, 2008  
Prof. B.L. (Bhushan) Karihaloo, UK, 2008, representative of ICF  
Prof. A. (Alfred) Kluwick, Austria, 2010  
Prof. T.A. (Tomasz) Kowalewski, Poland, 2008, member of the XCCC  
Prof. E.J. (Edwin) Kreuzer, Germany, 2010  
Prof. S. (Stelios) Kyriakides, USA, 2008  
Prof. P. (Pierre) Ladevèze, France, 2008  
Prof. L.G. (Gary) Leal, USA, 2008, representative of ICR  
Prof. J.-B. (Jean-Baptiste) Leblond, France, 2010  
Prof. F. (Fernando) Lund, Chile, 2008



Prof. P.A. (Peter) Monkewitz, Switzerland, 2008

Prof. N. (Nikita) Morozov, Russia, 2010

Prof. N. (Nigel) Peake, UK, 2010

Prof. T.J. (Timothy) Pedley, UK, 2008, Secretary, member of XCCC

Prof. B.A. (Bernhard) Schrefler, Italy, 2010, member of XCCC, representative of CISM

Prof. A. (André) Thess, Germany, 2008

Prof. E.O. (Ernie) Tuck, Australia, 2010

Prof. V. (Viggo) Tvergaard, Denmark, 2008

Prof. M.G. (Manuel) Velarde, Spain, 2010

Prof. G. Yagawa, Japan, 2010

**Item 25 – Continued discussion and final decision on appointment terms of members of Symposia Panels, including election of one new member on each Panel**

*With reference to the discussion under item 17, it was agreed:*

- to replace on the Symposia Panel for Fluid Mechanics Prof. T. Kambe by Prof. K.R. Sreenivasan,
- to replace on the Symposia Panel for Solid Mechanics Prof. F.L. Chernousko by Prof. G. Stepan.

**Item 26 – Date and venue of the next General Assembly**

*The General Assembly agreed to hold its next meeting during the 22st ICTAM in Adelaide, Australia, on Tuesday evening, 26 August, and on Wednesday afternoon, 27 August 2008.*

**Item 27 – Any other business**

- The Secretary of the Congress Committee explained that the International Papers Committee is selected by the XCCC at its meeting three years before the Congress. Except for communicating the composition of the IPC to the Congress Committee, the composition of the IPC is kept secret.
- The Secretary of the Congress Committee pointed out that the Congress Committee and the XCCC had suggested that during the intermediate meeting of IUTAM bodies in between two subsequent ICTAMs two sessions of the CC should be organized prior to the meeting of the GA in stead of one.

*It was agreed that such a second session of the Congress Committee should be encouraged and that the Bureau should further elaborate this.*

Professor T. Pedley thanked the President for having been on duty in the framework of the IUTAM meetings since Friday, 11 August, and having acted as an excellent host.

Then, the President closed the meeting.

*Dick van Campen, Secretary-General*

## 2006 Treasurer's Report

Statement of Change in Fund Balance	USD
<b>Balance, 31 December 2005</b>	<b>411,920.32</b>
Net revenues minus expenses for 2006	26,079.98
<b>Balance, 31 December 2006</b>	<b>438,000.30</b>

### Statement of Cash Revenues Collected over Expenses Paid

#### Revenues collected during 2006:

Subscription dues	102,546.42
Returns from Symposia Awards	3,181.82
Interest income	5,831.96
<b>Total</b>	<b>111,560.20</b>

#### Expenses paid during 2006:

Symposia	23,522.00
IUTAM Summer School	5,000.00
Travel, Bureau	12,399.00
Travel, Congress Committee Executive Committee	6,765.00
Travel, others	5,621.00
Contribution to ICSU	2,704.00
Administration & printing	38,571.89
Auditor's fee	2,953.77
Bank fees	438.18
<b>Total</b>	<b>97,974.84</b>

<b>Revenues minus expenses for 2006</b>	<b>13,585.36</b>
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Gain (loss) from exchange of currency	12,494.62
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<b>Net revenues minus expenses for 2006</b>	<b>26,079.98</b>
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**Statement of IUTAM Bank Accounts**  
**(1 January 2005 through 31 December 2005)**

<b>Bank</b>	<b>Balance</b>	<b>Withdrawals</b>	<b>Deposits</b>	<b>Balance</b>	<b>Currency</b>
	<b>31-Dec-05</b>	<b>2006</b>	<b>2006</b>	<b>31-Dec-06</b>	

**Checking Accounts**

Citizens Bank Providence 1009-367-2	76,730.97	-52,780.22	77,693.65	101,643.90	USD
Citizens Bank Providence 1597-967-1	130,205.56	0.00	2,240.23	132,445.79	USD
ABN-AMRO Bank Eindhoven 41.41.42.551	33,267.95	-46,650.01	20,857.50	8,475.44	USD
ABN-AMRO Bank Eindhoven 41.41.28.311	564.52	-28,488.64	35,689.80	7,765.68	EUR

**Savings Accounts**

<b>Bank</b>	<b>Balance</b>	<b>Withdrawals</b>	<b>Deposits</b>	<b>Balance</b>	<b>Currency</b>
	<b>31-Dec-05</b>	<b>2006</b>	<b>2006</b>	<b>31-Dec-06</b>	
Citizens Bank Providence	82,507.78	0.00	1,949.53	84,457.31	USD
ABN-AMRO Bank Eindhoven	75,262.33	0.00	1,204.19	76,466.52	EUR

## IUTAM Bank Account Information

### Treasurer:

Professor J. Engelbrecht, Institute of Cybernetics at Tallinn University of Technology, Akadeemia 21, 12618 Tallinn, Estonia

### Assistant Treasurers:

Professor D. H. van Campen, Faculty of Mechanical Engineering, Eindhoven University of Technology, Postbus 315, NL-5600 MB Eindhoven, The Netherlands  
 Professor L. B. Freund, Division of Engineering, Brown University, Providence, RI 02912-9104, USA

### Bank Accounts:

ABN-AMRO Bank, Postbus 515, 5600 AM Eindhoven, The Netherlands, Account 41.41.28.311 (EUR), 41.41.42.551 (USD)  
 Citizens Bank, One Citizens Drive, Riverside, RI 02915-3000, Account 1009-367-2 (USD)

### Subscription Due Paid in Membership Units (1 January 2005 through 31 December 2006)

<b>Adhering Organization</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
Argentina	1	--	--	--	--	--
Australia	3	3	3	3	3	3
Austria	1	1	1	1	1	1
Belgium	5	5	5	5	5	5
Brazil	1	1	1	1	1	1
Bulgaria	--	1	--	1	--	--
Canada	8	8	8	8	8	8
Chile*	1	1	1	--	--	--
China/ Beijing***	8	8	8	8	8	--

<b>Adhering Organization</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
China/Hong Kong	1	1	1	1	1	1
China/Taipei	3	3	3	3	3	3
Croatia	1	1	1	1	1	1
Czech Republic	1	1	1	1	1	1
Denmark	3	3	3	3	3	3
Egypt	1	1	1	1	1	1
Estonia	1	1	1	1	1	1
Finland	3	3	3	3	3	3
France***	8	8	8	8	8	--
Georgia****	--	--	--	--	--	--
Germany	8	8	8	8	8	8
Greece**	1	1	1	1	--	--
Hungary	1	1	1	1	1	1
India	5	5	5	5	5	5
Ireland***	1	1	1	1	1	--
Israel	3	3	3	3	3	3
Italy	8	8	8	8	8	8
Japan	8	8	8	8	8	8
Korea	1	1	1	1	1	1
Latvia	1	1	1	1	1	1
Netherlands	5	5	5	5	5	5

<b>Adhering Organization</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
New Zealand	1	1	1	1	1	1
Norway	1	--	--	1	1	--
Poland	3	3	3	3	3	3
Portugal	1	1	1	1	1	1
Romania	1	1	1	1	1	1
Russia	8	8	8	8	8	8
Saudi Arabia	1	1	1	1	1	1
Serbia & Montenegro	1	1	1	1	1	--
Slovakia	1	1	1	1	--	--
Slovenia	1	1	1	1	1	1
South Africa	1	1	1	1	1	1
Spain	1	1	1	1	1	1
Sweden	5	5	5	5	5	5
Switzerland	3	3	3	3	3	3
Turkey	1	1	1	1	1	1
Ukraine	1	1	1	1	1	1
United Kingdom	8	8	8	8	8	8
United States	12	12	12	12	12	12
Vietnam	1	1	1	1	1	1

**Note:** For any particular year, a dash (--) indicates that dues had not been paid as of 31 December 2006 and a blank space indicates no adhering organization.

Dues are expressed in membership units of 1, 3, 5, 8 or 12, corresponding to category of membership from I through V, respectively.

- 
- \* Chile, unpaid 1997 and 1998
  - \*\* Greece paid for 2005 and 2006, but not recorded in Bank Statement for 2006
  - \*\*\* China/Beijing, Ireland and France paid for 2006 but not recorded in Bank Statement for 2006
  - \*\*\*\* Georgia has partly paid over years (0.5 units)

## **Reports on Affiliated Organizations**

### **AFMC (Asian Fluid Mechanics Committee)**

The Eleventh Asian Congress of Fluid Mechanics was held in Kuala Lumpur, Malaysia, during 22-25 May 2006. The Congress was well represented by fluid dynamicist from Asian countries and regions as well as from countries elsewhere, the total number of participants being 164. Four Plenary invited lectures and 10 Special invited lectures were delivered. A total of 170 papers were presented by authors from Australia, Bangladesh, Belgium, China, the Czech Republic, India, Indonesia, Iran, Japan, Korea, Malaysia, Mexico, Morocco, Oman, Pakistan, Singapore, Sri Lanka, Taiwan region, Thailand and USA.

AFMC decided on the occasion that the Twelfth Asian Congress of Fluid Mechanics is to be held in Daejeon, Korea, in 2008. The members of the AFMC from Korea: Professor Hyun Jin Sung (Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology) and Professor Sang-Joon Lee (Department of Mechanical Engineering, Pohang University of Science and Technology) will coordinate the Congress activities. In the meantime, Asian Young Scientist Award was set up to encourage young people to contribute in the research of fluid mechanics.

In the meeting of Asian Fluid Mechanics Committee, held during the Congress period, Professor M. Kiya from Japan and Professor E. J. Cui from China resigned from their positions as the Chairman and Vice-chairman of the Committee respectively. Professor Jia-chun Li from China was elected to chair the Committee after the Congress. Professor Li is a Member of Chinese Academy of Sciences, and works in the Institute of Mechanics of the Chinese Academy of Sciences.

To facilitate academic activities in the community of Asian fluid mechanics, we have also established a website with address <http://www.cstam.org.cn/afmc/index.htm> for people's browse.

**Report composed by Li Jiachun and Heng Zhou**

### **CACOFD (Caribbean Congress of Fluid Dynamics)**

CACOFD is in the process of broadening its scope and transforming itself into a new organization, currently named LACCOTAM (Latin American and Caribbean Congress of Theoretical and Applied Mechanics)

The first LACCOTAM conference will take place in Trinidad and Tobago on February 6th and 7th 2008. The topics to be covered will be: Theoretical and computational solid



mechanics; mathematical aspects of material science; theoretical and computational fluid mechanics; turbulence; granular flows; non-linear waves; asymptotic methods applied to solids, fluids, and fluid-solid interactions; mathematical modeling applications. Other significant interactions of mathematics and mechanics will also be considered.

Members of the LACCOTAM Executive Council under new Statutes are intended to enter into office following elections to be held in February 2008 during the first LACCOTAM conference. Meanwhile, the Executive Board of CACOFD is holding on as the interim Board for LACCOTAM.

In order to foster collaborative efforts from other countries in the region, three co-opted Executive Board members have already been elected: Roberto A. Kraenkel (Brazil, IFT-UNESP), Andre Nachbin (Brazil, IMPA) and María Cristina Depassier (Chile, PUC). LACCOTAM welcomes the input and collaboration from all scientists in the region, and will focus on promoting inter-regional research initiatives in Theoretical and Applied Mechanics.

**Report composed by Donna M.G. Comissiong**

## **CISM (International Centre for Mechanical Sciences)**

### **1. Courses and Seminars**

The regular programme of courses and seminars, planned for the Centre for 2006 by the Scientific Council, took place in two Scientific Sessions, the Stuewe Session (June-July 2006) and the Fiszdon Session (September-October 2006). The topics, always at an advanced level, included different fields of mechanics and related sciences, both at a basic and applied level. One school was organized within KMM-Noe project, sponsored by the EC and one was sponsored by IUTAM.

The Stuewe Session:

Classical and Advanced Theories of Thin Structures. Mechanical and Mathematical Aspects  
Advances in Modelling and Control of Flexible Mechanical Systems  
Computational Aspects of Structural Acoustics and Vibration  
Computational Models for Turbulent Multiphase Reacting Flows  
Advanced Earthquake Engineering Analysis  
Probabilistic Methods in Geotechnical Engineering  
Mechanics of Playing and Making Musical Instruments

The Fiszdon Session:

Waves in Nonlinear Pre-Stressed Materials  
Computational Contact Mechanics  
Dynamics of the Flow Past a Bluff-body

Pattern Formation at Interfaces with Applications to Materials Science, Biomedical and Physico-Chemical Processes

Dynamical Analysis of Vehicle Systems: Theoretical Foundations and Advanced Applications

14th IUTAM International Summer School on Biomechanical Modelling at the Molecular, Cellular and Tissue Levels

Advanced Professional Training (APT)

Wind Effects on Buildings and Design of Wind-Sensitive Structures

## 2. Other Events

Besides the above courses, the following other meetings were organized or hosted by CISM in 2006

- 16th ROMANSY CISM-IFTToMM Symposium on Robot Design, Dynamics and Control (Warsaw, Poland)
- CEPET 7th Workshop (Central European Programme. in Economic Theory) (June 2006)
- Workshop on Crack Propagation in Welded Structures (June 2006)
- Workshop on New Tendencies in Fatigue Analysis (June 2006)
- KMM/NOE -Second Summer School, sponsored by EC (September 2006)
- Workshop ISSEK on "Similarities and Preferences" (October 2006)

## 3. Editorial Activities

The lectures of several courses held at CISM are published in book form and distributed by Springer Verlag Vienna-New York. The following books were published in 2006:

W.B.J. Zimmermann "Microfluidics: History, Theory and Applications"

D.B.Giaiotti-R.Steinacker-F.Stel "Atmospheric Convection: Research and Operational Forecasting Aspects"

F. De Bona-E.T. Enikov "Microsystems Mechanical Design"

G. Della Riccia-D.Dubois-R.Kruse-H.J.Lenz "Decision Theory and Multi-Agent Planning"

G.E. Stavroulakis-J. Haslinger "Nonsmooth Mechanics of Solids"

T. Zielinska - C. Zielinski "ROMANSY 16 - Robot Design, Dynamics and Control"

I. Elishakoff "Mechanical Vibration: Where Do We Stand?"

J. Grue - K. Trulsen "Waves in Geophysical Fluids, Tsunamis and Rogue Waves, Internal Waves and Tides"

The international journal for rapid communication Mechanics Research Communications (bimonthly) created by CISM and Pergamon Press, Oxford-New York in 1973, published

in 2006 its thirtythird volume. It contains short communications on research related to a wide domain of both theoretical and applied mechanics.

#### **4. Scholarships**

A number of scholarships, including free lodging and board or exemption from registration fee, was offered by CISM during the courses to participants who were not supported by their home institutions, priority being given to young researchers coming from countries that contribute to CISM's operating resources.

Partial travel reimbursements as well as free board and lodging in Udine were granted to several participants from European and extra-European participants thanks to IUTAM and EC contributions.

#### **5. International Participation**

In 2006, 89 lecturers from 20 countries delivered lectures in the Stuewe and Fiszdon Sessions. The courses were attended by 539 participants coming from 43 countries. Udine, February 23, 2007

**Report composed by Bernard Schrefler**

#### **EUROMECH (European Mechanics Society)**

EUROMECH - European Mechanics Society is an international non-governmental non-profit scientific organization.

The objective of the Society is to engage in all activities intended to promote in Europe the development of mechanics as a branch of science and engineering.

The society is governed by the Council whose members are being elected according to rules set in Statutes.

#### ***EUROMECH meetings***

The EUROMECH Council has overall responsibility for EUROMECH Colloquia and EUROMECH Conferences.

EUROMECH Colloquia are informal meetings on specialized research topics. Participation is restricted to a small number of research workers actively engaged in the field of each Colloquium. The organization of each Colloquium, including the selection of participants for invitation, is entrusted to a Chairperson. Proceedings are not normally published. Those who are interested in taking part in a Colloquium should write to the appropriate Chairperson (Number, Title, Chairperson or Co-chairperson).

EUROMECH Conferences are broad in scientific scope. They comprise

- the EUROMECH Solid Mechanics Conference,
- the EUROMECH Fluid Mechanics Conference,
- the EUROMECH Turbulence Conference,
- the EUROMECH Nonlinear Dynamics Conference and
- the EUROMECH Mechanics of Materials Conference.

They are open to all those interested and are expected to have a number of participants between 150 and 600. The general purpose is to provide opportunities for scientists and engineers to meet and discuss current research. The responsibility for each series of Conferences is delegated to a Standing Conference Committee. The organizational work is carried out by Local Organizing Committees (LOC). Those who are interested in taking part in one of the Conference should write to the Chairman or Secretary of the appropriate LOC.

### ***EUROMECH COLLOQUIA in 2005***

- [470] *Recent Development in Magnetic Fluid Research*, 27 February 2006-1 March 2006, Bremen, Germany
- [475] *Fluid Dynamics in High Magnetic Fields*, 1-3 March 2006, Ilmenau University of Technology, Germany
- [476] *Real-time Simulation and Virtual Reality Applications of Multibody Systems*, 13-16 March 2006 Ferrol, Spain
- [477] *Particle-laden Flow. From Geophysical to Kolmogorov Scales*, 21-23 June 2006, University of Twente, The Netherlands
- [478] *Non-equilibrium Dynamical Phenomena in Inhomogeneous Solids* 13-16 June 2006, Tallinn University of Technology, Estonia
- [479] *Numerical Simulation of multiphase flow with deformable interfaces*, 14-16 August 2006, Scheveningen, The Netherlands
- [480] *High Rayleigh number convection*, 4-8 September 2006, Trieste, Italy
- [484] *Wave Mechanics and Stability of Long Flexible Structures Subject to Moving Loads and Flows*, 19-22 September 2006, TU Delft, The Netherlands
- [486] *Deformation and Fracture Processes in Paper and Wood Materials*, 12-15 June 2006, University of Sundsvall, Sweden
- [487] *Structure Sensitive Mechanics of Polymer Materials-Physical and Mechanical Aspects*, 10-13 October 2006, Strasbourg, France

### ***EUROMECH CONFERENCES in 2006***

- [EMMC9] *MECAMAT, 9th European Mechanics of Materials Conference*, 9 - 12 May 2006, EDF facilities of "Les Renardières" Moret Sur Loing, France
- [EFMC6] *6th EUROMECH Fluid Mechanics Conference*, 26 - 30 June 2006, Royal Institute of Technology (KTH) Stockholm, Sweden
- [ESMC6] *6th European Solid Mechanics Conference* 28 August 2006 - 1 September 2006, Budapest University of Technology and Economics (BUTE), Budapest, Hungary
- For more details see [www.euromech.org](http://www.euromech.org).

**Report composed by Bernhard Schrefler**

**HYDROMAG (International Association for Hydromagnetic Phenomena and Applications)**

HYDROMAG is an international association of scientists and engineers active in those fields of research which involve the flow of fluids in the presence of a magnetic fields, namely magnetohydrodynamics (MHD), electromagnetic processing of materials (EPM) and dynamics of magnetic fluids (MF). HYDROMAG promotes growth and visibility of the field of hydromagnetics and stimulates exchanges between its members throughout the world via conferences, workshops, summer schools and publications. Detailed information on HYDROMAG can be accessed under <http://wcms1.rz.tu-ilmeneau.de/fakmb/hydromag.html>

This WWW-site contains information on membership, forthcoming conferences, the electronic HYDROMAG newsletter and a link to the German Ferrofluid Information Server, maintained by Prof. S. Odenbach (University of Dresden).

During the year 2006 several workshops and scientific meetings have been conducted involving the active participation of HYDROMAG and its members including the International Congress on Electromagnetic Processing of Materials in October 2006 in Sendai (Japan), which was considered as a major highlight.

A group of European Scientists successfully established a network on MHD in frame of the COST-programme of the European Commission called “COST action P17 Electromagnetic Processing of Materials”. The programme supports mutual visits of scientists. Detailed information can be obtained from [http://www.cost.esf.org/index.php?id=248&action\\_number=P17](http://www.cost.esf.org/index.php?id=248&action_number=P17)

**Report composed by André Thess**

**IABEM (International Association for Boundary Element Methods)**

The 2006 Symposium of the International Association for Boundary Element Methods (IABEM) was held at Graz University of Technology from July 10 to 12, 2006. One hundred and forty delegates, representing 24 different countries from all continents, attended the symposium, and close to one hundred papers on engineering and mathematical aspects of the Boundary Element Method (BEM) were presented. Topics included fracture mechanics, wave propagation, mathematical aspects, electromagnetics, fluid mechanics, fast methods, etc. The Young Researcher Award competition for the best presentation by a researcher under 35, initiated on the occasion of the previous IABEM meeting (Minneapolis, 2004), has been held again.

Another highlight of IABEM 2006 was the inaugural presentation of the Frank Rizzo Award for outstanding contributions in Boundary Element Methods. The 2006 Frank

Rizzo Award was presented to Professor Wolfgang L. Wendland in recognition of his contributions to the field.

Moreover, a minisymposium was organised in honour of his 70th birthday as part of the IABEM 2006 meeting. Selected contributions from that minisymposium are collected in a book published by Springer. Moreover, full-length revised and peer-reviewed versions of some of the contributions to IABEM 2006 are collected in a special journal issue of Computational Mechanics, to appear in 2007.

**Report composed by Marc Bonnet**

### **IACM (International Association for Computational Mechanics)**

**The WCCM VII** - 7th International Association for Computational Mechanics (IACM) World Congress took place in Century City, California, USA on July 16 - 22, 2006

#### **Next IACM World Congress**

- WCCM VIII - 8th. World Congress on Computational Mechanics in conjunction with the ECCOMAS Congress 2008 Lido Island, Venezia, Italy, June 30 - July 5, 2008  
<http://www.iacm-eccomascongress2008.org/frontal/default.asp>

#### **The following IACM supported event took place in 2006:**

- IABEM 2006 Conference - International Association for Boundary Element Methods Graz University of Technology, Austria. July 10 - 12, 2006
- ENIEF 2006 - XV Congreso sobre Métodos Numéricos y sus Aplicaciones Santa Fe, Argentina, November 7 – 10, 2006

#### **Future IACM supported events:**

4° Congreso Internacional y 2° Nacional de Métodos Numéricos en Ingeniería y Ciencias Aplicadas, Morelia, Michoacan, México 17-19 January 2007

FEF07 - 14th International Conference on Finite Elements in Flow Problems Santa Fe, New Mexico, USA. 26 - 28 March, 2007

COUPLED PROBLEMS 2007 – 2nd. International Conference for Coupled Problems in Science and Engineering, Ibiza, Spain, May 21 – 23, 2007

MARINE 2007 – 2nd. International Conference on Computational Methods in Marine Engineering, Barcelona, Spain, 4 – 6 June, 2007

USNCCM 2007 - 9th. US National Congress on Computational Mechanics San Francisco, California, USA, 23 - 26 July, 2007

COMPLAS 2007 - 9th. International Conference on Computational Plasticity Technical University of Catalonia, Barcelona, Spain, 5 - 7 September, 2007

MEMBRANES 2007 – 3rd. International Conference on Structural Textile Composites and Inflatable Structures, Barcelona, Spain, 17 – 19 September, 2007

ADMOS III - International Conference on Adaptive Modeling and Simulation Chalmers University, Göteborg, Sweden. 26 - 28 September, 2007

12th IACMAG Conference: Geomechanics in the Emerging Social and Technological Age, 1 to 6th October 2008, at GOA (INDIA)

AfrCCM'09 - 1st African Conference on Computational Mechanics, 12 – 15 January, 2009

For further details on the above events you can contact the IACM Secretariat, [iacm@cimne.upc.edu](mailto:iacm@cimne.upc.edu). Further information on IACM activities can be found in the web page <http://www.iacm.info>.

**Report composed by Sergio Idelsohn**

### **IAVSD (International Association for Vehicle Systems Dynamics)**

(<http://www.iavsd.org>)

The main event organized by IAVSD was the CISM Course “Dynamical Analysis of Vehicle Systems - Theoretical Foundations and Advanced Applications” in the time October 23 – 27 2006 at Udine, Italy (<http://www.cism.it/>). The event was successful and attended by many participants from academia and industry from many countries.

In the year 2006 IAVSD has again co-operated on the organization of the International AVEC'06 Symposium on Advanced Vehicle Control in the time August 20-24, 2006 in Taipei, Taiwan (<http://avec06.pme.nthu.edu.tw/>). The event was successful and attended by many scientists from many countries. There were presented 162 papers in 5 parallel sessions.

The supplement of Vehicle System Dynamics Journal from selected papers from the International 19th IAVSD Symposium 2005 in Milano, Italy from August 29 to September 2, 2005 was published.

The next associated events of IAVSD will be the International 20th IAVSD Symposium 2007 in Berkeley, USA in the time August 13-17, 2007.

**Report composed by Michael Valásek**

**ICA (International Commission for Acoustics)**

(<http://www.icacommission.org>)

The International Commission for Acoustics (ICA) is a worldwide consortium of societies concerned with the field of acoustics. The ICA convenes the triennial International Congress on Acoustics in accordance with the Commission's guidelines. The ICA has also undertaken a number of initiatives to promote international development and collaboration in all fields of acoustics. The ICA currently has 43 Member Societies worldwide.

The ICA continues to promote its *Conference Grant Program* for small (< 100 attendance) specialty symposia on acoustics. Support is now provided for a number of symposia each year. Each symposium typically receives up to 1500 Euros. The following four symposia were approved for support in 2006 to provide travel assistance for international participation:

- 1) 11-th International Conference SPEECH AND COMPUTER (SPECOM'2006), 25-29 June 2006 (St. Petersburg, Russia)
- 2) Western Pacific Acoustics Conference, 26-28 June 2006 (Seoul, Korea)
- 3) 33rd International Acoustical Conference - EAA Symposium ACOUSTICS High Tatras 2006, 4-6 October 2006 (Vysok Tatry, Slovakia)
- 4) National Symposium on Acoustics, 15-19 November 2006 (New Delhi, India)

This program is funded jointly between the ICA and the Committee for International Research and Education of the Acoustical Society of America.

The ICA continues to maintain an *International Calendar* of Meetings and Congresses on Acoustics through the ICA Information Services. The Calendar is published simultaneously on the ICA web site and in the Journal of the Acoustical Society of America.

The International Commission for Acoustics (ICA) held the Board meeting in Hawaii, the USA on 2 and 3 December 2006. The Acoustical Society of Croatia has been approved as a new member society. The total number of member societies in ICA is now 43. Treasurer Fastl reported the present status of the finance of ICA and the budget for ICA and proposed to change the amount of one share from 25 USD to 25 Euros. Three venues were proposed to host ICA Congresses in 2013 and it was decided that the Congress in 2013 will be held in the Pan-American region. The final decision will be made at the board meeting in 2007. Reports on progress in preparation for ICA Congress in 2007 to be held in Madrid and that for in 2010 to be held in Sydney were also presented by the Spanish Acoustical Society and the Australian Acoustical Society, respectively.

The ICA application to become a scientific associate of ICSU has formally been approved on 13 November 2006. In order to unify international activities in acoustics,



ICA is in the process of establishing a new category of membership called International Affiliates. ICA is in discussion with six potential International Affiliates: they are the International Institute of Noise Control Engineering (I-INCE), the International Institute of Sound and Vibration (IIAV), the European Acoustics Association (EAA), the Western Pacific Commission on Acoustics (WESPAC), the Ibero-American Federation of Acoustics (FIA) and the International Congress on Ultrasonics (ICU). ICA also has the intention to form an ICA International Conference Coordination Committee that will involve the potential International Affiliates in order to avoid the clashes in the timings and venues of acoustical conferences around the world

**Report composed by Philip A. Nelson and Sonoko Kuwano**

### **ICF (International Congress on Fracture)**

The next quadrennial conference of ICF (ICF12) will be held in Ottawa, Canada from July 12-17, 2009. More information can be found at ICF12 website [http://www.icf12.org/e/01\\_index\\_e.shtml](http://www.icf12.org/e/01_index_e.shtml).

### **ICHMT (International Centre for Heat and Mass Transfer)**

ICHMT organized one international symposium and sponsored two in 2006:

- “5th Symposium on Turbulence, Heat and Mass Transfer”, September 26-29, 2006, in Dubrovnik, Croatia. The symposium was Chaired by Professor Kemal Hanjalic, Delft University of Technology, The Netherlands, Professor Yasutaka Nagano, Nagoya Institute of Technology, Nagoya, Japan.
- “ASME/ATI Conference, Energy: production, distribution and conservation”, (Sponsored) May 14 - 17, 2006, in Milan, Italy. The symposium was Chaired by Professor Luigi Bressan, Foster Wheeler Italiana S.p.A., Milan, Italy.
- “3rd BSME - ASME International Conference on Thermal Engineering”, (Sponsored) December 20-22, 2006, Dhaka, Bangladesh. The Symposium was chaired by Professor A.K.M. Sadrul Islam, Islamic University of Technology, Bangladesh.

Details of these meetings can be found on the web site, <http://www.ichmt.org>

The organization of several future meetings have continued. These are:

- “Fifth International Symposium on Radiative Transfer”, 17-22 June 2007, Bodrum, Turkey. Detailed information can be found on the symposium Web site: <http://www.ichmt.org/Rad-07>
- “Regulation of Transport Phenomena in Biological Systems with Emphasis on the Cardiac System”, 16-20 September 2007, Antalya, Turkey. Detailed information can be found on the symposium Web site: <http://www.ichmt.org/Tpbs-07>

- “Computational Heat Transfer, CHT-08”, 12-16 May 2008, Marrakesh, Morocco. Detailed information can be found on the symposium Web site: <http://cht08.mech.unsw.edu.au/>
- “The Use of Polygeneration for Sustainability”, (Sponsored), Sping 2007, Palermo, Italy.
- “Thermal Issues in Emerging Technologies”, (Sponsored), 3-6 January, 2007, Cairo, Egypt. Detailed information can be found on the symposium Web site: <http://www.thetaconf.org/>
- “16th School-Seminar of Young Scientists and Specialists “Problem of Gas Dynamics and Heat and Mass Transfer in Power Engineering” (Sponsored), 20-25 May, 2007, Saint-Petersburg, Russia. Detailed information can be found on the symposium Web site: [http://www.spbstu.ru/conference/2007/Leontiev\\_School/english/index.html](http://www.spbstu.ru/conference/2007/Leontiev_School/english/index.html)
- “NATO Advanced Study Institute on Mini-Micro Fuel Cells as Electric Energy Generators” (Sponsored), 22 July – 3 August, 2007, Cesme, Izmir, Turkey. Detailed information can be found on the symposium Web site: <http://www.ichmt.org/Natoasi-07>
- “Fifth Mediterranean Combustion Symposium” (Sponsored), 9-13 September 2007, Monastir, Tunisia. Detailed information can be found on the symposium Web site: <http://www.ichmt.org/Mcs-07>
- “International Gas Turbine Congress” (Sponsored), 2-7 December, 2007, Tokyo, Japan, Detailed information can be found on the symposium Web site: [http://www.soc.nii.ac.jp/gtsj/igtc/IGTC07/index\\_e.html](http://www.soc.nii.ac.jp/gtsj/igtc/IGTC07/index_e.html)

### **Report composed by Gulter Mut**

### **ICM (International Congress on the Mechanical Behaviour of Materials)**

The 10<sup>th</sup> International Conference on The Mechanical Behaviour of Materials will be held in Busan, Korea from May 27-31, 2007. More information can be found on the website <http://www.icm10.org/>.

### **ICR (International Committee on Rheology)**

On the initiative of ICR President Jae Chun Hyun, a midterm meeting of the International Committee on Rheology (ICR) took place on April 27, 2006, at Hersonisos, Crete, in conjunction with AERC 2006. The International Committee on Rheology is the organization of world rheology that sponsors the International Congress on Rheology, which takes place every four years.

The next ICR will be 3-8 August 2008 in Monterey, California, USA, see <http://www.rheology.org/ICR2008>.

ICR Delegates of 19 Rheology Groups (including delegates from Europe, Canada, China, Japan, Korea, and the US) were present when ICR President Jae Hyun opened the meeting and welcomed delegates to this historic “first ever” midterm ICR meeting. So far, the ICR has only met on the occasions of the International Conference on Rheology, but it was felt that if we want to bring rheology to the world-wide agenda, a closer cooperation of and more frequent exchanges between ICR delegates may be necessary.

Key strategies in pursuit of this ambitious aim are the creation of an ICR website and an ICR logo. Following the successful ICR2004 held in Seoul, South Korea, the Korean Society of Rheology donated \$10,000 USD to the International Committee on Rheology to set up and to cover operational costs of an ICR web site, now up and running at [www.icr.tu-berlin.de](http://www.icr.tu-berlin.de). The ICR intends to operate its website as an umbrella of the National Society sites. The ICR site will not duplicate information that is available at the national level but rather will provide a platform for fast interlinking of rheological activities worldwide.

So far, the ICR had no logo and local organizers of International Conferences on Rheology are free to create their own logo. ICR delegates supported unanimously the proposal to accept a modified version of the 2004 Conference as ICR logo until further decisions will be taken.

ICR delegates also welcomed the initiative of Prof. Paul Slatter to form a Southern African Society of Rheology (SASOR, see <http://www.sasor.co.za/>). SASOR will organize the 1st Southern African Conference on Rheology at Cape Town, South Africa, 24-27 September 2006.

According to the rules of the ICR, ICR2012 will be held in Europe, and the European Society of Rheology has already started preparations of the site selection, which will be formalized at ICR2008.

### **Report composed by Manfred Wagner**

### **ICTS (International Congresses on Thermal Stresses)**

The main activity of ICTS in 2006 was the preparations for the Seventh International Congress on Thermal Stresses. The Congress will be held at the National Taiwan University of Science and Technology (NTUST) in Taipei, Taiwan, from June 4 to June 7, 2007.

Chair and the Local Organizer of the Congress is Professor Ching-Kong Chao, and Co-Chairs are Professors Richard B. Hetnarski (U.S.A.) and Naotake Noda (Japan), and Secretary is Professor Chyi Yeu Lin (Taiwan).

Chairs of the International Organizing Committee are Professor Franz Ziegler (Austria) and Liviu Librescu (U.S.A.).

National Organizing Committee:

Chair is Professor K. C. Wu; Co-Chairs are Professors C. C. Ma and W. F. Wu.

Industrial Committee:

Chair is Professor K. N. Chang; Co-Chairs are Professors P. H. Chen and W. P. Shih

Program Committee:

Chair is Professor A. C. Huang; Co-Chairs are Professor Y. H. Su and Y. C. Shu

Local Organizing Committee:

Honorary Chair is Professor S. S. Chen, President of NTUST;

Chair is Professor C. Y. Ou, Dean of Engineering College at NTUST.

A very impressive and beautifully designed official poster of the Congress has been created, and the brochures have been printed and distributed.

From the initial response, the Seventh International Congress on Thermal Stresses may attract the largest number of participants of all these Congresses.

The internet site of the Congress: <http://www.ntust.edu.tw/~ts2007>

**Report composed by Richard B. Hetnarski**

### **IIAV (International Institute of Acoustics and Vibration)**

IIAV at present has over 500 individual members in 55 countries. The tenth IIAV annual election was held in 2006 in which all members voted on candidates for five new directors. The elected directors replaced the directors whose four-year terms had expired. The five directors elected were: Eleonora Carletti (Italy), Wim Desmet (Belgium), Finn Jacobsen (Denmark), Robert Randall (Australia) and Jing Tian (China).

Professor Jan W. Verheij of the Netherlands completed his two year term as president of IIAV in July 2006 and Professor Franz Ziegler of Austria took up the position as president for a further two-year term. Professor Luis Bento Coelho of Portugal was elected as president-elect with his term as president to begin in July 2008.

The Thirteenth International Congress on Sound and Vibration (ICSV13) was held in Vienna, Austria on July 2-6 2006. It was organised by the Institute for Mechanics of Materials and Structures of the Vienna University of Technology, the Austrian Academy of Sciences, Acoustics Research Institute and the Austrian Federal Ministry of Education, Science, and Culture. ICSV13 was hosted by the International Institute of Acoustics and Vibration in cooperation with the Acoustical Society of Austria and the American Society of Mechanical Engineers. More than 1,000 abstracts from 59 different countries on all areas of sound and vibration were submitted. Altogether 800 delegates attended ICSV13. A list of submitted abstracts can be found on the Congress website, [www.icsv13.tuwien.ac.at](http://www.icsv13.tuwien.ac.at).

The opening ceremony and the first keynote lecture were given to a large audience in the famous Hofburg on Monday. The other technical papers were presented at the Freihaus, the Vienna University of Technology (TU Vienna). A reception was held on Monday

evening at the Austrian Academy of Science and a presentation was made on Mozart concerning his association with scientists of the day.

Many of the ICSV13 sessions were organised by members of the ICSV13 scientific committee. Forty special structured sessions were organised by members of the ICSV13 scientific committee. The ICSV13 technical proceedings were available to delegates at the congress itself on CD-ROM. The ICSV13 CD includes all abstracts and the full texts of all the accepted papers. During the congress banquet at a special ceremony, Professor Franz Ziegler was awarded the ninth honorary fellow membership of the IIAV. Professor Ziegler gave one of the plenary keynote lectures during the congress technical program.

The seven ICSV12 keynote lectures covered very different aspects of acoustics and vibration and were presented by prominent researchers such as Jorge P. Arenas, Valdivia, Chile: Sound Barriers and Environmental Impact Studies; Voichita Bucur, Nancy, France; Acoustics of Wood; Hugo Fastl, Munich, Germany, Psychoacoustic Basis of Sound Quality Evaluation and Sound Engineering; Daniel Inman, Blacksburg, USA; Active and Passive Damping of Structures; Hiroshi Wada, Sendai, Japan): Recent Findings on our Auditory System: It is Very Sensitive Owing to the Motility of Sensory Cells; Semyung Wang, Gwangju, Korea): Compressor Noise Control; and Franz Ziegler Vienna, Austria): The Tuned Liquid Column Damper as the Cost-effective Alternative of the Mechanical Damper within Vibration Prone Civil Engineering Structures.

The ICS13 technical programme also included lectures arranged in 12 parallel technical sessions over a period of three and a half days. Further details can be found on the ICSV12 website: [www.icsv12.ist.utl.pt](http://www.icsv12.ist.utl.pt).

The International Journal of Acoustics and Vibration (IJAV), the refereed quarterly journal of IIAV, continues to receive a steady flow of good papers and to be published on schedule. The titles and abstracts of papers are displayed on the internet in addition to hard copies, which are airmailed to all IIAV members and to libraries all over the world.

**Report composed by Malcolm J. Crocker (Executive Director IIAV)**

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

### ***1. STAMM XV in Vienna, 2006***

The most important event of 2004 for ISIMM has been the biennial meeting, STAMM XV, held at the Vienna University of Technology, at the heart of Vienna from July 10 to July 14, 2006. It has been organized jointly by Hendrik Kuhlmann, Phillipe Zysset and Hans Troger (all from the Faculty of Mechanical and Industrial Engineering of Vienna University of Technology).

The scientific program offered sixty-six presentations, eight of which were invited. Two presentations have been given by the 2006 ISIMM awardees, Olga Bernardi (University of Padova) and Giovanni De Matteis (University of Strathclyde). All papers, the invited ones in particular, were well received by the audience. The international character of the symposium was clearly underlined by participants from 24 countries. Some scientists from Eastern Europe and Africa have been supported by travel grants. A very good balance between mathematicians and physicists on one side and engineers on the other has secured many lively discussions.

The scientific sessions were framed by a reception in the Town Hall of Vienna and by an excursion to the Wachau which gave plenty of opportunities for scientific discussions and beyond.

## **2. Meeting of the Executive Committee**

The meeting was held in Vienna on July 13, 2006. Two were the main topics of discussion:

1. Improving the interaction between ISIMM (through the Executive Committee or its selected representatives) and the organizers of the biennial STAMM conferences.
2. Choosing the location of the next 2008 STAMM conference. After some discussion the Committee unanimously decided to choose Levico, near Trento, Italy, and charged Prof. Augusto Visintin to look after the organizational details. These are in progress.

## **3. The ISIMM Award**

The award had been publicized in the ISIMM Newsletters, still available in the ISIMM web page. The 2006 ISIMM awardees have been Olga Bernardi (University of Padova) and Giovanni De Matteis (now at the University of Strathclyde). Here is a short presentation of their work.

### **OLGA BERNARDI**

She got her doctoral degree in mathematics at the University of Padova, February 2006. Her thesis title is 'A Symplectic Topology approach to the Poincaré-Birkhoff theorem and to weak solutions for Hamilton-Jacobi equations'. The arguments of this PhD Thesis --periodic orbits for Hamiltonian systems in  $T^*T_n$  and weak solutions for the Hamilton-Jacobi equation-- belong to the large topical subject of the symplectic theory of generating functions and applications to the variational theories of Lusternik-Schnirelman and Morse.

In the first part of this thesis, by assuming the point of view elaborated by Claude Viterbo in 1992, and then using maximum-minimum considerations as in the original spirit of Birkhoff, a new and simplified proof of the 1984 Conley and Zehnder theorem is presented. A finite variational formulation of the problem, consisting of a generating

function quadratic at infinity, is proposed, and a suitable application of Lusternik-Schnirelman theory in the degenerate case, and Morse theory in the nondegenerate one, produces the expected result.

The second part of the PhD Thesis proposes the following two results:

- (i) An extension to non-integrable Hamiltonians  $H = H(q,p)$  of the of Hopf's formula for the integrable case  $H = H(p)$ , largely utilized in the analytical framework.
- (ii) A detailed proof of the coincidence of minimax and viscosity solutions, in the  $p$ -convex case.

Viscous solutions and minimax solutions emerge from different, separate fields of mathematics; such a coincidence, which does work surely for physically Hamiltonians, seems to mark a sensible step towards the recognition of a robust good model of solution for physical phenomena, as for instance wave propagation. Moreover, the thesis makes a further useful contribution to the process of presenting the technical machinery and developing the geometrical arguments, which can be applied to investigate solutions to specific problems in applied areas, as for instance optimal control and differential games.

#### GIOVANNI DE MATTEIS

His thesis, by the title 'Mathematical Models for Biaxial Nematic Liquid Crystals' was defended in July 2005 at the Scuola Normale di Pisa.

In the past 30 years thermotropic biaxial nematic phases have offered a formidable challenge to the liquid crystal science. Since their first theoretical prediction many claims of their experimental determination have been made and refuted. In 2004, the last, still undisputed, experimental evidence in favour of the existence of these elusive phases was published by three different groups.

This thesis studies a family of mathematical models that predict the transition to the biaxial phase from both the uniaxial and the isotropic ones. In particular, the direct isotropic-to-biaxial transition, which is predicted here to occur for a whole set of model parameters, encourages the hope that these phases could indeed be observed. Actually, the main outcome of this thesis is that the direct isotropic-to-biaxial transition can be both first- and second-order, as a tricritical point is found along this transition line. The thesis contains five chapters.

The first chapter, purely descriptive in nature, collects some general information on liquid crystals and their optical properties. Chapter 2 sets the scene of the further mathematical development: a general family of quadrupolar models is presented and interpreted in the language of dispersion molecular interactions. Special attention is paid to justify the model examined in more details in the two following chapters. Chapter 3 illustrates a general criterion for tricriticality, which applies in particular to biaxial liquid crystals. The chapter is closed by the prediction of a new tricritical point along the isotropic-to-biaxial transition line, in addition to the one already known to be present

along the uniaxial-to-biaxial transition line. In Chapter 4, this prediction is further sustained by a detailed bifurcation analysis of the equilibrium phases described within a mean-field approximation of the interaction potential. This analysis explains how the order-parameters diagrams are distorted in the vicinity of the tricritical point. A Monte-Carlo simulation confirms qualitatively the scenario predicted by the mean-field model. The closing Chapter 5 broadens the perspective of the thesis. Here special conjugation relations are studied between the parameters of the general family of quadrupolar models. It is shown, in particular, how to extend by conjugation the phase diagram obtained in Chapter 4.

#### **4. *Joint IUTAM-ISIMM Symposium***

The IUTAM General Assembly has approved the joint IUTAM-ISIMM Symposium “**Mathematical Modeling and Physical Instances of Granular Flows**”, coded GA.06-05 (=F/S.2) and introduced in the IUTAM calendar at <http://www.iutam.net/iutam/Events/index.php/1/2009>

The Symposium will take place in Reggio Calabria, Italy, in 2009. The members of the Scientific Committee are Joe Goddard (Chairman), Gianfranco Capriz, Carlo Cercignani (IUTAM Representative), Robert Connelly, Jim Jenkins, Ioannis Vardoulakis and Krzysztof Wilmanski.

The local organization is headed by Prof. Pasquale Giovine, Department of Mechanics and Materials, Faculty of Engineering - "Mediterranean" University of Reggio Calabria, Via Graziella, 1 - Locality Feo di Vito, I-89060 Reggio Calabria – Italy.

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Details will be published as soon as possible.

#### **5. *Collateral Activities***

The following collateral activities have been sponsored by ISIMM:

- IUTAM Symposium on Hamiltonian Dynamics, Vortex Structures, Turbulence, Moscow, Russia, August 25--30, 2006.
- International Conference on Multifield Problems, Stuttgart, Germany, October 4--6, 2006.

#### **6. *The following new members have been installed in the Society***

Graham Rogerson (Salford University), Millard Beatty (University of Nebraska), Long-yuan Li (Aston University, GB), Nigel Scott (University of East Anglia), G. Argentini (Res&Develop. Riello Burners), Peter Schiavone (University of Alberta), Hans Dieter Alber (Darmstadt), Paolo Maria Mariano (Firenze), Alain Miranville (Poitiers), Enrico Pagani (Trento), Elena Bonetti (Pavia), Maurizio Grasselli (Politecnico Milano), Ulisse Stefanelli (Pavia), Oreste Bursi (Trento) and Luca Deseri (Campobasso).



## 7. *Book series*

Due to the initiative of our publication committee a series of books has come to fruition. The series is called “*Interaction of Mechanics and Mathematics Series*” (IMM) and is published by Springer Heidelberg.

In the publication agreement it says that the series will “cover advanced textbooks and introductory scientific monographs in English language. The authors should be distinguished specialists with international reputation in their field of expertise”.

Professor Lev Truskinovsky has signed the agreement on behalf of the Society. He is also the editor of the series and he should be approached by members who wish to contribute. All ISIMM members are strongly encouraged to submit new proposals for this book series, whose importance for our society cannot be overemphasized, as it should reflect the progress of our subject which is the promotion of the mutual interaction of mathematics and mechanics.

At this time the following books have been printed:

- I.Müller, W. Weiss: Entropy and Energy, 2005
- H.Struchtrup: Macroscopic Transport Equations for Rarefied Gas Flows, 2005

The following books are in preparation:

- F.Cakoni, D. Colton: Qualitative Methods in Inverse Scattering Theory: An Introduction
- R. Knops: Saint-Venants Principle: Edge Effects in Continuum Theory
- L. Truskinovsky: Mechanics of Materials with Internal Instabilities
- G. Del Piero, H. Smaoi: Unilateral Problems in Structural Analysis. Theory and Applications
- A.Di Carlo: Material Remodelling: Introduction to the Dynamical Theory of Growth
- R. Batra: Theory and Analysis of Piezoelectric Plates
- B.Sleeman: Weyl Asymptotics for the Interior and Exterior Laplacian with applications to Fractal Domains
- G. Kremer, G. Alves, The Boltzmann Equation and Transport Processes in Reacting Gases
- M. Elzanowski, M. Epstein, Material Inhomogeneities and their Evolution: A Geometric Approach

These and other current activities of the Society are reported in Newsletters which appear on the webpage of the Society <http://isimm.dmsa.unipd.it>

**Report composed by A. Montanaro**

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**ISSMO (Int. Society for Structural and Multidisciplinary Optimization)**

The Society co-sponsored the 6th ASMO UK / ISSMO Conference on Engineering Design Optimization held in St. Edmund Hall, Oxford, UK, 3 – 4 July 2006. The conference was attended by 43 persons from 14 different countries, and 31 papers were presented and published in the proceedings (ISBN 0 85316 251 4, CD-ROM).

ISSMO also co-sponsored the 11th AIAA / ISSMO Multidisciplinary Analysis and Optimization Conference, held 6 – 8 September, 2006 in Portsmouth, Virginia, USA. About 275 persons attended the conference, and more than 197 papers were presented and published in the proceedings (CD-ROM).

The 7th (biannual) ISSMO World Congress on Structural and Multidisciplinary Optimization (WCSMO-7) is to be held in Seoul, Korea, 21 - 25 May, 2007 and its organization is at an advanced stage. About 410 papers have been submitted from 43 different countries, and 365 papers have been accepted for presentation.

Please consult the website <http://www.issmo.org> for more details on ISSMO.

**Report composed by Niels Olhoff**

## **Reports on ICSU and its Scientific Committees**

### **ICSU (International Council for Science)**

The most recent meeting of the ICSU General Assembly was held in Suzhou, China in October of 2005. IUTAM was represented at the meeting by delegates Keith Moffat and Yilong Bai. Their full report of the meeting was included in IUTAM Report 2005. Professor Moffat summarized their report for the IUTAM General Assembly in August of 2006. The main items are:

- revision of the ICSU mission statement to emphasize the role of science for the benefit of society,
- reaffirmation of a commitment to foster equity of opportunity for citizens of all nations to freely pursue scientific endeavors and to foster expansion of capacity for doing so in developing countries,
- renewed emphasis in its strategic plan on the environment and sustainable development, and
- the ICSU grants program has been temporarily suspended due to lack of resources; the Unions await a decision on possible renewal of the program with a call for proposals for grants in 2008.

Under the banner of universality of science, ICSU has taken public positions on two matters. Its Committee on Freedom and Responsibility in the Conduct of Science has written a letter, published in *Nature* (23 November 2006), calling for the global scientific community to unite over the persecution of academics in Iraq. In the second instance, ICSU has publicly expressed its support for reversing the injustice done to five Bulgarian nurses in Libya who have been convicted of infecting Libyan children with the HIV virus.

Finally, the second of ICSU's Regional Offices, the Regional Office for Asia and the Pacific, was formally inaugurated in Kuala Lumpur, Malaysia, in September of 2006. IUTAM was represented at the inauguration by Bureau member Tsutomu Kambe of Japan. This follows the opening of a Regional Office for Science in Africa in the city of Pretoria, South Africa, the preceding year. Two additional regional offices, one in the Arab regions of the world and the second in the region spanning Latin America and the Caribbean, are planned.

The next meeting of ICSU of significance for IUTAM is the Unions' Meeting scheduled for Rome in 2007.

**Report composed by Keith Moffat**

## **COSPAR (Committee on Space Research)**

As stated by the ICSU resolution creating COSPAR in 1958 its primary purpose is to “provide the world scientific community with the means whereby it may exploit the possibilities of satellites and space probes of all kinds for scientific purposes, and exchange the resulting data on a cooperative bases”.

COSPAR experienced enormous changes and much progress in the past fifty years; COSPAR vision now is to *Expand the knowledge frontier of space for the benefit of all humankind*. This statement has been made at the opening of the 36th Scientific Assembly of COSPAR in Beijing last July by the President of COSPAR Professor R.M.Bonnet.

The Scientific Assembly was the most important scientific event of COSPAR during last two years. A total of 2407 persons participated in the Assembly. 3705 abstracts submitted by over 2640 authors, were accepted for presentation. In addition to the core scientific program five interdisciplinary lectures, a three-hour Space Agency Round Table, and two special lunch presentations were organized at the Beijing Assembly.

The next 37th COSPAR Scientific Assembly will be held 13-20 July 2008 in Montreal, Canada.

All planned for year 2006 scientific meetings organized or co-sponsored by COSPAR have taken place successfully. Under them one may mention Colloquium on Mutagenic Consequences of the Space Environments (Xi'an, China, 23-25 July) which immediately followed the General Assembly.

In 2007 COSPAR will organize or sponsor the following meetings:

The Future of Space Exploration: Solutions to Earthly Problems (12-14 April, Boston, USA);

Solar-Terrestrial Interactions: Instrumentation and Techniques (Regional Workshop for Space Physicists from Central and Eastern Europe), Sinaia, Romania, 4-16 June;

URSI/COSPAR Int. Reference Ionosphere Workshop: Ionosphere Modelling, Forcing and Telecommunications (10-14 July, Prague, Czech Republic);

Scientific and Fundamental Aspects of the Galileo Program (2-4 October, Toulouse, France).

In 2006 COSPAR continued its publication activity. Seven issues of *Advances in Space Research* as parts of its Volume 38 (pp. 1-1566) have been published in 2006.

**Report composed by G.G. Chernyi**

## **SCOPE (Scientific Committee on Problems of the Environment)**

## **SCOR (Scientific Committee on Oceanic Research)**

No reports have been submitted on SCOPE and SCOR.

## **Agreement by and between IUTAM and Springer Science and Business Media B.V.**

hereinafter referred to as "the Publisher"

WHEREAS IUTAM and the Publisher agree that Springer Science and Business Media is the official designated publisher of the proceedings of IUTAM Symposia (hereinafter referred to as "Symposia". The organizer or organizers of an IUTAM Symposium, being the chairmen of the Scientific Committee of the Symposium, are hereinafter referred to as the "Organizers");

WHEREAS IUTAM and the Publisher agree that each IUTAM proceedings volume published by the Publisher (hereinafter referred to as "Volume"), providing it is appropriate vis-a-vis subject matter, will be published in the "Solid Mechanics and Its Applications" book series, or the "Fluid Mechanics and Its Applications" book series (hereinafter referred to as the "Series");

WHEREBY, in consideration of the mutual covenants and obligations herein contained, the parties hereto have agreed and do agree as follows:

### **1. Publication**

1. Springer Science and Business Media shall be the official publisher of the proceedings of all IUTAM Symposia. Each proceedings accepted for publication shall appear as a Volume in the Series. In those cases where it is not appropriate, the Volume will be published out-of-series in the same style and format. Each Volume will appear in a hard bound version.
2. IUTAM will inform the Organizers of IUTAM Symposia of the possibility of publishing a proceedings with the Publisher, and encourage them to contact the Publisher. Further contact between the Organizers and the Publisher will be bilateral. In addition, IUTAM will notify the Publisher sufficiently ahead of time which Symposia are to be organized and shall give the Publisher the names and addresses of the Organizers.
3. The Organizers of each individual Symposium, in accordance with the IUTAM Scientific Committee, will remain free to propose to publish the proceedings in a suitable journal. In such case, the Organizers and the Publisher shall first jointly make an effort to investigate the availability of a suitable journal of published by Springer Science and Business Media.
4. If the Organizers decide to publish a proceedings with the Publisher, as recommended by IUTAM, a separate contract will be concluded between the Organizers and the Publisher in which all details regarding publication will be settled. The terms and conditions relating to the publication of a given Volume will be a matter of negotiation between the Organizers and the Publisher, where the basic conditions are based on this present Agreement.
5. The Organizers act as the Editors of the Volume.

6. Typescripts for Volumes in the Series shall yield maximally about 450 printed pages. Exemption from this restriction can be agreed on by the Organizers and the Publisher. Further, the typescripts will not contain colour pictures or colour photographs, unless the Organizers and the Publisher agree otherwise.
7. The papers submitted for publication will be preferably in LaTeX format using the Springer style file. The style file will be made available by the Publisher, and the Publisher will assist in any questions regarding its use. The papers will be submitted in camera-ready, laser printed, form (with the original figures pasted in the typescript) according to the guidelines given by the Publisher.
8. The proceedings of IUTAM Symposia will be published as Volumes in the Series, having a uniform design and recognisable cover design, including the IUTAM logo (see article 1.2). Proceedings that will be or have been published with other publishers do not form part of the Series.
9. Both the Publisher and the Organizers will do their very best in bringing the Volume out no later than one year after the Symposium has taken place. This requires that the Volume Editors who are responsible of assembling the final typescript should deliver it on time, in consultation with the Publisher.
10. IUTAM grants the Publisher the non-exclusive rights of the use of the IUTAM logo.
11. IUTAM grants the Publisher the use of the brand name "IUTAM Symposium on". This brand name is solely reserved for proceedings Volumes based on the Symposia which have been decided upon by the IUTAM General Assembly and entrusted to the Scientific Committee of the Symposium.
12. The brand name "IUTAM Symposium on" will be an integral part of the title page and the front and back cover of each Volume, and will feature in relevant promotional material.
13. The right to publish the IUTAM Symposium proceedings is not transferable by Springer Science and Business Media to any other publisher.
14. The Volumes will be published entirely for the account and risk of the Publisher, who shall be the proprietor of the goodwill and copyrights to each individual Volume.
15. In consideration of the Publisher's obligations hereinafter mentioned, IUTAM grants to the Publisher all of its rights, title, and interest in and to the publication rights to the Volumes in any language throughout the world, including but not limited to the following: the exclusive right to print, publish and sell the Volumes in whole or in part, in book form and in any other form including, without limitation, mechanical, electronic and visual reproduction, electronic storage and retrieval systems, and all other forms of electronic publication not known or hereinafter invented. The Publisher also shall have the the exclusive authorization to license the right to translate, print, publish, or sell any no-English language edition of the Volumes, all during the unrestricted period of copyright.
16. IUTAM hereby agrees that the Publisher shall be the copyright holder of each Volume in the Series, and the Publisher shall be responsible for affixing the proper notice of copyright in each copy of each Volume.
17. The publisher agrees to publish an e-book of each IUTAM Proceedings Hardbound Edition.

## **2. Responsibilities**

1. The Organizers, will in their role as Editors of the Volume be responsible for ensuring that each Volume satisfies the standards of high scientific quality. This requires that a reviewing procedure should be carried out of each submission to the Volume. This reviewing procedure will in general be performed by the Scientific Committee of each Symposium.
2. The Publisher will provide either directly, or through the Volume Editors, guidelines and instructions to contributing authors so as to ensure that each contribution appearing in the Volume is prepared to a consistent style and format. The Editors of each Volume shall endeavour that the typescripts are prepared in accordance with the Publisher's instructions.
3. All decisions regarding publication, promotion, prices and the sale of Volumes in the Series shall be made by the Publisher. However, at the Publisher's request, IUTAM or the Volume Editors will advise the Publisher on matters pertaining to promotion and advertisement. IUTAM will allow the Publisher the right to use its name in connection with such advertising and promotion of the Series and Volumes in the Series.
4. The Publisher will be responsible for ensuring that the Volumes are produced to a high quality in a consistent style and format.
5. IUTAM and Volume Editors warrant to ensure to the best of their ability that no material in the Series contains anything that is obscene, objectionable, indecent, or of libellous or scandalous character.

## **3. Payments/Complimentary Copies**

1. Royalties shall not be paid to the Organizers.
2. In lieu of royalties, the Organizers will get a minimum of 2 copies of each Volume free of charge.
3. The Publisher will provide the IUTAM Bureau with 9 free copies of each Volume.
4. Participants to the Symposium will be given the opportunity to order the Volume at a special prepublication price. The special Volume price will be included in the Symposium registration fee, so that each registered Participant will automatically receive a copy of the Volume upon publication. The special price includes tax (if applicable) and postage. The special price will depend on the number of participants and the size of the Volume and will be subject to negotiation between the Publisher and the Organizers of the Symposium concerned.
5. The agreed pre-publication prices for 2005-2008 shall be as set forth in the addendum to this contract.
6. It will be the sole responsibility of the Organizers of a given Symposium to forward the appropriate, one-time payment to the Publisher. The Organizers will also supply the Publisher with adhesive labels with the names and addresses of the relevant participants.

#### **4. Special Conditions**

1. Should Springer Science and Business Media decide to send a representative to a given Symposium, the Organizers will agree to provide display space free of charge for the display of relevant publications and, possibly, the dissemination of relevant promotion material to participants in the conference portfolios.
2. Springer Science and Business Media will provide the Organizers with a subsidy of 850 Euro towards the costs of organizing the Symposium. This subsidy will be paid upon receipt of the contracts signed by the Organizers.

#### **5. Termination**

The Agreement between IUTAM and Springer Science and Business Media will remain in force for an initial period of 4 (four) years, starting January 1, 2005. The Agreement will be renewed for additional periods of 3 (three) years subject to confirmation of extension by both parties 12 months before the end of the initial 4-year period or subsequent 3-year periods. Either party may terminate the Agreement with or without cause upon 12 months written notice to the other.

#### **6. Arbitration**

All disputes that may arise in connection with this present agreement or the breach thereof shall be settled exclusively by arbitration, to be held in The Netherlands in accordance with Dutch law, and shall be conducted under the Rules of the 'Nederlands Arbitrage Instituut' (Netherlands Institute of Arbitration).



## Statutes

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

- 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.
- II\* Les principaux objectifs de l'Union sont
- a) de constituer un lien entre les personnes et les organisations engagées dans le travail scientifique dans toutes les branches de la mécanique théorique et appliquée, par des recherches analytiques, numériques et expérimentales;
  - 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.
- \*) Article II adopté par l'Assemblée Générale de l'Union, le 18 août 2004 à Varsovie, Pologne
- 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.
- 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 scientifique, partout 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.

- 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 Secrétaire 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.

- VI\*\* L'Assemblée Générale se compose des membres suivants avec droit de vote:

- a) des représentants des «organisations adhérentes» (cf. art. VIII);
- b) des membres du Bureau (cf. art. XI);
- c) des membres cooptés par l'Assemblée Générale de l'Union;

La durée de mandat d'un membre coopté est précisée, lors de son élection, par l'Assemblée Générale. La durée de mandat des membres du Bureau coïncide avec celle de leur appartenance au Bureau.

Les catégories suivantes d'observateurs sont invitées à participer, sans droit de vote, à l'Assemblée Générale de l'Union:

- i) des représentants des «organisations affiliées» (cf. art. X);
- ii) le Secrétaire du Comité de Congrès (cf. art. XII);
- iii) les présidents des «Symposia Panels»;
- iv) les présidents des «Working Parties»;
- v) des représentants des pays candidats à l'adhésion;
- vi) s'il y a lieu, et sur décision de l'Assemblée Générale, des représentants de comités ou groupes de scientifiques.

- \*\*\*) Article VI adopté par l'Assemblée Générale de l'Union, le 18 août 2004 à Varsovie, Pologne

- VII L'Assemblée Générale doit veiller à une représentation adéquate de tout groupe de scientifiques poursuivant des recherches en mécanique théorique ou appliquée et non représenté par une organisation adhérente.

VIII Les organisations de scientifiques 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 exclue 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.

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).

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, à l'organe ayant une responsabilité équivalente dans 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.

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 Secrétaire Général et un Trésorier) et de quatre autres personnes qui ont été membres de l'Assemblée Générale à un moment de la période précédant de quatre ans le moment de l'élection du Bureau.

Les membres, qui ne sont pas au Comité Directeur, ne peuvent recevoir plus de deux mandats consécutifs. Les membres du Bureau nouvellement élus entrent en fonction au premier novembre qui suit l'Assemblée Générale qui a procédé 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 Secrétaire Général, un autre membre de l'Assemblée Générale pour le remplacer.

C'est au Secrétaire Général que doivent être adressées 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 Secrétaire 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 doivent être choisis parmi les membres de l'Assemblée Générale, mais non nécessairement parmi les membres du Bureau.

Le Bureau doit établir un budget prévisionnel pour l'année à venir, administrer les finances de l'Union et soumettre, chaque année, à l'Assemblée Générale un rapport financier.

Le Vice-Président doit normalement remplir 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 un remplaçant temporaire pour remplir les fonctions du Vice-Président, du Secrétaire Général ou du Trésorier si cela s'avère nécessaire.

\*\*\*) Article XI adoptés par l'Assemblée Générale de l'Union, le 2 Septembre 1990 à Vienne, Autriche

XII L'Assemblée Générale désigne un Comité permanent des Congrès chargé d'organiser à intervalles réguliers les Congrès Internationaux de Mécanique Théorique et Appliquée (ICTAM).

- a) Le Président de l'Union préside aussi ce Comité des Congrès.
- b) Les Membres de ce Comité sont nommés par l'Assemblée Générale; ce sont des scientifiques actifs en mécanique théorique ou appliquée, n'appartenant pas nécessairement à l'Assemblée Générale.
- c) Le Comité des Congrès nomme un Secrétaire, sans précision de durée.
- d) Les règles de fonctionnement du Comité des Congrès sont soumises à l'approbation de l'Assemblée Générale.

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 accordé à l'Union des dons, des legs ou des subventions.

XIV Le nombre des représentants d'une «organisation adhérente» et le montant de la cotisation annuelle qu'elle doit acquitter sont défini dans le tableau suivant, par la catégorie à laquelle elle désire appartenir, et avec l'accord de l'Assemblée Générale.

Catégorie représentants	Nombre de de la cotisation annuelle	Nombre d'unités
I	1	1
II	2	3
III	3	5
IV	4	8
V	5	12

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

XV\*\*\*\* Toute proposition de modification des Statuts, présentée ou par le Bureau ou par le Secrétaire Général, et ayant reçu l'appui d'au moins dix membres de l'Assemblée Générale ayant le droit de vote, devra être envoyée aux membres de l'Assemblée Générale avec l'ordre du jour de la réunion de l'Assemblée Générale. Le débat sur de telles propositions devra s'effectuer au cours de la première session et le vote au cours de la seconde (Article V).

\*\*\*\*) Article XV adopté par l'Assemblée Générale de l'Union, le 28 Août 1994 à Amsterdam, les Pays-Bas

### **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 doit nommer un Comité Exécutif chargé de prendre en son nom toutes les décisions nécessaires pendant la période qui s'écoule entre deux réunions successives, et de lui en faire rapport à sa prochaine réunion. Le Comité Exécutif comprend le président, 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 le 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.

#### **Procédés pour l'élection du Bureau de l'IUTAM \*\*\*\*\***

1. Lors de l'Assemblée Générale (AG) précédant celle au cours de laquelle le nouveau Bureau doit être élu, un Comité Electoral (CE) doit être élu comprenant le Président de IUTAM (qui assure la présidence de ce Comité) et deux à quatre membres de l'AG, non-membres du Bureau en exercice.
2. A la suite de cette élection, le CE invite les membres avec droit de vote et observateurs de l'AG, spécifiés dans l'Article VI des Statuts sous les rubriques a), b), c), i) et ii), à faire connaître à son Président, dans des délais fixés, leurs suggestions de candidatures pour le Bureau, c'est-à-dire pour les charges de Président (P) de Secrétaire Général (S), de Trésorier (T) et pour quatre autres postes. Toutes ces suggestions doivent être traitées confidentiellement par le CE.
3. Prenant en compte toutes les suggestions reçues, le CE doit soumettre au Secrétaire Général les noms proposés comme candidats au Bureau: un seul nom pour les charges P,S,T et un ou plusieurs noms pour chacun des quatre autres postes (W,X,Y,Z). Le CE doit s'assurer que tous les candidats ainsi proposés sont prêts à accepter leur élection. Toutes ces propositions sont portées par le Secrétaire Général à la connaissance des membres de l'AG avant la première session de l'AG au cours de laquelle le nouveau Bureau doit être élu.

4. Lors de cette première session d'autres propositions de candidatures peuvent être proposées pour chacun des postes P, S, T, W, X, Y, Z. Aucun candidat ne peut être proposé pour plus d'un seul poste.
5. Avant la seconde session de l'AG au cours de laquelle le nouveau Bureau doit être élu, chaque proposition envisagée au point 4 ci dessus pour pouvoir être acceptée doit recevoir l'appui d'au moins dix membres de l'AG ayant le droit de vote au moyen d'une déclaration écrite et signée et faire l'objet d'un engagement écrit de la personne proposée indiquant qu'elle est prête à accepter son élection. Toute proposition ne remplissant pas ces conditions sera retirée.
6. Pour chacun des postes P, S, T, W, X, Y, S, l'AG est appelé à désigner le titulaire par un vote mettant en compétition les candidats restants. S'il y a plusieurs candidats pour un poste, le vote doit avoir lieu au scrutin secret.

\*\*\*\*\*) Procédure adoptée par l'Assemblée Générale de l'Union, le 18 Août 2004 à Varsovie, Pologne

### **Procédure pour l'élection de membres cooptés par l'Assemblée Générale\*\*\*\*\***

1. La procédure s'applique à l'élection et à la réélection des membres cooptés par l'Assemblée Générale mentionnés à l'article VI c) des Statuts.
2. Les propositions émanant des membres de l'Assemblée Générale ayant le droit de vote en vue de l'élection des membres cooptés, doivent parvenir au Bureau au moins trois mois avant l'Assemblée Générale au cours de laquelle ces propositions sont prises par elle en considération, en règle générale celle qui se tient pendant le Congrès International de Mécanique Théorique et Appliquée. Toutes ces propositions doivent être traitées confidentiellement par le Bureau.
3. Après avoir pris en compte toutes les propositions ainsi reçues le Bureau présente à l'Assemblée Générale une liste de celles qui sont jugées pouvoir recevoir de la part de l'Assemblée Générale un soutien raisonnable, pourvu cependant que le nombre total des membres cooptés n'excède pas  $1/8$  environ du nombre total des membres ayant le droit de vote. La liste de ces propositions est communiquée à tous les membres de l'Assemblée Générale pendant la première session de la réunion de l'Assemblée au cours de laquelle doit avoir lieu le vote.
4. Une liste de propositions différente de celle présentée par le Bureau n'est recevable que si elle a recueilli le soutien d'au moins dix membres de l'Assemblée Générale avant la seconde session.
5. L'Assemblée Générale vote sur les listes de candidats qui font l'objet des paragraphes 3 et 4.

\*\*\*\*\*)Procédure adoptée par l'Assemblée Générale de l'Union, le 26 Août 1992 à Haïfa, Israël

## **Statutes of the 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 in all branches of theoretical and applied mechanics and related sciences, including analytical, computational and experimental investigations;
- 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;
- d) to engage in other activities meant to promote development of mechanics, both theoretical and applied, as a branch of science.

\* ) Article II adopted by the General Assembly on August 18, 2004, in Warsaw, Poland

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 pursuing its objectives the Union shall observe the basic policy of non-discrimination 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 the following voting members:

- a) representatives of the adhering organizations (Article VIII);
- b) members of the Bureau (Article XI);
- c) members-at-large;

The term of a member-at-large shall be determined by the General Assembly at the time of the election. The term of members of the Bureau shall coincide with their term of service on the Bureau.

The following categories of observers are invited to take part in the General Assembly without voting rights:

- i) representatives of affiliated organizations (Article X);
- ii) Secretary of the Congress Committee (Article XII);
- iii) chairmen of the Symposia Panels;
- iv) chairmen of the Working Parties;
- v) representatives of countries applying for membership;
- vi) representatives of committees and groups of scientists, if so decided by the General Assembly.

\*\*\*) Article VI adopted by the General Assembly on August 18, 2004, in Warsaw, Poland

- 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 Organizations 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 organizations 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 persons who shall have been members of the General Assembly at some time within the four years preceding the time of election to the Bureau. 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 centre 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 fulfil 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.

\*\*\*) Article XI adopted by the General Assembly on September 2, 1990, in Vienna, (Austria)

XII The General Assembly establishes a standing Congress Committee that 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:

Category	Number of Representatives	Units of annual subscription
I	1	1
II	2	3
III	3	5
IV	4	8
V	5	12

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

XV\*\*\*\* Any proposal for alteration of the Statutes either prepared by the Bureau or supported by statements to the General-Secretary signed by at least ten voting members of the General Assembly with voting rights, shall be sent to members of the General Assembly with the Agenda for a meeting of the General Assembly. Such proposals shall be discussed during the first session of that meeting and voted upon during the second session (Article V).

\*\*\*\*) Article XV adopted by the General Assembly on August 28, 1994, in Amsterdam, The Netherlands

### **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 Congresses, 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 (GA) preceding the one at which the new Bureau is to be elected, an Electoral Committee (EC) shall be elected, consisting of the President of IUTAM (who shall act as Chairman of the EC) and two to four members of the GA who are not members of the current Bureau.
2. Following its election, the EC shall invite from those voting members and observers of the GA indicated under a), b), c), i) and ii) in Article VI of the Statutes, within a specified time limit, suggestions for candidates for the Bureau, viz. for the Offices of President (P), Secretary-General (S) and Treasurer (T), and for the four non-Officer positions. All suggestions shall be treated confidentially by the EC.
3. Taking account of all suggestions received, the EC shall submit to the Secretary-General nominations for candidates for election to the Bureau: one name for each of the Officer positions (P, S, T) and one or more names for each of the non-Officer positions (W, X, Y, Z). The EC will make sure that the candidates thus nominated are willing to accept an election. These nominations shall be conveyed by the Secretary-General to the GA in advance of the first session of the meeting of the GA at which the new Bureau is to be elected.
4. At this first session, additional candidates may be proposed by members of the GA for each and any of the positions P, S, T, W, X, Y, Z. No candidate may be proposed for more than one position.
5. Before the second session of the GA at which the new Bureau is to be elected, the proposals under clause 4 above shall be accepted if supported by statements to the Secretary-General each signed by at least ten (voting) members of the GA and by written confirmation that each nominee is willing to accept election; otherwise they shall be considered withdrawn.

6. The GA shall vote separately on the surviving nominations for each of the positions P, S, T, W, X, Y, Z. In any case in which there is more than one candidate for a position, the vote shall be by secret ballot.

\*\*\*\*\*) Procedure adopted by the General Assembly on August 18, 2004, in Warsaw, Poland

**Procedure for electing Members-at-Large of the General Assembly\*\*\*\*\***

1. This procedure shall apply for the election and re-election of the Members-at-Large of the General Assembly provided for in Article VI(c) of the Statutes.
2. Proposals, by members of the General Assembly with voting rights, for Members-at-Large must be received by the Bureau at least three months before the meeting of the General Assembly at which proposals are to be considered, normally during the International Congresses of Theoretical and Applied Mechanics (ICTAM). All proposals will be treated confidentially by the Bureau.
3. Taking into account all material received, the Bureau will present to the General Assembly such proposals as it deems will have at least a reasonable support by the General Assembly, provided however that the total number of Members-at-Large is not to exceed approximately one eighth (1/8) of the total General Assembly membership with voting rights. Such proposals will be circulated to all members of the General Assembly during the first session of meeting of the Assembly at which the proposals are to be voted on.
4. Proposals not identical with those presented by the Bureau are considered to be withdrawn, unless they are sustained and supported by at least ten members of the General Assembly before its second session.
5. The General Assembly will vote on those candidates mentioned in the proposals of paragraphs 3 and 4.

\*\*\*\*\*) Procedure adopted by the General Assembly on August 26, 1992, in Haifa, Israel

## List of Publications

Five categories of IUTAM publications can be distinguished:

**a) Annual Reports**

Since 1948, the Union has published a Report every year with detailed information on its activities. These Annual Reports are preserved at the IUTAM Archive at CISM, Udine, Italy.

The IUTAM Annual Reports over the last five years are available upon request from the IUTAM Secretariat and as pdf file on the IUTAM website <http://www.iutam.net/iutam/Publications/>

**b) Newsletters**

At the meeting of the Bureau of IUTAM held in Warsaw in August 2001 it was agreed that the IUTAM Newsletter should be revived.

A primary purpose of the Newsletter, in conjunction with the IUTAM website, is to provide information concerning future activities of IUTAM, particularly its Symposia and Summer Schools, and concerning the International Congress of Theoretical and Applied Mechanics (ICTAM).

The Newsletter will also serve to keep members of IUTAM informed about any other current developments of concern to IUTAM.

The last IUTAM Newsletter is available from the IUTAM Secretariat. Pdf versions of IUTAM Newsletters are available from the IUTAM website (<http://www.iutam.net/iutam/Publications/index.php/6>).

**c) Proceedings of IUTAM Symposia**

These are only available by ordering directly from the publisher.

**d) Proceedings of the International Congresses on Theoretical and Applied Mechanics (ICTAM)**

These are only available by direct ordering from the publisher.

**e) Publications on the history of IUTAM**

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**Proceedings of IUTAM Symposia**

The Proceedings of IUTAM Symposia published since 1995 are listed below. The names of the editors and of the publisher are given in every case. A complete listing of all published Proceedings can be found at the IUTAM website <http://www.iutam.net> or <http://www.iutam.org> or <http://www.iutam.info>.

**1995**

- 95-1 *IUTAM Symposium on Optimization of Mechanical Systems* (Stuttgart, Germany, 26-31 March 1995).  
The Proceedings of the Symposium, edited by D. Bestle and W. Schiehlen, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1996. ISBN 0-7923-3830-8.
- 95-2 *IUTAM Symposium on Asymptotic Methods for Turbulent Shear Flows at High Reynolds Numbers* (Bochum, Germany, 28-30 June 1995).  
The Proceedings of the Symposium, edited by K. Gersten, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1996. ISBN 0-7923-4138-4.
- 95-3 *IUTAM Symposium on Advances in Nonlinear Stochastic Mechanics* (Trondheim, Norway, 3 - 7 July 1995).  
The Proceedings of the Symposium, edited by A. Naess and S. Krenk, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1996. ISBN 0-7923-4193-7.
- 95-4 *IUTAM Symposium on Nonlinear Instability and Transition in Three-Dimensional Boundary Layers* (Manchester, UK, 17-20 July 1995).  
The Proceedings of the Symposium, edited by P. W. Duck and P. Hall, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1996. ISBN 0-7923-4079-5.
- 95-6 *IUTAM Symposium on Micromechanics of Plasticity and Damage of Multiphase Materials* (Paris, France, 29 August-1 September 1995).  
The Proceedings of the Symposium, edited by A. Pineau and A. Zaoui, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1996. ISBN 0-7923-41388-0.



95-7 *IUTAM Symposium on Nonlinear Analysis of Fracture*  
(Cambridge, UK, 3-7 September 1995).  
The Proceedings of the Symposium, edited by J. Willis, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1997.  
ISBN 0-7923-4378-6.

95-9 *IUTAM Symposium on Combustion in Supersonic Flows*  
(Poitiers, France, 2-6 October 1995).  
The Proceedings of the Symposium, edited by M. Champion and B. Deshaies, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1997. ISBN 0-7923-4313-1.

## 1996

96-1 *IUTAM Symposium on Interaction between Dynamics and Control in Advanced Mechanical Systems*  
(Eindhoven, The Netherlands, 21-26 April 1996).  
The Proceedings of the Symposium, edited by D.H. van Campen have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1997. ISBN 0-7923-4429-4.

96-2 *IUTAM Symposium on Innovative Computational Methods for Fracture and Damage*  
(Dublin, Ireland, 30 June-5 July 1996).  
The Proceedings of the Symposium, edited by P. E. O' Donoghue, M. D. Gilchrist and K. B. Broberg, have been published in the "Computational Mechanics Journal", 19, 447- 552; 20, 3-198, 1997.

96-3 *IUTAM Symposium on Variable Density Low Speed Turbulent Flows*  
(Marseille, France, 7-10 July 1996). Co-sponsored by ICSU.  
The Proceedings of the Symposium, edited by Louis Fulachier, John L. Lumley and Fabien Anselmet, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1997. ISBN 0-7923-4602-5.

96-4 *IUTAM Symposium on Mechanics of Granular and Porous Materials*  
(Cambridge, UK, 15-17 July 1996).  
The Proceedings of the Symposium, edited by N.A. Fleck and A.C.F. Cocks, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1997. ISBN 0-7923-4553-3.

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**1997**

- 97-1 *IUTAM Symposium on Lubricated Transport of Viscous Materials*  
(Tobago, 7-10 January 1997).  
The Proceedings of the Symposium, edited by Harold Ramkissoon, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1997. ISBN 0-7923-4897-4.
- 97-2 *IUTAM Symposium on Transformation Problems in Composite and Active Materials*  
(Cairo, Egypt, 9-12 March 1997).  
The Proceedings of the Symposium, edited by Y.A. Bahei-El-Din and G.J. Dvorak, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1998. ISBN 0-7923-5122-3.
- 97-3 *IUTAM Symposium on Non-Linear Singularities in Deformation and Flow*  
(Haifa, Israel, 17-21 March 1997).  
The Proceedings of the Symposium, edited by D. Durban and J.R.A. Pearson, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1998. ISBN 0-7923-5349-8.
- 97-4 *IUTAM Symposium on Variations of Domains and Free-Boundary Problems in Solid Mechanics*  
(Paris, France, 22-25 April 1997).  
The Proceedings of the Symposium, edited by P. Argoul, M. Frémond and Q.S. Nguyen, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1998. ISBN 0-7923-5450-8.
- 97-5 *IUTAM Symposium on Simulation and Identification of Organized Structures in Flows*  
(Lyngby, Denmark, 25-29 May 1997).  
The Proceedings of the Symposium, edited by J.N. Sørensen, E.J. Hopfinger, and N. Aubry, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1999. ISBN 0-7923-5603-9.
- 97-6 *IUTAM Symposium on Discretization Methods in Structural Mechanics*  
(Vienna, Austria, 1-6 June 1997).  
The Proceedings of the Symposium, edited by H.A. Mang and F.G. Rammerstorfer, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands 1999. ISBN 0-7923-5591-1.

- 97-7 *IUTAM Symposium on Material Instabilities in Solids*  
(Delft, The Netherlands, 9-13 June 1997)  
The Proceedings of the Symposium, edited by R. de Borst en E. van der Giessen, have been published by John Wiley & Sons, Chichester, UK, 1998 . ISBN 0-471-97460-9.
- 97-8 *IUTAM Symposium on Statistical Energy Analysis*  
(Southampton, UK. 8-11 July 1997).  
The Proceedings of the Symposium, edited by F.J. Fahy and W.G Price, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1998, ISBN 0-7923-5457-5.
- 97-9 *IUTAM Symposium on Rheology and Computation*  
(Sydney, Australia, 20-25 July 1997).  
No formal Proceedings of the Symposium have been published. Selected papers have been published in several 1999-volumes of the "Journal of Non-Newtonian Fluid Mechanics", with a footnote attached to each of those papers.
- 97-10 *IUTAM Symposium on New Applications of Nonlinear and Chaotic Dynamics in Mechanics*  
(Ithaca, NY, USA, 27 July-1 August 1997).  
The Proceedings of the Symposium, edited by Francis C. Moon, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1998. ISBN 0-7923-5276-9.
- 97-11 *IUTAM Symposium on Computational Methods for Unbounded Domains*  
(Boulder, USA, 3-7 August 1997).  
The Proceedings of the Symposium, edited by Thomas L. Geers, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1998. ISBN 0-7923-5266-1.
- 97-12 *IUTAM Symposium on Micro- and Macrostructural Aspects of Thermoplasticity*  
(Bochum, Germany, 25-29 August 1997).  
The Proceedings of the Symposium, edited by O.T. Bruhns and E. Stein, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1998. ISBN 0-7923-5265-3.
- 97-13 *IUTAM Symposium on Dynamics of Slender Vortices*  
(Aachen, Germany, 31 August - 3 September 1997).  
The Proceedings of the Symposium, edited by E. Krause and K. Gersten, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1998. ISBN 0-7923-5041-3.

- 97-14 *IUTAM Symposium on Rheology of Bodies with Defects*  
(Beijing, China, 2-6 September 1997).  
The Proceedings of the Symposium, edited by Ren Wang, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1998. ISBN 0-7923-5297-1.
- 1998**
- 98-1 *IUTAM Symposium on Three-Dimensional Aspects of Air-Sea Interaction*  
(Nice, France, 17-21 May 1998)  
The Proceedings of the Symposium, edited by F. Dias and C. Khariff, have been published as a special issue of the "European Journal of Mechanics B / Fluids", Vol. 18, No. 3 (1999)
- 98-2 *IUTAM Symposium on Synthesis in Bio Solid Mechanics*  
(Lyngby, Denmark, 24-27 May 1998).  
The Proceedings of the Symposium, edited by Pauli Pedersen and Martin P. Bendsøe, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1999. ISBN 0-7923-5615-2.
- 98-3 *IUTAM/IUGG Symposium on Developments in Geophysical Turbulence*  
(Boulder, USA, 16-19 June 1998).  
The Proceedings of the Symposium, edited by R.M. Kerr and Y. Kimura, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2000 ISBN 0-7923-6673-5.
- 98-4 *IUTAM Symposium on Viscoelastic Fluid Mechanics*  
(Stanford, USA, 21-25 June 1998).  
A Report on this Symposium by E.S.G. Shaqfeh and a collection of selected papers have been published in the "Journal of Non-Newtonian Fluid Mechanics", Vol. 82 (1999), pp. 127-457.
- 98-5 *IUTAM Symposium on Unilateral Multibody Contacts*  
(Munich, Germany, 3-7 August 1998).  
The Proceedings of the Symposium, edited by F. Pfeiffer and Ch. Glocker, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1999. ISBN 0-7923-6030-3.
- 98-6 *IUTAM/IFTToMM Symposium on Synthesis of Nonlinear Dynamical Systems*  
(Riga, Latvia, 24-28 August 1998).  
The Proceedings of the Symposium, edited by E. Lavendelis and M. Zakrzhevsky, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1999. ISBN 0-7923-6106-7.

- 98-7 *IUTAM Symposium on Advanced Optical Methods and Applications in Solid Mechanics*  
(Poitiers, France, 31 August-4 September 1998).  
The Proceedings of the Symposium, edited by A. Lagarde, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2000. ISBN 0-7923-6604-2.
- 98-8 *IUTAM/IASS Symposium on Deployable Structures: Theory and Applications*  
(Cambridge, UK, 6-9 September 1998).  
The Proceedings of the Symposium, edited by S. Pellegrino and S.D. Guest, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2000. ISBN 0-7923-6516-X.
- 98-9 *IUTAM Symposium on Mechanics of Passive and Active Flow Control*  
(Göttingen, Germany, 7-11 September 1998).  
The Proceedings of the Symposium, edited by G.E.A. Meier and P.R. Viswanath, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 1999. ISBN 0-7923-5928-3.

**1999**

- 99-1 *IUTAM Symposium on Nonlinearity and Stochastic Structural Dynamics*  
(Madras, India, 4-8 January 1999).  
The Proceedings of the Symposium, edited by S. Narayanan and R.N. Iyengar, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2000. ISBN 0-7923-6733-2.
- 99-2 *IUTAM Symposium on Mechanical and Electromagnetic Waves in Structured Media*  
(Sydney, NSW, Australia, 18-22 January 1999).  
The Proceedings of the Symposium, edited by R.C. McPhedran, L.C. Botten and N.A. Nicorovici, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2001. ISBN 0-7923-7038-4.
- 99-3 *IUTAM Symposium on Recent Developments in Nonlinear Oscillations of Mechanical Systems*  
(Hanoi, Vietnam, 2-5 March 1999).  
The Proceedings of the Symposium, edited by N. Van Dao and E.J. Kreuzer, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2000. ISBN 0-7923-6470-8.

- 99-4 *IUTAM/IACM/IABEM Symposium on Advanced Mathematical and Computational Mechanics Aspects of the Boundary Element Method* (Cracow, Poland, 31 May-3 June 1999).  
The Proceedings of the Symposium, edited by T. Burczynski, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2001. ISBN 0-7923-7081-3.
- 99-5 *IUTAM Symposium on Segregation in Granular Flows* (Cape May, New Jersey, USA, 5-10 June 1999).  
The Proceedings of the Symposium, edited by A.D. Rosato and D.L. Blackmore, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2000. ISBN 0-7923-6547-X.
- 99-6 *IUTAM Symposium on Nonlinear Wave Behaviour in Multi Phase Flow* (Notre Dame, Indiana, USA, 7-9 July 1999)  
The Proceedings of the Symposium edited by H.C. Chang, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2000. ISBN 0-7923-6454-6.
- 99-7 *IUTAM Symposium on Theoretical and Numerical Methods in Continuum Mechanics of Porous Materials* (Stuttgart, Germany, 5-10 September 1999).  
The Proceedings of the Symposium, edited by W. Ehlers, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2001. ISBN 0-7923-6766-9.
- 99-8 *IUTAM Symposium on Laminar-Turbulent Transition* (Sedona, Arizona, USA, 12-18 September 1999).  
The Proceedings of the Symposium, edited by H. Fasel and W.S. Saric, have been published by Springer-Verlag, Berlin/Heideberg/New York, 2000. ISBN 3-540-67947-2.
- 99-9 *IUTAM Symposium on Geometry and Statistics of Turbulence* (Hayama, Japan, 1-5 November 1999).  
The Proceedings of the Symposium edited by T. Kambe, T. Nakano and T. Miyauchi, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2001. ISBN 0-7923-6711-1.
- 2000**
- 00-1 *IUTAM Symposium on Creep in Structures* (Nagoa, Japan, 3-7 April 2000).  
The Proceedings of the Symposium, edited by S. Murakami and N. Ohno, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2000. ISBN 0-7923-6737-5.

- 00-2 *IUTAM Symposium on Bluff Body Wakes and Vortex-induced Vibration* (Marseille, France, 13-16 June 2000).  
The Proceedings of the Symposium edited by T. Leweke, P.W. Bearman and C.H.K. Williamson, have been published by Academic Press in the Journal of Fluids and Structures, Special Issue on Bluff Body Wakes and Vortex-Induced Vibrations, London, 2001. ISSN 0889-9746, Vol. 15, nos. 3/4.
- 00-2a *IUTAM Symposium on Scaling Laws in Ice Mechanics and Ice Dynamics* (Fairbanks, Alaska, USA, 13-16 June 2000).  
The Proceedings of the Symposium, edited by J.P. Dempsey and H.H. Shen, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2001. ISBN 1-4020-0171-1.
- 00-3 *IUTAM Symposium on Mechanical Waves for Composite Structures Characterization* (Chania, Crete, Greece, 14-17 June 2000).  
The Proceedings of the Symposium, edited by D.A. Sotiropoulos, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2001. ISBN 0-7923-7164-X.
- 00-4 *IUTAM Symposium on Advances in Mathematical Modelling of Atmosphere and Ocean Dynamics* (Limerick, Ireland, 2-7 July 2000).  
The Proceedings of the Symposium, edited by P.F. Hodnett, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2001. ISBN 0-7923-7075-9.
- 00-5 *IUTAM Symposium on Free Surface Flows* (Birmingham, United Kingdom, 10-14 July 2000).  
The Proceedings of the Symposium, edited by A.C. King and Y.D. Shikhmurzaev, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2001. ISBN 0-7923-7085-6.
- 00-6 *IUTAM Symposium on Diffraction and Scattering in Fluid Mechanics and Elasticity* (Manchester, England, 17-20 July 2000).  
The Proceedings of the Symposium, edited by I.D. Abrahams, P.A. Martin and M.J. Simon, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2002. ISBN 1-4020-0590-3.

- 00-7 *IUTAM Symposium on Field Analyses for Determination of Material Parameters-Experimental and Numerical Aspects* (Kiruna, Sweden, 31 July-4 August 2000).  
The Proceedings of the Symposium, edited by P. Stahle and K.G. Sundin, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2003. ISBN 1-4020-1283-7.
- 00-8 *IUTAM Symposium on Smart Structures and Structronic Systems* (Magdeburg, Germany, 26-29 September 2000).  
The Proceedings of the Symposium, edited by U. Gabbert and H.S. Tzou, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2001. ISBN 0-7923-6968-8.
- 00-9 *IUTAM Symposium on Designing for Quietness* (Bangalore, India, 12-14 December 2000).  
The Proceedings of the Symposium, edited by M.L. Munjal, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2002. ISBN 1-4020-0765-5.
- 2001**
- 01-1 *IUTAM Symposium on Flow in Collapsible Tubes and Past Other Highly Compliant Boundaries* (Warwick, Coventry, March 26-30, 2001).  
The Proceedings of the Symposium, edited by P.W. Carpenter and T.J. Pedley, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2003. ISBN 1-4020-1161-X.
- 01-2 *IUTAM Symposium on Material Instabilities and the Effect of Microstructure* (Austin, Texas, USA, 7-11 May 2001).  
The Proceedings of the Symposium, edited by S. Kyriakides and N. Triantafyllidis, have been published by Elsevier Science Ltd. as a special issue of the International Journal of Solids and Structures, number 39, 2002.
- 01-3 *IUTAM Symposium on Turbulent Mixing and Combustion* (Kingston, Ontario, Canada, 3-6 June 2001).  
The Proceedings of the Symposium, edited by A. Pollard and S. Candel, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2002. ISBN 1-4020-0747-7.



- 01-4 *IUTAM Symposium on Micromechanics of Martensitic Phase Transformation in Solids*  
(Hong Kong, 11-15 June 2001).  
The Proceedings of the Symposium, edited by Q.P. Sun, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2002.  
ISBN 1-4020-0741-8
- 01-5 *IUTAM Symposium on Analytical and Computational Fracture Mechanics of Non-Homogeneous Materials*  
(Cardiff, England, 18-22 June 2001).  
The Proceedings of the Symposium, edited by B.L. Karihaloo, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2002.  
ISBN 1-4020-0510-5
- 01-6 *IUTAM Symposium on Computational Mechanics of Solid Materials at Large Strains*  
(Stuttgart, Germany, 20-24 August 2001).  
The Proceedings of the Symposium, edited by C. Miehe, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2003.  
ISBN 1-4020-1170-9
- 01-7 *IUTAM Symposium on Tubes, Sheets and Singularities In Fluid Dynamics*  
(Zakopane, Poland, 2-7 September 2001).  
The Proceedings of the Symposium, edited by K. Bajaj and H.K. Moffatt, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2002. ISBN 1-4020-0980-1

**2002**

- 02-1 *IUTAM Symposium on Micromechanics of Fluid Suspensions and Solid Composites*  
(Austin, Texas, USA, 3-5 April 2002).  
The Proceedings of the Symposium have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, in a special issue of the Philosophical Transactions: Mathematical, Physical & Engineering Sciences in May 2003
- 02-2 *IUTAM Symposium on Unsteady Separated Flows*  
(Toulouse, France, 8-12 April 2002).  
The Proceedings of the Symposium edited by M. Braza, Ch. Hirsch and F. Hussain, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, in a special issue of Flow, Turbulence and Combustion, Volume 71, Nos 1-4, 2003. ISSN 1386-6184.

- 02-3 *IUTAM Symposium on Dynamics of Advanced Materials and Smart Structures* (Yamagata, Japan, 20-24 May 2002).  
The Proceedings of the Symposium edited by K. Watanabe and F. Ziegler, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2003. ISBN 1-4020-1061-3.
- 02-4 *IUTAM Symposium on Asymptotics, Singularities and Homogenisation in Problems of Mechanics* (Liverpool, UK, 8-11 July 2002).  
The Proceedings of the Symposium edited by A.B. Movchan, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2003. ISBN 1-4020-1780-4.
- 02-5 *IUTAM Symposium on Complementary, \_Dual Variational Principles in Nonlinear Mechanics* (Shanghai, China, 13-16 August 2002).  
The Proceedings of the Symposium edited by David Y. Gao have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, in 2004. ISBN 1-4020-7887-0 (HB) and ISBN 1-4020-7888-9 (E-book)
- 02-6 *IUTAM Symposium on Nonlinear Stochastic Systems* (Urbana-Champaign, Illinois, USA, 25-31 August 2002).  
The Proceedings of the Symposium edited by N. Sri Namachchivaya and Y.K. Lin, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2003. ISBN 1-4020-1471-6.
- 02-7 *IUTAM Symposium Transsonicum IV* (Göttingen, Germany, 02-06 September 2002).  
The Proceedings of the Symposium edited by H. Sobieczky, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2003. ISBN 1-4020-1608-5.
- 02-8 *IUTAM Symposium on Reynolds Number Scaling in Turbulent Flow* (Princeton, N.J. USA, 11-13 September 2002).  
The Proceedings of the Symposium edited by A.J. Smits, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2003. ISBN 1-4020-1775-8.
- 02-9 *IUTAM Symposium on Evolutionary Methods in Mechanics* (Cracow, Poland, 24-27 September 2002).  
The Proceedings of the Symposium edited by Tadeusz Burczynski and Andrzej Osyczka have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, in 2004. ISBN 1-4020-2266-2 (HB) and ISBN 1-4020-2267-0 (E-book)

- 02-10 *IUTAM Symposium on Multiscale Modeling and Characterization of Elastic-Inelastic Behavior of Engineering Materials*  
(Marrakech, Morocco, 20-25 October 2002).  
The Proceedings of the Symposium edited by S. Ahzi, M. Charkaoui, M.A. Khaleel, H.M. Zbib, M.A. Zikry, and B. LaMatina, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2003.  
ISBN 1-4020-1861-4.
- 2003**
- 03-1 *IUTAM Symposium on Mechanics of Physicochemical and Electromechanical Interactions in Porous Media*  
(Kerkrade, The Netherlands 18-23 May 2003).  
The Proceedings of the Symposium edited by J.M. Huyghe, P.A.C. Raats and S.C. Cowin, have been published by Springer, Dordrecht, The Netherlands in 2006.  
ISBN: 978-1-4020-3864-8
- 03-2 *IUTAM Symposium on Integrated Modeling of Fully Coupled Fluid-Structure Interactions*  
(Rutgers, N.J. USA 02-06 June 2003).  
The Proceedings of the Symposium edited by Haym Benaroya and Thomothy Wei, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2003. ISBN 1-4020-1806-1.
- 03-3 *IUTAM Symposium on Chaotic Dynamics and Control of Systems and Processes in Mechanics*  
(Rome, Italy, 08-13 June 2003).  
The Proceedings of the Symposium edited by G. Rega and F. Vestroni have been published by Springer, Dordrecht, The Netherlands in 2005.  
ISBN 1-4020-3267-6 (HB) and ISBN 1-4020-3268-4 (E-book)
- 03-4 *IUTAM Symposium on Mesoscopic Dynamics of Fracture Process and Materials Strength*  
(Osaka, Japan, 06-11 July 2003).  
The Proceedings of the Symposium edited by H. Kitagawa and Y. Shibutani, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2004. ISBN 1-4020-2037-6 (HB) and ISBN 1-4020-2111-9 (e-book).

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**2004**

- 04-1 *IUTAM Symposium on Size Effects on Material and Structural Behavior at Micron- and Nano-Scales*  
(Hong Kong, China, 30 May-4 June, 2004)  
The Proceedings of the Symposium edited by Q.P. Sun and P. Tong, have been published by Springer, Dordrecht, The Netherlands in 2006.  
ISBN 1-4020-4945-5
- 04-3 *IUTAM Symposium on Non-Uniqueness of Solutions to the Navier-Stokes equations and their Connection with Laminar-Turbulent Transition*  
(Manchester, UK, 9-11 August, 2004)  
The Proceedings of the Symposium edited by T. Mullin and R.R. Kerswell, have been published by Springer, Dordrecht, The Netherlands in 2005.  
ISBN 1-4020-4048-2
- 04-4 *IUTAM Symposium on One Hundred Years of Boundary Layer Research*  
(Göttingen, Germany, 12-14 August, 2004)  
The Proceedings of the Symposium edited by G.E.A. Meier, K.R. Sreenivasan et.al, have been published by Springer, Dordrecht, The Netherlands in 2006.  
ISBN 1-4020-4149-7
- 04-5 *IUTAM Symposium on Elastohydrodynamics and Microelastohydrodynamics*  
(Cardiff, UK, 1-3 September, 2004)  
The Proceedings of the Symposium edited by R.W. Snidle and H.P. Evans, have been published by Springer, Dordrecht, The Netherlands in 2006.  
ISBN 1-4020-4532-8
- 04-6 *IUTAM Symposium on Mechanics and Reliability of Actuating Materials*  
(Beijing, China, 1-3 September, 2004)  
The Proceedings of the Symposium edited by W. Yang, have been published by Springer, Dordrecht, The Netherlands in 2005. ISBN 1-4020-4130-6
- 04-7 *IUTAM Symposium on Computational Approaches to Multiphase Flow*  
(Argonne, Illinois, USA, 4-7 October, 2004)  
The Proceedings of the Symposium edited by S. Balachandar and A. Prosperetti, have been published by Springer, Dordrecht, The Netherlands in 2006.  
ISBN 1-4020-4976-5
- 04-8 *IUTAM Symposium on Elementary Vortices and Coherent Structures: Significance in Turbulence Dynamics*  
(Kyoto, Japan, 26-28 October, 2004)  
The Proceedings of the Symposium edited by Kida, Shigea, have been published by Springer, Dordrecht, The Netherlands in 2006.  
ISBN 1-4020-4180-2

- 04-9 *IUTAM Symposium on Laminar-Turbulent Transition*  
(Bangalore, India, 13-17 December, 2004)  
The Proceedings of the Symposium edited by Govindarajan, Rama, have been published by Springer, Dordrecht, The Netherlands in 2006.  
ISBN 1-4020-3459-8
- 2005**
- 05-1 *IUTAM Symposium on Multiscale Modelling of Damage and Fracture Processes in Composite Materials*  
(Kazimierz Dolny, Poland 23-27 May, 2005).  
The Proceedings of the Symposium edited by T. Sadowski, have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2006.  
ISBN 978-1-4020-4565-3.
- 05-2 *IUTAM Symposium on IUTAM Symposium on Mechanical Behavior and Micro-mechanics of Nanostructured Materials*  
(Beijing, China 27-30 June 2005).  
The Proceedings of the Symposium edited by Y.L. Bai, Q.S. Zheng and Y.G. Wei have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2007. ISBN 978-1-4020-5623-9.
- 05-3 *IUTAM Symposium on Impact Biomechanics: From Fundamental Insights to Applications*  
(Dublin, Ireland 11-15 July, 2005).  
The Proceedings of the Symposium edited by M.D. Gilchrist, have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2005.  
ISBN 978-1-4020-3795-5.
- 05-4 *IUTAM Symposium on Vibration Control of Nonlinear Mechanisms and Structures*  
(Munich, Germany 18-22 July, 2005).  
The Proceedings of the Symposium edited by H. Ulbrich and W. Günthner, have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2005. ISBN 978-1-4020-4160-0.
- 05-5 *IUTAM Symposium on Topological Design Optimization of Structures, Machines and Materials - Status and Perspectives*  
(Aalborg and Lyngby, Denmark, 26-29 October, 2005).  
The Proceedings of the Symposium edited by M.P. Bendsøe, N. Olhoff and O. Sigmund, have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2006. ISBN 978-1-4020-4729-9.

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**2006**

- 06-1 *IUTAM Symposium on Multiscale Problems in Multibody System Contacts* (Stuttgart, Germany, February 20-23, 2006).  
The Proceedings of the Symposium edited by Peter Eberhard, have been published by Springer Academic Publishers, Dordrecht, The Netherlands, 2006. ISBN 978-1-4020-5980-3
- 06-3 *IUTAM Symposium on Plasticity at the Micron Scale* (Lyngby, Denmark, May 21 - May 25, 2006).  
The Proceedings of the Symposium edited by V. Tvergaard, have been published by IOP Publishing, in a special issue of Modelling and Simulation in Materials Science and Engineering, Volume 15, number 1, 2007, ISSN 0965-0393.

**Proceedings of the International Congresses on Theoretical and Applied Mechanics (ICTAM)**

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 the organization was separately entrusted to a local Organizing Committee who also undertook the publication of the Proceedings. Consequently, there is no central point from which Proceedings may 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.

*1st Congress*, Delft (Netherlands), 22-26 April 1924.

Proceedings of the First International Congress for Applied Mechanics, Delft 1924, edited by C.B. Biezeno and J.M. Burgers (one vol.). Technische Boekhandel en Drukkerij J. Waltman Jr. Delft, 1925. No more copies are available for sale at Delft.

*2nd Congress*, Zürich (Switzerland), 12-17 September 1926.

Verhandlungen - Comptes rendus - Proceedings of the 2nd International Congress for Applied Mechanics, Zürich, 12-17 September 1926, herausgegeben von E. Meissner (one vol.). Orell Füssli Verlag, Zürich und Leipzig, 1927.

*3rd Congress*, Stockholm (Sweden), 24-29 August 1930.

Verhandlungen - Comptes rendus - Proceedings of the 3rd International Congress for Applied Mechanics, herausgegeben von A.C.W. Oseen und W. Weibull (3 vol.). AB. Sveriges Litografiska Tryckerier, Stockholm, 1931.

*4th Congress*, Cambridge (UK), 3-9 July 1934.

Proceedings of the Fourth International Congress for Applied Mechanics, Cambridge, UK, 3-9 July, 1934 (one vol.). University Press, Cambridge (UK), 1935.

*5th Congress*, Cambridge (Massachusetts, USA), 12-16 September 1938.

Proceedings of the Fifth International Congress for Applied Mechanics, held at Harvard University and the Massachusetts Institute of Technology, Cambridge, Massachusetts, September 12-16, 1938, edited by J.P. den Hartog and H. Peters (one vol.), John Wiley and Sons, Inc. New York (USA), and Chapman and Hall Ltd. London (UK), 1939.

*6th Congress*, Paris (France), 22-29 September 1946.

Proceedings not published (was given in the hands of Gauthier-Villars, Paris).

*7th Congress*, London (UK), 5-11 September 1948.

Proceedings of the Seventh International Congress for Applied Mechanics, 1948, published by the Organizing Committee (Introduction, Vol. I, Vol. II - Parts 1 and 2, Vol. III, Vol. IV).

*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.

*9th Congress*, Brussels (Belgium), 5-13 September 1956.

Proceedings published by the Organizing Committee (Vol. I to Vol. VIII). Free University of Brussels, 50, avenue Franklin-Roosevelt, Brussels (Belgium), 1957.

*10th Congress*, Stresa (Italy), 31 August-7 September 1960.

Proceedings published by the Consiglio Nazionale delle Ricerche, Piazzelle delle Scienze 7, Roma (Italia), printed by Elsevier Publishing Company, Amsterdam-New York, 1962.

*11th International Congress on Theoretical and Applied Mechanics (ICTAM)*, Munich (Germany), 30 August-5 September 1964.

The Proceedings, edited by H. Görtler, have been published by Springer-Verlag, Heidelberger Platz 3, Berlin (Germany), 1966.

*12th International Congress on Theoretical and Applied Mechanics (ICTAM)*, 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.

*13th International Congress on Theoretical and Applied Mechanics (ICTAM)*, Moscow (USSR), 21-26 August 1972.

The Proceedings, edited by E. Becker and G.K. Mikhailov, have been published by Springer-Verlag, Berlin (Germany), 1973.

*14th International Congress on Theoretical and Applied Mechanics (ICTAM)*, Delft (Netherlands), 30 August-4 September 1976.

The Proceedings, edited by W.T. Koiter, have been published by North-Holland Publishing Company, Amsterdam-New York-Oxford, 1976, 1977.

*15th International Congress on Theoretical and Applied Mechanics (ICTAM)*, Toronto (Canada), 17-23 August 1980

The Proceedings, edited by F.P.J. Rimrott and B. Tabarrok, have been published by North-Holland Publishing Company, Amsterdam-New York-Oxford 1980.



*16th International Congress on Theoretical and Applied Mechanics (ICTAM)*,  
Lyngby (Denmark), 19-25 August 1984.

The Proceedings, edited by F.I. Niordson and N. Olhoff, have been published by Elsevier Science Publishers (North-Holland), Amsterdam, 1985.

*17th International Congress on Theoretical and Applied Mechanics (ICTAM)*,  
Grenoble (France), 21-27 August 1988.

The Proceedings, edited by P. Germain, M. Piau and D. Caillerie, have been published by North-Holland, Elsevier Science Publishers, Amsterdam, 1989. ISBN 0-444-87302-3.

*18th International Congress on Theoretical and Applied Mechanics (ICTAM)*,  
Haifa (Israel), 22-28 August 1992.

The Proceedings, edited by S.R. Bodner, J. Singer, A. Solan and Z. Hashin, have been published by Elsevier Science Publishers, Amsterdam, 1993.  
ISBN 0-444-88889-6.

*19th International Congress on Theoretical and Applied Mechanics (ICTAM)*,  
Kyoto (Japan), 25-31 August 1996.

The Proceedings, edited by T. Tatsumi, E. Watanabe, T. Kambe, have been published by Elsevier Science Publishers, Amsterdam, 1997.  
ISBN 0-444-82446-4.

*20th International Congress on Theoretical and Applied Mechanics (ICTAM)*,  
Chicago (USA), 27 August-2 September 2000.

The Proceedings, entitled "Mechanics for a new Millenium and edited by H.Aref and J.W.Phillips, have been published by Kluwer Academic Publishers, Dordrecht, The Netherlands, 2001. ISBN 0-7923-7156-9.

*21th International Congress on Theoretical and Applied Mechanics (ICTAM)*,  
Warsaw (Poland), 15-21 August 2004.

The Proceedings, entitled "Mechanics of the 21st Century" and edited by W. Gutkowski and T.A. Kowaleski, have been published by Springer, Dordrecht, The Netherlands, 2005. ISBN 1-4020-3456-3.

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**Publications on the history of IUTAM***IUTAM - A Short History,*

edited by S. Juhasz, has been published by Springer-Verlag, Berlin, Germany, 1988. ISBN 3-540-50043-X.

The short history is dedicated to the memory of Professor Theodore von Karman who had an essential role in the formation of IUTAM. Contributions by S. Juhasz, Sir James Lighthill, G. Battimelli, J. Hult, N.J. Hoff, D.C. Drucker and F.I. Niordson are included in the book.

*Mechanics at the Turn of the Century,*

edited by W. Schiehlen and L. van Wijngaarden, has been published by Shaker Verlag, Aachen, Germany, 2000. ISBN 3-8265-7714-0.

This Report is the result of an initiative of the Bureau of IUTAM to provide some landmarks on the developments in Mechanics during the 20th Century, to report on the 50 years of impulse to Mechanics by the International Union of Theoretical and Applied Mechanics (IUTAM), to visualize by a poster Meters of Motion on the occasion of the 20th International Congress of Theoretical and Applied Mechanics (ICTAM), to look ahead on a very personal basis and to show the broad international involvement of scientists in IUTAM in recent years.

The booklet “Mechanics at the Turn of the Century” is accessible free of charge on the website of Shaker Verlag. The internet address is [www.shaker.de](http://www.shaker.de) and search for Schiehlen as the author. Moreover, this booklet is available upon request at the IUTAM Secretariat

**Please note again:**

The publications listed above, with the exception of the Annual Reports over the last five years and the booklet “Mechanics at the Turn of the Century”, are not available at the IUTAM Secretariat. Please order directly from the publisher.

Details of all IUTAM publications may be found at

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